Older adults spend more time engaged in sedentary behavior (SB) than any other segment of the population. Interrupting sedentary time with short bouts of walking improves 24-hour glycemic control compared to uninterrupted sitting. However, it is not known if short-walking bouts are as beneficial to 24-hour glycemia as a single bout of continuous exercise. **Purpose:** To compare the effectiveness of multiple, short intermittent walking bouts and one, calorically equivalent continuous bout of walking on 24-hour glycemia in older adults. **Methods:** Healthy, overweight/obese older adults (N=18, 67 ± 5 yrs, BMI = 32.2 ± 4.3 kg/m²) completed two, 24-hour conditions in a whole room indirect calorimeter; 1) Intermittent walking (IW): 1.5 min of moderate intensity treadmill walking (36 min total) every 30 min (82 calories/min), 2) continuous walking (CW): 36 min continuous, moderate intensity treadmill walking performed in the morning (~8AM). Outside of the prescribed walking times, subjects remained in SB for the remainder of the waking day. Continuous glucose monitoring was used to measure intragalactose glucose concentrations every 5 minutes. Energy and macronutrient intake was standardized between conditions. **Results:** 24-hour energy expenditure (2257 ± 329 vs. 2165 ± 302 kcal, mean ± SD) and RQ (0.84 ± 0.03 vs. 0.84 ± 0.03) were similar during IW and CW, respectively. Peak postprandial glucose following dinner was lower (p=0.05) during IW (120.4 ± 10.7 mg/dl) compared to CW (135 ± 15.3 mg/dl). No differences were observed in any other 24 hour glycemia variables, including 24 hour area under the glucose curve (IW = 154862 ± 12724 mg/dl, CW = 158096 ± 15156 mg/dl), glycemic variability (standard deviation of 24 hour glucose concentrations) (IW = 12.2 ± 4.4 mg/dl, CW = 12.2 ± 4.2 mg/dl), and peak postprandial glucose concentrations following breakfast (IW = 1440 ± 22.7 mg/dl, CW = 144.8 ± 27.2 mg/dl) and lunch (IW = 1379 ± 17.1 mg/dl, CW = 1392 ± 17.8 mg/dl). **Conclusion:** These results suggest PWV (talking or listening while sitting) and mentally-active sedentary behaviors as CW on 24-hour glycemia, although the postprandial glucose response to meals consumed later in the day may be lower with IW. IW may improve cardiometabolic health in older adults.

**Purpose:** Social participation provides health benefits for older adults, but it is not known whether social participation is associated with their being more physically active or less sedentary. We examined these associations in a population-based sample of older Japanese adults. **Methods:** A mail survey conducted in 2010 and gathered data from 1146 community-dwelling, non-working older adults (mean age: 70.1 years, 43% men) on social participation, physical activity, sedentary time and socio-demographic characteristics. Median splits were used to categorize social participation, physical activity and sedentary behavior as either “higher” or “lower”. Multivariate logistic regression analyses were used to calculate odds ratios (ORs) for the associations of higher versus lower social participation with being physically active and having higher sedentary time. Similar analyses were conducted after classifying sedentary behaviors into two distinct types: passive sedentary behaviors (consisting of “television viewing”, “sitting around”, and “listening or talking while sitting”) and mentally-active sedentary behaviors (consisting of “computer use” and “reading books or newspapers”). **Results:** Those with higher social participation had a significantly greater odds of higher physically active (OR=2.10, [95% confidence interval (CI): 1.44-3.06] among men; OR=1.93, [1.39-2.68] among women); and, a significantly lower odds of being physically active among men (OR=0.62, [0.42-0.90]), but not among women (OR=0.80, [0.58-1.11]). Those with higher social participation had significantly lower passive sedentary time (OR=0.55, [0.38-0.81] for men; OR=0.72 [0.51-0.99] for women), but this was not the case for mentally-active sedentary time (OR=1.36, [0.91-2.02] for men; OR=1.17 [0.83-1.63] for women). **Conclusions:** Promoting social participation among older adults may be effective for increasing their physical activity and reducing sedentary time.
after the 6-month study period, and Pearson correlation analysis was used to identify correlations between the stair climbing steps and leg strength. Results: Forty-nine participants (34 women and 15 men) completed the study. At the baseline, the participants recorded an average of 120 stair steps per day, which was approximately 2% of their daily total walking steps. After the 6-month study period, the mean walking steps (6,607 ± 2,325 steps vs. 7,556 ± 2,715 steps) and stair steps (119 ± 90 steps vs. 166 ± 123 steps) increased significantly (p < 0.01). There were no significant changes in leg muscle strength (Pre-test vs. Post-test: Adductor, 0.35 ± 0.11 vs. 0.35 ± 0.10 kg; Abductor 0.41 ± 0.11 vs. 0.44 ± 0.10 kg/kg). However, men in the correlation coefficient between the stair steps and abductor muscle strength was observed (Pre-test: r = 0.428, p = 0.04; Post-test: r = 0.556, p = 0.03). Conclusions: Stair-use campaigns increased routine daily stair use (about 50 steps) in older adults. This did not significantly change leg muscle strength, however, men in the relationship between the stair steps and abductor muscle strength was observed. In a future study, cross-sectional evaluations of stair steps and leg muscle strength will be examined.

Results: Twenty-three participants in the body exercise group and twenty-two participants in the Tai Chi group completed the study. The body exercise intervention did not change any gait measures. However, the Tai Chi intervention significantly improved single-task stride time (from 1.20 ± 0.11 s to 1.16 ± 0.10 s, p < 0.05) and swing time (from 31.77 ± 3.20 % to 32.23 ± 2.82 %, p < 0.05), and decreased dual-task gait asymmetry (from 5.40 ± 3.92 % to 2.87 ± 3.07 %, p < 0.05). Also, comparing the 2 interventions, participants in the Tai Chi group versus the body exercise group showed increased dual-task gait asymmetry from baseline to the post-intervention assessment (body exercise: 0.33 ± 0.35 vs. Tai Chi: -2.53 ± 4.41, p < 0.05). Conclusion: Tai Chi improved several single-task and dual-task gait measures in older adults with multisite risk and risk for falls. A larger study is required to examine the effectiveness of Tai Chi on mobility and fall risk in older adults with multisite pain. (Supported by NIH Grant R21 AG043883)

Chronic pain is associated with impaired mobility and risk of falls in older adults. Methods: Fifty-four community-dwelling older adults (≥65 years) with multisite pain who reported falling in the previous year or using an assistive device were randomized to gentle body exercise or mind-body exercise (Tai Chi), each offered twice weekly for 12 weeks. Assessments were performed at baseline and within 2 weeks after completing the intervention. Mobility was measured in 2 conditions: single-task walking and dual-task walking with a cognitive attentional challenge, using a 16-foot sensorized gait mat. Paired t-tests were used to assess changes within each group, and student t-tests were used to assess differences between groups. Results: Twenty-three participants in the body exercise group and twenty-two participants in the Tai Chi group completed the study.

CONCLUSIONS: Participants in the walking exercise group showed significant improvement in CES-D scores (11.0 ± 4.1 points vs. 9.7 ± 4.8 points, p < 0.001), MCS scores (54.5 ± 9.1 vs. 56.8 ± 8.6, p = 0.005), and RCS scores (49.4 ± 9.4 vs. 52.8 ± 9.0, p < 0.001) compared to the baseline values. Overall, the average step counts per day of the walking exercise group participants significantly increased, compared to the baseline values (7747 ± 1782 steps / day vs. 8736 ± 2701 steps / day, p < 0.001). Conclusions: Twelve months of walking exercise may be effective for improving CES-D, MCS, and RCS scores in older adults.
Participants spent 56 ± 11% (9.0 ± 1.9 hr) of the waking day sedentary and 12.5 ± 3.0% (2.0 ± 0.5 hr) walking. Partial correlations from stepwise regression showed that sedentary time was positively related to muscle activation during walking (r = 0.56, p = 0.011), but not to ventilation (r = 0.23, p = 0.346) or heart rate (r = 0.03, p = 0.915). In contrast, walking time was inversely related to minute ventilation (r = -0.57, p = 0.008), but was not related to muscle activation (r = -0.04, p = 0.881) or heart rate (r = 0.14, p = 0.569). CONCLUSIONS: Physical activity and sedentary behavior are independent disease risk factors and this study’s results indicate that different aspects of physical function may contribute to their variability in older adults. Time spent sedentary was related to the degree of neuromuscular demand during walking suggesting that older adults who have high muscle activation during ambulation are more likely to engage in sedentary behavior. Time spent walking was inversely related to pulmonary demand suggesting that those who walk with a high ventilatory rate are less likely to engage in walking activity.

A-21 Thematic Poster - Children and Adolescents

Wednesday, May 31, 2017, 9:30 AM - 11:30 AM
Room: 304

Chair: Karin A. Pfeiffer, FACSM. Michigan State University, East Lansing, MI.

89 Board #1
May 31 9:30 AM - 11:30 AM
Fitness and Body Composition Outcomes in Adolescent Athletes Consuming Chocolate Milk or Gatorade Post-Exercise
Philip Cheshire, Katelyn Born, Erin Dooley, John Bartholomew, FACSM. University of Texas at Austin, Austin, TX. (Sponsor: John Bartholomew, FACSM)
Email: andyc6@utexas.edu

Purpose. This study examined fitness and body composition outcomes for adolescents consuming chocolate milk (CM) or a carbohydrate/electrolyte (CHO) drink throughout a school-sponsored summer strength and conditioning program. Methods. Participants were 100 high school athletes (M age = 15.1, SD = 1.3; 78% male; 46% Afr. Amer.). Measures included a bench press (BP), squat, power clean, bodyweight, and hand-held BIA body fat assessment. BP and squat were averaged for both CM and CHO groups across 4 days of training. Participants completed 4 days/week of strength and conditioning training for 4 weeks. The workouts consisted of a 1-hour free weight resistance training session followed by 1-hour of on-field agility drills and conditioning sprints. Participants were randomly assigned to receive either CM (16 oz, 300 Cal, 5g fat, 360 mg Na, 630 mg K) or CHO (28 oz, 0 g fat, 320 mg Na, 44 g carbs, 16 g protein) or CHO (28 oz, 0 g fat, 320 mg Na, 44 g carbs, 16 g protein) immediately post-exercise. Results. A 2-way repeated measures ANOVA showed no bodyweight changes from pre- to post-test (p = 0.371, d = 0.6). Additionally, there was not a significant change in body fat percentage (p = 0.89, d = 0.03). No interactions were present for body condition by weight (p = 0.49, n = 0.005) or body fat (p = 0.43, n = 0.006). Both groups showed an improvement in power clean (p < 0.001, d = 0.22) across time with no interactions. However, the CSS showed a significant condition by time interaction (p = 0.044, n = 0.08) wherein the CHO group did not significantly increase VO2 at the higher VO2 levels compared with the CM group (0.0395±0.006) compared with the older boys (0.0316±0.008, p=0.017).

CONCLUSION: This study is the first study comparing the impact of CM and CHO on athletic outcomes in an adolescent population in a field-based environment. The use of CM appears to have provided a moderate benefit for increases in strength. This study replicates the findings of laboratory studies, and extends them by showing a benefit in adolescent athletes in a naturalistic setting. Future research will benefit from longer study durations with larger numbers of participants.

90 Board #2
May 31 9:30 AM - 11:30 AM
A Novel Approach To Calculate Work Rate On A Treadmill (TM) In Early-and Late-pubertal Children
Ronen Bar-Yoseph1, Janos Porszasz2, Shlomit Radom-Aizik1, Pearl Law1, Dan M. Cooper1. UCI, Irvine, CA. ‘Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Torrance, CA.
Email: rbyosey@uci.edu

(No relationships reported)

Childhood obesity and children who survive previously fatal diseases and conditions highlight the need for rigorous measures of fitness in children and across the lifespan. Cardiopulmonary exercise testing (CPET) data in children must be scaled to the magnitude of the metabolic perturbation. In CPET using cycle ergometry (CE), the external work (WR) is readily determined. With TM testing WR is hard to estimate from its key elements of speed, incline, and body mass (S, I, M) given the complexity of the mechanics of energy cost as S and I change. PURPOSE: To estimate WR associated with TM exercise (S,I,M) in early and late pubertal boys.

METHODS: Our strategy involved: 1) Using CE to establish the regression coefficient (a) and intercept (b) from the linear equation VO2=aWR+b; 2) assuming the same relationship we estimated work rate (WR)’ from the VO2 measured on TM using S, I, M (Fig A) and S’, I, M (Fig B); 3) analyzed the regression parameters from the function WR’=aS’I’M’b in 10 early pubertal (mean age 9.8 y/o, Tanner stage 1-2) and 10 late pubertal boys (15.8 y/o, Tanner stage 4-5), performed CPET on CE and TM. RESULTS: WR’ was moderately and non-linearly correlated with S’ I M (mean r=0.61, Fig A). However mean r=0.96 and linear relationship was found with WR’=aS’I’M’b, (Fig B). Further, the slope (a) was significantly higher in the younger (0.0395±0.006) compared with the older boys (0.0316±0.008, p=0.017).

CONCLUSION: This approach enables CPET data interoperability between TM and CE. WR’ seems to be a square function of S, making it a linear function of kinetic energy (MS2). CPET slopes (e.g., ∆VO2/∆WR or ∆HR/∆WR) can be calculated and provide useful insights into disease mechanisms and progression in children and adults, when maximal efforts are questionable. The methodological differences between WR’ and SIM suggest a biological difference in the efficiency of muscular work as children grow and develop.

Supported by NIH P01HD-048721 & PERC System Biology Fund

91 Board #3
May 31 9:30 AM - 11:30 AM
Effectiveness of the Scaling Method in Normalizing Strength Measurement of U.S. Children And Youth
Hai Yan, Weimo Zhu, FACSM. University of Illinois at Urbana Champaign, Urbana, IL. (Sponsor: Weimo Zhu, FACSM)
Email: haiyan2@illinois.edu

(No relationships reported)

PURPOSE: Studies have shown that body size may affect athletes’ performance in fitness tests. Thus, individuals with larger body mass (BM) often exhibit a greater amount of muscle tissue and perform well on certain fitness tests when the load is “absolute” (i.e., the load, e.g., a 10 kg dumbbell, keeps the same across the test takers). To account for this effect, it is common practice to normalize athlete performance by simply dividing the outcome variable by BM. Yet, the effectiveness of this approach has not been well studied in children and youth. Using the data from the 2012 NHANES National Youth Fitness Survey (NNYFS), this study was to explore and evaluate possible scaling methods to eliminate the effect of body mass on children’s performance in fitness tests, especially strength tests.

METHODS: 1640 participants (50.2% male; aged 3-15 yr) took part in the physical fitness tests. Lower body muscle strength (LBMS) was derived from knee extension tests and hand grip strength (HGS) was determined by the handgrip dynamometer. Five different scaling methods (dividing the outcome variable by BM, BM², BM³, standard error of the mean (SEM), and natural logarithm (ln) of BM) were applied and the correlations between test results and BM (kg) before and after scaling were examined in each method.

RESULTS: Results from the correlation analysis showed that BMI is highly correlated with strength measures in both boys (LBMS: .702, HGS: .793) and girls (LBMS: .666, HGS: .794).
CONCLUSION: The effect of body size on measurement of LBMS and HGS could be adjusted by simply dividing by BM and the effect was more significant in boys.

Maturation-based superiority in adolescent sport performance has been well documented. Because the timing of maturational events differs among ethnic or geographically-disparate populations, we hypothesized that interpopulation variations in physical growth patterns may be related to differences in athletic performance. PURPOSE: To determine the relationship between height growth and swim performance progression for two geographically disparate populations (Japanese, JPN; and the U.S., US) and the extent to which interpopulation variations in height growth are related to respective swim performance progressions. METHODS: Growth reference data were acquired for JPN (MEXT, 2000) and US (Kuczynski et al., 2002). All performance times (sec) in 50-meter locomotor (50Fr) for JPN (N = 46900) and US (N = 60739) in 2008 were compiled from each swimming federation’s database. For each age within each sex, a t-test was performed to compare 50Fr between JPN and US. Pearson correlation coefficient from each swimming federation's database. For each age within each sex, a t-test was performed to compare 50Fr between JPN and US. Pearson correlation coefficient was used to evaluate 1) the strength of the relationship between age-related median height growth and median 50Fr for each sex within each country and 2) the extent to which interpopulation variations in age-related height growth (expressed as JPN to US ratio) are related to those in age-related 50Fr progression for each sex. RESULTS: As compared with the respective US cohort, age-related peak height gains occur approximately two years earlier for JPN (10 vs 12 yr in girls; 12 vs. 14 yr in boys). The 50Fr was faster for JPN girls aged 7 to 11 yr and JPN boys aged 7 to 9 yr (p < 0.001), not different for girls at 12 yr and boys at 10 and 11 yr, and slower at 13 yr and older for JPN girls and 12 and older for JPN boys (p > 0.001). Median height was correlated with median 50Fr during adolescent ages for US girls and boys (r(12) = -0.97, p < 0.001), JPN girls and boys (r(9) = -0.97, p < 0.001). The JPN to US ratio in height growth was also correlated with that in 50Fr progression in girls (r(9) = 0.71, p < 0.015), but not in boys (r(9) = 0.49, p < 0.12). CONCLUSIONS: Maturation-related superiority in swim performance is not only observable within a population but also between populations. Interpopulation variations in the timing of maturational events (as measured by age-related peak height gain) partially explain differences in adolescent athletic performance.

During adolescence, sedentary time tends to increase while physical activity (PA) declines. Self-report measures of adolescents’ activities are often prone to recall bias and are limited by their inability to detect simultaneous activities. Real-time measurements (Experienced Sampling Method, ESM) may address these limitations.

### Table: Scaling Method | LBMS (pounds) | HGS (kg)
---|---|---
Boy | None | 702 | .793
| BM | -.044 | -.171
| BM<sup>2</sup> | -.658 | -.823
| BM<sup>3</sup> | -.763 | -.776
| ln(BM) | .444 | .530
| ln(BM) | .596 | .695
Girl | None | 666 | .790
| BM | -.173 | -.412
| BM<sup>2</sup> | -.698 | -.834
| BM<sup>3</sup> | -.716 | -.778
| ln(BM) | .348 | .417
| ln(BM) | .529 | .653
Overall | None | 687 | .780
| BM | -.102 | -.258
| BM<sup>2</sup> | -.676 | -.824
| BM<sup>3</sup> | -.693 | -.774
| ln(BM) | .406 | .483
| ln(BM) | .569 | .669

### Board #4
May 31 9:30 AM - 11:30 AM
Interpopulation Variations in Height Growth: a Potential Explanation for Differences in Adolescent Swim Performance
Kosuke Kojima<sup>1</sup>, Paul L. Jamison<sup>2</sup>, Christopher L. Brammer<sup>2</sup>, Joel M. Stager, FACSM<sup>1</sup>, I. Counsilmans Center for the Science of Swimming, Indiana University, Bloomington, IN; 2Indiana University, Bloomington, IN. (Sponsor: Joel Stager, FACSM)
Email: kokojima@indiana.edu

### Board #5
May 31 9:30 AM - 11:30 AM
Activity Profile of Pokemon GO in College Students
Charles Fontainette, Emily Springer, Jasmine Sward. University of Minnesota Duluth, Duluth, MN. (Sponsor: John R. Keener, FACSM)
Email: cfountai@d.umn.edu

### Board #6
May 31 9:30 AM - 11:30 AM
Associations Among Perceived Motor Competence, Motor Competence, Physical Activity, And Health-related Physical Fitness Of Children Ages 10-15 Years Old.
Emily M. Post<sup>1</sup>, Dawn P. Coo, FACSM<sup>2</sup>, Eugene C. Fitzhugh<sup>2</sup>, Jeffrey T. Fairbrother<sup>2</sup>, R. The Ohio State University, Columbus, OH; 2The University of Tennessee, knoxville, TN. (Sponsor: Dr. William Kraemer, FACSM)

### Board #7
May 31 9:30 AM - 11:30 AM
Tracking Physical Activity and Sedentary Behavior in Adolescents using a Mobile Application
Todd Buckingham, Karin Pfeiffer, FACSM. Michigan State University, East Lansing, MI. Email: buckin21@msu.edu

### Table: Descriptive Statistics of 60-min of Playing Pokemon Go

<table>
<thead>
<tr>
<th>Avg. HR (bpm)</th>
<th>Peak HR (bpm)</th>
<th>Steps</th>
<th>Sedentary (min)</th>
<th>Light (min)</th>
<th>Moderate (min)</th>
<th>Vigorous (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.3 ± 17.7</td>
<td>133.8 ± 11.3</td>
<td>5992.1 ± 578.8</td>
<td>4.9 ± 3.0</td>
<td>6.1 ± 3.9</td>
<td>50.1 ± 5.3</td>
<td>0.15 ± 0.4</td>
</tr>
</tbody>
</table>

### Purpose:
To examine the associations among perceived motor competence (PMC), motor competence (MC), moderate to vigorous physical activity (MVPA), and health-related physical fitness during middle childhood and early adolescence. METHODS: Participants were 47, 10-15-year-old youth (12.2 ± 1.64 yrs , 50.2 ± 16.2 kg, 157 ± 13.1 cm). Each participant made two visits, separated by at least 7 days, in East Tennessee or northwest Ohio, during which they completed the Bruininks-Oseretsky Test of Motor Proficiency, 2<sup>nd</sup> Edition, Harter’s PMC questionnaire (Harter, 1978), and the FITNESSGRAM battery for health-related physical fitness. Actigraph GT3X accelerometers were worn for seven days to measure MVPA. RESULTS: There were significant (p < 0.05) positive correlations between physical fitness and both MC (r<sup>s</sup> = 0.44, p < 0.01) and PMC (r<sup>s</sup> = 0.32, p < 0.05). Additionally, a significant positive correlation was discovered between PMC and MC (r<sup>s</sup> = 0.47, p < 0.05). There were no significant correlations between average daily MVPA and the other variables. CONCLUSION: Results indicated that higher MC and PMC were associated with higher levels of health-related physical fitness. The interrelationship of these three variables was consistent with previous studies linking the development of fundamental motor skills to participation in complex movement behaviors, such as sports and other lifetime fitness activities, and the development and strengthening of PMC (Stodden & Robertson, 2009; Hands et. al., 2008; Cliff et al., 2011; Zask et al., 2012; Barnett et al., 2010).

### Table: Activity Profile of Pokemon GO in College Students

No relationships reported.
by assessing activities when they take place. PURPOSE: To describe adolescents’ after-school behaviors through use of a mobile application using ESM. The secondary purpose was to examine the feasibility and acceptability for adolescents to track their after-school PA and sedentary behaviors.

METHODS: Participants completed surveys on the behavior in which they were engaged at the time the survey was sent, using an app on their mobile device. The surveys occurred randomly, three times, from 3:30-9pm, for seven days. Participants also completed a 15-minute, telephone-based follow-up interview to assess ease and likeability of using the app on 5-pt scales (1=very easy, 5=very hard; 1=disliked a lot, 5=liked a lot). RESULTS: Thirty adolescents, 11-15 years old, submitted 560 surveys using the mobile device app (89% response rate). The adolescents most often reported engaging in “Other” activities (e.g., shopping, sitting) at 16.8% of total responses, followed by physical activity (14.3%). The least common activity was using their computer (1.6%). Two participants reported engaging in multiple activities at the same time (0.5%). Participants indicated the app was very easy to use (mean=1.5), and that they liked using the app (mean=3.9). On average, adolescents completed the survey in 0:08:06. However, from the time the survey was sent to the time they began the survey, it took the adolescents nearly 3 hours to begin.

CONCLUSIONS: To be considered ESM, participants must answer surveys immediately after they are sent. Although the mobile app appears to be appealing and easy to use, adolescents did not always answer the surveys in a manner that qualifies as ESM. Mostly, this was due to participants’ lack of reliable access to their own mobile device. ESM may be an improvement over self-report recall surveys, but future investigators should note the limitations of using ESM with adolescents. Supported by the Michigan State University College of Education Summer Research Fellowship.

A-22 Thematic Poster - Disease Muscle: Cancer and Muscle Dystrophy

Wednesday, May 31, 2017, 9:30 AM - 11:30 AM
Room: 404

Chair: Christopher G. Ballmann. Samford University AL.

The Effects Of Creatine And Creatine Depletion Rates On Rates Of Apoptosis In Doxorubicin-treated Myoblasts

Creighton University, Omaha, NE. (Sponsor: Joan Eckerson, FACSM). Email: ericbredahl@creighton.edu

(No relationships reported)

Doxorubicin (DOX) is a powerful chemotherapeutic agent that is associated with a number of deleterious side effects, including skeletal muscle dysfunction and skeletal muscle wasting. Although the exact mechanisms behind the observed myotoxicity have yet to be fully understood, the direct effect of DOX can generally be attributed to the generation of reactive oxygen species (ROS) and interference with DNA replication. Conversely, creatine (Cr) supplementation has been shown to have a therapeutic role in several disease states characterized by muscle atrophy, which is a hallmark of DOX treatment. Yet, there has been no investigation into the effects of Cr or creatine (CrN) on DOX-induced apoptosis. PURPOSE: To investigate the effects of Cr and CrN treatment on DOX-induced apoptosis. METHODS: Rat skeletal muscle cells (RKSMC) were cultured in skeletal muscle growth medium until they reached 90-95% confluence. Cells were then collected and seeded on to a 96-well plate at a density of 10,000 cells/ml containing fresh skeletal muscle growth media and allowed to recover for 24 hours. Cells were then exposed to fresh growth media containing either 1.5 μM of DOX, 10 mM of Cr, 10 mM CrN, 1.5 μM DOX + 10 mM Cr, or 1.5 μM DOX + 10 mM CrN for an additional 24 hours. Rates of apoptosis were then assessed using Annexin V apoptosis detection kit (BD Pharmagen) and high contrast staining. RESULTS: In the cells treated with DOX, 31±5.9% of imaged cells were undergoing apoptosis, which was significantly higher than the Cr (11.9±3.8%) and the CrN (10.1±4.9%) treated group (P=0.04 and P=0.03, respectively). No significant difference in rates of apoptosis was found between Cr+DOX, CrN+DOX, or the DOX treated groups CONCLUSION: Initial evidence from this investigation does not support the use of Cr or CrN to protect against DOX-induced apoptosis.

P. Wiggs2, Tyrone A. Washington1.
1University of Arkansas, Fayetteville, AR. 2University of Texas at Tyler, Tyler, TX.
(Sponsor: Stephen F. Crouse, FACSM). Email: npg Greene@uark.edu

(No relationships reported)
Doxorubicin (DOX) is an effective chemotherapy treatment associated with several deleterious side effects, including skeletal muscle dysfunction. Previous research from our lab has shown that ex vivo creatine (Cr) pretreatment, prior to DOX incubation, attenuated DOX-induced fatigue in the EDL, but not the SOL. The effects of in vivo supplementation on DOX myotoxicity, however, are currently unknown. PURPOSE: To investigate the effects of in vivo Cr supplementation on DOX myotoxicity.

METHODS: Male Sprague-Dawley rats were randomly assigned to the control (CON), doxorubicin (DOX), or creatine + doxorubicin (CR+DOX) group. CR+DOX received rodent chow supplemented with 3% creatine monohydrate and the CON and DOX received standard rodent chow. After two weeks of feeding, CR+DOX and DOX groups received a bolus (15 mg/kg) intraperitoneal (i.p.) DOX injection and CON received an i.p. saline injection as a placebo. Dietary interventions then continued for 5 more forelimbs. Grip strength was then measured as an indicator of in vivo muscle function and muscle fatigue was analyzed ex vivo using a 100% force speed protocol.

RESULTS: When compared to CON, a significantly lower grip strength was observed in DOX (-23%, p<0.05), and creatine monohydrate feeding attenuated this decrement (-15% CR+DOX vs. CON, p>0.05). In isolated muscle experiments performed to explore fatigability, solei (primarily type I muscle) from CON produced significantly less force than baseline at 60 s (p<0.05) and solei from DOX produced significantly less force than baseline at 30 s (p<0.05); however, CR+DOX produced significantly less force than baseline at 60 s (p<0.05) suggesting that Cr feeding attenuated DOX-induced fatigue in type I muscle. In the primarily type II EDL, a significant decline in force production from baseline was observed at 50 s in CON and CR+DOX (p<0.05) and at 20 s in DOX (p<0.05) suggesting that Cr attenuated DOX-induced fatigue in type II muscle. CONCLUSIONS: A diet supplemented with Cr attenuated the decrease in grip strength and increase in fatigue that accompanies DOX treatment. These findings suggest that Cr supplementation may have use in managing DOX myotoxicity in cancer patients.

Doxorubicin (DOX) is a polyphenol found in grapes and red wine, that has been previously reported to improve muscle function in a mouse model of Duchenne muscular dystrophy, mdx mice. In 5-week old mdx mice after 8 weeks of treatment, significant improvements in retarated performance and in situ peak tension of the triceps were observed. In addition, the total immune cell inflammation was significantly reduced, while significantly increasing IL-6 gene expression after 8 weeks of treatment. The aim of this study is to evaluate muscle and cardiac function of Resveratrol after 12 weeks of treatment using a comprehensive phenotyping platform. METHODS: This study was performed on two groups (n=11-12): group 1: Normal diet and group 2: diet with Resveratrol) of mdx mice in a blinded manner. Mice were randomized based on body weight and evaluated using a series of functional (In vitro force contractions, Echocardiography), behavioral (Grip strength, open field digiscan and Rota-rod), and histological evaluations. To unmask the mild phenotype of the mdx mice we subjected all mice to treadmill running (12 m/min; 30 min) bi-weekly except during data collection timepoints.

RESULTS: Resveratrol treatment showed no changes in body weight, forelimb and hindlimb grip strength measurements, or latency to fall in comparison to the control group after 12 weeks of treatment. There was, however, a significant decrease in the vertical force component of the open field digiscan and Rota-rod, and histological analysis showed no change in the number of degenerating, regenerating, or inflammatory cells after 12 weeks of treatment. CONCLUSIONS: This study has showed that Resveratrol did not alter the disease phenotype of the mdx mice. The inconsistency between studies may have been brought about by various factors such as the testing facility, the chows, experimenters performing the experiments to name a few. Therefore, it is essential to have independent laboratories validate the pre-clinical data prior to proceeding onto human clinical trial.
ejection fraction (EF) and fractional shortening (FS) significantly decreased by 11 months of age in the mdx mice. Evaluation of inflammation in live animals showed that inflammation is more at 2 months than QuickDASH. CONCLUSIONS: Our data demonstrates that the quality and reproducibility of preclinical trials depend not only on the parameter to be analyzed but also on the stage of the disease and sample size required to meaningfully interpret the data.

105 Board #7  
May 31 9:30 AM - 11:30 AM  
**Exercise-Induced Leukocyte Infiltration in Skeletal Muscle under Chemotherapy**  
Chia-Hua Kuo, FACSM. University of Taipei, Taipei, Taiwan.  
(No relationships reported)

BACKGROUND: Weight training can cause muscle inflammation. However, inflammation mechanism is essential for increasing or maintaining muscle mass after challenge. METHODS: We examined leukocyte infiltration in rat muscle challenged by downhill running after adriamycin administration, which is used to systemically inhibit cell regeneration (2.5 mg/kg per body weight). RESULTS: Leukocyte infiltration in exercised muscle was completely eliminated in adriamycin-treated rats in exercised muscle. A significant proton leak was observed under adriamycin treatment. Results from long-term adriamycin treatment show a significant development of sarcopenia. CONCLUSION: Blocking cell proliferation eliminates muscle inflammation induced by exercise, which may account for development of sarcopenia and eventual death after prolonged chemotherapy.

106 Board #8  
May 31 9:30 AM - 11:30 AM  
**The Effects of Impaired Arm Function on Quality of Life in Breast Cancer Survivors**  
Sarah A. Sayyari, Bolette S. Rafi, Stanley H. Hung, Alison M. Hoens, Margaret L. McNoey, Chiara A. Singh, Winkle Kwan, Carol Dingeé, Elaine C. McKevitt, Urve Kuusk, Kristin L. Campbell, University of British Columbia, Vancouver, BC, Canada.  
University of Alberta, Edmonton, AB, Canada. Fraser Health Authority, Surrey, BC, Canada. BC Cancer Agency, Fraser Valley, BC, Canada.  
(No relationships reported)

PURPOSE: Treatment for breast cancer is associated with long-term impaired arm function typically characterized by pain, muscular weakness, poor range of motion or lymphedema, which can negatively impact quality of life (QoL). An appropriate definition for impaired arm function specific to women with breast cancer is needed to guide treatment decisions and evaluate efficacy of interventions. The purpose of this study is: 1) to explore the relationship between impaired arm function and QoL; and 2) to propose a definition for impaired arm function that may be utilized to identify women who could benefit from a targeted exercise intervention. METHODS: Women with breast cancer were assessed for self-reported arm function and QoL at pre-surgery and at 12 months post surgery. Arm function was measured by the QuickDASH (Score: 0-100) and QoL was measured by the Functional Assessment of Cancer Therapy Breast (FACT-B+4). The minimally clinically important difference (MCID) of 14 for QuickDASH was used as a cut-off point to categorize participants as having impaired arm function. Pearson’s correlations were used to examine the association between arm function and QoL. Further, independent t-tests tested the difference in QoL between participants with and without impaired arm function. RESULTS: Thirty-seven women between ages 30-75 were enrolled. QuickDASH at 12-months post-surgery strongly correlated with the physical well-being subscale of the FACT-B+4 (r = 0.38, p < 0.01). Moderate correlations were found between QuickDASH and the arm function subscale of the FACT-B+4 (r = 0.49, p < 0.01) and the functional well-being subscale of the FACT-B+4 (r = 0.33, p = 0.05). Applying the MCID of 14 points on QuickDASH displayed a difference in QoL between participants with and without impaired arm function in the same physical well-being (p < 0.01) and arm function (p < 0.01) subscales of the FACT-B+4. CONCLUSIONS: QoL and arm function strongly correlate at 12-months following surgery for breast cancer. Applying the MCID for QuickDASH is effective in identifying participants whose impaired arm function is associated with decreased QoL. Utilizing this cut-off point may help identify women whose arm function has not recovered after treatment for breast cancer and who could benefit from a targeted exercise intervention.
were university students. Verbal feedback included high levels of satisfaction and interest in making it into an annual event. **CONCLUSION:** The EIM On Campus leadership team successfully implemented an event to promote physical activity based on principles that would encourage participation. The next steps are to: 1) add more members to the EIM On Campus leadership team from diverse areas, 2) hold educational opportunities, and 3) implement the physical activity vital sign within the student health center.

**Background:** Exercise is Medicine on Campus (EIM@OC) is an international initiative promoting physical activity (PA) participation on college campuses, targeting the decline in PA seen with the transition to college. Pennsylvania State University has been promoting EIM@OC since 2010 and hosting annual EIM@OC Week events since 2012. **Purpose:** To evaluate strategies for expanding EIM@OC partnerships and collaborations across campus since 2015.

**Methods:** EIM@OC Week has been held each year since 2012. In an attempt to expand and enhance the impact of EIM@OC, the committee has worked to improve campus-wide integration and increase participation and support from other University entities. Following the 2016 EIM@OC Week event, organizations that participated or provided support through the 2015-2016 campaign were interviewed regarding future goals, EIM@OC impressions, barriers to collaboration, and general observations. Results were compiled, transcribed and coded for common themes.

**Results:** Organizations working with EIM@OC (n=15) were divided into three categories: University entities, student organizations, and community outreach. University entities (n=7) included University divisions and departments (e.g. academic unit, colleges), student health services, and campus recreation. Student organizations (n=4) were primarily undergraduate and graduate student groups, such as clubs. Community outreach entities (n=4) included private businesses and other off-campus organizations. All of the organizations strongly supported the concept of EIM@OC, and were interested (93%) in supporting EIM@OC in a mutually-beneficial fashion (i.e. referrals, increasing membership). Future goals included expanded collaboration (53%) and a more defined partnership (40%). Common barriers to collaboration were time (80%), logistics (80%), available resources (40%) and departmental/university rules and regulations (47%).

**Conclusions:** The current study offered insight on the challenges and potential success in expanding EIM@OC on a large campus. As this EIM@OC initiative enters its 7th year, expanding its reach and improving University-wide collaborations are key for sustained impact. Identifying common strategic goals and pooling resources across multiple entities may prove essential to the future of EIM@OC.

**Purpose:** To use the Reach, Effectiveness, Adoption, Implementation, Maintenance (reach) methodology to evaluate Exercise Is Medicine-On Campus Program (EIM@OC).

**Methods:** In 2015, the EIM@OC program at Florida Gulf Coast University (EIM@FGCU) was launched. The program consists of monthly EIM@FGCU events, a referral network, faculty/student research, and service learning projects (SLP). EIM@OC programs can be more than just referral networks, and offer multiple opportunities for students and faculty to utilize the EIM framework. This project uses the RE-AIM methodology to evaluate effectiveness of EIM@OC.

**Results:** Reach: During the 2015-2016 academic year, over 500 students attended EIM@FGCU on campus events, and 85 students were referred to the EIM@FGCU program by Student Health Services. Seven (7) different poster presentations were delivered and on average 22 ± 1 hrs of SLP were performed by exercise science (ES) students. Effectiveness: ES students in EIM@FGCU events report “...makes me want to learn more about adaptive training and working with various populations, clinical or otherwise.” Of the 85 students referred, 16 participated in baseline assessment. There were 2 undergraduate student presentations at national meetings, 5 faculty presentations, and 3 in process faculty publications. Adoption: Starting in the 2016-2017 academic year, there was an increase in the number of EIM@FGCU Events (2015-2016: N = 5 to 2016-2017: N = 10) with two additional referral sites were added (Center for Academic Achievement, and Counseling and Psychological Services). Implementation: Program implementation was designed to be low through the utilization of student SLPs. This project is currently funded through internal campus resources ($10,500). The cost per referral is $584 per person; however, when supported by a project the referrals are free. Maintenance: The amount of faculty/student scholarship is increasing. The change in physiological markers of participants in the program will not be known until the end of this academic year.

**Conclusions:** Because EIM@OC programs have broader implications than a simple referral network, methodologies such as RE-AIM can be utilized to determine project effectiveness.

**Purpose:** To use the Reach, Effectiveness, Adoption, Implementation, Maintenance (reach) methodology to evaluate Exercise Is Medicine-On Campus Program.
Exercise is Medicine (EIM) is a global health initiative focused on encouraging health care practitioners to include physical activity when designing treatment plans for patients. EIM on Campus (EIM-OC) calls on institutions of higher education to promote physical activity (PA) as a vital sign of health. **PURPOSE:** The purpose of this investigation was to determine where college students obtain physical activity information and rates of physical activity counseling from health care practitioners. **METHODS:** Participants were college student subjects (n=697, 53% male, 76% Caucasian) that completed a fitness assessment and online survey. Aerobic fitness, muscular endurance, body composition (BMI and bioelectrical impedance) and blood lipids were assessed. The survey assessed participant demographics, current PA, PA counseling at on or off-campus clinics and typical sources of information about PA. Independent t-tests and chi squares examined differences in PA counseling by fitness outcomes. **RESULTS:** 62% of our participants reported some counseling for PA. There were no differences in rates of counseling by BMI nor VO2max, however, individuals with higher percent body fat were more likely to report counseling from their healthcare provider (t=2.76, p=0.006). There were no differences in counseling by current moderate or vigorous PA. Females were more likely to be counseled than males (X² = 4.39, p<0.04). Reports of counseling were higher at off-campus than on-campus clinics (X² = 42.2, p<0.001). Among our population 5% of participants obtained PA information online, 16.5% from peers, 73% from magazines, 51% from apps, 91% from TV, 40% from family, 17.7% from fitness professionals and 45% from health care providers. **CONCLUSIONS:** The current study provides insight into healthcare provider counseling for PA among college students. Off-campus healthcare providers were more likely to provide counseling, indicating an area of possible focus for further study. College students are typically not looking to a health care practitioner for their PA information, indicating that further information is needed on the role of healthcare providers and on-campus health clinics in counseling for PA among this young adult, typically healthy population.
METHODS: Eighteen men (23.4±4.4 yr; 81.8±10.2 kg; 9.8±3.5% body fat) participated in this cross-sectional study. EA was determined as the amount of energy remaining after subtracting the energy cost of exercise, both derived from 7-day diet and exercise logs, and was normalized for fat free mass (FFM) assessed by bioimpedance. Participants completed tests for resting metabolic rate (RMR) and aerobic fitness as well as questionnaires regarding exercise and diet habits, eating behaviors, and medical history. Based on their EA, participants were divided into tertiles: low EA (LEA): 19.9-31.5 kcal/kg FFM, moderate EA (MEA): 31.9-38.3 kcal/kg FFM, or high EA (HEA): 39.4-84.6 kcal/kg FFM.

RESULTS: BMI (LEA: 25.6±2.9 kg/m², MEA: 25.9±3.7 kg/m², HEA: 24.0±2.3 kg/m²) and body fat percentage (LEA: 11.0±4.6%, MEA: 10.5±2.8%, HEA: 8.3±2.8%) were similar among EA groups. The ratio of measured/predicted RMR was similar between LEA (0.96 ± 0.05) and HEA (0.93 ± 0.06) but lower in MEA (0.89 ± 0.06; p<0.03). Resting respiratory quotient was reduced in LEA (0.81 ± 0.09) compared to MEA (0.90 ± 0.05; p<0.03) and HEA (0.93 ± 0.12; p=0.04). Compared to HEA, participants in LEA were more likely to report past weight fluctuations (p<0.05) and dieting (p<0.01). There were no differences among EA groups for eating behavior traits such as dietary restraint (p=0.29), emotional eating (p=0.56), and drive for thinness (p=0.46).

CONCLUSION: Despite being in an apparent energy deficit and showing evidence of increased fat oxidation, exercising men with LEA did not exhibit altered body composition or RMR suppression per se. Nevertheless, LEA seems to be connected to issues related to weight control and a history of dieting. Future research is needed to quantify the metabolic and endocrine consequences of LEA in exercising men.

In elite rugby union the pre-season training period is used to optimise players’ strength, power, endurance and body composition. Given the increased training loads during this time, players could find themselves at risk of Low Energy Availability (LEA). A state of LEA can be caused by large energy expenditure in exercise (EEE) and/or low energy intake (EI), which reduces the amount of energy available for physiological functions. Despite the majority of the literature focusing on female athletes, it is possible that male athletes are also at risk of LEA, particularly during periods of increased training load such as pre-season.

PURPOSE: The purpose of this study was to examine the energy intake, energy expenditure and energy availability of elite male rugby union players during pre-season training.

METHODS: During this observational study, three-day diet records were collected for 23 Rugby Union players using video, photographs, checklists and recalls. Energy expenditure data was also collected via heart rate monitoring, GPS tracking and Activity Logs. Skinfold thicknesses (International Society for the Advancement of Kinaethropometry protocols) were used to assess body composition. Data was analysed based on groups established by training goals determined by the teams support staff: weight gain (n=8)/weight maintenance (n=8)/weight loss (n=7).

One-way ANOVA was used to identify differences between groups, with post-hoc pairwise comparison of means, adjusted using Bonferroni.

RESULTS: For all participants exercise energy expenditure was 2,240 ± 1,140 kcal (mean ± SD). The average energy intake was 3799 ± 958 kcal/day for all participants. The weight loss group had significantly lower mean (± SD) energy availability (6.7 ± 6.4 kcal/kg FFM·day⁻¹) than the weight maintenance (20.3 ± 7.6 kcal/kg FFM·day⁻¹), p<0.003) and weight gain (28.6 ± 8.0 kcal/kg FFM·day⁻¹, p<0.001) groups.

CONCLUSION: This research shows that NZ Super rugby players can, and do suffer from short-term LEA during the intense pre-season training period. However, as this study was observational, the results are only indicative of the three-day sampling period. Therefore, the duration of LEA cannot be determined from this study nor can any health or performance implications.

Supported by the University of Otago Research Grant.
Exercise usually results in less weight loss than expected. It is therefore postulated that changes in energy expenditure (EE) and/or compensatory increases in energy intake (EI) occur to counteract energy deficits induced by exercise.

**PURPOSE:** Compare changes in all components of daily energy expenditure (24hEE) after 24 weeks of exercise training between varying doses of exercise recommended for weight loss.

**METHODS:** Forty-eight (28 F, 13 M) obese (35±3.7 kg/m²) middle aged (47±12.5 y), sedentary individuals from the Exercise of Mechanism (E-MECHANIC) study were randomized to either a healthy living control group (HL, n=13) or a supervised, controlled aerobic exercise (20 KKW, n=25) study. Subjects (n=38) were divided into 4 groups (n=10) based on a combination of sex [male (M) or female (F)] and training history [endurance (E) or resistance (R) trained]. M = 24 + 4 y, 160.5 ± 17.2 kg, 12.8 ± 5.7 %BF; F = 22 + 2 y 135.5 ± 15.8 kg, 23.3 ± 4.8 %BF. On separate days, 45 min aerobic (A) or weight-training (W) exercises were performed. Serum was collected pre, 0 & 60 min post exercise (T0, T1 & T2), and analyzed via UHPLC/MS for identification of 754 biochemicals. Principle components analysis (PCA) was used to define metabolite profiles.

**RESULTS:** Both A and W increased glycolysis (A: 3.5 ± 0.7 fold, W = 3.9 ± 1.0 fold, P<0.05) with a significantly greater activation for RW, P<0.05. TCA activity (AVG = 1.5 ± 0.3 fold and 1.9 ± 0.3 fold, P<0.05) also increased. Downstream TCA intermediates (succinate, fumarate, & malate) were increased at T1, particularly for succinate in E (P<0.05), and returned to baseline by T2. Exercise, A increased fat metabolism as evidenced by elevation of multiple FFAs and acylcarnitines (i.e., stearate =1.4 + 0.3 fold; 3-hydroxyisobutyrate = 1.8 + 0.2 fold; P<.05) and generally faster returns towards baseline for all metabolites. Sex-dependent differences in global metabolite profiles were more pronounced in E than R groups, including elevated FFAs and matured TCA intermediates in both RW and BCAA catabolism in E (P<0.05) and in W (P<0.05). A more prolonged exercise duration is attributed to the increased physical activity (P=.03) and not to changes in EE during exercise. TCA capacity in E and greater glycolytic power in R leading to differential fuel selection during exercise, particularly with matched mode. Females displayed lower TCA activity, yet higher FFA oxidation with sex differences most apparent in the E groups.

**CONCLUSIONS:** The biological response to exercise is dictated by the metabolic demand of the exercise and the physiology of the exerciser, allowing exercise type and individual variation to alter the exercise metabolism. Data support greater TCA capacity in E and greater glycolytic power in R leading to differential fuel selection during exercise, particularly with matched mode. Females displayed lower TCA activity, yet higher FFA oxidation with sex differences most apparent in the E groups.

## Board #8 May 31 9:30 AM - 11:30 AM Metabolic Responses to Acute Aerobic and Anaerobic Exercise Bouts

Joseph K. Pellegrino1, Christopher E. Ordway1, Sean P. Conway2, Alan J. Walker2, Marissa J. Bello1, Anthony Poyssick1, Eddie B. Capone1, Nick Mackowski1, David J. Sanders1, Bridget A. McFadden1, Morgan Hofacker2, Peter J. Gillies1, Shawn M. Aren1, FACSM1, Rutgers University, Rutgers Center for Health & Human Performance, New Brunswick, NJ. 2DURO Health, New York, NY. (Sponsor: Shawn M Aren, FACSM)

**Email:** joepell@rutgers.edu

**PURPOSE:** To explore the acute serum metabolic responses following single bouts of aerobic and anaerobic exercise in differentially-trained subjects. Methods: Subjects (N=40) were equally distributed into one of four groups (n = 10) based on a combination of sex (male [M] or female [F]) and training history [endurance (E) or resistance (R) trained] (M = 24 ± 4 y, 160.5 ± 17.2 kg, 12.8 ± 5.7 %BF; F = 22 ± 2 y 135.5 ± 15.8 kg, 23.3 ± 4.8 %BF). On separate days, 45 min aerobic (A) or weight-training (W) exercises were performed. Serum was collected pre, 0 & 60 min post exercise (T0, T1 & T2), and analyzed via UHPLC/MS for identification of 754 biochemicals. Principle components analysis (PCA) was used to define metabolite profiles.

**RESULTS:** Both A and W increased glycolysis (A: 3.5 ± 0.7 fold, W = 3.9 ± 1.0 fold, P<0.05) with a significantly greater activation for RW, P<0.05. TCA activity (AVG = 1.5 ± 0.3 fold and 1.9 ± 0.3 fold, P<0.05) also increased. Downstream TCA intermediates (succinate, fumarate, & malate) were increased at T1, particularly for succinate in E (P<0.05), and returned to baseline by T2. Exercise, A increased fat metabolism as evidenced by elevation of multiple FFAs and acylcarnitines (i.e., stearate =1.4 + 0.3 fold; 3-hydroxyisobutyrate = 1.8 + 0.2 fold; P<.05) and generally faster returns towards baseline for all metabolites. Sex-dependent differences in global metabolite profiles were more pronounced in E than R groups, including elevated FFAs and matured TCA intermediates in both RW and BCAA catabolism in E (P<0.05) and in W (P<0.05). A more prolonged exercise duration is attributed to the increased physical activity (P=.03) and not to changes in EE during exercise. TCA capacity in E and greater glycolytic power in R leading to differential fuel selection during exercise, particularly with matched mode. Females displayed lower TCA activity, yet higher FFA oxidation with sex differences most apparent in the E groups.

**CONCLUSIONS:** The biological response to exercise is dictated by the metabolic demand of the exercise and the physiology of the exerciser, allowing exercise type and individual variation to alter the exercise metabolism. Data support greater TCA capacity in E and greater glycolytic power in R leading to differential fuel selection during exercise, particularly with matched mode. Females displayed lower TCA activity, yet higher FFA oxidation with sex differences most apparent in the E groups.
loaded breathing for 30 minutes. Subjects maintained breathing frequency at 15 breaths min⁻¹, duty cycle at 0.5 and transdiaphragmatic pressure at 70% of maximum which was provided by a variable sized aperture with a length of 2 mm. Inspiratory muscle work was estimated by the diaphragm pressure-time product (PTPdi), which was calculated by multiplying breathing frequency by transdiaphragmatic pressure integrated over the period of inspiratory flow. Plasma samples were collected at rest (0 min), 5 and 30 minutes during, and 30 minutes after (+30 min) inspiratory flow resistant load of 0.5 kg m⁻¹ s⁻¹ and analyzed for F₁,₂-prostanoids using isotope dilution mass spectrometry. Time comparisons were made using a one-way ANOVA with repeated measures. RESULTS: PTPdi (+0.05%) from 663 ± 102 (mean ± SD) at 0 min to 1931 ± 501 and 1618 ± 258 cmH₂O·s·min⁻¹ at 5 and 30 min, respectively. Plasma F₁,₂-prostanoids increased (P<0.05) from 154 ± 22 at 0 min to 197 ± 35, 229 ± 83 and 256 ± 58 pg mL⁻¹ at 5, 30, and +30 min, respectively. CONCLUSIONS: Lactic acidosis remained elevated following, inspiratory flow resistant load breathing. Our novel data are the first to indicate that the inspiratory muscles may directly contribute to systemic oxidative stress during periods of increased inspiratory muscle work, such as those encountered in COPD. Supported by University of Southern Queensland Centre for Health Sciences Research sponsored research grant scheme.

127

May 31 10:45 AM - 10:00 AM

Competitive Runners Can Adapt To Nasal Breathing With Similar Peak Running Velocity And Lower Ventilation

Steve R. McClaran, George M. Dallam, Carol P. Foust. Colorado State University Pueblo, Pueblo, CO.

Email: steve.mcclaran@csupueblo.edu

(No relationships reported)

PURPOSE: This study investigated the effect of breathing restricting to the nasopharynx (NB) versus the oropharynx (OB) in 10 mixed gender (5 males, 5 females) recreationally competitive runners (VO2max = 40.10 ± 2.65 ml/kg/min).

METHODS: Each subject performed a maximal graded exercise test (GXT) and a subsequent six minute high intensity steady state run (SSR) during random order NB and OB days. All runners had previously adapted themselves to nasal only breathing at all levels of running intensity. RESULTS: In the GXT trials the subjects exhibited no significant mean difference in time to exhaustion (TE) (NB = 428 ± 24 vs. OB = 421 ± 18 sec), absolute maximal oxygen consumption (VO2max) (NB = 2.55 ± 0.25 vs. OB = 2.75 ± 0.25 L/min) and peak lactate (NB = 7.0 ± 0.76 vs. OB = 7.2 ± 0.76 mmol/L). In the nasally restricted breathing condition they demonstrated a significantly lower mean ventilatory equivalent for oxygen (VE/VO2) (NB = 35.20 ± 1.34 vs. OB = 41.30 ± 1.59) and carbon dioxide (VE/VO2CO2) (NB = 29.4 ± 1.33 vs. OB = 32.8 ± 1.13) and peak ventilation (VE) (NB = 92.8 ± 10.8 vs. OB = 112.6 ± 16.8) with a significantly higher breathing frequency (RR) (NB = 39.2 ± 2.1 vs. OB = 49.4 ± 2.5) at VO2max. During the SSR trials the subjects exhibited no significant difference in lactate (NB = 7.92 ± 0.98 mmol/L) and again demonstrated a significantly lower mean VE/VO2 (NB = 32.43 ± 0.77 vs. OB = 36.70 ± 1.03 L/min) and VE/VO2CO2 (NB = 28.47 ± 0.68 vs. OB = 32.92 ± 0.92 L/min) and again demonstrated a significantly higher RR (NB = 36.4 ± 1.8 vs. OB = 43.2 ± 2.3).

CONCLUSION: This study confirms the ability of competitive recreational runners to adapt to breathing restriction to the nasopharynx during running at both a maximal effort and a subsequent high intensity steady state effort, with a lower VE and RR and without a loss in TE or VO2max.
Its compressibility increased. **PURPOSE.** To determine whether high-altitude engenders a greater magnitude of TGC artefact on the MEFV curve. **METHODS.** Twenty-four adults (10 women 14 men) with normal baseline pulmonary function (>90% pred.) completed an 11-day sojourn at Mt. Kilimanjaro. Participants were assessed at Moshi (Day -1, 834 m) and at Baraafu Camp (Days 8-9, 4,837 m). Typical MEFV curves with no TGC correction were obtained in accordance with ATS/ERS guidelines. MEFV curves were then corrected for TGC by performing 7-9 vital capacity manoeuvres at varying degrees of apparent effort. Both MEFV curves were further corrected to account for differences in gas-density between altitudes. **RESULTS.** At both altitudes, peak expiratory flow rate (PEFR), and forced expiratory flows at 75, 50 and 25% of vital capacity (FEV1, FEV2, FEF25%, and FEF50%) respectively were higher after correction for TGC (P < 0.05). The magnitude of the change in the MEFV envelope incurred by TGC-correction was relatively greater at Baraafu Camp compared with data at Moshi for FEV1 (A16 ± 19% vs A3 ± 5%, P < 0.05) and FEF25% (A3 ± 40% v A15 ± 16%, P < 0.05). Once corrected for TGC and gas-density, we observed that PEFR, FEF25%, FEF50%, and FEF75% were lower at Baraafu Camp compared with data at Moshi (P < 0.05). **CONCLUSIONS.** Our data further emphasize what is already well-known at sea-level: that is, the MEFV envelope is significantly underestimated if no attempt is made to correct for TGC. More importantly, however, we show that the underestimation of the MEFV curve due to TGC is worsened upon ascending to higher altitudes, particularly for those expiratory flows occurring over the effort-independent portion of the MEFV envelope.

**A-26 Free Communication/Slide - Thermoregulation in Clinical Populations**

Wednesday, May 31, 2017, 9:30 AM - 10:45 AM
Room: 103

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

134 May 31 9:30 AM - 9:45 AM

Core Temperature Responses To Exercise Using A Simulated Burn Injury Model: Impact Of Body Size
Matthew N. Cramer, Ken Kouda, Gilbert Moralez, Paula Y.S. Poh, Daniel Gagnon, Craig G. Crandall, FACSM. Institute for Exercise and Environmental Medicine, Dallas, TX. (Sponsor: Craig Crandall, FACSM)
Email: matthewcramer2@texashospital.org  
(No relationships reported)

**BACKGROUND:** The US Army’s Standards of Medical Fitness indicate that a burn injury spanning >40% of total body surface area (BSA) “does not meet the standard.” While whole-body sweat production and thus evaporation are diminished in burn survivors with extensive skin grafts, the impact of a 40% BSA burn injury on core temperature regulation during exercise is likely dependent on body size, as larger individuals will have a greater absolute skin area that can still participate in heat loss despite the same percentage BSA burn injury. 

**PURPOSE.** Using a simulated burn injury model, we tested the hypothesis that the detrimental effect of a 40% BSA “burn injury” would be exacerbated in individuals of smaller versus larger body size during exercise due to a lower absolute (i.e., in m2) skin area available for heat loss.

**METHODS:** On separate occasions, healthy non-burned individuals of small (SM: n=8, 62.4 ± 5.8 kg, 1.69 ± 0.11 m2) or large (LG: n=8, 99.1 ± 8.4 kg, 2.25 ± 0.09 m2) surface area available for heat loss.

**RESULTS:** Greater increases in T60c were observed in SM at 0% (SM: 1.09 ± 0.33°C; LG: 0.64 ± 0.22°C; P=0.03) and 40% (SM: 1.65 ± 0.32°C; LG: 1.14 ± 0.23°C; P=0.01). However, the exacerbated rise in T60c from 0% to 40% was not different between groups (SM: 0.57 ± 0.28°C; LG: 0.49 ± 0.24°C; P=0.60).

**CONCLUSIONS:** Preliminary data suggest that the exacerbated rise in core temperature with a simulated burn is not dependent on body size. Nevertheless, SM subjects with a simulated burn exercising at the same rate of metabolic heat production experienced the highest absolute T60c and would therefore be at the greatest risk for a heat-related injury. Funding support: Department of Defense - US Army, W81XWH-15-1-0647.
To date, only two studies have examined the effects of Type 1 diabetes (T1D) on the body’s ability to dissipate heat during exercise in the heat. The first study showed no effect of diabetes on local or whole-body heat loss during moderate intensity exercise. However, a recent study revealed that differences may be heat load dependent as evidenced by the fact that attenuations in sweating were seen only for select skin sites at moderate-to-high exercise intensities. It remains to be determined however if these regional attenuations may lead to reductions in whole-body heat loss thereby compromising body core temperature regulation. PURPOSE: To examine if T1D impairs whole-body heat loss as function of increasing exercise-induced heat loads.

METHODS: Young (27 ± 6 years) adults with (n=6, hemoglobin A1c: 8.0 ± 1.7%, duration of diabetes: 15 ± 7 years) and without T1D (CON, n=6) were matched for age, physical characteristics and aerobic fitness (VO₂peak). Participants performed three 30-min bouts of cycling at fixed incremental rates of metabolic heat production of 200 (Ex1), 250 (Ex2) and 300 W·m⁻² (Ex3) in the heat (35°C), equivalent to 35, 52 and 65% of their VO₂max. Each exercise bout was followed by a 30-min recovery. Whole-body evaporative and dry heat loss and metabolic heat production were measured by direct and indirect calorimetry respectively. The change in body heat storage was calculated from the temporal summation of the rate of heat production and heat loss. RESULTS: Evaporative heat loss tended to be lower in the T1D group at the end of the second (T1D: 247 ± 48 kJ; CON: 167 ± 52 kJ; p=0.06) and third (T1D: 462 ± 75 W; CON: 479 ± 62 W; p=0.12) bout of exercise only when compared to their healthy counterparts. No differences in dry heat gain were measured between groups for all exercise bouts (all p>0.05). Accordingly, the individuals with T1D stored more heat during all exercise bouts (Ex1: 197 ± 39 kJ; Ex2: 236 ± 80 kJ; Ex3: 248 ± 80 kJ). CONCLUSION: Our preliminary findings demonstrate that T1D may impair whole-body heat loss during exercise in the heat. Further, we show that the influence of T1D on heat dissipation is dependent upon the exercise-induced heat load. Support provided by the Canadian Institutes of Health Research.

Older adults with type 2 diabetes (T2D) have an attenuated physiological ability to dissipate heat during moderate intensity exercise in the heat. However, it is unclear if T2D-related impairments in heat dissipation only occur above a certain exercise-induced heat load and therefore level of heat stress. PURPOSE: To determine whether T2D-related impairments in whole-body heat loss, as assessed by direct calorimetry, occur above a certain heat load threshold. METHODS: Twelve older (60 ± 7 years) habitually active males with (n=6, hemoglobin A1c: 6.8 ± 0.6 %, duration of diabetes: 9 ± 5 years) and without (n=6) T2D (CON) matched for age, body surface area, and fitness (VO₂peak) completed three successive 30-min bouts of semi-recumbent cycling performed at fixed incremental rates of metabolic heat production of 300 (Ex1), 400 (Ex2) and 500 (Ex3) W in the heat (40°C). This was equivalent to 37, 50 and 62% of their pre-determined VO₂max. A 15-min recovery period followed each exercise bout. Whole-body heat loss (evaporative and dry heat exchange) was measured using direct calorimetry. The simultaneous measurement of metabolic heat production via indirect calorimetry was used to calculate the change in body heat storage. RESULTS: Whole-body heat loss was reduced in the T2D group relative to CON at the end of Ex1 (T2D: 235 ± 23 W; CON: 261 ± 34 W; p=0.004), Ex2 (T2D: 294 ± 24 W; CON: 335 ± 44 W; p=0.030), and Ex3 (T2D: 330 ± 59 W; CON: 390 ± 39 W; p=0.02). Given that dry heat gain was similar between groups at the end of all exercise bouts (all p>0.05), differences in whole-body heat loss were due only to differences in evaporative heat loss. The relative difference in the maximal level of whole-body heat loss achieved between groups became greater with increasing exercise-induced heat loads. CONCLUSION: Our findings suggest that T2D-related attenuations in whole-body heat loss are only evident above a certain exercise-induced heat load threshold.
A-27 Clinical Case Slide - Cardiovascular I
Wednesday, May 31, 2017, 9:30 AM - 10:50 AM
Room: 401

Chair: Aaron L. Bagish, FACSM. Massachusetts General Hospital, Boston, MA.
(No relationships reported)

Discussant: Paul D. Thompson, FACSM. Hartford Hospital, Hartford, CT.
(No relationships reported)

HISTORY: An 18 year old male freshman diver at a division 1 university presented to the student health clinic for his pre-participation exam. On discussing his medical history, he reported that at age 8 he syncopized while swimming and was referred to neurology practice. He was taken to the ED for evaluation, and, after a normal glucose and CT scan of the head, the episode was attributed to dehydration. Over the coming weeks the patient syncopized twice more at practice. He was then admitted to the hospital for a cardiac MRI and a left cardiac sympathetic denervation. The patient was subsequently placed in a retrograde rehabilitation protocol and was restricted from competitive diving and started weightlifting and performing light cardio.

PHYSICAL EXAMINATION (at PPE): BP 112/76. HR 60. NAD. CV: NRRR, no palpitations, or dyspnea. His past medical history is unremarkable. No family history of sudden death. He has no current or prior history of smoking or drug use.

DIFFERENTIAL DIAGNOSIS: Physiologic Murmur, Healthy.

TEST AND RESULTS: Electrocardiogram: Normal sinus rhythm, 60 bpm, axis 0°, PR 0.16 s, QTC 0.38 s, early repolarization, IRBBB, U waves V2-V6. Echocardiogram: Aortic root is severely dilated (aortic annulus 30.5 mm, z-score 1.6); sinus of Valsalva 50.7 mm, z-score 5.5; sinotubular junction 43.5 mm, z-score 5.2; proximal ascending aorta 42.0 mm, z-score 4.2). Aortic valve and tricuspid valve are normal.

TEST AND RESULTS: CT head: WNL. ECG WNL. EEG: Physiologic Murmur, Healthy.

FINAL WORKING DIAGNOSIS: Moderate to severe aortic root aneurysm with tricuspid aortic valve and annuloaortic ectasia.

TREATMENT AND OUTCOMES: Valve sparing aortic root replacement (macroscopic hyaline degeneration of the aneurysm). Acetylsalicylic acid 100 mg/day for 3 months. Progressive aerobic exercise training (low to moderate intensity) for 3 months. Strength training (40-50% of body weight) after first 3 months post-surgery. Refers to genetic testing. Control (3 months): Asymptomatic; ECHO: aortic annulus 27.4 mm, sinuses of Valsalva 35.4 mm, sinotubular junction 33.1 mm, proximal ascending aorta 33.1 mm. Is expected to return to diving activities after 1 year without complications.

139

Discussant: Jeffrey M. Mjaanes, FACSM. Northwestern University, Evanston, IL.
(No relationships reported)

422

May 31 9:30 AM - 9:50 AM
He’s All Heart
Elana Bannerman1, John H. Stevenson1, Pierre Rouzier, FACSM2, Greg Little2. University of Massachusetts, Worcester, MA. 1University of Massachusetts, Amherst, MA.
(No relationships reported)

HISTORY: A 34 years old asymptomatic male underwent a complete cardiovascular screening as part of his occupational health screening in the Special Police Force, Diving Section. Physically active (e.g. running, martial arts, strength training, swimming, and diving). He reports no history of chest pain, syncope, dizziness, palpitations, or dyspnea. His past medical history is unremarkable. No family history of sudden death. He has no current or prior history of smoking or drug use.

PHYSICAL EXAMINATION: Anthropometrics: height 179 cm; weight 83 kg; BSA 2.02 m². Vitals: HR 60 bpm; BP 120/70 mmHg. The cardiac exam revealed a protodiastolic murmur that was heard in the inferior left sternal border, intensity 2/6 with no irradiation. Rest of the examination was normal.

DIFFERENTIAL DIAGNOSIS: Physiologic Murmur, Healthy.

TEST AND RESULTS: Electrocardiogram: Normal sinus rhythm, 60 bpm, axis 0°, PR 0.16 s, QTC 0.38 s, early repolarization, IRBBB, U waves V2-V6. Echocardiogram: Aortic root is severely dilated (aortic annulus 30.5 mm, z-score 1.6); sinus of Valsalva 50.7 mm, z-score 5.5; sinotubular junction 43.5 mm, z-score 5.2; proximal ascending aorta 42.0 mm, z-score 4.2). Aortic valve and tricuspid valve are normal.

TEST AND RESULTS: CT head: WNL. ECG WNL. EEG: Physiologic Murmur, Healthy.

FINAL WORKING DIAGNOSIS: Moderate to severe aortic root aneurysm with tricuspid aortic valve and annuloaortic ectasia.

TREATMENT AND OUTCOMES: Valve sparing aortic root replacement (macroscopic hyaline degeneration of the aneurysm). Acetylsalicylic acid 100 mg/day for 3 months. Progressive aerobic exercise training (low to moderate intensity) for 3 months. Strength training (40-50% of body weight) after first 3 months post-surgery. Refers to genetic testing. Control (3 months): Asymptomatic; ECHO: aortic annulus 27.4 mm, sinuses of Valsalva 35.4 mm, sinotubular junction 33.1 mm, proximal ascending aorta 33.1 mm. Is expected to return to diving activities after 1 year without complications.

140

Discussant: Francisco Morales1, Araceli Boraita2, Maria-Eugenia Heras3, Manuel Marina-Breysse2, Alvaro N. Gurovich, FACSM1.
1Massachusetts General Hospital, Boston, MA. 2University of Massachusetts, Amherst, MA. 3University, Evanston, IL.
(No relationships reported)

141

Discussant: Jeffrey M. Mjaanes, FACSM. Northwestern University, Evanston, IL.
(No relationships reported)

142

May 31 9:30 AM - 9:50 AM
He’s All Heart
Elana Bannerman1, John H. Stevenson1, Pierre Rouzier, FACSM2, Greg Little2. University of Massachusetts, Worcester, MA. 1University of Massachusetts, Amherst, MA.
(No relationships reported)
HISTORY: A 20-year-old female collegiate volleyball player presented with a 3-month history of chest pain. Pain was non-exertional, localized to the mid-chest and described as constant with rating of 8/10. She initially sought consult 3 months prior in the emergency room with EKG and labs unremarkable. The patient was diagnosed with costochondritis and managed with a steroid dose pack that provided temporary relief. Her pain then progressively increased to inability to tolerate volleyball activity. Of note, she reported mild left hip and lower back pain that started one week prior to consult.

PHYSICAL EXAMINATION: Cardiac exam revealed regular rate and rhythm with no murmurs. Tenderness to palpation was significant over the sternomanubrial junction. Left hip exam revealed positive piriformis test and sacroiliac compression test. Range of motion was full throughout the bilateral upper and lower extremities. Strength, reflexes, sensation, and pulses normal throughout.

DIFFERENTIAL DIAGNOSIS:
1. Costochondritis
2. Osteomyelitis of sternum
3. Seronegative spondyloarthropathy
4. Benign paroxysmal positional vertigo (BPPV)
5. Central nervous system lesion
6. Vestibular system dysfunction
7. Exercise Associated Hyponatremia
8. Exertional Heat Stroke
9. Osteomyelitis of sternum
10. Central nervous system lesion

TESTS AND RESULTS:
1. MRI of bilateral SI joints performed and suggestive of sacroiliitis.
2. Initiated NSAIDs and physical therapy for suspected piriformis syndrome.
3. Follow up with primary care for any worsening of symptoms.
4. Instructed to avoid rapid or frequent head movements for the next few days.
5. Gradual return to running after complete resolution of symptoms.
6. The Epley maneuver was performed, inducing one episode of emesis followed by gradual improvement of symptoms over the following 10 minutes.
7. Central nervous system lesion

FINAL/WORKING DIAGNOSIS:
Seronegative spondyloarthropathy

TREATMENT AND OUTCOMES:
1. Patient referred to Rheumatology given concern for inflammatory arthritis.
2. Initiated NSAIDs and physical therapy for suspected piriformis syndrome.
3. MRI of bilateral SI joints performed and suggestive of sacroiliitis.
4. In preparation for TNF agent treatment, patient found to be Hep B core antibody positive and referred to Hepatology.
5. Started entacavir for Hepatitis B treatment and adalimumab.
6. After 2 months, the patient returned to full volleyball participation with complete resolution of her symptoms.

A-28 Clinical Case Slide - Head

Wednesday, May 31, 2017, 9:30 AM - 10:45 AM

Chair: Christina L. Master, The Children’s Hospital of Philadelphia, Haverford, PA.

Discussant: Robert C. Cantu, FACSM, Emerson Hospital, Concord, MA.

Discussant: John Ledy, University at Buffalo Sports Medicine Institute, Buffalo, NY.

150 May 31 9:30 AM - 9:50 AM

Dizziness - Runner

Amanda M. Honsvall1, William O. Roberts, FACSM2, Kelly Roberts Lane, FACSM3, University of Minnesota Medical School, Minneapolis, MN. 1University of Minnesota, Minneapolis, MN. 2Fix It Physical Therapy, Mahomet, MN.

Email: honsv003@d.umn.edu

(No relationships reported)

HISTORY:
A 36 year old previously healthy male presented to the medical tent via wheelchair with acute onset of dizziness and nausea after finishing a marathon. He had met his goal of finishing just under 3 hours. He alternated water and sports drinks for fluid replacement. He described the dizziness as a spinning sensation that began shortly after crossing the finish line associated with emesis. This persisted while lying still with his eyes closed. Symptoms were exacerbated by tilting his head or attempting to look up. No lightheadedness, chest pain, shortness of breath, hearing changes, numbness or altered mental status. No history of vertigo episodes, recent illness or head trauma. In the medical tent, he vomited 3 times. He was laid supine with his legs elevated. Over 45 minutes, he had 5 cups of oral electrolyte replacement, 3 cups of water and a banana without improvement. He was eventually able to walk one lap around the medical tent while keeping his gaze focused downwards.

PHYSICAL EXAMINATION:
T 0 min:
BP 120/58, HR 94, RR 19, O2 94%

T 45 min:
Supine BP 116/64, HR 63
Standing BP 105/60, HR 72
Rectal temp 97.9F

He was mildly ill-appearing with clear mental status, alert and oriented x 4. Cranial nerves II-XII were intact and he demonstrated 5/5 strength in b/l upper and lower extremities. Extraocular movements and smooth pursuit were normal. No signs of spontaneous nystagmus. Nystagmus was observed with change in posture from sitting to supine to side lie. Head impulse testing was positive for compensatory saccade response. Dix-Hallpike maneuver to the right was positive for nystagmus and reproduction of symptoms.

DIFFERENTIAL DIAGNOSIS:
1. Exercise associated postural hypotension
2. Exertional Heat Stroke
3. Exercise Associated Hypotremia
4. Vestibular system dysfunction
5. Central nervous system lesion

TESTS AND RESULTS:
N/A

FINAL/WORKING DIAGNOSIS:
Benign paroxysmal positional vertigo (BPPV)

TREATMENT AND OUTCOMES:
1. The Epley maneuver was performed, inducing one episode of emesis followed by gradual improvement of symptoms over the following 10 minutes.
2. Instructed to avoid rapid or frequent head movements for the next few days.
3. Gradual return to running after complete resolution of symptoms.
4. Follow up with primary care for any worsening of symptoms.

151 May 31 9:50 AM - 10:10 AM

Head Injury - Soccer

Christina L. Master1, Eileen P. Storey1, Lei Wang2, Hasan Ayaz2, Olivia Podolak1, Matthew F. Grady1, The Children’s Hospital of Philadelphia, Philadelphia, PA. 1University of Minnesota Medical School, Minneapolis, MN. 2Drexel University School of Biomedical Engineering, Philadelphia, PA.

(No relationships reported)

HISTORY:
A 16-year-old female soccer goalie sustained a head injury during a heading drill. The player reported a few awkward headers, including one that hit her in the back of the head. The player developed a headache and nausea, but had a normal evaluation by an athletic trainer on the sidelines. The trainer still removed the athlete from play due to the mechanism of injury and the player’s report of low-grade symptoms.

PHYSICAL EXAMINATION: The player reported only a mild headache at rest the following day when she presented to clinic. On clinical examination, the player had no symptoms or abnormalities with smooth pursuits, saccades, vestibulo-ocular reflex, visual motion sensitivity, convergence and accommodation tests.

DIFFERENTIAL DIAGNOSIS:
1. Concussion
2. Sub-concussive head injury
3. No concussion
TEST AND RESULTS:
- The player performed the physical examination both 1-day and 1-week post-injury while wearing a functional near-infrared spectroscopy (fNIRS) headband that recorded anterior prefrontal cortex oxygenation changes. Compared to her baseline, the player showed significantly different levels of oxygenation changes at 1-day post-injury that approached pre-injury levels but had not fully returned to baseline at 1-week post-injury.
- At a clinical evaluation a week after injury, the player reported no symptoms at rest or during the physical examination. The clinician detected no abnormal findings on physical examination.

FINAL WORKING DIAGNOSIS:
Concussion with subclinical deficits

TREATMENT AND OUTCOMES:
1. At 1-day post-injury, the player was permitted to begin a return-to-learn plan as well as a return-to-play protocol.
2. The player was cleared to return to soccer at 1-week post-injury with resolution of symptoms and normal physical examination.

HISTORY: 11 year old male presents to the sports medicine office for evaluation of concussion two weeks after he fell off his bike, hitting his head on concrete. He had no loss of consciousness. He was evaluated in the ED for laceration repair. Initial symptoms included headache, vomiting, and sleeping more than usual. Approximately one week into his injury he developed diplopia at which time his parents noticed his eyes were “crossing” more. Headaches and vomiting resolved 10 days post-injury. He endorses a history of color-blindness. He denies history of concussion, mood disorders, strabismus, amblyopia, or eye surgery. There is a strong family history of strabismus and eye surgery.

PHYSICAL EXAM: Neurological exam notable for left CNVI palsy on EOM testing. Normal resting gaze. Testing of smooth pursuits, saccades, and gaze stability did not provoke symptoms. Diplopia and left eye lateral gaze deficit persisted throughout testing, but this was variable. He was able to cross midline intermittently. Near point of convergence was 4cm and accommodation was 7cm bilaterally. Finger to nose testing was fast but inaccurate. Balance testing revealed difficulty with tandem walk backwards with eyes open and closed.

DIFFERENTIAL DIAGNOSIS:
Traumatic abducens palsy
Lateral rectus entrapment
Intracranial mass
Ocular migraine
Malinger

TESTS AND RESULTS:
CT and MRI brain both normal
Ophtalmology: left abducens palsy, bilateral resolving papilledema, recommended patching to alleviate symptoms
Neurology: Traumatic abducens palsy. Resolved papilledema. No other neurological findings.

FINAL WORKING DIAGNOSIS:
Concussion with left abducens palsy

TREATMENT AND OUTCOMES:
4 weeks after his injury he still complained of diplopia, but more intermittently and no longer requiring eye patches. He remained headache free with full academics. He had normal extraocular movements with slow pursuits, but deficit would return with fast eye movements. He was lost to follow up, but per mother’s report, diplopia resolved approximately 7 weeks from injury.

HISTORY: 16-year-old female presents for evaluation of a possible post-concussion syndrome after being struck in the head by a dodgeball in gym class. Patient was asymptomatic at the time of injury. Two weeks following the injury she awoke feeling “different”. Symptoms predominately consisted of headache, head pressure, nausea and photophobia. Her symptoms progressed to the point where she was unable to attend school. She was seen in the sports medicine clinic for presumed post concussive syndrome. Upon presentation she denied upper extremity weakness, radicular pain or sensory symptoms. Her post-concussion symptom score was 56 at the time of her sports medicine visit, with significant headache, light and noise sensitivity, and a continued sensation of feeling “not right.” She had a history of concussion sustained two years prior to presentation in which symptoms resolved after two days.

PHYSICAL EXAMINATION: Healthy-appearing individual, sensitive to light. No malingering or during the physical examination. The clinician detected no abnormal findings on physical examination.

DIFFERENTIAL DIAGNOSIS:
Brain tumor, Post-concussion syndrome, Migraine headaches, Depression, Anxiety

TEST AND RESULTS: MRI without contrast: No definite evidence of traumatic brain injury. Large cystic-appearing mass in the right lateral ventricle. MRI with contrast: compared to her baseline, the player showed significantly different levels of oxygenation changes at 1-day post-injury that approached pre-injury levels but had not fully returned to baseline at 1-week post-injury.

Abstracts were prepared by the authors and printed as submitted.
TREATMENT AND OUTCOMES: Referrals were made to pediatric neurooncology and pediatric neurosurgery. The patient underwent a right tempoparietal craniotomy with full tumor resection. Surgery was without complications. Biopsy results confirmed a choroid plexus xanthogranuloma. Seven days following surgery she experienced postoperative seizures, and was placed on Keppra. She did not experience recurrent seizures and was able to be titrated down on her Keppra. A six month postoperative MRI scan is pending, with neurology and neurosurgery appointments to follow. She was slowly reintegrated back into school and is currently asymptomatic.

HISTORY: A 14-year-old male sustained a closed head injury while playing recreational lacrosse with a friend. During a face off, he tripped over his feet and hit frontal aspect of head on turf. There was no loss of consciousness, hematoma, or bleeding. He was disoriented and taken home due to headache and confusion. He slept for 45 minutes, then awoke with emesis three times. The family took him to a local pediatric emergency room, a head CT was performed and diagnosed with a concussion. He followed up in concussion clinic 8 days later. He reported symptoms of fatigue, motor slowing, and no headaches. After intake and history, he began computer Cogstate Concussion Test. Within 5 minutes of start, his father called for help due to a first time seizure.

PHYSICAL EXAMINATION: Not alert, sitting in chair with left arm flexed and left leg extended actively having a generalized tonic colonie seizure. He was lifted to the table and head tilted thrust performed due to dusky appearance with improvement, 100% non-rebreather face mask was placed, and seizure self-resolved in 4 minutes. He was slow to arouse and answered questions slowly and appropriately. On examination vital signs were normal for age and no focal deficits elicited with equal strength, sensation, and reflexes bilateral upper & lower extremities. He was transported from concussion clinic to the pediatric emergency room by EMS for further evaluation.


TEST AND RESULTS: Head CT day of injury: No acute intracranial abnormality. Extensive confluent hypodensity in the periventricular cerebral white matter with atrophy. MRI of brain with contrast 8 days after injury: Extensive, symmetric areas of T2 prolongation within the deep white matter of both cerebral hemispheres, with small cystic changes adjacent to the frontal horns of the lateral ventricles.

EEG: Intermittent slowing on the left is suggestive of underlying cerebral dysfunction.

FINAL WORKING DIAGNOSIS: Vanishing White Matter Disease

TREATMENT AND OUTCOMES:
1. Whole Genome Sequencing completed and positive for Vanishing White Matter Disease.
2. Held from all further contact sport participation.
3. Physical therapy and occupational therapy to address progressive weakness.

Clinical Case Slide - Shoulder I

A-29  

Head- Lacrosse  
Amy Valasek. Nationwide Childrens Hospital, Westerville, OH.  
(Sponsor: James MacDonald, FACSM)  
Email: amy.valasek@nationwidechildrens.org  
(No relationships reported)

HISTORY: 11 y/o RHD male with no PMH presented for evaluation of left shoulder pain. He did not complain of any pain, but his mother became concerned when she noticed he wasn’t moving his left arm much. When asked, the patient did admit to some pain over the lateral aspect of the shoulder. He could not lift his arm over his head despite lack of significant pain with the motion. He denied neck pain, radicular pain, numbness, tingling or prior shoulder injury. The symptoms had not improved since the time of injury.

Physical Examination:
General: well appearing, no apparent distress
L shoulder:
Inspection: antalgic carriage of shoulder, no deformity, atrophy, swelling
Palpation: tender over humeral head, glenohumoral joint, posterior shoulder
ROM: significantly limited in AROM despite lack of significant pain
Strength: Weak diffusely (3-4/5) out of proportion to minimal level of pain
Neurovascular: distal pulses intact, negative Spurings, decreased sensation over anterior biceps, otherwise intact
Skin: no breakdown, erythema, ecchymosis

Differential Diagnosis:
Brachial plexus injury
Nerve root avulsion
Suprascapular nerve palsy
Shoulder dislocation
Fracture: humeral head, humeral neck, glenoid, clavicle, cervical
AC separation
Contusion
Non-accidental trauma
Altered pain inhibition

Shoulder Pain and Weakness in 11 y/o Male after Bike Accident  
Everett Hayes. Evergreen Sports Medicine, Augusta, ME.  
(Sponsor: Peter Sedgwick, FACSM)  
(No relationships reported)

159 May 31 9:30 AM - 9:50 AM  
Biceps Pain- Rock Climber  
Stephanie Kramer1, Darius Greenbacher2, Pierre Rouzier, FACSM1.  
1Baystate Medical Center, Springfield, MA.  
2Baystate Medical Practices, Northampton, MA.  
3University of Massachusetts, Amherst, MA. (Sponsor: Pierre Rouzier, FACSM)  
Email: stephanie.kramerDO@baystatehealth.org  
(No relationships reported)

HISTORY: 44 year old right hand dominant rock climber presented with right sided anterior-medial biceps pain without acute injury, although history significant for 500 push ups and 100 pull ups daily, as well as 3-4 hours of rock climbing 3-4 times/week. He does have a history of a 15 foot fall while climbing (in harness and about 7-8 feet from last anchor point) after losing grip with his right hand, but does not associate this with the onset of his pain. He complains of pain with any type of elbow flexion, more with abduction to 90 degrees such as when climbing.

PHYSICAL EXAMINATION: Elbow exam: Inspection: No obvious defects of the biceps/anterior musculature. No overlying ecchymosis. Palpation: Mild tenderness over mid to distal biceps and myotendinous junction, no bony tenderness. ROM: full Strength: 5/5 Special: No Popeye sign. Pain with resisted flexion of the elbow (greater with thumb up) and resisted forearm supination.

Shoulder exam: Inspection: No asymmetry, atrophy or ecchymosis. Palpation: no pain with palpation. ROM: full strength: 5/5 and symmetric Special: Jobe’s test neg. Some mild discomfort with Speed’s and Yergason’s test at the mid biceps muscle belly but no proximal shoulder/arm pain. No pain with impingement tests. Biceps pain with O’Brien’s. Neurowascularly intact.


TEST AND RESULTS: MRI (not arthrogram) showed minimal tendinosis of supraspinatus but no rotator cuff tear. Large type II SLAP tear extending from just posterior to biceps anchor to the upper aspect of posterior labrum. Biceps long head tendon intact and normal position. Normal musculature at marker site placed by pt (approx 15cm from shoulder joint). No evidence of biceps retraction.

FINAL WORKING DIAGNOSIS: Type II SLAP tear

TREATMENT AND OUTCOMES: Minimal relief with rest/PT. Corticosteroid injection provided some relief and pt able to resume activities, however not yet at full volume 1 month after treatment

160 May 31 9:50 AM - 10:10 AM  
Shoulder Pain and Weakness in 11 y/o Male after Bike Accident  
Everett Hayes. Evergreen Sports Medicine, Augusta, ME.  
(Sponsor: Peter Sedgwick, FACSM)  
(No relationships reported)
HISTORY: A 21 y/o male, college football running back and basketball player felt his left shoulder pop and shift during a contact play in a football game. He removed himself immediately from play, and on the sideline, he was diagnosed with an anterior glenohumeral dislocation. He had no prior shoulder instability. His shoulder was successfully reduced using a Hemonip-Kocher maneuver on the sideline. Examination immediately following the reduction showed no deficits and he was allowed to return to play wearing a Sully brace. Later in the same game, he was carrying the ball and stiff armed an opponent with the left hand and dislocated his shoulder a second time. Re-reduction on the sideline was initially unsuccessful the second time and he was taken to the athletic training room and his shoulder was there successfully reduced using a traction/counter-traction technique.

PHYSICAL EXAMINATION:
- Left shoulder pain and weakness
- Passive ROM in all planes was normal
- No bony TTP
- Neurovascular exam was intact.

DIFFERENTIAL DIAGNOSIS:
- Glenohumeral Dislocation
- Impingement Syndrome
- Rotator Cuff Tear
- Labral Tear
- Subacromial Bursitis
- Parsonage-Turner Syndrome
- Cervical disk disease
- Shoulder impingement syndrome
- Neoplastic brachial plexopathy
- Suprascapular tendinopathy
- Tests and results: Xray were obtained; no fracture, arthritis or soft tissue abnormalities were seen. Patient was sent for cervical and plexus MRI as well as EMG and nerve conduction studies. MRI results were without infiltrating process or extrinsic compression on the brachial plexus. Cervical spine MRI revealed a small right central disc excision without impingement. Nerve conduction studies demonstrated significant differences between the right and left Median and Ulnar nerves. The right Median and Ulnar nerves F-wave latency showed no response compared to 20.3 msc on the left side, which is consistent with a proximal injury as at the level of the plexus. Final working diagnosis: Parsonage-Turner syndrome

OUTCOME: Patient was given Toradol and Diclofenac IM as well as Medrol dose pack and Amitriptyline. She was also referred to PT.

Return to activity and follow up: 7 weeks after the initiation of the treatment patient reported almost complete resolution of her symptoms. She was instructed to follow up 7 weeks after the initiation of the treatment patient

TREATMENT AND OUTCOMES: He was seen in the college’s athletic training room three days following the injury. The medical team presented treatment options to him with no improvement. He saw his primary care doctor who prescribed physical therapy. He attended 10 sessions with no improvement. Pain is currently 5/10, aching, worse after lifting weights and with palpation of the mass.

PHYSICAL EXAMINATION: Exam reveals no ecchymosis on inspection. There is a 2x2 non-mobile soft tissue mass over posterior inferior axillary region that is tender to palpation. Shoulder abduction and flexion on right is limited to 160 degrees with full internal/external rotation. 4+/5 strength with shoulder adduction.

DIFFERENTIAL DIAGNOSIS: Infraspinatus tear, teres major tear, latissimus dorsi tear, lipoma, liposarcoma, neurofibroma, hematoma, asymmetric fat deposition, rhabdomyosarcoma

TREATMENT AND OUTCOMES: Due to chronicity of symptoms and failure of physical therapy, patient elected for dextrose tenotomy. At one month follow up, he reported improvement in his pain from 5/10 to a 2/10, and was advised to slowly increase his activity. Three months after initial treatment, returned for follow up and reported 80% improvement in symptoms and strength. He elected for repeat dextrose tenotomy, and after the procedure was referred to physical therapy. After one month of physical therapy, he was discharged with full strength and complete resolution of pain. He was able to successfully audition for America Ninja Warrior.
A-39 Basic Science World Congress/Poster - Motor Control and Movement Disorders

**Board #1**

**May 31 9:30 AM - 11:00 AM**

**Rock Climbing as a Novel Intervention to Improve Function in Parkinson’s Disease: A Case Series**


Email: jgwool@gwu.edu

*(No relationships reported)*

**PURPOSE:** To preliminarily characterize the feasibility and safety of indoor rock climbing (IRC) as a therapeutic intervention for persons with Parkinson’s Disease (PD) and to explore any potential IRC may have for improving physical function.

**METHODS:** Subjects participated in 8 weeks of thrice weekly IRC. Each climbing session was comprised of 3 climbing sets. Sets gradually progressed from 5 to 8 min as did the degree of technical difficulty (5.5 to 5.7, assessed by the Yosemite Decimal System) over the 8-week intervention. Self-reported difficulty of movement and movement self-confidence were assessed using the Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL). Dynamic balance was assessed using the Mini Balance Evaluation Systems Test (miniBESTest). Functional leg strength/power was measured using the five times sit-to-stand test (5xSTS).

Aerobic capacity was assessed using the 6-min walk test (6MWT). Grip strength (GS) was assessed using a hand dynamometer. All data were collected at baseline (T0) and after the intervention period (T1). Data for each subject were obtained at the same time of day on T0 and T1.

**RESULTS:** Three men on stable medication regimes (in order of recruitment: ages 73, 70, 72 yrs; BMI: 24, 24, 25 kg/m²; disease duration: 7, 13, 4 yrs; subjects 1 and 2 had idiopathic PD, subject 3 had familial PD) participated. Most subjects reported improvements in difficulty of movement (change scores [T1-T0] for each subject: -5, +3, -7) and all reported improvements in movement self-confidence (-4, -9, -15) on the OPTIMAL. Minimal dynamic balance improvements (+1, +1, +2) were noted on the total score of the miniBESTest for all subjects. Minimal improvements in functional leg strength/power for 2 subjects (+0.54, +1.27, -0.71 sec) were observed as measured by the 5xSTS. No improvements were observed for 6MWT or GS. No adverse events occurred.

**CONCLUSIONS:** IRC appears to be a feasible therapeutic activity with minimal safety risks for persons with PD. IRC may play a unique role in decreasing the perceived difficulty of movement and increasing movement self-confidence for persons with PD. IRC may potentially improve dynamic balance and functional leg strength. This case series provides preliminary evidence for larger studies to examine potential benefits of IRC for persons with PD.

**181 Board #2**

**May 31 9:30 AM - 11:00 AM**

**Impact of Rock Climbing on Complex Tasks in Persons with Parkinson’s Disease: A Case Series**

Susan J. Leach, Elizabeth Ruckert, Natalia Aguero, Joshua G. Woolstenhulme. *George Washington University, Washington, DC.*

Email: leachss@gwu.edu

*(No relationships reported)*

**PURPOSE:** Indoor rock climbing (IRC) incorporates a physical component of climbing a wall with a cognitive component of selecting an appropriate climbing route. A climber is required to divide attention between the physical and cognitive demands of the task, a necessary skill in many daily activities. The purpose was to examine the impact of a novel and challenging IRC intervention on complex tasks such as those requiring divided attention in individuals with Parkinson’s Disease (PD).

**METHODS:** A pretest, postest pilot intervention study had participants perform IRC 3x per week for 8 weeks while increasing climbing duration and technical difficulty. Outcome measures included the Trail Making Part B test, the dual task Timed Up & Go (TUG) manual and cognitive tests, the timed Supine to Stand test, and the Four Square Step Test.

**RESULTS:** Three novice rock climbers with PD took part in this study. Participant 1 (P1) was a 73-year-old male with a 7-year history of idiopathic PD with early stage clinical presentation. Participant 2 (P2) was a 70-year-old male with a 13-year history of idiopathic PD with middle stage clinical presentation. Participant 3 (P3) was a 72-year-old male with a 4-year history of familial PD with early stage clinical presentation and cognitive involvement. The following results represent the change from pretest to posttest in seconds. Climbers P1 and P3 had faster and improved Trail Making Part B times: P1: -3.89; P2: +22; P3: -8.57. Climbers P2 and P3 had faster and improved TUG manual times: P1: +0.041; P2: -0.141; P3: -0.976. Climber P3 had faster and improved TUG cognitive times: P1: +0.209; P2: +0.633; P3: +3.791 seconds. All 3 climbers had faster and improved timed Supine to Stand times: P1: -0.442; P2: -0.209; P3: -3.791. Climber P3 had faster and improved 4 Square Step Test times: P1: +0.3; P2: +1.258; P3: -1.458.

**CONCLUSIONS:** Three novice rock climbers with PD demonstrated improvements in complex tasks following 8 weeks of IRC: P1 and P2 in 2.5 measures; P3 in 5/5 measures. The extent of improvement appeared greatest in P3 who presented with cognitive impairment at baseline. It is possible that IRC prepares learners for task complexities similar to those encountered in the community. This pilot study provides preliminary evidence for larger studies to investigate potential benefits of IRC for persons with PD.
Val66Met polymorphism influenced changes in depression symptoms after dynamic cycling. METHODS: Fourteen participants (N=10, 6M/4F Val-allele group, N=4, 2M/2F Met-allele group; 64 years old, disease with idiopathic PD) were assessed with the Beck Depression Inventory (BDI-II) and provided saliva samples for BDNF Val66Met genotyping. The exercise intervention was three 40 minute dynamic cycling sessions separated by 48 hours. RESULTS: There were no differences in the severity or prevalence of depression symptoms at pre-intervention for Val-allele group (N=10, 11.20±12.43) vs. Met-allele group (N=4, 6.25±5.97) on a 0-63 scale (p=0.468). Four of the fourteen participants experienced moderate to severe depression symptoms: one participant - mild depression symptoms (15/63), two participants - moderate depression symptoms (22/63 and 23/63), and one participant - severe depression symptoms (38/63). Participants with moderate or greater depression symptoms had an average BDI-II score that significantly improved (p=0.017) from pre-intervention (24.50±9.68) to post-intervention (17.56±9.8). CONCLUSION: Val66Met polymorphism did not influence the presence or severity of depression symptoms and did not influence improvements in depression symptoms after dynamic cycling in individuals with mild depression symptoms. However, there was a significant improvement in participants who had moderate to severe depression symptoms regardless of the polymorphism presence. Future research will recruit individuals with PD who have moderate/severe symptoms to determine if these trends hold true in a larger sample. Supported by Kent State University’s School of Health Sciences, Midwest American College of Sports Medicine, and Ohio Parkinson Foundation Northeast Region Grant.

Cerebellar Transcranial Direct Current Stimulation For Parkinson’s Disease

PURPOSE: The purpose of this study was to determine the long-term influence of Cerebellar Transcranial Direct Current Stimulation For Parkinson’s Disease. Parkinson’s disease (PD) affects more than one million people in the US and this number is expected to double by 2040. PD is a progressive neurodegenerative disease that leads to difficulties in performing activities of daily living, such as balance and walking. Dynamic high cadence cycling is a unique rehabilitation modality that has been shown to improve motor function in individuals with idiopathic PD after three sessions. PURPOSE: To assess if six bouts of dynamic cycling, on a custom motorized recumbent cycle, improves motor function and mobility in individuals with PD. METHODS:Individuals were randomized to either a dynamic cycling or a stretching group. Dynamic cycling consisted of a 5 minute warm-up at 50 revolutions per minute (rpm), 30 minutes of dynamic high cadence cycling between 75-85 rpm, and a 5 minute cool down. Motor function, balance and gait were assessed after every cycling bout using the UPDRS Motor III scale, Kinesia One, and Timed up and Go (TUG). RESULTS: Six bouts of dynamic cycling significantly improved UPDRS III scores (p < 0.001), hand movement amplitude (p = 0.002) and TUG time (p = 0.005) from baselines testing to end of treatment. There was a 17% improvement in UPDRS scores and a 22% improvement in TUG time from baseline testing to end of treatment. CONCLUSIONS: Six bouts of dynamic cycling improves motor symptoms, overall motor function and mobility in individuals with PD. These findings suggest that dynamic cycling could be a valuable rehabilitation modality in this population.

Effect Of Aquatic-treadmill Training On Cerebrovascular Function In Community-dwelling Stroke Survivors: A Pilot Study

INTRODUCTION: Cerebellar transcranial direct current stimulation (c-TDCS) is a novel non-invasive brain stimulation technique that has proven to acutely increase motor performance in healthy populations. Since altered cerebellar activity contributes to Parkinson’s disease (PD) pathology, anodal c-TDCS may improve motor function in PD. PURPOSE: The purpose of this study was to determine the long-term influence of c-TDCS on motor learning and transfer of motor learning in PD. METHODS: The study was a sham-controlled, double blind, between-subjects design. Twelve PD patients were allocated to either a c-TDCS group or a SHAM group. Practice consisted of 9 daily sessions involving performance of a complex, visuomotor precision grip task (PGT) with their most affected hand during either c-TDCS (25 minute duration, 2 mA current strength) or SHAM. The PGT involved matching a target sine wave (target range: 5-15% of maximum) for 10 trials in each session. PGT performance was quantified as the average force error relative to the target force. Transfer tasks were performed in 2 testing sessions performed before and after the 9 practice days and included the Unified Parkinson’s Disease Rating Scale Part III (UPDRS) and the Jebsen Taylor Hand Function Test (JTT). RESULTS: The PGT, there was no difference in the percentage decrease in force error between groups from the 1st to the 9th practice sessions (p = 0.64, c-TDCS 29 ± 13%, SHAM 29 ± 14%). For the JTT, the main effect for Group was not significant (p = 0.37, c-TDCS 37 ± 8 sec, SHAM 33 ± 5 sec). Furthermore, the main effect for Test was not significant (p = 0.42; Test 1 35 ± 6 sec, Test 2 35 ± 7 sec). Finally, the Group x Test interaction was not significant (p = 0.58). For the UPDRS, the main effect for Group was not significant (p = 0.53; c-TDCS 18 ± 4 pts vs SHAM 18 ± 9 pts). Furthermore, the main effect for Test was not significant (p = 0.38; Test 1 19 ± 7 pts, Test 2 17 ± 7 pts). Finally, the Group x Test interaction was not significant (p = 0.07). CONCLUSION: These findings indicate that long-term c-TDCS does not seem to elicit improvements in motor learning or transfer of motor learning in PD. Therefore, c-TDCS may not be as effective as TDCS applied to the motor cortex in PD. The first author is a CAPES PhD student grantee (BEX 13509/13-6) and this research was supported by a CTR-IN Pilot grant to Brach Poston.

Effect Of Aquatic-treadmill Training On Cerebrovascular Function In Community-dwelling Stroke Survivors: A Pilot Study

INTRODUCTION: Water aerobics exercise could be a useful therapy for improving the cerebral hyperemic response to cognition in individuals with MS. METHODS: Thirty-one individuals diagnosed with MS were assigned to either an exercise group (N = 17) or a non-exercise group (N = 14). The non-exercise group maintained normal activity for the 7 days, while the exercise group participated in 1 hour of water aerobics exercise on each of the 7 days. Oxygenated hemoglobin (O2Hb), deoxygenated hemoglobin (HHb), and total hemoglobin (Hb) were measured using near-infrared spectroscopy at rest and during a cognitive task prior to and after the 7 day period. For both groups, paired samples t-tests were used to compare differences in O2Hb, HHb, and Hb from rest to cognition before and after the 7 days. RESULTS: There was no significant difference between O2Hb from rest to cognition at pre-testing (t(16) = -1.91, p = 0.07), however O2Hb significantly increased from rest during cognition at post-testing (t(16) = -2.30, p = 0.04). For the control group, O2Hb significantly increased from rest during cognition at pre-testing (t(13) = -2.51, p = 0.03), but there was no significant difference between O2Hb from rest to cognition at post-testing (t(13) = 1.6, p = 0.13). CONCLUSIONS: Water aerobics exercise could be a useful therapy for improving the cerebral hyperemic response to cognition in individuals with MS, which may help offset the cerebral hypermetabolic effects of the disease.
Reviewing the above document, it appears that the text is about a study on the effects of a 4-week intervention on brain blood flow activation in chronic stroke patients. The study used functional magnetic resonance imaging (fMRI) to examine the effects of different types of exercise on brain blood flow activation in chronic stroke patients.

The study found that the multi-directional strategy (MET) used in the intervention resulted in a differential increase between hemispheres (interaction effect: p=0.41). The effect did not reach statistical significance (p=0.08) nor was there statistical support for a differential increase in activation of blood flow after exercise training. However, there was no change in activation of blood flow after exercise training. Further studies are needed to confirm this finding in a larger sample and to determine whether this acute motor activation from high-intensity AEX can be used to improve motor outcomes following stroke.

**PURPOSE:** Recent studies reported that repetitive unidirectional exercise therapy (UET) like treadmill-walking stimulates subcortical brain areas and the cerebellum. UET may stimulate plasticity of the central nervous system by increasing blood flow in this area and hence increasing neuronal activity. The aim of this study was to examine the effects of two different types of exercise on brain blood flow activation in chronic stroke patients: multi-directional training using a half-dome ball and an aerobic-steps protocol (MET) versus UET on a treadmill.

**METHODS:** Twenty chronic stroke patients were randomly assigned to two 12-week exercise programs, MET (n=10, 50.9±15.0yrs) or UET (n=10, 58.3±12.1yrs). Activation of blood flow in the brain was measured during leg movement using functional magnetic resonance imaging (fMRI) at baseline and after 12 weeks of exercise. The MET consisted of using a half-dome ball and an aerobic step at 85% of maximal heart rate for 1h/day, 3days/week. SPM5 (http://www.fil.ion.ucl.ac.uk/spm/) was used for preprocessing and statistical analysis of the fMRI data.

**RESULTS:** Paired T-tests were used to analyze differences between pre- and post-exercise results (p < .001). RESULTS: Both MET and UET groups showed a significant increase in activation of blood flow after exercise training. However, there was no significant difference between MET and UET in the total area of activation of blood flow in the brain. While it was not statistically significant, the fMRI analysis reveals different patterns of activation: in the MET group, the most highly activated areas were motor movement and posture control (t=10.54, t=8.6, t=8.12, p < .001), while in the UET group, the highly activated areas were somatosensory functions (t=13.10, t=10.08, t=3.95, p < .001). CONCLUSION: Our finding suggest that although both MET and UET exercise program enhanced blood flow to the brain in chronic stroke patients, MET exercise promotes more activation in submotor areas responsible for unilateral involuntary motor movement and posture control.
Challenging tasks. The present cognitive-motor intervention was identified as a process is associated with structural and functional alterations of autonomic nervous system functions that are responsible for an impaired ability to adapt to environmental challenges. The present cognitive-motor intervention was identified as a potential promising method to counteract these age-related negative adaptations. Supported by Norway Grants, Project No. 4300:472/2014

In the aging process, there is a higher competition for attentional resources during challenging-dual-task postural conditions, which consequently increases risk of falls. Fall prevention programs should therefore seek proper interventions to improve dual-task performance of the elderly. PURPOSE: To assess psychophysiological responses to dual-task postural control in older adults and the effectiveness of 3-month cognitive-motor intervention. METHODS: Thirty healthy older adults (70±6y, 76% women) were randomly divided into either 3-month cognitive-motor or control group. Postural control was monitored using a force plate (AMTI HE600-600-2K, MA, USA) during quiet stance and in tandem position, both in normal and in DT conditions (subtracting the control was monitored using a force plate (AMTI HE600-600-2K, MA, USA) during quiet stance and in tandem position, both in normal and in DT conditions (subtracting the quiet stance). Psychophysiological responses (heart rate and variability, heart rate variability, skin temperature and galvanic skin responses) were assessed with NeXus-10 MKII (Mind Media B.V., The Netherlands). Finally, the subjective ratings of physical and cognitive workload were assessed by Borg scale. The results were addressed by interactions of RM ANOVA at p<0.05. RESULTS: Significant interactions in terms of better outcomes for cognitive-motor group were found for heart rate (p=0.044) and breathing frequency (p=0.048) whereas results for postural sway failed to reach statistical significance (non-significant trend p=0.097). Furthermore, subjective ratings were increased in both groups with increased postural difficulty (p=0.05). Finally, the cognitive-motor group revealed higher accuracy of secondary (cognitive) task while balancing at the end of the intervention (p=0.032). CONCLUSION: Aging process is associated with structural and functional alterations of autonomic nervous system functions that are responsible for an impaired ability to adapt to environmental challenges. Participants in the social-support enhanced group received two extra Fitbits and scales to share with up to two persons in their social circle. There were no significant differences between conditions, so analyses collapsed groups and examined the full sample. Paired t-tests were used to evaluate changes in weight and daily steps from baseline to post-treatment. Spearman rank correlation coefficients were calculated to test the associations between the total number of days the Fitbit was used (out of 112 days) and changes in daily steps and weight. Fitbit use was objectively established by weekly monitoring of synced data from the Fitbit website. RESULTS: At baseline, participants were obese (BMI=36.1 ± 7.3 kg/m²) and low active (M=5546 ± 2390 steps/d). Weight losses averaged -3.5±4.3 kg (p<0.001) and daily steps increased an average of 1101±2395 (p<0.001) over baseline. Participants used the Fitbit an average of 5.9±2.5 days/week. A significant correlation between total number of days the Fitbit was used and weight loss such that there was greater use of Fitbit was associated with greater weight loss (r=−0.61, p<0.001). A significant, positive correlation was found between the change in daily steps and the number of days the Fitbit was used (r=−0.43, p<0.001). CONCLUSION: These preliminary findings suggest that advanced wearable physical activity trackers hold promise as tools for assisting with physical activity promotion and weight loss in adults within the context of a multi-component behavioral weight loss program.

Board #14 May 31 11:00 AM - 12:30 PM Use It And Lose It: Fitbit Use, Daily Steps, And Weight Change Among Overweight Adults Chelsea A. Larsen, Courtney M. Monroe, Delia S. West. University of South Carolina, Columbia, SC. (Sponsor: Sara Wilcox, FACSM) (No relationships reported)

Despite the increasing proliferation of advanced wearable physical activity tracking devices (e.g., Fitbit Zip), their value as tools for physical activity promotion and weight loss remains unclear.

PURPOSE: As part of a pilot intervention trial that examined the efficacy of a novel social support approach for enhancing weight loss, participants were provided with a Fitbit Zip to monitor their physical activity. The current study examined the relationships between Fitbit use and change in weight and daily steps over 4 months.

METHODS: Overweight adults (N=36) were randomized to either a standard or social support-enhanced, 16-week behavioral weight loss intervention. In addition to a Fitbit Zip, both groups received weekly, in-person group counseling sessions and digital body weight scales. Participants in the social-support enhanced group received two extra Fitbits and scales to share with up to two persons in their social circle. There were no significant differences between conditions, so analyses collapsed groups and examined the full sample. Paired t-tests were used to evaluate changes in weight and daily steps from baseline to post-treatment. Spearman rank correlation coefficients were calculated to test the associations between the total number of days the Fitbit was used (out of 112 days) and changes in daily steps and weight. Fitbit use was objectively established by weekly monitoring of synced data from the Fitbit website. RESULTS: At baseline, participants were obese (BMI=36.1 ± 7.3 kg/m²) and low active (M=5546 ± 2390 steps/d). Weight losses averaged -3.5±4.3 kg (p<0.001) and daily steps increased an average of 1101±2395 (p<0.001) over baseline. Participants used the Fitbit an average of 5.9±2.5 days/week. A significant correlation between total number of days the Fitbit was used and weight loss such that there was greater use of Fitbit was associated with greater weight loss (r=−0.61, p<0.001). A significant, positive correlation was found between the change in daily steps and the number of days the Fitbit was used (r=−0.43, p<0.001). CONCLUSION: These preliminary findings suggest that advanced wearable physical activity trackers hold promise as tools for assisting with physical activity promotion and weight loss in adults within the context of a multi-component behavioral weight loss program.
levels) outcomes were assessed at baseline, 7-week, 6- and 12-months. Indices of treatment perception, adherence, abstinence rates, and PA levels were compared between groups using chi-square analyses and ANOVA.

RESULTS: Smoking abstinence in the PA and wellness groups were 18.6% and 23.8%, respectively at 7 weeks, 15.1% and 16.1% at 6 months, and 14.1% and 16.6% at 12 months. Between group differences did not significantly differ from each other (all χ² p-values > 0.18). In the PA group, increases from baseline to 7 weeks were observed for total minutes of PA of 97.8 min to 145.2 min; p < 0.01) and total minutes of strength training/week (12.8 to 29.7; p < 0.005). For the PA group, total PA and strength training were not different at 6 and 12 months compared to baseline, and no changes at any follow-up were observed in the wellness group. Intervention session attendance over the year averaged 65% for the PA intervention and 72% for the wellness (p = 0.001). Participants in both the PA and wellness conditions found the intervention to be “very helpful” in quitting smoking [85% and 83% respectively (p = 0.20)]. Time commitment to the program was considered to be “not at all a burden” [88% in both conditions (p = 0.84)]. Participants indicated they would “strongly agree” to recommend the program to a friend [95% and 92% respectively (p = 0.06)].

CONCLUSION: A combination of individual smoking cessation counseling, nicotine replacement therapy, and a community-based PA or wellness program was acceptable to smokers but did not appear to improve long-term abstinence rates above what has been seen with nicotine replacement therapy in previous studies.

Grant funded: PHS Grant RO1 HL088569

Introduction: Biomedical research aimed toward a deeper understanding of yoga’s benefits and physiological mechanisms has become an active area of study. To decrease disparity between populations who can readily access yoga classes and therapies, benefits of yoga could be implemented in an exergame format at clinical or home environments. This platform could be installed with low cost hardware using the Cloud for analytics and data collection. Purpose: Objective was to analyze yoga posture alignment using a 3D room sensor to produce a physical activity exergame for specific groups, such as young adults. This research utilizes gesture analysis software to provide skill improvement feedback to students in a yoga course setting. Methods: We measured yoga posture alignment over the course of a 10-week period using Kinect SDK 2.0. A convenience sample of 12 undergraduate students with minimal yoga experience were recruited under an IRB approved protocol. Results: Five yoga postures were captured from seven yoga teachers, as a gold standard for comparison and used for training supervised machine learning algorithms. Default settings in Kinect Visual Gesture Builder produced solutions with high true positives (99.5%) and low false positives (0.03%) for most yoga postures sampled. Depth stream and skeleton coordinates for the 12 participants were acquired and analyzed against this trained solution. Analysis showed sensitivity for True Positives was greatest for “Side Bend” (0.496) and “Upward Salute” (0.141) and created recognition software that accurately scored the alignment of yoga postures and led to an increase in the user’s perceived benefit of the activity. Prior research has shown that even short-term yoga based lifestyle interventions were efficacious due to the “gold standard” feature of each posture. Discussion: Gesture analysis for yoga alignment training may be a useful tool for the development of home and clinical yoga therapy for those who could not participate in traditional physical activity. The exergame developed provides a tool that scores the performance of yoga postures and improvement. Prior research has shown that even short-term yoga based lifestyle interventions were efficacious in weight loss, inflammation and stress and positively influenced cardiovascular risk factors. Conclusions: Our plans are to target special populations, study the potential effects of body mass and age on posture alignment, and assess breathing, heart rate and limb stretch.

A great deal of research has focused on implementing walking interventions with the intent of increasing employee well-being and decreasing organizational healthcare costs. The inclusion of dogs within a walking intervention can not only facilitate walking adherence, but also increase health benefits. Purpose: To assess the benefits experienced by university staff members after walking local shelter dogs during their lunch breaks. Methods: Staff members at a local university were recruited through a campus listserve. Seven full-time staff members (100% female, 100% white, 27-66 years of age) completed the study. Shelter dogs were transported to campus weekly for four weeks in the Spring of 2016. One week was canceled due to rain. Participants were paired and instructed to walk their assigned dog for 30 minutes using the sample walking routes provided. Accelerometer data (hip-worn Actigraph GT3X) were collected during each walk to document intensity levels and post-intervention interviews were conducted upon completion of the study to assess participant perceived benefits of the intervention. Results: Eighty-six percent of participants completed all walking sessions. Participants averaged 24.9 ± 7.4 minutes of moderate-to-vigorous physical activity (range 12-37 minutes) during the walk. Interview data revealed that participants sat anywhere from 3-7.5 hours out of their 8-hour workday. Participants self-reported being somewhat physically active outside of the workplace setting, but all wanted to find ways to be more physically active throughout the day. The majority indicated walking the dogs was somewhat physically active (95% and 82% respectively). Time commitment to the study was considered to be “not at all a burden” (88% in both conditions (p = 0.84)). Participants indicated they would “strongly agree” to recommend the program to a friend [95% and 92% respectively (p = 0.06)].

Conclusion: Incorporation of dogs into a university-based walking program can encourage program adherence and promote moderate intensity walking among women staff members.

Non-specific chronic low back pain (NCLBP) is a common ailment in older adults. It is possible that simple and inexpensive exercise programs could reduce pain and improve physical function, fitness and body composition in older women with NCLBP. PURPOSE: To analyze the effects of a short-term elastic band resistance program (EBRP) on pain, spine function, fitness and body composition in older adults with NCLBP. METHODS: 20 sedentary older women (70.9±9.5 yr) with NCLBP for at least 6 months were randomly divided into two groups: control group (CG) (n=9) that continued normal activities without exercise; and EBRP group (EBRPG) (n=11) that performed an 8-wk EBRP on 2 d/wk with 6 multi- articular standing exercises for upper and lower extremities for 4 sets of 10 repetitions (8-9 perceived effort) with 60 s of recovery between sets. Participants did not consume any nutritional supplements and none had any pathology that was currently being treated. Measures assessed pre- and post-training were: visual analogue scale of pain (VAS); Oswestry disability index (ODI); categorized sciatica pain (CSP); back performance tests: pick and lift repetitions tests (PT and LRT, respectively); Schober’s test (SFT); timed up and go test (TUGT); six-minute walk test (6MWT); isometric strength tests: vertical row (VRT); squat (SQT) and trunk curl (TCT); body fat percentage (BFT) and fat-free mass (FFM) (via bioelectric impedance). RESULTS: CG did not change from pre- to post-testing while EBRPG significantly (p<0.05) improved all variables analyzed. Conclusion: Significant differences were noted in PPT, CSP, EBRPG, respectively: VAS +9.4 vs. -70.3; ODI +16.0 vs. -49.1; CSP +4.2 vs. -100; PT +66.7 vs. -85.7; LRT -4.2 vs. +26.4; SFT -2.6 vs. +4.6; TUGT -2.7 vs. -25.4; 6MWT -1.5 vs. +16.6; VRT -7.2 vs. +14.1; SQT +5.2 vs. +23.5; TCT-14.8 vs. +33.2; BFT +1.6 vs. -2.4; FFM -1.1 vs. +22.4. Intergroup post-training significant differences were found on VAS, ODI, CSP, PT, LRT, and TUGT. CONCLUSION: An intense EBRP applied in a short time period appears to help reduce pain and improve spine function, physical fitness and body composition in older women with NCLBP. Further research is needed regarding the long-term impact of this program on NCLBP.

AcSM May 30 – June 3, 2017 Denver, Colorado
PURPOSE: To determine the effect of combined training on fitness and fitness outcomes, including body fat mass, waist circumference, muscle strength, and flexibility; and also clinical outcomes, including blood pressure, brachial-ankle pulse wave velocity and fasting blood glucose in Japanese women.

METHODS: Forty-one women were randomized to a training group, n = 23 (age 47.3 ± 6.5 years) or control group, n = 18 (age 46.7 ± 6.5 years). The intervention included participation in a 24-minute circuit training session (combining aerobic and resistance training) each of which lasted 30 seconds and 6-minute stretching 3 times per week for 16 weeks. The aerobic exercise was stepping on a step board while executing resistance training, using 12 different hydraulic devices designed for females to increase their muscle strength. During this training, the participants measured their heart rates once every 8 minutes based on the instructor’s guidance to maintain them at 60 to 80% of their maximal heart rates throughout training by adjusting training intensity levels. All outcomes were measured at baseline and after the intervention.

RESULTS: Although there was no statistically significant change in the control group, there were significant reductions in waist circumference (91.0 ± 6.3 to 89.8 ± 6.5 cm) (p = 0.045), systolic blood pressure (127.5 ± 19.0 to 123.3 ± 19.5 mmHg) (p = 0.038), fasting blood glucose (101.0 ± 19.4 to 95.3 ± 13.2 mg/dL) (p = 0.015), and brachial-ankle pulse wave velocity (1315 ± 181 to 1271 ± 173 cm/s) (p = 0.009) in the combined training group. Also, significant increases in the knee extension strength (858 ± 184 to 1140 ± 216 watts) (p = 0.001) and flexibility (33.7 ± 6.4 to 35.9 ± 6.4 cm) (p < 0.001) only in the training group.

CONCLUSIONS: The results of this randomized controlled trial showed that a 16-week combined training significantly improved the fitness and fitness outcomes and the clinical outcomes in Japanese women.

May 31 11:00 AM - 12:30 PM
Combination Of Sling Exercise Training And Nutritive Administration Of Carbohydrates And Protein By Food As A Strategy To Increase Strength In Older Men And Women

Patrick Diel, Gina Kiewardt. Geman Sports University Cologne, Cologne, Germany.
Email: diel@dshs-koeln.de

NO RELATIONSHIPS REPORTED

PURPOSE: After the age of 60, muscle strength is reduced by 1-1.5% per year increasing to 3% per year. However, strength training can counteract age related loss of strength. Sling training, a specific type of strength training, has positive effects on balance and functional mobility. However, knowledge about its effects on force and strength is limited. Malnutrition may be part of aging; especially the uptake of proteins and nutritive protein and carbohydrate uptake by food may be a suitable strategy to counteract age related loss of strength and muscle mass and improve the quality of life in the elderly.

RESULTS: Sling training resulted in a significant increase of strength in the control group as well as the intervention group. Average strength increased between 20 to 30% (858 ± 184 to 1140 ± 216 watts) (p < 0.001) and flexibility (33.7 ± 6.4 to 35.9 ± 6.4 cm) (p < 0.001) only in the training group.

CONCLUSIONS: The results of this randomized controlled trial showed that a 16-week combined training significantly improved the fitness and fitness outcomes and the clinical outcomes in Japanese women.
RESULTS: Both the exercise (Ex) and the waitlist (WL) groups significantly decreased, from baseline to week 16, mean caloric intake (Ex: Δ=-232.43 kcal, p<0.01; WL: Δ=-192.89 kcal, p<0.01), mean protein intake (Ex: Δ=-11.26 g, p<0.01; WL: Δ=-9.42 g, p<0.01), mean fat intake (Ex: Δ=-7.42 g, p<0.01; WL: Δ=-8.29 g, p<0.01), and mean carbo intake (Ex: Δ=-24.06 g, p<0.01; WL: Δ=-24.28 g, p<0.1). No significant change in aMed over time was found for either group (Ex: Δ=-31, p=0.24; WL: Δ=-35, p=0.05). There were no significant difference between the groups in any of the 5 diet measures (p>0.05).

CONCLUSIONS: Despite this intervention’s singular focus on aerobic training, both groups showed a marked reduction in KCal and Macronutrients. Sedentary participants willing to enroll in an exercise study may already be in the action stage of behavior change and may independently elect to change dietary behavior to improve overall wellness. Future studies should investigate what psychological triggers lead to a behavioral “spillover” and if the degree of engagement in the primary behavior could predict the magnitude of the “spillover”.

203 Board #24
Abstract Withdrawn

Participating in sports events through exercise class may be able to help goal setting, which contributes to establishing exercise habits.

METHODS: The requirement of participants were 20- to 64-year-olds who have not been having exercise habits and confidence to play sports for a long period of time without orthopedic and cardiovascular disease. Fifteen women participated in an exercise (EX) class 6 months, 90 min/session, twice a week and 16 women who were recommended to participate in a weight-loss (WL) class (the first 3 months were only dietary guidance and the last 3 months were only exercise. Guidance and exercise were 90 min/session, and once a week). Two months after the EX class started, we set a goal to participate in sports events (physical activity and free time) 5 km running race or 6 km walking. The EX class did not set any exercise goals. The participants’ exercise habits were investigated and 3 MEs or more physical activity level was measured using an accelerometer of activity monitor 1 year after the start of the class.

RESULTS: The stability rate of the exercise habits was significantly higher in the EX class than in the WL class (EX: 12 participants, 80.0%; WL: 8 participants, 50.0%; χ² test, p = 0.03). However, 4 of the 8 participants in the WL class already had the exercise habits before the class. In addition, 10 participants from the EX class who finished the running race last year have applied for the next year’s race. However, physical activity did not differ significantly between the two classes after 1 year (EX: 4.3 ± 1.9 METs/day; WL: 5.8 ± 1.9 METs/day; t-test, p = 0.46).

CONCLUSIONS: It is concluded that when establishing exercise habits goals should be set and making use of sports events through exercise class contribute to set definite goals easily and establish new exercise habits.
and allowed to familiarize with laboratory bicycle riding for two days, during which pre-test dependent variables (FBG, RHR, BP, blood lipids, maximal anaerobic power by Wingate Test, and post Wingate blood lactate) were measured. On the third day, the subject performed modified Wingate Tests with 2.5% of their body weight as the resistance (3 sets of 30 seconds with 2 minutes of active resting between sets, 3 times a week for 2 weeks). 24 hours after the last session of HIIT, the same dependent variables were assessed for post-test data collection. Results were expressed as mean ± SEM and analyzed by one tail student t-test. RESULTS: The HIIT exercise reduced post-exercise BLA (pre-test: 11±2.68; post-test: 9±3.19, p<0.05), LDL cholesterol (17±4.5% drop, compared to pre-test levels, p<0.05) and total cholesterol levels (9±3% drop compared to pre-test levels, p=0.05), with no significant differences found in FBG, RHR or BP, and HDL cholesterol. CONCLUSIONS: HIIT was effective in lowering LDL and TC levels, and BLA during maximal anaerobic power exercise. Our results suggest that as reflected in long-term endurance exercise, short-term HIIT may also be a sufficient means of ameliorating cardiovascular risk factors, specifically bad cholesterol. Our results also suggest that HIIT would be effective to improve fatigue resistance evidenced by reduced lactate levels during maximal aerobic power, which typically resulted from long-term endurance exercise. Taken together, our study supports emerging evidence that HIIT may be a potent mode of exercise contributing to preventing cardiovascular diseases.

208 Board #29  May 31 11:00 AM - 12:30 PM
ACSM Recommended Exercise of 30 minutes Per Day Improves Aerobic Capacity Similar to 60 minutes Per Day in Individuals with NAFLD
Erik P. Kirk, FACSM1, Shelby Sullivan2, Samuel Klein2. 1Southern Illinois University Edwardsville, Edwardsville, IL. 2Washington University School of Medicine, Saint Louis, MO. Email: ekirk@siue.edu

The effects of two different exercise doses on improving aerobic capacity (VO2peak) in obese individuals with nonalcoholic fatty liver disease (NAFLD) is unknown.

PURPOSE: The aim of this study was to evaluate the effect of the American College of Sports Medicine physical activity guidelines for adults (30min/d) on aerobic capacity compared to a high dose (60 min/d) in obese persons with NAFLD.

METHODS: Eighteen obese people (mean ± SD, Age 46.8±5.2 years, BMI=37.3±4.9 kg/m²) with NAFLD were randomized to 16 weeks of verified exercise training (45-55% VO2peak, 5 days/week) to either a low dose (LD, 30 min; n=9) or high dose (HD, 60 min/day; n=9). Aerobic capacity (VO2peak) was measured on a motor-driven treadmill. Participants walked to physiological exhaustion using the Balke treadmill protocol. Dual Energy X-ray Absorptiometry (DXA) was used to measure body weight (BW) and percent body fat. Magnetic resonance spectroscopy was used to evaluate (intrahepatic triglyceride) IHTG content. All measures were performed at baseline and 16 weeks.

RESULTS: Aerobic capacity significantly (p<0.05) improved in both the LD (9.8±2.8%) and HD (8.6±3.0%) from pre to postexercise with no significant differences between groups. There were no between group differences for IHTG, BW, or percent body fat so data was combined. Exercise training resulted in a 10.5±4.7% decrease in IHTG content (p<0.05), but did not change total body weight (103.5±4.0 kg vs 102.7±3.0 kg) or percent body fat (39.0±2.0% to 38.5±2.1%) from baseline to 16 weeks. CONCLUSION: Performing verified physical activity as recommended by the ACSM improves aerobic capacity, IHTG, and body composition similarly to a higher exercise dose of 60min/day in obese persons with NAFLD.

209 Board #30  May 31 11:00 AM - 12:30 PM
Types of Social Support and Weight Change among Overweight Adults
Courtney M. Monroe, Chelsea Larsen, Delia West. University of South Carolina, Columbia, SC. (Sponsor: Sara Wilcox, FACSM) Email: cmmonroe@mailbox.sc.edu

Engaging social support has been found to be an effective strategy to promote weight loss. Yet, little is known about the specific types of social support that may be the most influential.

PURPOSE: The aim of this study was to examine the association between weight change and the types of social support adults participating in a behavioral weight loss interventions reported between those who lost > 5% of their initial body weight and those who did not.

RESULTS: Participants were obese at baseline (M BMI = 36.1 ± 7.3 kg/m²), and 43% lost > 5% of their initial weight by 16 weeks. Only emotional, esteem, and tangible support emerged as the most frequently reported most helpful types of support among all participants across the intervention period. A greater proportion of those who lost > 5% of their baseline weight identified esteem support as the most helpful type of support versus those who lost < 5% of their initial weight (47% vs 10%, p = 0.02). No significant differences between weight change groups were found for other support types (p > .05).

CONCLUSION: These findings suggest that esteem support may be especially influential for fostering weight loss. However, future studies should employ designs that allow for the direct comparison and more robust evaluation of the effectiveness of different types of support on weight loss in adults.

210 Board #31  May 31 11:00 AM - 12:30 PM
The Effect Of A Hi At And Resistance Exercise Program On Body Composition In Obese Females
Ashley Peart, Mynor Rodriguez-Hernandez, Shelby Foote, James McDonald, David Pascoe, FACSM, Danielle Wadsworth. Auburn University, Auburn, AL. (Sponsor: Dr. David Pascoe, FACSM) Email: azh0078@auburn.edu

PURPOSE: High intensity interval training (HIIT) has shown reductions in fat mass in normal weight populations’ equal to or superior than continuous training. However, limited literature exists on the benefits and feasibility of HIIT training with obese participants. Furthermore, it is not known the additional benefits of incorporating resistance training with HIIT training on body composition for obese participants.

The purpose of this study was to examine the effect of a 10-week HIIT and resistance training intervention on body composition in obese females.

METHODS: 20 women (M Age = 37.1 ± 7.4) participated in a 10-week exercise intervention consisting of a high intensity interval treadmill protocol and resistance training three times a week for a total of 30 sessions. Body composition was assessed with the DEXA.

RESULTS: Participants significantly (p<0.007) increased lean mass from pre (105.7±15.4) to post (110.2±18.2) and significantly decreased fat mass from pre (101.9±33.5) to post (96.7±32.7). Greatest fat loss occurred in android (p<0.007) and visceral (p<0.006) area.

CONCLUSIONS: Based on the results of this study, HIIT training is a feasible intervention to reduce fat in obese individuals. Combining HIIT training with a resistance training program resulted in favorable body composition changes in obese females.
1% after. The proportion meeting WHO guidelines increased from 46% to 57%, and the proportion of people walking for 15+ minutes on 5-7 days per week increased from 47% to 61%.

Conclusion

Intelligent Health’s analysis from the 26 completed Beat the Street projects to date suggests that the concept of turning a whole community into a game leads to immediate changes in population levels of physical activity.

POURPOSE: The purpose of this study was to evaluate the influence of a 12-week traditional Chinese Qigong exercise (TCQG) on physiological and physical functions in patients with Ankylosing Spondylitis (AS).

METHODS: Sixty patients diagnosed with AS according to the modified criteria of New York were randomly assigned into either experimental (n = 30) or control groups (n = 30) using a computer-based random generator. AS patients in the experimental group experienced 60-minute DaoyinQong session twice per week for 12 weeks, whereas AS patients in the control group stayed with their original lifestyle during the 12-week intervention period. The TCQG exercise consisted of 15 basic movements associated with deep breathing, chest expansion, trunk rotation and bending, hip extension and flexion, flying bird movements, opening and closing the hands, and waving hands in the clouds. Heath-related outcome measures included Modified Schober Flexion Test (MSF), Finger-to-floor test (FF), and Chest Expansion Test (CE), administered by two certificated physicians. The intragroup data within both groups were compared with the paired t-test. The intergroup comparison of changes between baseline and week 12 was investigated with the unpaired t-test.

RESULTS: AS patients in the experimental group showed an improvement from baseline to week 12 in all three outcome measures (p < .001), whereas the control group only showed an improvement in Finger-to-floor test (p = .012). For the intergroup comparison, significant differences were only observed in MSF (p = .001) and CE (p = .041), but FF (p = .483). More specifically, the experimental group showed greater improvement in the two tests than the control group.

CONCLUSIONS: Traditional Chinese Qigong exercise is effective in improving spinal mobility, chest expansion, and flexibility. Clinicians could incorporate the TCQG routine into rehabilitation program for patients suffering from AS.

PURPOSE: To examine the impact of PA monitoring and a poster campaign on the PA behaviors of hospital nurses. METHODS: A total of 26 nurses (control: n=13; experimental: n=13) participated in this study. Instructional exercise posters and lifestyle modification posters specific to the nursing profession were hung in the breakroom of two experimental hospital units. Posters were replaced every two weeks for a total of eight weeks. All subjects completed a PA behavior survey pre (week 1) and post (week 10) intervention. Subject PA was objectively monitored with a Actigraph wGT3X-BT accelerometer for 24 hours on three workdays during weeks 1, 5, and 10. All subjects were provided a pedometer in week 2 and received an activity time and intensity breakdown after each accelerometer wear period. PA changes were analyzed with a repeated measures ANOVA. RESULTS: Subjects spent more time sedentary (15.3±3.02 vs. 7.0±0.01), took fewer steps (522.8±47.1 vs. 659.9±38.8 steps/hr), and engaged in less moderate intensity activity (9.8±0.6 vs. 8.0±0.6%) at home than at work independent of condition and study phase, p < .05. Both groups increased activity-specific caloric expenditure (36.2±3.7 vs. 42.1±3.8 kcal/hr) and step count at home (472.9±610.9 steps/hr) from week 1 to week 5 (p<.05). By week 10, activity levels were no longer statistically different than week 1 for either group (p>.05). In contrast, subjects who incorporated PA into work breaks continued to increase caloric expenditure (+24.9±15.4%) and MVPA (+30.9±18.2%) from week 5 to week 10, p<.05. At post-test, six experimental subjects were regularly performing exercises depicted in wall posters at work and/or at home compared to two control subjects who participated in PA breaks throughout the study duration. CONCLUSION: Instructional and motivational posters promoting self-care are more likely to induce lasting changes on the daily PA behavior of hospital nurses than information provided through PA monitoring devices.

POURPOSE: To investigate the effect of two exercise interventions based on Zumba Fitness and Bodyweight training on body composition and physical fitness in inactive employed females. METHODS: A total of 56 inactive employed female participants in this study (38.7±1.00 yr). The sample was randomly divided into two groups: Zumba Fitness (Z, n=28) and Zumba Fitness + 20 minutes of Bodyweight training (BZ, n=28, 1.33 hours/week), including both 3 days per week. Body composition (BMI, Fat mass, muscle mass and 6-skinfold) and Physical Fitness through Alpha Fitness Battery for adults: Motor fitness (one leg stand test), Musculoskeletal fitness (shoulder and neck mobility test, jump and reach test, hand-
Mild cognitive impairment (MCI) is a transitional state between healthy aging and dementia. Individuals with MCI have been reported to reduce their cognitive and physical function and consequently worsen their quality of life and sleep quality. Given that no effective pharmaceutical treatment exists for MCI patients to alter the progress of cognitive decline exists, there is much interest in lifestyle approaches, such as exercise. Momentum-based dumbbell training is a self-initiated dumbbell-spinning exercise aimed at challenging, concurrently, physical and cognitive abilities. The health effects of this exercise on quality of life and sleep quality were unclear.

**PURPOSE:** The purpose of this study was to determine the effect of 12-week momentum-based dumbbell training on quality of life and sleep quality among older adults with MCI.

**METHODS:** We conducted a 12-week randomized controlled trial of 45 community-dwelling older adults with MCI. Participants were randomly assigned to either a dumbbell training group (DTG; n=22) or control group (CG; n=23). Participants in the DTG participated in a 3-time weekly exercise session for 12 weeks. The primary outcomes were changes in physical component summary (PCS) and mental component summary (MCS) of Short Form 36 health (SF-36) survey with secondary outcomes being eight subscales of SF-36 survey and the Pittsburgh Sleep Quality Index (PSQI).

**RESULTS:** At post intervention, participants in the DTG, compared to those in the CG participants in the DTG had significantly improved ADAS-Cog (5.02 points, P<0.01) and DST-B (2.41, P=0.01) and DST-B (2.41, P=0.01). Compared to baseline, there was a significant within-group changes (improvement) in ADAS-Cog (t=-3.44, P<0.03), MMSE (t=-2.04, P=0.06), MoCA (t=-3.35, P=0.01), TMT-A/B (t=-3.80, P<0.01; t=-3.09, P=0.01) and DST-B (t=-2.41, P=0.03). Participants in the DTG improved their functional mobility (TUG=0.81s, F=4.34, P=0.043). There was no between-group difference in other outcomes.

**CONCLUSION:** A 12-week momentum-based dumbbell training can improve cognitive and physical function in older adults with MCI, especially global cognitive function and mobility. Supported by the National Natural Science Foundation of China (81572213).
METHODS: HAIT consisted of 4x4 minutes of walking or running uphill at 85 - 95% of maximal heart rate, and MCT consisted of continuous walking at 70-75% of maximal heart rate. After the training intervention, the participants chose themselves how to exercise during the next three months, and all training sessions were registered.

RESULTS: 19 individuals in each training group completed 12 weeks of supervised training, while 16 in HAIT and 10 in MCT completed the 6 months follow up. 3 months after intervention, HBa1c in HAIT was reduced by 0.7% points to 7.0% (p<0.01), and the difference remained significant (p<0.01) at 12 months. No change in HBa1c was observed in the MCT group. The change in HBa1c was also reduced during the intervention (from 7.7 to 7.1%) and was thus unchanged in the last 3 months (7.0%). VO2max increased by 19% during the intervention (from 24.1 to 28.8 ml·kg⁻¹·min⁻¹; p<0.01) and was also unchanged in the last 3 months after intervention (28.0 ml·kg⁻¹·min⁻¹). No change was found in either VO2max or HBa1c in MCT between the three measurement time points (25.9, 25.4, 26.4 ml·kg⁻¹·min⁻¹ and 6.9, 6.8, 6.9, respectively). The difference between HAIT and MCT after the 12 week intervention was statistical significant for both HBa1c and VO2max (p<0.01).

CONCLUSIONS: HAIT is an effective exercise strategy to improve aerobic fitness and reduce HBa1c in T2D. The results from HAIT were still kept after 6 months.

222
Board #43
May 31 11:00 AM - 12:30 PM
Effect of Moderate Versus High Intensity Interval Exercise Training on Vascular Function in Inactive Latin-American Adults: A Randomized Clinical Trial
Paula Andrea Hernández-Quilicon1, Alejandra Torrecilla-Santía1, Estefanía Sjobald1, Jorge E. Correa-Bautista1, Natalia García-Hermoso2, Robinson Ramírez-Vélez.1 Centre de Estudios para la Medición de la Actividad Física «CEMA» . Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá D.C, Co., Bogotá, Colombia. 2Grupo GICAEDS, Facultad de Cultura Física, Deporte y Recreación, Universidad Santo Tomás, Bogotá, Colombia. 3Laboratorio de Ciencias de la Actividad Física, El Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile.

Email: robin60@hotmail.com

(No relationships reported)

PURPOSE: Exercise training is effective for improving cardiometabolic health and physical fitness in inactive adults. However, limited research has been conducted on the optimal exercise training intensity for this population. We investigate the effect of moderate versus high intensity interval exercise training on vascular function and physical fitness in physically inactive adults.

METHODS: Twenty inactive adults were randomly allocated to receive either moderate intensity training (MCT group) or high intensity interval training (HIT group). The MCT group performed aerobic training at an intensity of 55-75% of the walking on a treadmill at 60-80% heart rate max (HRmax) until expenditure of 300 kcal until the end of training. The HIT group performed running on a treadmill during 4 minutes at 85-95% peak HRmax and had a recovery of 4 minutes at 65% HRmax until expenditure of 300 kcal. Results: Both groups had a significant improvement in VO2max (difference between groups 1.3 ± 0.4 vs. 3.4 ± 2.7 P between groups = 0.001). PWV changed 0.1 in the MCT group but decreased −0.3 in the HIT group, (not significantly different from the MCT or HIT group, P between groups = 0.91). Percentage body fat did not change in the MCT group 0.0 (0.8) but decreased in HIT group, −1.1 (0.4) (difference between groups 1 ± 0.95% CI, 1 to 2.4 between groups = 0.04)). No significant group differences were observed in physical fitness, blood lipids or blood pressure.

CONCLUSIONS: HIT is more effective in improving endothelial function and reducing body fat than MCT in inactive Latin-American adults. ClinicalTrials.gov NCT02738385, registered on 23 March 2016.

224
Board #45
May 31 11:00 AM - 12:30 PM
A Feasibility RCT: Understanding Impact of Community Gardening on Physical Activity and Sedentary Behavior
Elizabeth Thomson1, Kaigang Li,2 Ricky Pimentel3, Alyssa Beavers1, Kelsey Burr4, Jill Litt1.1Colorado State University, Fort Collins, CO. 2Children’s Hospital Colorado, Aurora, CO. 3Michigan State University, East Lansing, MI. 4University of Colorado Denver, Denver, CO.

Email: Elizabeth.Thomson@colorado.edu

(No relationships reported)

PURPOSE: To investigate the feasibility of using accelerometers to objectively measure physical activity (PA) during gardening to provide preliminary evidence for a large scale gardening intervention. METHODS: This study was conducted in 2016 in a Denver low-income community. Repeated measures of PA and sedentary behavior (SB) were compared at two time points (T1: June and T2: October) between two groups (TG = gardeners and NG = non-gardeners). At both T1 and T2, increase in physical activity was found in the TG compared to the NG group (p<0.05). This result suggests that gardening might be a feasible way to promote PA in low-income populations.
The purpose of this study was to compare 24 hour changes in appetite/satiety among overweight/obese, college age females and walking (in sedentary overweight/obese (BMI ≥ 25) college age females). The purpose of this study was to compare 24 hour changes in appetite/satiety among overweight/obese, college age females and walking (in sedentary overweight/obese (BMI ≥ 25) college age females). The purpose of this study was to compare 24 hour changes in appetite/satiety among overweight/obese, college age females and walking (in sedentary overweight/obese (BMI ≥ 25) college age females). The purpose of this study was to compare 24 hour changes in appetite/satiety among overweight/obese, college age females and walking (in sedentary overweight/obese (BMI ≥ 25) college age females).
in the lessons and 96 (70%) who were active, practiced twice weekly in various medical centers promote employees health thereby neutralizing negative aspects such as worker burnout, mental and physical fatigue and increases employee satisfaction at the workplace. Therefore, promotion of physical activity at the workplace should be encouraged in order to increase employee participation. However, further research is needed in public medical center to verify these research findings among healthcare employees.

While pedelecs became an important element of active transportation, little is known about the physiological responses during their use. PURPOSE: To compare the heart rate (HR) response during everyday pedelec use and cycling and to determine if pedelecs are a suitable tool to meet American College of Sports Medicine (ACSM) physical activity guidelines for health benefits of 150 min moderate activity (64-76% of maximum HR (HRmax)) per week. METHODS: In a crossover design 101 employees recorded HR, duration and intensity of their rides via smart phone app during two periods, lasting two weeks each: one with a provided pedelec (P) and one with their own bicycle (B), in a randomized order. HRmax was determined in graded exercise tests on a cycle ergometer prior to the observation periods. RESULTS: The amount of trips per week was significantly higher during P compared to B (5.3 ± 4.3 vs. 3.2 ± 4.0 trips, p < 0.001). The average duration of trips did not differ significantly between P and B (37.5 ± 23.5 vs. 40.3 ± 27.8 min, p = 0.45). Perceived exertion during the trips was significantly lower with P (11.7 ± 1.8 vs. 12.8 ± 2.1, p < 0.001). Total ride time per week was significantly longer during P (174 ± 146 vs. 99 ± 109 min, p < 0.001). Average HR during P was significantly lower than during B (109 ± 14 vs. 118 ± 17, p < 0.001) averaging 64 ± 8 vs. 67 ± 9 HRmax, respectively. There was no difference in the percentage of subjects meeting ACSM recommendations for physical activity between P and B (25 vs. 24% of subjects, p = 0.86). CONCLUSIONS: In everyday use, average HR during pedelec trips is only three percent lower than during cycling and sufficient to classify the intensity as moderate. Higher usage rates make pedelecs an equal active transportation alternative for fulfilling ACSM guidelines, especially for people who normally would not use a bicycle. Supported by BMBF Grant 16N0112D.

Exercise Science students have a unique opportunity to contribute to the wellness of their university community while also improving their own practical experience. PURPOSE: The aim of this study was to assess the feasibility and effectiveness of a low-budget wellness initiative at a small liberal arts university. METHODS: Deliberate choices were made throughout the planning phase to reduce cost and improve feasibility, even when it necessitated a less valid approach. Thirty-eight Exercise Science students with varying levels of education volunteered to be research assistants. An entirely online enrollment process was developed using Google Forms that included informed consent, PAR-Q, demographic information, activity history, and wellness. A baseline assessment of physical fitness included height and weight (digital scale with stadiometer), waist and hip circumference, 1-mile walk or 1.5-mile run, and resting and exercise heart rate (assessed via radial pulse). Participants were asked to log their self-reported total minutes of weekly physical activity and average rating of perceived exertion (6-20 scale). The product of activity duration and perceived exertion served as a numerical activity score. The student research assistants then contacted their assigned participants weekly for 10 weeks to record activity and create accountability. RESULTS: The feasibility of this study and $2,000 budget allowed for a maximum of 450 participants. Of the 180 participants who completed the online enrollment process and scheduled their baseline fitness assessment, 117 actually showed up and were tested.

Pedestrian-based interventions have been found to be successful in increasing physical activity (PA) during the intervention but adherence is challenging. Implementation intentions (II) are specific plans of action concerning when, how, and where an intended behavior will be enacted. The use of this self-regulatory skill with self-monitoring of the pedometer has the potential to initiate behavior change as well as adherence. PURPOSE: To test differences between participants that used both II and a pedometer and those that just used a pedometer. METHODS: Employees (N = 51) at a mid-sized public university recruited via email to participate in an 8-week pedometer-based intervention. Only employees currently not meeting minimum PA recommendations (<150 minutes of moderate to vigorous PA/week) could enroll. A 2-arm randomized trial was used to compare the effectiveness of:

1. Male civil servants of non-health accounts 77.32%, higher than 68.75% of female (P < 0.05). ③50 to 59 year-old group was the highest 84.75% (P < 0.05), 20-29 was the second. ④About exercise habits, 70.33% (294/418) are for keep fit, 3/week and 30-60min are the most, 61.72% (258/418) and 53.59% (224/418). Sitting 5-8/h and more than 8/h are the most, 38.28% (160/418) and 34.45% (144/418).

⑤Duration time and unhealthy score are significant correlation (P < 0.05), while frequency and sitting time are not (P > 0.05). ⑥Less than 30min and 30-60min have great difference in unhealthy score, physical and psychological. Less than 30min, and more than 60min shows significant difference in unhealthy score, physical and social (P < 0.05). ⑦3-5/week and more than 5/week shows significant difference in psychological unhealthy (P < 0.05). Less than 3/week shows no significant difference with other group (P > 0.05).

CONCLUSIONS: ①The health status of civil servants in Chengdu is not protective, and their sitting time is a little long. ②Exercising more than 30min can make great difference of health status in physics, psychology and society. Combining with frequency, 3-5/week and more than 30min/time are the best intervention.

Medical School, Hannover, Germany.

A. Gonzalez2.

Email: saundenw@mountunion.edu

No relationships reported

No relationships reported

No relationships reported

No relationships reported

No relationships reported
only pedometers (PED) (n = 25) and 2 pedometers and II (PED + II) (n = 26) on PA. 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. Pedometers were reissued for a delayed post assessment 4 weeks after the intervention ended (n = 36). Paired t-tests were used to compare differences between baseline to Week 8 and 12 separately for the 2 groups. RESULTS: Significant increase in steps (p = .004) were observed from baseline (7100 ± 2452.5) to Week 8 (8542 ± 2424.1) for the both groups combined and for the PED-II group (p = .004; mean difference: 1458 ± 1099.2). No difference was observed for the PED group (p = .112; mean difference: 1427 ± 2511.1). Average steps significantly decreased (p < .0005) from Week 8 (9019.2 ± 4684.3) to Week 12 (6689.3 ± 1983.2) for the both groups combined. There was no between group differences in any comparison (p = .159 - .845). CONCLUSION: The PED-II group significantly increased steps during the intervention indicating that the behavioral strategy was effective. However, participants in both groups had a significant decrease in steps from the end of the intervention to the delayed-post assessment highlighting the struggle to maintain behavioral changes after the intervention ends. Future interventions should continue to combine behavioral modification strategies to increase adherence.

234 Board #54 May 31 11:00 AM - 12:30 PM
Lifestyle and Health Habits Among Canadian University Community
Email: alexandre.busque@uqtr.ca

No (relationships reported)

PURPOSE: It is estimated that by 2019, 55.4% of the Canadian adult population will be categorized as overweight (34.2%) or obese (21.2%) (Tweddle et al., 2014). Increase of obesity prevalence, calls for continuous search of effective obesity-prevention and health promotion strategies. Following the work of Perusse-Lachance and colleagues (2010), the present study aimed to further examine the prevalence of obesity and lifestyle habits through environmental factors in a different Canadian university community.

METHODS: A web based-survey assessing lifestyle habits such as physical activity and nutrition was sent by email to all university’s students (n=14 500) and employees (n=2000). Students or employees had to be registered as part or full time during the 2016 fall semester to participate in the study. Response rate was 13.3% for students (n=1 989) and 24.3% for employees (n=485). All data were analyzed using SPSS.

PRELIMINARY RESULTS: Results showed that 18.7% of students and 28.5% of staff members were overweight (BMI = 25.0–29.9), 10% of students and 10.7% of staff members were obese (BMI ≥ 30.0) while 40% of students and 37% of the employees were currently trying to lose weight. Results also revealed that 50% of staff members and 57% of students were considered sedentary (<150 minutes of physical activity/week).

Regarding fruits and vegetables intake, only 14% of students consumed four or more servings of fruits per day compared to 15% for staff members. In addition, only 15% of students consumed four or more vegetables servings per day as opposed to 26% for staff members. Finally, 91% of employees, compared to 81% of the students, were having breakfast every day.

CONCLUSION: Healthy environments are crucial in the adoption of healthy behaviors (Booth et al., 2001). In this regard, the herein results suggest that overweight and obesity can be an important concern in a well-educated sample and that this issue is associated with various health-related behaviors. These conclusions highlight the need to develop specific health promotion strategies in this Canadian University community.

235 Board #56 May 31 11:00 AM - 12:30 PM
Incorporating Spirituality and Role Models into Physical Activity Programs for Black Women: A Qualitative Inquiry
Rodney P. Joseph, Colleen Keller, Steven P. Hooker, FACSM, Barbara E. Ainsworth, FACSM, Arizona State University, Phoenix, AZ.
Email: rodney.joseph@asu.edu

No (relationships reported)

Previous research has shown favorable outcomes for incorporating religion and spirituality into (physical activity) PA programs delivered through faith-based or faith-placed settings. Limited research has examined how these concepts can be incorporated into PA programs delivered outside of religious institutions. Likewise, few studies have explored the individuals that Black women consider to be physically active role models and how these role models can be leveraged in a PA program. PURPOSE: To qualitatively examine how spirituality, religion, and roles models can be incorporated into a PA program for Black women. METHODS: Twenty-five Black women (M age = 38.5 years, M BMI = 39.4 kg/m²) were enrolled in the study. Focus group guides were designed to gain information on how religion, spirituality, and roles models can be incorporated into a culturally relevant PA program for Black women. Focus groups were audio recorded and transcribed verbatim. Content analysis was used to analyze focus group data. RESULTS: Participants reached consensus that incorporating aspects of spirituality (i.e., words of affirmation, meditation, mind-body activities) into a PA program was universally acceptable, regardless of religious affiliation. On the other hand, including concepts of religion (i.e., bible verses and/or quotes from religious leaders) was controversial and not recommended among women who did not identify with a religious faith. In reference to the topic of physically active role models, women identified various individuals they considered as role models, including relatives (i.e., their mother, siblings, and children), friends, community leaders, and celebrities (i.e., Michelle Obama, Oprah Winfrey). Participants endorsed the use of these role models in a PA program designed for Black women.

CONCLUSIONS: Findings suggest that including spirituality, as opposed to religion, is an acceptable and motivational concept to include in a PA program for Black women. Similarly, women reported a diverse group of individuals that could be included as physically active Black role models. Designing PA promotion programs to include aspects of spirituality and roles models can enhance the acceptability and salience of the program, which may ultimately lead to increased PA behaviors.

236 Board #57 May 31 11:00 AM - 12:30 PM
Pilates Exercise Improves Balance in Middle-Aged Chinese Women
Yi Dai1, Hengjing Zou2, Guangyi Lai2. ‘Chengdu Sport University, Chengdu, China. 2Chengdu First People’s Hospital, Chengdu, China. (Sponsor: Tongjian You, FACSM)
Email: 763335348@qq.com

No (relationships reported)

PURPOSE: To investigate if an 8-week Pilates exercise program could improve static balance, dynamic balance and core myodynamia strength in middle-aged Chinese women.

METHODS: Sixty middle-aged Chinese women (52-65 years old) were randomly assigned to experimental group (n=30) and control group (n=30). The Pilates exercise also included Likert scale questions concerning exercise, and the Godin leisure time exercise questionnaire. Godin scores were calculated and converted to CDC recommended activity levels.

Results: A total of 145 students responded for a response rate of 37%, with 97% agreeing that it is important for physicians to have and exemplify an active lifestyle. However, only 23% met the aerobic physical activity guidelines set by the CDC for adults. Based on the Fisher Exact Test (P=1.1x10^-4) respondents who met CDC recommendations for exercise also indicated stronger agreement with the statement “I make physical fitness a priority in my life.” Although 41% of respondents agree that the medical school curriculum has educated them on appropriate use of exercise, only 2.8% (4/145) were able to correctly state the CDC recommendations for physical activity in adults.

Conclusion: Most medical students in the UMSOM agree that it is important for physicians to maintain an active lifestyle but most do not achieve the CDC recommended level of exercise. Less than half of respondents agreed that the PBL curriculum educated them on appropriate use of exercise, and most could not state the CDC recommendations for physical activity in adults. Healthcare is evolving towards preventative care, including patient exercise counseling and prescription, which may be a current weakness of PBL. Further research is needed to compare PBL curricula to traditional curricula, as well as seeing the ultimate effect on the students’ future medical practices.
was performed 90 minutes per time, 3 times per week, for 8 weeks, including core myodynamia training, static standing, muscle strength and endurance training of lower extremities. Static balance and dynamic balance tests were performed, and the strength of core myodynamia was measured using a BIODEX balance test system. The SPSS 19.0 statistical software was used for data analysis. Paired tests were used for comparison before and after intervention within each group. Group comparisons in changes over time were performed by independent t-tests.

**RESULTS:**
While comparing with themselves before the 8-week Pilates exercise, the women after the exercise had longer time of standing with one foot and eyes’ closed (14.68±5.4s vs. 27.68±4.21s), the Romberg experiment with eyes’ closed (40.23±6.47s vs. 66.58±7.43s), marching on the spot with eyes’ closed (9.35±3.26s vs. 20.74±10.62s) and 8 degree abdominal bridge test (24.57±8.71s vs. 82.78±21.53s) and shorter time of standing and walking (6.36±2.15s vs. 7.93±1.59s), vestibular step test (9.02±2.51s vs. 3.58±2.37s) and the risk of tumbling test (2.42±1.03s vs. 2.11±0.95s), and the difference was statistically significant (P < 0.05). Compared to control group who did not have the 8-week Pilates exercise, the time of standing with one foot and eyes’ closed (15.06±5.98s vs. 27.68±4.21s), the Romberg experiment with eyes’ closed (39.87±9.01s vs. 66.58±7.43s), marching on the spot with eyes’ closed (9.47±4.03s vs. 20.74±10.62s) and 8 degree abdominal bridge test (25.41±6.22s vs. 82.78±21.53s) were prolonged in the experimental group (P all < 0.01), and the time of standing and walking (16.86±1.97s vs. 7.93±1.59s), vestibular step test (9.02±2.51s vs. 3.58±2.37s) and the risk of tumbling test (2.39±1.07s vs. 2.11±0.95s) were shorten (P all < 0.01).

**CONCLUSIONS:** After 8 weeks of Pilates exercise, the experimental group’ static balance and dynamic balance, and the strength of core myodynamia were improved; and this may reduce the risk for falls.
An increased lifespan and body adiposity as people age are considered risks factors for all-cause mortality. Handgrip strength is considered a powerful predictor of cause-specific and total mortality in older disabled women and to cardiometabolic risk in older adults.

**METHODS:** The participants included 108 healthy older women (age: 74±5 years; range: 65-89). The stepping rate, muscle strength (handgrip strength, knee extension strength), balance (one-leg standing time with eyes open), mobility (timed up-and-go test [TUG], maximum walking speed) and physical activity of the participants were measured. The maximal stepping rate in 10 seconds, as measured using an industrial stepping rate counter (Stepping Counter; Yagami), was used as an index of agility.

**RESULTS:** The stepping rate was 74.8±14.2 (range 34-108) times/10s and was not correlated with age. A multiple regression analysis adjusted for age revealed that leg stepping rate was associated with handgrip strength (β=-0.345, p<0.001), knee extension strength (β=0.218, p<0.05), one-leg standing time (β=-0.312, p<0.01), TUG (β=-0.239, p<0.05), maximum walking speed (β=-0.446, p<0.001) and the percentage of time engaged in low intensity PA (β=-0.245, p<0.05).

**CONCLUSION:** The present study showed the association between agility and muscle strength, balance, walking ability and physical activity of physically independent older women.

The assessment of dynamic balance through the use of standardized objective measures is important to identify impairments which may increase fall risk in older adults. Many of the current clinical balance tests are not challenging enough to assess balance and identify risk fall in healthy older adults. A test which may be appropriate for healthy older adults is the Lower Quadrant Y Balance Test (LQ-YBT). The LQ-YBT is a test of dynamic motor control at the limits of stability in single-leg stance which has typically been researched in younger athletic populations to evaluate dynamic balance and risk for injury. **PURPOSE:** To determine the inter-rater and test-retest reliability of the LQ-YBT in healthy women from 50-80 years old.

**METHODS:** Forty-six potential participants were screened and data collection included 16 healthy women 50-80 years old, with mean age 64.3 (±7.9) years. Each participant completed the LQ-YBT in a standardized manner as described in the LQ-YBT manual. The scores for each participant were independently determined and recorded to the nearest centimeter by two examiners. After a 5-minute rest, a subset of eight participants performed the LQ-YBT a second time in the same session for the purpose of test-retest reliability. The maximum distance reached in each direction, normalized for leg length, was used for data analysis. Intraclass Correlation Coefficients (ICC [2,1]) were used to determine the test-retest and interrater reliability of the normalized reaches in each direction and the composite scores. **RESULTS:** The LQ-YBT demonstrated excellent

---

**Inter-rater And Test-retest Reliability Of The Y-balance Test In Healthy Women 50-80 Years Old**

Jacob Shepherd, Autumn Oostindie, Jared Locke, Srikant Vallabhajosula, Deborah Stettes, Jane Freund. Elon University, Elon, NC. (Sponsor: Dr. Stephen Bailey, FACSM)

Email: jshepherd3@elon.edu

(No relationships reported)
inter-rater reliability with ICC values of 0.98 to 1.0 for the various directions, and 1.0 for the composite scores, bilaterally. The test-retest ICC values were also excellent ranging from 0.95 to 0.97 for the various reaches and 0.96 and 0.95 for the right and left lower extremity composite scores, respectively. CONCLUSION: The LQ-YBT demonstrated excellent inter-rater and test-retest reliability in healthy women 50-80 years old and may be considered for use as a measure of dynamic balance in this population.

244 Board #65
May 31 9:30 AM - 11:00 AM
Purine Metabolites and HGPRT Activity in Male Speed-Power vs Endurance Masters Athletes Aged 20-90 Years
Jacek Zielinski1, Ewa Słominska1, Magdalena Krol-Zielinska1, Zbigniew Krasinski1, Krzysztof Kusy1. 1 Poznan University of Physical Education, Poznan, Poland. 2 Medical University of Gdansk, Gdansk, Poland. 3 Poznan University of Medical Sciences, Poznan, Poland.

Purpose: According to recent studies, purine metabolism better reflects exercise response and muscle adaptation than widely used indicators. Consequently, we proposed using purine derivatives, especially plasma hypoxanthine (Hx) concentration and erythrocyte HGPRT activity as indicators of training status in highly trained young athletes. The aim of this study was to compare the effects of many years' sprint and endurance training on levels of purine derivatives and HGPRT activity.

Methods: Master sprinters (SP, n= 52), master endurance runners (ER, n= 60) and healthy control participants (CO, n= 60), age range 20-90 years, were compared. They underwent a treadmill test until exhaustion. Venous blood samples were drawn at rest and post exercise. Hx, xanthine (X), uric acid (UA) and erythrocyte HGPRT activity were assayed by means of HPLC method. Regression analyses were performed to show the relationships between purine derivatives and HGPRT activity and age.

Results: Resting and post-exercise Hx were similar in both athletic groups and different from the CO group, in which highest Hx values were observed. Resting and post-exercise X were only different between SP and CO groups. Resting HGPRT and post-exercise UA were different between all three groups. Age explained 87-96%, 69-94%, 17-55% and 41-54% of variance in Hx, X, UA and HGPRT, respectively, except for UA in the CO group (1-5%). The relationships between age and Hx and resting X were nonlinear (polynomial function of degree 2). The age-related changes in UA were only minimal in athletes and virtually nonexistent in the CO group. CONCLUSION: The age-related elevation in resting and post-exercise Hx suggests that the exercise-induced energetic stress considerably progresses with age. Increased Hx levels, despite increasing HGPRT activity that supports ATP resynthesis through the purine salvage pathway, bring about a delayed restoration of the adenine nucleotide (AdN) pool.

245 Board #66
May 31 9:30 AM - 11:00 AM
Improving Power Output in Older Adults Utilizing Plyometrics in an AlterG Treadmill
Tyler J. Dobbs, Shawn R. Simonson, Scott A. Conger. Boise State University, Boise, ID. (Sponsor: Dawn P. Coe, FACSM)

Email: tylerdobbbs@boisestate.edu

Purpose: To determine the effects of performing plyometrics in an AlterG treadmill on power output and functional strength in older adults when compared to traditional strength training.

Methods: Twenty-three subjects were randomized to a strength (SG) (n = 8), plyometric (PG) (n = 8), or control (CG) (n = 7). SG and PG exercised 3x/week for 8 weeks and CG performed no exercise. SG performed sets of 3x10 at 65-80% of one repetition maximum (1RM) (estimated from 3-5RM) on the leg press (LP), leg extension (LE), and single leg lunge (LL). PG performed 3x10 in the squat jump, single leg bound, and power skipping at an intensity range of 65-80% body mass. Timed sit-to-stand and stair climb, estimated maximal muscular strength, and isokinetic power during leg flexion and extension were compared pre and post intervention. 2 x 3 repeated measures ANOVA was used to determine differences between groups. Data was reported as percent change from baseline.

Results: Significant improvements occurred in the PG in the timed sit-to-stand (22.11 ± 8.48%, p < 0.013), timed stair climb (14.68 ± 6.28%, p < 0.002), and chair stand power (16.59 ± 9.07%, p < 0.001). PG and SG significantly increased their estimated 1RM in the LE and LL (p < 0.05). PG was significantly more powerful at all 3 velocities in both flexion and extension except at 60°/sec extension, ranging from 24.54 ± 19.94% to 85.74 ± 62.23% (p < 0.001). PG increased muscular strength similarly or better than SG without performing resistance training.

Conclusion: Eight weeks of plyometrics in an AlterG treadmill improved functional strength and power in older adults, accomplished through performing exercise requiring less total work per exercise session. Researchers suggest that plyometrics, if modified and performed in a safe environment, can increase muscular strength and power and improve functional abilities in older adults.

246 Board #67
May 31 9:30 AM - 11:00 AM
Strength Decline Of Sedentary Adult Men In Different Age Groups
André da Camargo Smolarek1, Luis P. Mascarenhas1, Steven R. McAnulty2, João C. B. Alves3, Charllynnson W. Cordeiro4, Ilma C. Honorato5, Alan C. Uter, FACSM6, Tacito P. Souza-Júnior7, 1UNICENTRO, Itumbiara, Brazil. 2Appalacian State University, Boone, NC. 3UFPF, Curitiba, Brazil. 4Bio Training, Guarapuava, Brazil. 5Faculdade Guairaca, Guarapuava, Brazil. 6Federal University of Parana, Curitiba, Brazil. (Sponsor: Alan C. Uter, FACSM)

Email: andrecskr@gmail.com

Purpose: To determine the effects of performing plyometrics in an AlterG treadmill on power output and functional strength in older adults.

Methods: The sample was 331 sedentary men divided in three groups of according with age 21-29 years (G1), 30-39 years (G2) and 40-49 years (G3). All sample had 3x10 repetitions for right (47.0±6.0) and left (47.4±7.0) lower limb than active group (42.2±4.8 and 52.0±2.5, respectively). The age-related changes in UA were different between all three groups. Age explained 87-96%, 69-94%, 17-55% and 41-54% of variance in Hx, X, UA and HGPRT, respectively, except for UA in the CO group (1-5%). The relationships between age and Hx and resting X were nonlinear (polynomial function of degree 2). The age-related changes in UA were only minimal in athletes and virtually nonexistent in the CO group.

Results: The muscle decline and your functional capacity have age association, strength capacity also be relation with life style. For health men, this factor still suffers the effects somatopause, but the data for sedentary men still need scientific attention.

Conclusion: We can conclude for the 1AT and body mass was verify a significant reduction as advancing age in sedentary men. However that in the flexion strength elbow not detected a strength decline as advancing age in sedentary men.

247 Board #68
May 31 9:30 AM - 11:00 AM
Comparisons of Fat Free Mass and Fat Mass between Active and Inactive Older Women
Maressa P. Krause, Rodrigo Baumann Velho, Sergio Gregorio da Silva. Universidade Tecnologica Federal do Parana, Curitiba, PR, Brazil.

Email: maressakrause@hotmail.com

Purpose: To compare the fat free mass and fat mass between active and inactive older women.

Methods: Participated in this investigation 44 older women, mean aged of 66.0 ± 5.4 years-old. Sample was classified as inactive (Inactive group - IG, n = 18), who was not enrolled in an exercise program in the previous six months, and active (Active group - AG, n = 26), who have been participating regularly in the last six months in an exercise program (bench stepping group exercise - BSPE) promoted by the physical education department in the Tecnological Federal University of Parana. Body composition was analyzed by the Dual Energy X-Ray Absorptiometry (DXA) equipment. Data were described by mean and standard deviation and analyzed by the independent T-test using the SPSS software (p≤0.05). Results: Comparisons between groups showed that IG had a significantly lower fat free mass for all measurements - right and left upper limb (1665.5±467.4 and 1506.8±443.4 grams) and mid-thigh and left leg (1866.9±282.2 grams, respectively), trunk (19961.3±3629.4 grams), right (5108.4±600.3 grams) and left (5079.5±542.0 grams) VS Active group (1667.2±467.8 and 1505.0±443.4 grams, respectively), trunk (19979.8±3629.4 grams) and right (5107.2±600.3 grams) (all p<0.05). Also, the IG had a higher %fat mass for right (47.0±6.0) and left (47.4±7.0) lower limb than active group (42.7±4.8 and 42.5±4.8, respectively) (all p<0.05).

Conclusion: Older women who participated in a bench stepping group exercise program had a better body composition than their inactive peers. This results were more evident for fat free mass which has been positively associated with functional-physical fitness and successful aging. Also, it is consensus that the accumulation of fat mass increases the risk for several metabolic syndrome factors. The body fat distribution also be relation with life style. For health women, this factor still suffer the effects somatopause, but the data for sedentary men still need scientific attention.
Purposes: To investigate the influence of body mass index (BMI) and walking speed on postural control in Korean elderly.

Methods: A total of 127 elderly (76.4±7.0 yrs, 155.5±8.1 cm, 60.8±10.2 kg, 25.2±3.5 kg/m²) walked on a force platform for 4.5 meter distance on their pace and parameters of postural control such as Envelope Area (ENV), Rectangular Area (REC), total length from center of pressure (TLC), and Sway Velocity (SV) were measured. Based on their walking speed, they were divided into three groups; slow (S, n=41, 6.5±sec), average (A, n=47, 6.5±sec), and fast (F, n=44, ≤5 sec). In addition, based on their BMI, they were grouped as; normal weight (NW, n=35, 23.1±1.3), overweight (OW, n=38, 24.2±0.5, range 23.4-25.9), and obese (OB, n=54, 28.5±2.5 kg/m², 25±sec). Their physical fitness was also measured by 2-minute Step Test, 30-second Chair Stand, 8-Ft Up and Go, and One-leg Standing.

Results: No differences in age and height were noticed when compared by groups of BMI. Body weight, fat content, and waist circumference were greater as BMI was higher (p<0.05). ENV (299±285, 316±286, and 252±253 mm²), REC (699±720, 765±731, and 619±683 mm²), TLC (333±175, 331±175, and 289±177 mm²), and SV (17±9, 17±9, and 14±6 mm/sec in NW, OW, and OB, respectively) were not different between groups of BMI. When compared by walking speed all postural parameters such as ENV, REC, TLC, and SV were not different among S, A, and F. When physical fitness variables were analyzed, no group differences by walking speed and BMI were noticed.

Conclusion: The degree of sway of center of pressure during walking in elderly was not different when it was compared by groups of BMI and walking speed. Capability of maintaining body balance in elderly population during locomotion may not be predicted by their BMI or walking speed.

Maximal velocity parameters are negatively affected by aging; however, little is known regarding the short-term effects of resistance training (RT) on maximal velocity variables in older adults. Furthermore, whether or not unilateral RT induces maximal velocity adaptations in the untrained limb has not been determined.

Purpose: To examine the effects of unilateral RT on maximal velocity parameters of the ipsilateral and contralateral leg in older males.

Methods: Twenty-one untrained older males were randomly assigned to a training (TG; n=11, age = 64.7±6.9 yrs.) or control (CG; n=11, age = 65.5±11.5 yrs.) group. The TG performed 3 sessions per week of unilateral isokinetic testing of the knee extensors for the trained (TL) and untrained (UL) leg at 50°·s⁻¹ (ISOK1), was performed before (PRE), at week 2 (MID), and after week 4 (POST) of RT. There was no resistance during ISOK2 experiments with the exception of the lever arm mass, as the velocity was above all subjects’ maximum velocity. The highest velocity attained (PV, deg·s⁻¹) and the linear slope of the velocity-time curve (RVD; deg·s⁻²) were recorded for analysis. For the TL and UL, one-way repeated measures analyses of variance were used for the TG and CG separately. RESULTS: PV and RVD remained unchanged in both legs for the CG (p > 0.05). PV did not change in the TL (p = 0.084), while RVD increased from PRE to POST (+5.8%; p = 0.029) and MID to POST (+4.1%; p = 0.038). PV (r = 0.644) and RVD (r = 0.523) were unaltered in the UL. CONCLUSION: RVD appears to be more sensitive to change during the early-phase of RT compared to PV in older males. However, neither PV nor RVD in the UL appear to be affected by short-term unilateral RT. Since many neural adaptations are expressed bilaterally, the improvement in RVD for only the training leg suggests the adaptation is more likely mechanical in origin.
252 Board #73  
May 31 9:30 AM - 11:00 AM  
Beneficial Effects of Senior Functional Fitness to Manage Blood Pressure in Community-dwelling Older Adults
Szu Ming Fang, Michael-S Lo, Linda L. Lin, Chiao-Hsin Chen, Yueh-Chang Tsai. Institute of Physical Education, Health and Leisure Studies, Taiwan, Taiwan.
Email: penguin81102@gmail.com (No relationships reported)

Purpose: To investigate the relationships and difference of senior functional fitness between varied levels of blood pressure (BP) and functional fitness assessments with community-dwelling older adults.

Method: 1003 community-dwelling residents aged 65±2yr(Male, n=384, age =74yrs; female, n=615, age =69yrs) volunteered to participate in the study during 2010-2015. Participants completed 6 functional fitness tests, blood pressure measured and a health-screening questionnaire. The senior functional fitness including flexibility, muscle strength, muscle endurance, aerobic endurance, and body agility/dynamic balance. The classification of Blood Pressure for Adults: Normal systolic blood pressure(SBP)=120 and diastolic blood pressure(DBP)=80 mmHg(NOR);Prehypertension SBP 120–139 or DBP 80–89 mmHg(PRE); Stage 1 hypertension SBP 140–159 or DBP 90–99 mmHg(1st); Stage 2 hypertension SBP ≥160 or DBP ≥100 mmHg(2nd). One-way ANOVA and Pearson’s product moment correlation were used to determine plasticity of functional fitness among individual BP.

Result: Senior functional fitness had the significant correlations with blood pressure (p<0.05). In aerobic endurance, NOR is better than 2nd (1.36%) (p<0.005). Furthermore, significant differences were observed in lower limbs muscle endurance, NOR is higher than 1st and 2nd (8.71%,1.46%)(p<0.005). In upper body flexibility, NOR is better than 2nd (88.51%) (p<0.005). However, in upper body flexibility, NOR and PRE were better than 1st and 2nd (p<0.005). In body agility/dynamic balance, NOR is faster than 1st and 2nd (9.87%, 16.4%) (p<0.005).

Conclusion: The participants with better control of the blood pressure have better lower extremity muscle endurance, ability, balance, lower and upper extremity flexibility. The cardiovascular function and upper body flexibility were the most direct influence factors to prevent or manage hypertension.

Keywords: prehypertension, older adults, functional fitness

253 Board #74  
May 31 9:30 AM - 11:00 AM  
Effects of Resistance Training on Physical Exercise Capacity and Vascular Function Among Elderly Women
Joyce E. Ballard, FACSM, Arturo A. Arce-Esquivel. The University of Texas at Tyler, Tyler, TX.
(no relationships reported)

Aging is associated with a decline in physical exercise capacity and in limb blood flow that could lead to a reduction in overall functional capacity. Exercise training has emerged as an effective therapy to improve the decline in physical and vascular function. PURPOSE: The purpose was to examine the effects of whole-body resistance training (RT) on physical exercise capacity and microvascular function among elderly women.

METHODS: 66 women (age: 69 ± 7.45 years) were referred by physicians as apparently healthy and signed informed consents prior to testing. These women participated in whole-body RT program performed, 2 days/week for 8 weeks. Before and after training muscle strength [One repetition maximum (1RM) for chest press, biceps curl, leg extension, and leg curl], physical exercise capacity [i.e., six-minute walk test (6MW)], and microvascular function (i.e., vascular reactivity) were measured.

RESULTS: The 1RM for all the muscle strength outcomes increased significantly [chest press: 29.74%, pre = 8.64±2.46; post = 11.21±2.91 kg; biceps curl: 37.02%, pre = 9.02±2.45; post = 12.36±2.49 kg; leg extension: 19.95%, pre = 36.00±8.92 kg; post = 45.12±8.52 kg]. The 6MW test increased significantly 15.76% [pre = 564.0±90.83; post = 653.10±50.78 m, (p<0.05)]; and the vascular reactivity index [measured by fingertip digital thermal swings analyses = 17.3 ± 4.4, 13.1 ± 7.9, “lower is better”; 6MW(6) = 1906 ± 213 (67th %ile), PRE = 13.1 ± 2.0 “somewhat hard”, HR (b/min) = 127 ± 20, HR max = 81 ± 15 “vigorous.” Age was not correlated with any variables, except months of playing golf per year (r = -0.56, p = 0.003) with older golfers playing fewer months than younger golfers. Age when beginning golf participation was positively correlated with handicap, average scores for 9- and 18-holes, and number of golf swing errors (rs = 0.71, 0.68, 0.65; ps < 0.03). Golfers’ body weights were correlated with better TPI-fit scores (r = −0.64, p = 0.01) and average scores for 9- and 18-holes of golf (rs = −0.67, −0.65, ps = 0.02) representing greater strength or leverage during the golf swing. Golfers with better TPI-fit scores tended to have higher exercise enjoyment (r = −0.42 p = 0.09). TMD scores on the POMS improved (97.4 ± 13.9, 89.5 ± 15.2; p = 0.06) after only 6-min of high intensity walking. Greater 6MW HRs were correlated with greater TMD improvements (r = 0.49, p = 0.05). CONCLUSIONS: Senior women golfers with more years of golf experience, or who were heavier, performed better on TPI golf-specific fitness and swing tests. The women also reported enjoying exercise and desirable changes in mood after aerobic exercise. Future studies of senior women golfers are needed to continue examining the role of golf participation in seniors’ fitness levels and overall subjective well-being.

254 Board #75  
May 31 9:30 AM - 11:00 AM  
Fitness Correlates Of Golf Performance, Exercise Enjoyment, And Mood In Senior Women Golfers
Lynn A. Darby, FACSM1, Bonnie G. Berger1, David R. Owen2. 1Bowling Green State University, Bowling Green, OH. 2Brooklyn College, CUNY, Brooklyn, NY. (No relationships reported)

Senior golfers (≥50 yrs of age) constitute approximately 5 million of the 20 million “committed” U.S. golfers (National Golf Foundation, 2016). This number emphasizes that golf is a lifelong physical activity. PURPOSE: To investigate the relationships among golf-specific fitness measures, golf performance, exercise enjoyment, and mood alteration. METHODS: Female senior golfers completed golf histories, 17 golf-specific fitness screening tests (TPI-fit; Tistleit Performance Institute®), golf swing analyses, and the Physical Activity Enjoyment Scale (PACES). Heart rate (HR), ratings of perceived exertion (RPE), and Total Mood Disturbance (TMD) scores on the Profile of Mood States were measured before and after a 6-min walk test (6MWLT). Pearson correlations were calculated. RESULTS: Descriptive characteristics, means ± SD: Age (yrs) = 64.1 ± 8.0; Body weight (kg) = 71.1 ± 14.3; TPI-fit and golf swing analyses = 17.3 ± 4.4, 13.1 ± 7.9, “lower is better”; 6MW(6) = 1906 ± 213 (67th %ile), RPE = 13.1 ± 2.0 “somewhat hard”, HR (b/min) = 127 ± 20, HRmax = 81 ± 15 “vigorous.” Age was not correlated with any variables, except months of playing golf per year (r = -0.56, p = 0.003) with older golfers playing fewer months than younger golfers. Age when beginning golf participation was positively correlated with handicap, average scores for 9- and 18-holes, and number of golf swing errors (rs = 0.71, 0.68, 0.65; ps < 0.03). Golfers’ body weights were correlated with better TPI-fit scores (r = −0.64, p = 0.01) and average scores for 9- and 18-holes of golf (rs = −0.67, −0.65, ps = 0.02) representing greater strength or leverage during the golf swing. Golfers with better TPI-fit scores tended to have higher exercise enjoyment (r = −0.42 p = 0.09). TMD scores on the POMS improved (97.4 ± 13.9, 89.5 ± 15.2; p = 0.06) after only 6-min of high intensity walking. Greater 6MW HRs were correlated with greater TMD improvements (r = 0.49, p = 0.05). CONCLUSIONS: Senior women golfers with more years of golf experience, or who were heavier, performed better on TPI golf-specific fitness and swing tests. The women also reported enjoying exercise and desirable changes in mood after aerobic exercise. Future studies of senior women golfers are needed to continue examining the role of golf participation in seniors’ fitness levels and overall subjective well-being.
Numerous studies have reported similar neuromuscular adaptations between low-intensity (LI) blood flow restricted exercise (LI BFR) and high-intensity (HI) resistance training. Unfortunately, since none of these experimental designs individualized BFR levels to each participant, their findings are difficult to interpret. PURPOSE: To compare the acute effects of LI BFR (80% of absolute vascular occlusion pressure) with LI non-BFR and HI training on muscle torque, activation and neuromuscular fatigue. METHODS: Ten men (23.8 ± 5.4 yrs) exercised at 20 (LI) and 75% (HI) of 1 repetition maximum. LI consisted of 4 sets of knee extensions (30+15+15+15 repetitions) with and without BFR. HI included 4 sets of knee extensions (10+10+10+10 repetitions) without BFR. BFR pressure was determined individually using resting blood-flow measurements. Torque was determined during maximal voluntary contractions (MVC) before and after exercise. Surface electromyographic activity (root mean square - RMS and median frequency - MF) was recorded for the rectus femoris (RF) and vastus medialis (VM) muscles, before and after each session of training, during isometric contractions performed at 20% MVC. RESULTS: Torque decreased post-LI and HI BFR (-9.5 and -7.8%, respectively; p<0.05), but not after LI without BFR. The MF was reduced following HI in the VM and the RF muscles (-5.3 and -12.5%, respectively; p<0.05). Conversely, the impact of LI BFR on reducing MF was limited to the RF muscle (-10.7%; p<0.05). The RMS values for the VM and RF muscles were increased after HI BFR (+26.3%; p<0.05). In contrast, while RMS decreased by 19.0% post-LI (p<0.05), this was not seen after LI with or without BFR. CONCLUSION: HI BFR is as effective as HI in decreasing post-exercise MVC. However, since our data unequivocally demonstrate that the neuromuscular impact of HI is more profound than that of LI BFR, it should be emphasized that the use of high mechanical loads represents a stronger stimulus for muscular adaptation.

Aerobic exercise training with blood flow restriction (BFR) has been reported to increase aerobic capacity and muscle strength and volume. However, there is no evidence that such a training strategy increases performance in athletes. PURPOSE: To elucidate the effects of a 4 week BFR cycle training protocol on aerobic capacity, muscle function and performance variables in triathletes of a university club. METHODS: Eighteen healthy university triathletes were randomly assigned to BFR group (n = 12; 19 ± 1 yrs) or no BFR group serving as the control (CON; n = 6; 20 ± 1 yrs). Both groups trained by cycling for 30 minutes, 3 days/week for 4 weeks. BFR was performed for 15 minutes total during each session as 5 minutes with BFR followed by 5 minutes without BFR, by applying cuffs to the upper thighs. The BFR group was further subdivided into two groups: one group with compression set to 160 mmHg (constant pressure, BFR-CP, n = 6); in the other, the compression was gradually increased from 160 to 200 mmHg over 4 weeks (incremental pressure, BFR-IP, n = 6). All tests were performed before (Pre) and after 4 weeks of training (Post). Triathlon-specific performance tests were used: 5000-m run and 1500-m swim time trials and a 20-min bike distance trial, as well as the evaluation of peak oxygen uptake (VO2peak), one leg knee extensor strength, and thigh muscle cross sectional area (CSA). Two-way repeated ANOVAs were used for BFR-CP vs CON or BFR-CP vs BFR-IP and Pre vs Post with significance accepted as p<0.05. RESULTS: VO2peak significantly increased after the training (main effect of time) and significant group-by-time interactions were detected (3198 to 3449 mL/min and 3152 to 3212 mL/min in BFR and CON). However, a post-hoc analysis indicated no significant interaction in VO2peak between BFR-CP (3137 to 3396 mL/min) and BFR-IP (3259 to 3501 mL/min). Although the 5000-m run time was significantly shorter after the training (main effect of time), no significant interaction were detected (20.3 to 19.8 min and 20.1 to 19.8 min in BFR and CON). Lastly, there were no significant effects of training on muscle strength or CSA, 1500-m swim time, or 20-min bike distance. CONCLUSIONS: In this group of university triathletes, 4 weeks of BFR cycle training increased aerobic capacity, but had no added effect on muscle strength and volume or performance test outcomes.

Abstract: It has been reported that blood flow restriction (BFR) induced increases in muscle activation are correlated with decreased muscle blood flow resulting from external compression (i.e. higher relative pressures) (Sugaya M; 2011). However it has been reported that higher relative pressures may not be necessary with low-intensity exercise with BFR (Loenneke JP et al; 2015). PURPOSE: The purpose of this study was to compare the effects of resistance exercise with different degrees of BFR on muscle activation.

METHODS: 15 healthy adults performed 3 sets of bench press exercise (30, 15, and 15 reps; load: 30% 1RM) during 4 different BFR conditions: non-pressure (N-BFR), low pressure BFR (L-BFR), middle pressure BFR (M-BFR), and high pressure BFR (H-BFR). Surface EMG was recorded from the pectoralis major muscle (PM), anterior deltoid muscle (AD), and the triceps brachii muscle (TB). EMG amplitude (RMS) normalized as the relative exercise intensity (%) was analyzed (2-way repeated measures analysis of variance, and multiple post hoc test).

RESULTS: During 3 sets of exercise, gradual increases in RMS were observed in all muscles. The RMS of AD were 44.0±9.4-52.4±12.1-54.7±13.2 (mean±SD, %, 1set-2set-3set, N-BFR), 47.4±11.6-57.4±15.9-61.9±17.4 (L-BFR), 42.1±8.0-58.3±12.2-65.4±15.7 (M-BFR), and 47.0±12.3-68.2±25.9-77.3±33.9 (H-BFR). Interactions

Aerobic Exercise on Hemodynamics in Females

Acute Neuromuscular Adaptations In Response To Low-intensity Blood-flow Restricted Exercise And High Intensity Resistance Training


(No relationships reported)

RESULTS

at 10, 20, and 40 minutes following exercise. Conditions were separated by at least 48 hours. Subjects would lie down, in the supine position, and have baseline hemodynamics measured. Torque was determined during maximal voluntary contractions (MVC) before and after exercise. Surface electromyographic activity (root mean square - RMS and median frequency - MF) was recorded for the rectus femoris (RF) and vastus medialis (VM) muscles, before and after each session of training, during isometric contractions performed at 20% MVC.

RESULTS: Torque decreased post-HI and LI BFR (-9.5 and -7.8%, respectively; p<0.05), but not after LI without BFR. The MF was reduced following HI in the VM and the RF muscles (-5.3 and -12.5%, respectively; p<0.05). Conversely, the impact of LI BFR on reducing MF was limited to the RF muscle (-10.7%; p<0.05). The RMS values for the VM and RF muscles were increased after HI BFR (+26.3%; p<0.05). In contrast, while RMS decreased by 19.0% post-LI (p<0.05), this was not seen after LI with or without BFR. CONCLUSION: HI BFR is as effective as HI in decreasing post-exercise MVC. However, since our data unequivocally demonstrate that the neuromuscular impact of HI is more profound than that of LI BFR, it should be emphasized that the use of high mechanical loads represents a stronger stimulus for muscular adaptation.

Acute Effects of Blood Flow Restriction Cuffs During Aerobic Exercise on Hemodynamics in Females

Margarita Gonzalez, Brittany Esparza, Patrick Murphy, Murat Karabulut, University of Texas Rio Grande Valley, Brownsville, TX.

Email: margarita_gonzalez_8@yahoo.com

(No relationships reported)

PURPOSE

The purpose of this study was to investigate the acute effects of a 20-minute walk/run at 40% VO2 with and without blood flow restriction (BFR) cuffs on pulse rate (PR), stroke volume (SV), cardiac output (CO), cardiac ejection time (CET), systemic vascular resistance (SVR) and total vascular impedance (TVI) when compared to a 60-minute walk/run at 65% VO2 in females. METHODS: Seventeen female subjects, between the ages of 18 and 40, were familiarized with the study protocol, had thigh circumference (THC) measured, and performed the Bruce protocol on the first day. BFR cuff inflation was based on THC. The three randomized sessions: 1) 40% VO2 with BFR for 20 minutes (BFR-20min), 2) 40% VO2 without BFR for 20 minutes (no-BFR-20min), and 3) 65% VO2 without BFR for 60 minutes (no-BFR-60min). Each session began with the subject reaching a hydration status at or below 1.010. Once the hydration levels were reached, the subject would lie down, in the supine position, and have baseline hemodynamics measured. Following baseline measurements, the subject walked/run at a randomly predetermined intensity and time with or without BFR cuffs. BFR cuffs were taken off immediately after the 20-minute BFR condition. Post measurements of hemodynamics were taken at 10, 20, and 40 minutes following exercise. Conditions were separated by at least 48 hours.

RESULTS: Significant condition main effects were found in PR (p<0.01), BFR-20min vs. no-BFR-60min, SV (p<0.01), BFR-20min vs. no-BFR-60min, CET (p<0.04 no-BFR-20min vs. no-BFR-60min). Significant time main effects were found in PR (p<0.01), SV (p<0.04), CO (p<0.04), CET (p<0.01), SVR (p<0.04), and TVI (p<0.01). Significant condition*time interactions were found in PR (p<0.01), SV (p<0.01), CO (p<0.02), SVR (p<0.04), and TVI (p<0.01).

CONCLUSIONS: The BFR-20min condition, at 40% VO2, elicited higher SV and lower PR responses than the no-BFR-60min condition using 65% VO2, which might be caused by the use of a lower intensity that produced a lower sympathetic nervous system response. Furthermore, the no-BFR-60min condition produced a lower response in SVR and TVI than the no-BFR-20min condition that may have been caused by a greater release of nitric oxide from the session length that was thrice as long.

Acute Effects of Blood Flow Restriction Cuffs During Aerobic Exercise on Hemodynamics in Females

Margarita Gonzalez, Brittany Esparza, Patrick Murphy, Murat Karabulut, University of Texas Rio Grande Valley, Brownsville, TX.

Email: margarita_gonzalez_8@yahoo.com

(No relationships reported)
between BFR conditions and sets for AD had significant effects (F=2.53, p<0.05). The main effect of BFR conditions was significant for PM, average of 3 sets (mean±SD, %), N-BFR: 46.5±6.7; L-BFR: 52.4±14.3; M-BFR: 52.2±11.7 ; H-BFR: 61.5±21.1, F=3.06, p<0.05, but was not significant for TB (N-BFR: 46.5±14.7; L-BFR: 55.9±20.1; M-BFR: 50.5±10.8; H-BFR: 52.1±17.4, F=0.86, p>0.05). CONCLUSION: These findings indicate that muscle activation was affected by relative differences in applied pressure for non-restricted trunk muscles (i.e. PM and AD), but not affected for restricted limb muscles (i.e. TB). Previous studies focused on restricted limb muscle following single-joint resistance training. Therefore, it is important that the influence of the degree of blood flow restriction on muscle activation is investigated in multi-joint exercise.

CONCLUSIONS: BFRRT is associated with significant improvements in muscle hypertrophy and functional improvements in healthy subjects. There were significant improvements in hop testing distances, indicating the benefits of BFRRT extend beyond improved strength. Subsequent studies should evaluate the possibility of creating BFRRT programs that target injury-specific muscle groups when high load resistance training is contraindicated due to surgery or injury.

PAPER 155
May 31 9:30 AM - 11:00 AM
Acute Effects Of Aerobic Exercise With Blood Flow Restriction Cuffs On Arterial Compliance In Males
Magalie Sanchez, Margarita Gonzalez, Brittany Esparza, Patrick Murphy. University of Texas Rio Grande Valley, Brownsville, TX. Email: magalec717@yahoo.com

PURPOSE: The purpose of this study was to examine the acute effects a 20-minute run, at 40% VO2, with and without blood flow restriction (BFR) cuffs has on systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and pulse pressure (PP) when compared to a 60-minute run at 65% VO2 without BFR in males. METHODS: On the first session, seventeen male subjects (between the ages of 18 and 50) were familiarized with the study protocol, measured for thigh circumference, and preformed the Bruce protocol. Inflation of BFR cuffs was based on thigh circumference. Conditions were randomized into three sessions, 1) a 60-minute walk/run without BFR cuffs at 65% VO2 intensity, 2) 20-minute walk/run at 40% VO2 intensity with the BFR cuffs inflated, and 3) 20-minute walk/run at 40% VO2 intensity without BFR. Participants were required to show up hydrated, reaching a status at or below 1.010, and with at least 8-hour fasted during the three separate randomized sessions. After the subject reached set hydration levels, they would lie down on a table for at least 45 minutes. The researchers would take BP and measure pulse pressure (PP) every 15 minutes for a total of four sets (30, 15, 15, 15) at an intensity of 20% 1RM. The contralateral limb was trained with two sets of 11 repetitions on each day. The 4 treatment conditions included whole body vibration (WBV), whole body vibration with BFR (WBVK), maximal voluntary contractions (MVC) and maximal voluntary contractions with BFR (MVCK) both via deadlift. Repeated measures ANOVA compared conditions for percent changes in power and jump height as well as for the raw power and height values after the study. RESULTS: There were significant differences in percent change in jump height for 3 of the 4 interventions compared to CON (-1.5±1.0); WBV: 33.4cm, p=.007), and triple hop (pre: 405.5± 106.4cm, post: 428.4 ± 104.1cm, p=.025).

There were significant differences in percent changes in power and jump height as well as for the raw power and height values after the study. RESULTS: There were significant differences in percent change in jump height for 3 of the 4 interventions compared to CON (-1.5±1.0); WBV: 33.4cm, p=.007), and triple hop (pre: 405.5± 106.4cm, post: 428.4 ± 104.1cm, p=.025).

May 31 9:30 AM - 11:00 AM
Differences in Neuromuscular Adaptations After Two Weeks of Conventional vs Blood Flow Restriction Resistance Training
Danny D. Dominguez, Patrick Gage Murphy, Brittany N. Esparza, Gabriela Soto, Roberto Osornio, IV, Ulku Karabulut, Murat Karabulut. University of Texas at Rio Grande Valley, Brownsville, TX. (No relationships reported)

PURPOSE: The purpose of the study was to determine the neuromuscular changes in the rectus femoris (RF) muscle as measured by electromyography (EMG) following short-term resistance training with and without blood flow restriction (BFR).METHODS: 12 males (age = 27.4 ± 6.3 years; height = 171 ± 5 cm; weight = 79.8 ± 13.2 kg) performed six sessions of lower body unilateral resistance training using a leg extension machine. The leg on which BFR was applied was determined through randomization leg dominance. Each training session consisted of unilateral knee extensions with and without blood flow restriction. Electromyography data was recorded for each participant from two isometric maximum voluntary contractions (MVC) and two isokinetic knee extension tests (180°/s and 60°/s) using a Biodex System 4 Pro™. EMG was recorded from the RF during these tests. Resistance training consisted of six non-consecutive sessions of knee extension exercises performed in a time frame of two weeks. For the BFR group, subjects trained for a total of four sets (30, 15, 15, 15) at an intensity of 70% 1RM. The contralateral limb was trained with two sets of 11 repetitions at an intensity of 70% 1RM without BFR. The volume of exercises was similar for both conditions.

RESULTS: Significant improvement was found for peak quadriceps strength (pre: 170.0 ± 47.98 N, post: 197.1 ± 57.2 N, p<0.037), single leg hop (pre: 128.9 ± 35.8cm, post: 154.2 ± 33.4cm, p<0.007), and triple hop (pre: 405.5 ± 106.4 cm, post: 428.4 ± 104.1 cm, p<0.025).
Heart failure with preserved ejection fraction (HFpEF) is the most common form of heart failure among older persons, and >80% of patients are overweight/obese. Increased adiposity is associated with numerous systemic impairments that contribute to HFpEF pathophysiology, and is significantly correlated to severity of exercise intolerance, the primary symptom in HFpEF. Yet only one study has examined the effects of caloric restriction (CR) with or without aerobic training (AT) in older HFpEF patients. The Study of Caloric Restriction and Exercise Training (SECRET) demonstrated that a short-term (20-weeks) CR or AT+CR intervention resulted in significant weight loss and led to significant improvements in peak VO2 and quality of life. However, whether these changes are sustained over time is not known.

PURPOSE: To evaluate long-term changes in exercise function and body composition in older HFpEF patients after completion of the SECRET interventions. METHODS: Sixteen patients, from CR or AT+CR groups (≥10 kg weight loss), underwent maximal treadmill exercise and DXA body composition assessment 29 ± 11 months (range 10-47 months) after completion of their SECRET trial participation. Paired t-tests were used to compare changes over time. Pearson correlations were used to explore the relationship between body composition measures. RESULTS: Compared to status at trial end, at follow-up, mean weight change was ±5.2 ± 3.8 kg. There was a significant increase in fat mass (+4.9 kg, p<0.001), but not lean mass (+0.3 kg, p=0.67). There was a significant correlation between change in total mass and fat mass (r = 0.75, p=0.001), but only a trend between change in total mass and lean mass (r = 0.49, p=0.053). There was also a significant decrease in relative peak VO2, (2.2 ± 2.1 ml/kg/min, p=0.003) and exercise time (2.4 ± 2.6 min, p=0.006), with a trend for absolute peak VO2 (<8.7 ± 152 ml/min, p=0.062). CONCLUSIONS: While CR and AT+CR in older HFpEF patients produces significant improvements in exercise tolerance associated with improved body composition, these positive changes appear to diminish during long-term follow-up, and regained weight appears to be mostly fat. This suggests a need for long-term interventions to prevent weight regain and maintain improvements in physical function and body composition in older HFpEF patients.

**CONCLUSIONS:** Both reduced Qc and A V-O2 diff contribute significantly to the impairment of exercise capacity in HFpEF through Qc is augmented for a given VO2. Lifelong exercise training enhances Qc and peak AV-O2 diff in the elderly population and normalizes Qc/VO2 relationship.

**METHODS:** Based on lifestyle physical activity level categorization, elderly-sedentary seniors (n=27, 69.5±5 yrs) and elderly-athletic seniors (n=25, 68.3±3 yrs), and patients with heart failure with preserved ejection fraction (HFpEF) (n=24, 71.7±7 yrs) were selected and underwent cardiopulmonary exercise testing. A modified Astrand-Saltin incremental treadmill protocol was performed to determine VO2 and ventilatory gas exchange using the Douglas bag technique. Cardiac output (Qc) was measured with the C200 re-breathing method. Peak arterio-venous O2 difference (peak AV-O2 diff) was calculated by Fick equation (peak VO2 divided by peak Qc). The slope of the relationship between changes in VO2 and Qc during exercise was calculated by ΔQc/ΔVO2.

**RESULTS:** Peak VO2, and peak Qc was lower in HFpEF group than the other groups (peak VO2: HFpEF: 13.1±3.6; vs. Sedentary: 23.5±4.4; vs. Athlete: 39.5±5.3 ml/kg/
Increased carotid intima-media thickness (CIMT) is accepted as an early indicator for the development of atherosclerotic coronary artery disease (CAD). The presence of CAD risk factors is shown to have a negative influence on CIMT. As obesity rates increase in children which negatively alters CAD risk factors, it is unclear how this might alter CIMT. PURPOSE: The purpose of this study was to determine if there is a relationship between children’s CIMT and CAD risk factors as well as number of CAD risk factors combined. METHODS: One hundred and nineteen children (age 10.51±0.52, height 147.2±7.05cm, and weight 46.51±12.21kg) took part in the CIMT assessment. Subjects were randomly selected from the Cardiovascular Health Intervention Program. Subjects had previously completed a fasting blood lipid and glucose profile, height, weight, and resting blood pressure to evaluate CAD risk factors. A licensed sonographer completed scans on the right and left common carotid using the ultrasound unit (Terson 53200) with a linear transducer probe. CIMT was measured using the software The Carotid Analyzer for Research Version 6. RESULTS: An increase in CIMT was observed in the right (p<.05), left (p<.01) and combined right and left CIMT (p<.001) in children with an elevated BMI (>35%) vs those with a normal BMI. The children with elevated blood pressure (>95%) had an elevated CIMT in both the left (p<.001) and combined left and right CIMT (p<.05). In respect to elevated blood glucose (>100mg/dl), only an elevated CIMT was observed in the right CIMT (p<.05). When comparing CIMT to number of CAD risk factors, an increase in CIMT (p<.05) was observed in children with 2+ CAD risk factors vs 0 CAD risk factors. CONCLUSIONS: CIMT is negatively altering arterial stiffness in children. Changes in CIMT (left VS right) appear to be different based on the CAD risk factor of interest. Children with 2+ CAD risk factors might alter CIMT.

Purpose: To determine whether acute sympathetic blockade alters the relationship between heart rate (HR), RPE and VO2 during incremental exercise. METHODS: Eleven healthy adults completed six GXTs on a motorized treadmill, under a β, receptor antagonist and placebo. Treadmill speed increased by 2 km·h⁻¹ every 2 min and participants reported their RPE ( Borg 6-20 RPE Scale) each min until exhaustion. The VO2 and HR were measured continuously. Linear regression modelled the growth of individual participant relationships of RPE and HR with VO2. To account for differences in peak HR between conditions, values were expressed relative to the peak HR from each GXT. Paired sample t-tests assessed differences in the slope (b) of the individual regression models between conditions. RESULTS: The VO2 peak and HRpeak were lower during β-blockade (51.9±5.3 vs 48.6±7.5 ml kg⁻¹ min⁻¹, p<0.05; 192.7±8.2 vs 156.0±23.1 b min⁻¹, p<0.01, respectively). As expected, the slope for the relationship between HR and VO2 was greater during [β-blockade (b 0.37±0.03 vs 0.48±0.07, p<0.01), however, there was no significant difference in the slope of the RPE:VO2 relationship (b 3.34±0.71 vs 3.53±0.77, respectively p>0.05) and no significant difference in 6 when HR was expressed relative to the peak HR during the GXT (b 0.71±0.07 vs 0.73±0.07, p>0.05). CONCLUSION: Despite a marginally lower VO2 peak, the relationship between RPE and VO2 remains unchanged by sympathetic blockade, whereas the absolute HR:VO2 relationship is significantly altered. This means that RPE can be used in place of HR to determine metabolic work or estimate fitness sub-maximally in individuals taking β-blockade.
Phase II cardiac rehabilitation (CR) has been shown to be effective at reducing risk factors associated with cardiovascular disease (CVD). A delay in starting CR has been associated with poorer fitness outcomes. The risk of CVD more than doubles in the presence of metabolic syndrome (MetS). The association between initiation of CR, and hospital readmissions in patients with MetS was previously unknown.

Purpose: We sought to determine the relationship between the length of time to the start of CR, and hospital readmissions in patients with MetS. Further, we aimed to determine if there was an association between demographic and clinical variables, and hospital readmissions in this patient population.

Methods: We examined the records of 353 CR patients at a quaternary medical center who had MetS. Continuous measures were imputed using predicted mean matching regression, while categorical measures were imputed based on logistic models.

Readmissions prior to beginning CR were excluded.

Results: Patient readmissions within 90 days were more likely to be non-white (p<0.026) and have a time to CR initiation of ≤30 days (p<0.001). Patients readmitted at ≤ 6 months were more likely to be non-white (p<0.001) and have time to CR ≤ 60 days (p = 0.017). Of 54 patients readmitted within 6 months, 75.9% began CR within 60 days and 56.9% were non-white. In multivariable models for readmission within 6 months, those of white race (OR 0.62 [0.18, 2.07]; p=0.041) were less likely to be readmitted. Patients who began CR early were 2.47 times more likely to be readmitted by 6 months (OR 2.47 [1.22, 5.02]; p=0.012).

Conclusions: Patients with MetS were more likely to be readmitted if they were non-white. Early uptake to CR resulted in higher likelihood of readmission at ≥ 90 days. These results raise questions about the health status and other unique traits of patients with MetS who begin CR early. Future studies should focus on designing CR programs to meet the needs of non-whites and those who may be sicker at the onset of CR.

Conclusions: Resting systolic and diastolic BP were significantly lowered after 6 weeks of aerobic exercise training. No additional changes were observed in BP at 12 weeks of exercise. Thus, exercise BP is lowered after just six weeks of aerobic exercise training or approximately 12-18 sessions.

Table.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Midpoint</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic BP (mmHg)</td>
<td>138.7 ± 14.6</td>
<td>130.3 ± 14.1</td>
<td>129 ± 13.6</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>79.9 ± 7.3</td>
<td>74.9 ± 9.1</td>
<td>73.6 ± 9.8</td>
</tr>
</tbody>
</table>

272 Board #93
May 31 9:30 AM - 11:00 AM
The Relationship Between Initiation of Cardiac Rehabilitation and Readmission Rates for Patients with Metabolic Syndrome

Lee Anne Siegmund, Mark McClelland, James Benha. Cleveland Clinic, Cleveland, OH.
Email: siegmuid@ccf.org
(No relationships reported)

Our recent meta-analysis on the blood pressure (BP) lowering effects of concurrent exercise training (CET) found systolic BP (SBP) and diastolic BP (DBP) were moderately reduced an average of ~3 mmHg overall. However, large SBP/DBP (~9/8 mmHg) reductions were noted among adults with hypertension, indicating the potential clinical utility of CET as an antihypertensive lifestyle therapy. PURPOSE: To perform a meta-analysis to determine whether acute concurrent exercise (CE) is also efficacious antihypertensive lifestyle therapy. METHODS: Databases were searched for controlled studies that included: adults (≥19 yr), a single bout of CE, and measured BP pre- and post-CE and control. Analyses followed random-effects assumptions.

RESULTS: 8 studies and 13 interventions (4) qualified. Subjects (N=109) were young to middle-aged (35.9±16.4 yr), overweight (26.7±3.1 kg/m²) men (34.6%) and women (65.4%) with a resting SBP/DBP of 122.3±11.9/76.6±7.2 mmHg. Among the total sample, 38.6% (N=42) had hypertension, 12.4% (N=14) prehypertension, and 49.0% (N=53) normal BP. CE was performed at moderate-to-vigorous intensity (aerobic=65±8.1%; maximum oxygen uptake, resistance=63.9±16.5%; one-repetition maximum) for 55.0±6.1 min, with 53.9% of the interventions performing aerobic first. Aerobic exercise interventions included walking (38.5%, k=5), cycling (38.5%, k=4), running (15.4%, k=2), and step aerobics (7.7%, k=1) for 29.1±3.0 min. Dynamic resistance exercise interventions were performed on machines for 26.1±4.9 min, and consisted of 2.8±1.2 sets of 11.5±5.4 repetitions per set for 5.9±1.2 exercises. CE was measured in the laboratory for 89.2±45.4 min post-CE. Overall, acute CE elicited large reductions in SBP (d [95% CI] = -0.84 [-1.23, -0.44], -9 mmHg), but not DBP (d [95% CI] = -0.68 [-0.72, 0.11], -0.6 mmHg) compared to control. We observed significant heterogeneity for SBP (I² [95% CI] = 82.7% [71.6%, 89.4%]) and DBP (I² [95% CI] = 75.9% [49.4%, 73.4%]), but no significant moderators emerged.

CONCLUSION: Similar to CET, acute CE leads to clinically meaningful reductions in SBP (~9 mmHg), but in contrast to CET, not DBP. The BP lowering patterns appear to differ between acute and chronic CE, findings that should be confirmed in future randomized CE trials.

PURPOSE: The American Heart Association (AHA) identified isometric exercise training (IET) as a “potential” supplementary therapy for blood pressure management (Class IIIb Level of Evidence C), highlighting a need for further investigation. Importantly, reductions in resting blood pressure (RBP) following IET have been reported in laboratory environments, but data regarding the use of IET in the field are limited. Therefore, IET may be an effective and safe intervention for self-management of RBP in the wider community. Additional research is needed, accounting for other factors that affect RBP, to further confirm, IET as an effective intervention for reducing RBP. Supported by a Faculty Research Grant at UNC-Charlotte.
The use of electrical muscle stimulation (EMS) has been shown to potentially improve or compensate for disadvantages in disabled or chronic patients with physical inactivity. However, little is known about the effects of EMS on the arterial function.

**PURPOSE:** The aim of this study was to evaluate the effects of EMS to the lower extremities on the vascular endothelial function determined by flow-mediated vasodilation (FMD).

**METHODS:** Eight healthy adult men were studied under two experimental trials (EMS and control without any stimulation) in the supine position. In the EMS trial, both lower leg and thigh muscles were sequentially stimulated at 4 Hz for 20 min. Before and after each trial, the brachial systolic and diastolic blood pressures (SBP and DBP) were measured. In order to measure FMD, a forearm cuff was inflated to 50 mmHg over their SBP for 5 minutes with subsequent deflation. The right brachial artery diameter was measured using a high-resolution ultrasound device. The FMD was then estimated as the percent change in the arterial diameter over the baseline value at maximum dilation during reactive hyperemia.

**RESULTS:** The EMS trial was significantly elevated immediately after (12.1±1.1%) and at 30 min after EMS (11.0±0.9%) compared with rest (9.2±0.8%). However, there were no significant changes in the control trial (9.3±0.9% at rest, 9.4±0.8% immediately after C trial, and 9.2±0.9% at 30min after C trial). Immediately after and 30min after each trial, significant differences in the FMD were found between the EMS and control trials (p<0.05). No such changes were found in the SBP/DBP in either trial.

**CONCLUSIONS:** Acute EMS appears to improve the vascular endothelial function. These findings suggest that chronic EMS might be useful for reducing the risk of cardiovascular disease in people suffering from partial paralysis or arthritis as well as in healthy subjects.

**Prolonged Sitting-induced Lower Limb Vascular Dysfunction: The Effect of Oxidative Stress**

Ryan Garten, Matthew Scott, Tiffany Zuniga, Austin Hogwood. Virginia Commonwealth University, Richmond, VA.

**Email:** rgarten@vcu.edu

**No relationships reported**

Prolonged sitting has been reported to result in significant vascular dysfunction due to increases in lower limb pressure and subsequent reductions in shear stress. Oxidative stress, a known modulator of vascular function, has been reported to increase in the vasculature in response to high pressures, but contrary findings exist when assessing the activity of blood flow stimulation.

**PURPOSE** investigated this within an exercise bout.

**METHODS** examined the blood flow response using the same pressure for every individual independent of limb size, and have only done so at rest, after inflation of the cuff, and following exercise. No investigations have examined this response using relative blood flow pressure (0.3) to 0.5).

**RESULTS** There were significant differences in concentrations of total and oxy-haemoglobin during the last three epochs of the resting/absorption period (p≤0.05) and the cognitive task period 1 h post consumption (p≤0.05). Furthermore, MC consumption significantly lowered systole (p≤0.05) over a period of 3 h, with peak reductions of 0±2 mmHg at 1 h post MC consumption relative to the placebo. Cognitive function and mood were not affected.

**CONCLUSIONS:** The findings suggest that MC concentrate can acutely modulate CBF in the prefrontal cortex characterized by increased concentrations of both total- and oxy-haemoglobin. Despite this, the results do not translate to improvements in cognition or mood in the hours following consumption. Importantly, these data support previous findings observations that demonstrate a significant improvement in systole following MC supplementation.

**Blood Flow in Humans During Low-Load Exercise with and without Blood Flow Restriction**

J Grant Mouser, Gilberto C. Laurentino, Scott J. Dankel, Samuel L. Buckner, Matthew B. Jesse, Brittany R. Counts, Kevin T. Mattocks, Jeremy P. Loenneke, Samuel L. Buckner, Matthew B. Jesse, Brittany R. Counts, Kevin T. Mattocks, Jeremy P. Loenneke. 1The University of Mississippi, University, MS; 2University of Sao Paulo, Sao Paulo, Brazil; 3University of South Carolina, Columbia, SC.

**Email:** jgrant.mouser@gmail.com (No relationships reported)

**Blood flow restriction (BFR) in combination with exercise has been well studied, however, little is known about the actual blood flow response to this type of exercise. The range of applied pressures in the research is wide, and previous studies have only examined the blood flow response using the same pressure for every individual independent of limb size, and have only done so at rest, after inflation of the cuff, and following exercise. No investigations have examined this response using relative applied pressures as a percentage of arterial occlusion pressure (AOP) nor have they investigated this within an exercise bout.

**PURPOSE:** To measure blood flow before, during, and after low-load elbow flexion exercise combined with no restriction (NOBFR), 40% of AOP (40BFR), and 80% of AOP (80BFR).

**METHODS:** 140 participants (women=75, men=65) were randomized into one of three conditions. After AOP and one-repetition maximum (1RM) measurement, ultrasound measurement of median blood flow at rest in the right brachial artery were taken. Participants performed four sets comprising 75 total repetition goals of elbow flexion at 30% IRM. Blood flow was measured between sets and at one and five minutes post-exercise.

**RESULTS:** Blood flow decreased following inflation, with no difference between BFR conditions (40BFR: 38.1 ml min⁻¹ vs. 80BFR: 36.3 ml min⁻¹; p>0.05). Men had greater blood flow than women in all conditions at all time points (411.6 vs. 214.0 ml min⁻¹;
respectively, p<0.001). Maximum blood flow was decreased during exercise with pressure (NOBFR=406.7 ml·min⁻¹, 40BFR=311.1 ml·min⁻¹, 80BFR=188.5 ml·min⁻¹, p<0.001). Blood flow tended to increase across sets regardless of contraction. One minute following cuff deflation, blood flow was higher in 80BFR than in 40BFR for women only (372.2 vs. 253.1 ml·min⁻¹, p=0.005). One minute following cuff deflation, there was no group difference in blood flow for men (NOBFR=675.2 ml·min⁻¹, 40BFR=715.4 ml·min⁻¹, 80BFR=666.3 ml·min⁻¹, p>0.75). CONCLUSIONS: In exercise-induced blood flow during BFR is pressure-dependent, with higher pressures eliciting a decrease in the magnitude of the hyperemic response. Blood flow increased above baseline during all BFR conditions; the use of relative applied pressures ensures that full occlusion does not occur during exercise.

PURPOSE: To study vascular responses to intermittent hypoxia (IH) exposures. METHODS: Eleven healthy subjects (7 men; 4 women) completed three experimental trials: sitting, prior exercise + sitting, and standing. Following baseline popliteal artery flow-mediated dilation (FMD) measurements, subjects maintained a supine position for 3 hours of standing did not have a significant impact on popliteal artery FMD (4.10 ± 0.45% vs. 3.97 ± 0.65%; P > 0.05). CONCLUSIONS: Prolonged sitting-induced leg endothelial dysfunction can be partially prevented by prior aerobic exercise. Moreover, in the absence of exercise, standing represents an effective substitute to sitting for maintaining normal leg vascular function.

281 Board #102 May 31 11:00 AM - 12:30 PM
Prior Aerobic Exercise Attenuates Prolonged Sitting-induced Leg Endothelial Dysfunction
Takuma Morishima, Robert M. Restaino, Lauren K. Walsh, Jill A. Kanaley, FACSM, Jaume Padilla. University of Missouri, Columbia, MO. (Sponsor: Jill Kanaley, FACSM) (No relationships reported)

PURPOSE: Prolonged sitting leads to leg endothelial dysfunction; however, it remains unknown whether this impairment can be prevented with prior exercise. It is also unknown if, in the absence of exercise, standing is an effective alternative strategy to sitting for conserving leg endothelial function. Accordingly, the purpose of this study was two-fold: 1) to test the hypothesis that prior exercise prevents sitting-induced endothelial dysfunction; and 2) to test the hypothesis that standing is an effective substitute to sitting for maintenance of leg endothelial function. METHODS: Eleven young healthy subjects (7 men; 4 women) completed three experimental trials: sitting, prior exercise + sitting, and standing. During IH, middle cerebral arterial blood flow velocity (V̇MCA, Ez-Dop), blood pressure (BP, NIBP100D), O₂ saturation (SaO₂, Radiometer), breathing frequency (Fbr), tidal volume (VT, Universal Ventilation Meter), inspired and expired O₂ and CO₂ fractions (1100 Medical Gas Analyzer; Perkin-Elmer) were continuously monitored. The SaO₂ was decreased during 6-min IH (P<0.001), which was more significant in the 5th than the 1st bout of IH exposures (P<0.005). The V̇MCA was significantly increased by IH and its magnitude was greater in the 5th than the 1st bout of IH exposures (P<0.005). IH did not change mean BP (MICP) from the baseline (min 0) during either the 1st or 5th bout (see Table). Minute ventilation (V̇E) was stimulated by IH (P=0.023) with no difference between the bouts. The increased V̇E was driven by increases in V̇E, because ḞE remained constant throughout IH exposures. There was a decrease (P<0.001) in partial pressure of end-tidal CO₂ (P̄ETCO₂) during IH, which was not different between the 1st and the 5th bouts of IH exposures.
**Board #105**

**May 31 11:00 AM - 12:30 PM**

**Hemodynamic Changes Following High-Velocity Circuit Resistance or Treadmill Training in Adults with Cardiometabolic Risk Factors**


Email: kxr181@miami.edu

(No relationships reported)

Cardiometabolic syndrome (CMS) is classified as a combination of maladaptive cardiovascular and metabolic abnormalities that includes hypertension, dyslipidemia, and blood vessel dysfunction. These outcomes can negatively influence hemodynamics (HDYN) via a decrease in myocardial efficiency due to increased afterload and/or decreased vascular elasticity. Studies have reported changes in HDYN during and following acute exercise in clinical populations. However, there is a paucity of information on how high-velocity circuit resistance training (CRT) compared to continuous treadmill exercise (TM) affects these parameters at rest. PURPOSE: To compare the effects of CRT, TM and no exercise (CONT) on HDYN variables at rest in older adults with multiple CMS risk factors. METHODS: Eleven women (66.4 ± 6.4 years) participated in 12-weeks of CRT or TM. Stroke volume (SV), cardiac index (CI), systemic vascular resistance (SVR), end-diastolic volume (EDV), ejection fraction (EF), and oxygen consumption (\( rVO_2 \)) were measured by impedance electrocardiography and indirect calorimetry before and after training. RESULTS: A within-group analysis revealed significant increases in CI (MD=0.257, SE=0.092, p=0.023) and EDV (MD=31.10, SE=11.96, p=0.032), a trend towards an increase in SV (MD=8.63, SE=4.28 p=0.07) and a decrease in SVR (MD=154.15, SE=71.07, p=0.06) for CRT. TM resulted in significant increases in CI (MD=218, SE=80.92, p=0.020) and EDV (MD=26.16, SE=10.36, p=0.035); however, increases were not comparative to those seen with CRT. The CONT group showed a significant decrease in \( rVO_2 \) (MD=1.60, SE=6.4, p=0.03). No significant differences were observed for EF. At post-testing CONT resulted in a decrease in \( rVO_2 \) approaching significance compared to TM (MD=3.10, p=0.07). CRT demonstrated more favorable changes in SV, CI, SVR and EDV than TM or CONT. However, these changes did not reach statistical significance. CONCLUSION: These preliminary results indicate that CRT and TM lead to significant favorable changes in CI and EDV, however, CRT showed greater improvements in each and a trend towards improvements in HDYN when compared to TM and CONT. It is expected that completion of testing on existing subjects will further strengthen our results.

**Board #106**

**May 31 11:00 AM - 12:30 PM**

**Impact of Short-term Training Camp on Aortic Pressure in Collegiate Endurance Runners**

Tsubasa Tomoto1, Jun Sugawara1, Ai Hirasa2, Tomoko Imai1, Shigehiko Ogoh, FACSM2, *National Institute of Advance Industrial Science and Technology, Tsukuba, Japan.* 1Kyorin University, Mitaka, Japan. 2Aichi Institute of Technology, Toyota, Japan. (Sponsor: Shigehiko Ogoh, FACSM)

Email: (No relationships reported)

PURPOSE: Stiffening of the aorta may be a possible cause of increased aortic blood pressure (BP) reflecting increased cardiac workload. We have previously reported that in regularly highly-trained endurance athletes, arterial stiffness increases after a short-term training camp characterized by greater training volume. As a follow-up study, we investigated the effect of such exercise on aortic BP. METHODS: In a total of 36 regularly highly-trained collegiate endurance runners, pulse wave analysis was performed before and after a seven-day training camp for evaluating aortic BP and the round-trip travel time (TR) of the pressure wave which is a surrogate index of aortic stiffness. They underwent a group training (three sessions per day mainly consists of long distance running and sprint training). Variables of interest were compared between two groups based on accomplishment of the task (running at least 26 km per day). RESULTS: In the accomplished group, TR significantly shortened after the camp. In addition, aortic systolic BP and pulse pressure slightly but significantly elevated despite no significant changes in brachial BP and pulse pressure. Such significant changes were not observed in the non-achieved group. Additionally, there was a significant correlation between the training distance during the camp and the change in aortic systolic BP (r=0.490, P=0.001). CONCLUSION: These results suggest that, even in regularly highly-trained endurance athletes, aortic BP increases acutely after the short-term vigorous training camp, and it is partly due to stiffening of the aorta. In addition, the greater training volume could be a cause of increased aortic BP but not in brachial BP.
Regular endurance exercise improves endothelial dependent vasorelaxation. However, the initial stress of acute exercise may impair vascular function prior to the beneficial adaptive response. PURPOSE: The purpose of this study is to examine the effects of acute exhaustive exercise on endothelial-dependent vascular function.

METHODS: 7-9 mo old, male, Wistar rats were divided into four groups (n=6/group): sedentary (SED), 6h post-exercise (6h), 24h post-exercise, and 48h post-exercise. Exercise consisted of one bout of exhaustive treadmill exercise lasting between 30-40 min. Endothelium dependent vasorelaxation was assessed in ring segments of the aorta by constructing an acetylcholine dose response curve (10^-6-10^-7 M) in a wire myograph. RESULTS: Maximal vasorelaxation was impaired in 6h (70.1±5.2%), and 24h (76.2±4.4%) compared to SED (86.9±4.2%) and 48h (83.7±4.4%). EC50 for 6h (3.9e-5) was significantly greater than SED (1.3e-5) and 48h (1.5e-5). CONCLUSIONS: These data suggest that acute, exhaustive treadmill exercise results in impaired endothelial dependent vasorelaxation up to 24h post-exercise and returns to sedentary levels within 48h.

Dietary supplementation of inorganic nitrate (NO-3) reduces blood pressure (BP) in normal and hypertensive subjects. An acute bout of exercise also reduces BP in many normotensive and in most hypertensive individuals. The possible additive hypotensive effect of NO-3 plus exercise has not been investigated in pre- and hypertensives. PURPOSE: To assess whether intake of NO-3 followed by maximal exercise may obliterate when combined with exercise.

METHODS: Ten pre- or hypertensive subjects participated in a randomized double-blind study one week apart. Exercise consisted of one bout of exhaustive treadmill exercise lasting between 30-40 min. Endothelium dependent vasorelaxation was assessed in ring segments of the aorta by constructing an acetylcholine dose response curve (10^-6-10^-7 M) in a wire myograph. RESULTS: Maximal vasorelaxation was impaired in 6h (70.1±5.2%), and 24h (76.2±4.4%) compared to SED (86.9±4.2%) and 48h (83.7±4.4%). EC50 for 6h (3.9e-5) was significantly greater than SED (1.3e-5) and 48h (1.5e-5). CONCLUSIONS: These data suggest that acute, exhaustive treadmill exercise results in impaired endothelial dependent vasorelaxation up to 24h post-exercise and returns to sedentary levels within 48h.

Several studies have established that arterial stiffness, assessed via pulse wave velocity (PWV), is reduced following passive heat stress or exercise. Yet, no study to date has simultaneously investigated the cumulative effects of exercise and heat stress on measures of PWV. PURPOSE: Determine the independent and combined effects of heat and exercise on arterial stiffness. METHODS: Nine subjects (n=3 females, 46±11 years old; 24±1.2 kg/m²) completed four trials, with different interventions, in a randomized order. In a control trial subjects rested supine (CON). In order to independently test the effect of heat stress, subjects were passively heated (i.e. no exercise) in a hot environment (~40°C) while wearing a water perfusion suit with hot water (PH). In two other trials, subjects cycled at ~50% of VO2peak in a hot environment (~40°C, HC) or cool (~15°C, CC) environment. Prior to interventions and in the hour following interventions, pulse wave velocity (PWV), via Doppler ultrasound, was measured at the tibial, radial, femoral and carotid artery sites. Central PWV (CPWV) was assessed using measures between the carotid/femoral artery sites, while peripheral stiffness was assessed using the radial/carotid (T1), and tibial/femoral (T2), artery sites. Mean body temperature (Tb) was measured with skin and rectal thermistors RESULTS: No significant changes in Tb were observed during the CON and CC trials. However, the PH and HC trials elevated Tb (~2.69±0.23°C and 1.67±0.27°C, respectively; p<0.01). No changes in any measure of PWV were observed in the CON, CC, or HC trials (p>0.05). However, in the PH trial T1 did not change (~17°C), but C0 and IL were reduced immediate post (~17±81 cm/s) and 15 minutes (~93±82 cm/s) post heating (p<0.05). CONCLUSIONS: Contrary to previous data, we did not observe changes in arterial stiffness following aerobic exercise (i.e., CC). Further, although heat stress alone reduced arterial stiffness (specific to the upper peripheral arteries), when combined with exercise in the heat, there was no change in arterial stiffness (i.e., HC). This suggests that heat stress has an independent effect on arterial stiffness that is obliterated when combined with exercise.

AquaTreadmill (ATM) exercise training has been shown to reduce blood pressure reactivity to exercise to a greater degree than land treadmill (LTM) exercise training. Furthermore, ATM exercise tends to elicit a greater post-exercise hypotensive response and an acute augmentation in flow-mediated dilation (FMD). However, the mechanisms for such changes are unclear, and previous research showed no differences in plasma nitrites or nitrates between modes. PURPOSE: To determine the effects of an acute bout of ATM and LTM exercise on atrial natriuretic peptide (ANP), norepinephrine (NE), and epinephrine (EPI) in pre-hypertensive men. METHODS: Following BP screening and a maximal exercise test, 13 men (33 ± 11 years, 27.7 ± 10.6% fat, 39 ± 7.7 ml kg^-1 min^-1 130 ± 7.7 / 77 ± 7 mmHg) completed an acute bout of both ATM and LTM at 60% VO2max for a duration required to expend 300 kcal (~30 minutes). Blood samples were obtained pre-exercise and immediately post-exercise. Blood samples were analyzed for ANP, NE, and EPI. RESULTS: All results are displayed in the table. The percent increase in ANP was significantly greater (p < 0.05) for ATM than LTM exercise. There were no significant differences in the change in NE or EPI between modes. Conclusion: ANP is released by the atria in response to increased volume load on the heart, and plays a role in blood pressure regulation through both vasodilatory effects and renal natriuretic/diuretic effects. Water submersion is known to increase venous return and preload on the heart. Increased ANP levels observed following ATM exercise in the present study may explain in part the previous findings of an augmented post-exercise hypotensive response and augmented FMD with ATM exercise.
Acute exercise-induced transient increases in inflammatory cytokines are linked to the beneficial vascular effects of exercise, but the underlying mechanisms that promote appearance are contingent on numerous factors (e.g. muscle mass recruited, exercise intensity/duration, etc.). Evidence suggests that a lack of oxygen and/or blood flow to working muscle modifies cytokine appearance. However, little is known about the inflammatory response to intermittent ischemia in working muscle.

**PURPOSE:** Determine the extent to which local ischemia is involved in the response to ischemic exercise by reproducing the peripheral arterial disease (PAD)-associated phenomenon of intermittent claudication without the presence of potential confounding comorbidities frequently exhibited by patients with PAD.

**METHODS:** 14 healthy males performed unilateral isometric forearm contractions for 30 minutes with and without experimental ischemia. Blood was drawn at baseline, 5 and 10 minutes into exercise, at the end of exercise, and 30, 60, and 120 minutes after exercise.

**RESULTS:** Oxygen saturation levels, as measured by near-infrared spectroscopy, were reduced by 10% and 41% during non-ischemic and ischemic exercise, respectively (p < 0.001). Non-ischemic exercise did not affect cytokine values during exercise (all p > 0.05). Ischemic exercise enhanced concentrations of basic fibroblast growth factor, tumor necrosis factor-alpha, and vascular endothelial growth factor at the end of exercise by 148%, 197%, 129%, 154%, and 164% (p < 0.05), respectively, but IL-8 was not influenced by ischemic exercise (p > 0.05).

**CONCLUSION:** In conclusion, the present study demonstrates that ischemic, small muscle endurance exercise elicits local inflammatory cytokine production, compared to non-ischemic exercise. The effect of ischemic exercise with PAD-associated comorbidities may impact the inflammatory response during and after exercise.

**FUNDING:** This study was supported by funds from the Office of the Vice President for Research and the College of Education at the University of Georgia (to N.T.J.).

**DISCLOSURES:** J.R.M. is Chief Operating Officer and K.K.M. is President of Experimental Intermittent Ischemia Augments Cardiovascular Response Over Four Rounds of Exercise-Induced Inflammatory Cytokine Production.

**REFERENCES:**

**CONTACT:** Edman@ntnu.edu, Trondheim, Norway.
for more than two decades, this experimental design has, somewhat surprisingly, not been validated. **METHODS:** To evaluate the reliability and accuracy of this technique following handgrip exercise. **RESULTS:** VO₂max and workload exhibited a linear relationship (r=0.992) following all submaximal workloads (0.50W:43.8±1.0mL · min⁻¹; 0.75W:53.8±1.4mL · min⁻¹; 1.00W:63.4±1.6mL · min⁻¹; 1.25W:72.2±1.7mL · min⁻¹). However, the decreases in LF and VLF phase shift during the Go/No-Go task was not with change in MCA V̇O2. **CONCLUSIONS:** The positive effects of low intensity blood flow restriction (BFR) training on muscle metabolism in occupationally relevant forearm musculature. **females, a difference that does not appear related to hormonal fluctuations. Most studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**RESULTS:** Our results reveal that forearm VO₂-assessment by Doppler-ultrasound and direct venous sampling is a valid experimental design across a range of exercise intensities, and suggest that this method can be applied for assessment of small muscle mass metabolism in occupationally relevant forearm musculature.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.**

**REFERENCES:**

1. BFR significantly increased arm muscle mass (P=0.03) assessed by dual energy x-ray absorptiometry when compared to CON. Handgrip strength was higher in both BFR and HI groups (P<0.001). Three months of either BFR or HI were not deleterious to vascular function. Future studies should investigate the possible risks and benefits of this intervention in frail elderly with sarcopenia.
Central BP responses to low and high-intensity, unilateral handgrip exercise performed with and without BFR. METHODS: Eight college-aged males (Age=24±5 yrs; BMI=30.7±2 kg/m²; handgrip max voluntary contraction-MVC=52±8 kg) underwent three 5-minute bouts (counter-balanced, 10 mins rest) of dynamic handgrip (1:2 sec duty cycle, 20 squeezes/min) performed at a low (40% MVC) and high-intensity (60% MVC) with and without proximal occlusion (80-100mmHg, 50-80% arterial occlusion assessed via radial artery Doppler-ultrasound). Peripheral BP’s (brachial artery) were obtained using the oscillometric method, and a proprietary transfer function was applied to the pulse waveform to estimate central aortic BP’s (systolic, diastolic, mean arterial pressure (MAP) and rate-pressure product (RPP=heart rate x systolic BP)). RESULTS: Peripheral systolic and diastolic BP, MAP and RPP were greater than central pressures at BL (e.g., peripheral systolic BP=130±6 vs. central systolic BP=113±5 mmHg; P<0.001). Similar findings were observed for peripheral and central systolic and diastolic BP, RPP, and INT (central MAP=130±6 vs. 117±5 mmHg; P<0.001). CONCLUSION: The present findings indicate that low intensity, unilateral handgrip exercise performed with BFR produces a comparable BP response (i.e., magnitude increase for MAP) as high intensity handgrip without BFR; however, RPP was greater during high intensity handgrip both with and without BFR, compared to low intensity with BFR.

EPOC was reported as a measure of autonomic balance. A 2-way ANOVA was used to compare BP and measures of autonomic control between conditions and over time. Significant level of 0.05 was used for all tests. RESULTS: Table 1 shows the values for BP during the conditions. There was a main effect of time on SBP such that it was significantly lower at all post-exercise time points compared to PRE. There were no significant changes in DBP between conditions or over time. Furthermore, there was a main effect of time on LF/HF such that it was higher at 5 minutes post-exercise (CONT: 1.23±0.04; INT: 1.17±0.03) compared to PRE (CONT: 1.02±0.02; INT: 1.06±0.02) and 60 (CONT: 1:11±0.03; INT: 1.10±0.03) and 120 min (CONT: 1.10: 0.02; INT: 1.07±0:02) post-exercise. CONCLUSION: Both CONT and INT resulted in similar post-exercise reductions in SBP and alterations in autonomic balance. Accumulating exercise in multiple bouts appears to result in a similar post-exercise BP response as the same volume of exercise done continuously.

Table 1

<table>
<thead>
<tr>
<th>Time</th>
<th>PRE</th>
<th>3 min</th>
<th>30 min</th>
<th>60 min</th>
<th>120 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONT</td>
<td>120.3±2</td>
<td>111.0±3*</td>
<td>108.0±3*</td>
<td>105.4±3*</td>
<td>108.5±3*</td>
</tr>
<tr>
<td>INT</td>
<td>121.2±2</td>
<td>111.8±3*</td>
<td>108.6±3*</td>
<td>108.5±3*</td>
<td>105.9±3*</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONT</td>
<td>65.8±2</td>
<td>65.9±2</td>
<td>67.3±2</td>
<td>65.7±2</td>
<td>66.4±2</td>
</tr>
<tr>
<td>INT</td>
<td>67.0±2</td>
<td>67.9±2</td>
<td>65.1±2</td>
<td>64.0±2</td>
<td>65.9±2</td>
</tr>
</tbody>
</table>

*P<0.05 vs. PRE; Data are mean ± SE

PERCUSSION: The purpose of this study was to compare the magnitude of post-exercise hypotension (PEH) after a bout of high intensity interval training (HIIT) in comparison to an isocaloric bout of traditional moderate intensity continuous exercise (CE). METHODS: After supine rest fourteen obese (31±1 kg·m⁻²) middle-age (57±2 y) metabolic syndrome patients (84% hypertensive) underwent a bout of HIIT (45 min)
and CE (70.5 min) in a random order and then returned to supine recovery for another 45 min. Exercise trials were isocarollic and compared to a no-exercise trial (CONT). Before and after exercise we assessed blood pressure (BP), heart rate (HR), cardiac output (Q), systemic vascular resistance (SVR), intestinal temperature (Tint), forearm skin blood flow (SBF) and percent dehydration.

RESULTS: During CONT blood pressure and the rest of variables remained unchanged. HIIT produced larger PEH than CE (systolic BP 14±4 vs 4±2 mmHg; P=0.004) and Q increases in post exercise resting HR (27±2 vs 4±2 beats min⁻¹; P=0.005). Post-exercise Tint and SBF increased only after HIIT (P<0.05). PEH after HIIT correlated with the reductions in SVR (r=0.58; P=0.030) the increases in Q (r=0.91; P=0.001) systolic BP prior to exercise (r=0.60; P=0.023).

CONCLUSIONS: Our findings suggest that HIIT is a superior exercise mode than CE to transiently reduce hypertension in M5yn subjects. PEH seems to be enhanced by some factor positively related the elevations blood pressure during the previous exercise bout.

Supported by a Grant from the Spanish Ministry of Economy and Competitiveness (DEP2014-52930-R)

WEDNESDAY, MAY 31, 2017

303 Board #124
May 31 11:00 AM - 12:30 PM
Effects of Warm up and Cool Down on Wingate Anaerobic Power Test Hemodynamics
Ryan Page, Lauren Chandler, Luisa Echeverry, Kaitlin Montfeith, Richard Happe, John Petrizzi, Robert M. Otto, FACSM, John W. Wygand, FACSM. Adelphi University, Garden City, NY.

Email: rpage@adelphi.edu

(No relationships reported)

The impact of warm-up (WU) and cool down (CD) on systemic vascular resistance (SVR[dyn.s/cm]) relative to high intensity exercise is limited. SVR (mean arterial pressure – central venous pressure + cardiac output [CO]) is an index of change in vascular resistance of individual vascular beds and provides insight into local hemodynamic (H) function. PURPOSE: The purpose was to examine the effects of a WU and CD on power output and the cardiovascular (CV)/H response to the Wingate Anaerobic Power Test (WAPT). METHODS: Following familiarization with impedance cardiography and the WAPT, 20 subjects (21.9 ± 2.7 yr, 170.7 ± 10 cm, body mass 70.5 ± 10.9 kg, 7.7) were randomly assigned in a crossover design to the following trials: WU & CD (C1), WU & no CD (C2), no WU, but CD (C3), and no WU & no CD (C4) with 48 hours between trials. Both WU and CD were 3 min cycling @ 50 rpm @ 50 watts. No WU or no CD required 3 minutes of seated rest. All measures were monitored continuously until 5 min post-test. Blood pressure was measured immediately post exercise. RESULTS: Statistical analysis by ANOVA with repeated measures (p<.05) of combined data of WU trials (C1 & C2) vs no WU trials (C3 & C4) reveals a significant difference (p<.05) pre-WAPT between HR 102 vs 84 b/min, SVR 95 vs 83 mL/b, CO 9.8 vs 7.0 L/min, and SVR 681 vs 590 dyn.s/cm, respectively. Combined data of CD trials (C1 & C3) vs no CD trials (C2 & C4) post-WAPT reveals significant differences (p<.05) in HR 141 vs 130 b/min, CO 16.0 vs 14.4 L/min, and SVR 415 vs 469 dyn.s/cm. SV of 114 vs 111 mL/b was not significantly different. No differences were found between trials performing the same type of WU or CD. Peak power and average power of all trials were 1131 ± 308 W and 583 ± 120 W with NSD among trials.

EFFECT: Differences were found between trials performing the same type of WU or CD. Peak power and average power of all trials were 1131 ± 308 W and 583 ± 120 W with NSD among trials.

304 Board #125
May 31 11:00 AM - 12:30 PM
The Hypotensive Effects of Isometric Training are Associated with Decreasing Daytime Sleepiness in Young Women
Takashi Yamagata, Takayuki Sako. Japan Women’s University, Tokyo, Japan.

Email: yamagatat@fc.jwu.ac.jp

(No relationships reported)

Isometric exercise training (IET) has been conducted to reduce resting blood pressure; however, the underlying mechanisms are not fully understood. Sleep and sleepiness have been shown to be associated with cardiac risk factors including hypertension. In addition, although some studies indicate that exercise can improve sleep and sleepiness, it remains unknown whether IET can influence sleep, sleepiness, and their relationship with hypotensive effects. PURPOSE: To investigate whether IET influences sleep, sleepiness, and to determine their relationship with reduced resting blood pressure (BP). METHODS: Twenty-two normotensive young women were assigned to either control (n=11) or training (n=11) group. The training group performed unilateral isometric handgrip (IHG) sessions three times per week for 8 weeks (wks). The training protocol consisted of four 2-min bouts of IHG exercise at 25% of maximal voluntary contraction, separated by 3-min rest periods. Sleep and sleepiness were assessed using the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS). Resting blood pressure was measured pre and post 8 wks of training. PSQI and ESS were measured at pre (0 wk), middle (4 wk), and post (8 wk) training. BP was compared between pre and post training, using paired T-test in each group. PSQI and ESS were analyzed by two-way analysis of variance (time x group), using post hoc Tukey HSD test. A Pearson correlation was determined between resting BP change ratio and change ratio for PSQI and ESS from pre to post training period. RESULTS: Following 8 wks, IHG training significantly reduced systolic BP (-4.5±6.3 mmHg, p<.05) and mean BP (-3.8±4.6 mmHg, p<.05), but not diastolic BP (-3.4±5.3 mmHg, p=0.058). No BP changes were noted in the control group. The PSQI scores were not significantly different among groups. A significant interaction effect was observed in ESS, which indicated that ESS significantly decreased from pre to post training period in the training group (10.3±3.7 to 8.4±4.6, p<.05). ESS change ratio was significantly associated with the resting mean BP change ratio (r=0.732, p=0.01).

CONCLUSION: Our findings suggest that IHG training could reduce resting blood pressure and was associated with daytime sleepiness in young women.
The increasing prevalence of older adults with diabetes and hypertension has resulted in a major public health issue and seriously challenged healthcare professionals in China. PURPOSE: The purpose of this study is to design a multi-component exercise program (MEP) with a randomized controlled trial and examine the effectiveness of the MEP on physiological function among older adults with diabetes, hypertension or mixed at a community setting in China. METHODS: Seventy older adults (34 men, 36 women; M age=66.5±5.0 year old) randomly assigned for the MEP participated in 60 minutes of supervised exercise consisting of various activities related to flexibility, strength, balance, and endurance three times per week for 12 weeks. An experimental pretest-posttest design was employed measuring physiological fitness: strength, endurance, flexibility, balance and VO2 peak, and physiological function: a systolic blood pressure (SBP), diastolic blood pressure (DBP), total cholesterol (TC), triglyceride (TG), high density lipoprotein (HDL), low-density lipoprotein (LDL), and fasting glucose (FG). Paired t-tests were utilized to analyze for within-group comparisons between baseline and the results after three months. RESULTS: The results revealed that fitness variables were improved significantly in strength (bench press, seated row, arm curl, knee extension, leg press), endurance (VO2 peak), flexibility (hamstring flexion, knee flexion, shoulder flexion,) and balance (8 foot up and go and chair stand ) (P<0.05) after training, meanwhile, the results showed a greater decrease in DBP (t=3.34 P=0.00) SBP (t=3.49 P=0.00). Biomarkers further demonstrated that the MEP had a significant effect on physiological function: TC (t=-3.89 P=0.00), LDL (t=-3.20 P=0.00), FG (t=-2.85 P=0.01), but no significant effect emerged on TG (t=1.01 P=0.34), HDL (t=-0.73 P=0.46) in pretest-posttest. CONCLUSIONS: The findings from this intervention indicated that this MEP has significant effects on physical fitness, aerobic capacity, blood pressure and biomarkers among older adults with diabetes and hypertension. Such intervention should be expanded to a larger older population.

307 Board #128 May 31 9:30 AM - 11:00 AM

Muscle Weakness and Diabetes Jointly Exacerbate the Rate of Functional Disability among Older Mexican Americans

Ryan P. McGrath1, Brenda M. Vincent2, Brad P. Dietert3, Kate A. Duchowny1, Kyratzos S. Markides4, Sohman Al Snih5, Mark D. Peterson, FACSM1. 1University of Michigan Medical School, Ann Arbor, MI. 2VA Ann Arbor Health System, Ann Arbor, MI. 3Providence Medical Research Center, Spokane, WA. 4University of Michigan, Ann Arbor, MI. 5University of Texas Medical Branch, Galveston, TX.

Email: mcgrutry@med.umich.edu

No relationships reported

PURPOSE: Preserving muscle strength and avoiding chronic diseases such as diabetes may reduce the rate of developing a functional disability at an older age, especially among at risk populations. The purpose of this study was to determine the independent and joint contributions of muscle weakness and diabetes on the incidence of activities of daily living (ADL) disability in an older Mexican-American cohort. METHODS: A subsample of 2,278 Mexican American males and females aged 65 years and older at baseline were followed for 17 years. Muscle strength was assessed with a handheld dynamometer and was normalized to body weight (normalized grip strength [NGS]). Male and female participants were considered weak if their NGS was ≤0.46 and ≤0.30, respectively. The presence of diabetes, ADL disability, and the age of each diagnosis was self-reported by participants. Males and females were classified into four separate groups depending on their muscle strength and diabetes status. Sex-stratified Cox proportional hazard models were used to examine the independent and joint effects of muscle weakness and diabetes on incident ADL disability after adjusting for relevant covariates. RESULTS: Males and females that were weak and had diabetes at baseline had a 2.36 (95% confidence interval [CI]: 2.29–2.43; p<0.0001) and 1.96 times higher rate (CI: 1.92-2.20; p<0.0001) of ADL disability compared to males and females that were strong and did not have diabetes at baseline, respectively. Strong male and female participants that had diabetes at baseline had a 1.84 (CI: 1.76-1.93; p<0.0001) and 1.36 times higher rate (CI: 1.33-1.40; p<0.0001) of ADL disability than males and females that were strong and did not have diabetes, respectively. Weak male and females that did not have diabetes at baseline had a 1.36 (CI: 1.32-1.39; p<0.0001) and 1.11 times higher rate (CI: 1.09-1.12; p<0.0001) of ADL disability than males and females that were strong and did not have diabetes, respectively. CONCLUSION: Preserving muscle strength and avoiding diabetes reduces the rate of incident ADL disability in older Mexican Americans. Older Mexican Americans should engage in behaviors and activities that are conducive to healthy aging in order to reduce future declines in physical functioning.
**INTRODUCTION:** Cardiovascular disease has been a significant public health concern among US adults. Recently, great attention has been given to the sedentary behavior (SB) in relation to health indicators such as CD risk factors (CDRF). However, the relationship between sedentary behavior (SB) and CDRF has been little known in patients with osteoarthritis.

**PURPOSE:** The aim of this study was to investigate the association between leisure-related SB (LSB) time and CDRF among US adults suffering with osteoarthritis.

**METHODS:** Data from the 2004-2005 Osteoarthritis Initiative Database were analyzed for this study. 4,796 adults (male = 1,992; average age 61.16 ± 9.2 years), currently experiencing or at risk of developing severe osteoarthritis, were included in this analysis. LSB time was defined as leisure time sitting hours per day for past 7 days, categorized into less than 1 hour, 1 hour to less than 2 hours, 2-4 hours and more than 4 hours. Patients with CDRF were operationally defined as presence of any one of hyperlipidemia (blood cholesterol ≥240 mg/dl), obesity (BMI ≥30 kg/m²), hypertension (BP ≥140/90 mmHg), and diabetes (blood glucose ≥200 mg/dl). Logistic regression analysis was used to examine the association between LSB and CDFR when controlling covariates (i.e., age, sex, race, education, and marital status). Statistical analyses were conducted using SPSS (v.22). Significance level was set at 0.05.

**RESULTS:** 57.1% of participants had CDRF. 79.4% of the participants had leisure time sitting for more than 2 hours per day. The adjusted odds ratios (OR) were statistically significant between LSB time and CDFR for less than 1 hour vs more than 2 hours sitting (OR = 1.47, 95% CI: 1.01 - 2.13) and less than 1 sitting hour vs more than 4 sitting hours (OR = 1.80, 95% CI: 1.24 - 2.62). Sitting time for 1 hour but less than 2 hours was not significant.

**CONCLUSIONS:** The results of this study indicate that LSB time associates significantly with CDFR among osteoarthritis patients. This finding suggests that avoiding LSB may be beneficial for lowering the risk of CDFR in US adults with osteoarthritis.
Supported by GRF 14409514.

A multifaceted intervention that considers the contextual and personal factors may help inactive pattern at home and slightly more PA accrual at recess and after-class setting. 

We employed secondary data analysis using 6814 adults with ID (age 18-96 years; 56% men) from the 2013-14 Adult Consumer Survey by National Core Indicators to reveal the potential predictors. Tested variables included personal, health, satisfaction, community participation, and choice-related variables. Considering a type of the outcome variable (i.e., four health categories from poor to excellent), a forward model selection method based on ordinal multiple regression was employed to find out the best model explaining health with ID. RESEARCH QUESTION: Does the introduction of physical activity (PA) engagement, tobacco use, staff support, having a job, eating out in the past month, and having a vacation in the past year all were significant predictors of health in this population (p < .001), and the model containing those predictors explained 17% of variance on health of adults with ID, after accounting for BMI and age. Those who moved without mobility aids, engaged in PA, didn’t smoke, had a job, received less staff support, ate out, and had vacation were significantly healthier than their counterparts. For instance, the ordered logit for adults with ID who didn’t routinely engage in moderate PA being a less healthy category is .49 more than their counterparts. The goodness-of-fit test (Pearson χ² = 2041.5; p > .05) revealed that this model fits well. CONCLUSION: Apart from BMI and age, we have to consider various personal, social and environmental predictors to better explain health of adults with ID. Interestingly, the health predictors found in this study are closely aligned with the International Classification of Functioning, Disability and Health (WHO, 2001).

No. 5

316 Board #137 May 31 9:30 AM - 11:00 AM Associations Among Residential Settings, Physical Activity And Health Outcomes In Adults With Intellectual Disabilities

Joonkoo Yun1, Joyoeye Jin1, Stamatis Agiovlasitis, FACSM1.
Oregon State University, Corvallis, OR. 2University of Seoul, Seoul, Korea, Republic of. 3Mississippi State University, Mississippi State, MS. (Sponsor: Stamatis Agiovlasitis, FACSM)
No relationships reported

The impact of different forms of residential settings on the quality of life of people with intellectual disabilities (ID) has received considerable attention. Previous studies indicate positive effects of deinstitutionalization on social network, adaptive behavior, and many other behavioral outcomes. However, the relationship between residential settings and health-related outcomes in people with ID has not been adequately studied, despite the significance of health and health risk factors such as physical activity (PA).

PURPOSE: To examine the relationships between perceived general health, PA engagement, body mass index (BMI), and types of residential settings in adults with ID.

METHODS: We analyzed data from the 2013-2014 Adult Consumer Survey by National Core Indicators. Data were available from 13991 cases of adults with ID (8069 men; 5922 women) aged 18 to 96 years (M = 43.35 ± 14.97 yrs). Perceived health, height, weight, BMI, mobility, engagement in moderate PA, age, and residential settings were extracted for secondary data analyses. Binary logistic regression, multinominal logistic regression, and univariate one-way ANOVA were used to answer the research questions.

RESULTS: There were significant differences in BMI between adults with ID residing in different settings (p < .001). Individuals with ID who live in institutions have the lowest BMI, whereas those who live independently have the highest BMI. However, there are different results on perceived health and PA engagement. There are significant differences on PA engagement among adults with ID in different residential settings. PA engagement is more likely to be higher among individuals with ID living in institutions than those living with parents (OR = 6.1; CI: 5.0 – .75), after controlling for mobility. Individuals with ID who live in institutions are 4 times more likely to rate their health as poor than those who live with parents (OR = 4.19; CI: 2.54 – 6.88), after controlling for age. There are no significant differences on perceived health between those living independently and those living with parents. CONCLUSION: Although individuals with ID who reside in institutions have the lowest BMI, they are less likely to engage in moderate PA and to have lower perceived health than individuals who live independently or with their parents.

317 Board #138 May 31 9:30 AM - 11:00 AM BMI Across Age-groups In Adults With Down Syndrome And Adults With Intellectual Disability

Stamatis Agiovlasitis, FACSM1, Joyoeye Jin1, Joonkoo Yun1, Mississippi State University, Mississippi State, MS. (Sponsor: Stamatis Agiovlasitis, FACSM)
Email: sagiovlasitis@colled.msstate.edu
No relationships reported

The age-associated response of body mass index (BMI) in adults with Down syndrome (DS) has not been thoroughly examined. DS is associated with faster biological aging; thus, BMI may change differently in response to age between adults with DS and adults with other intellectual disabilities (ID). Differences between these groups in the age-associated response of BMI may reflect differences in how weight and height change as these people age.

PURPOSE: To examine if BMI, weight, and height differ
The participation in sport activities is important in children with spinal cord injury, namely to counteract their sedentary lifestyle and the loss of hand and upper limb function. However, there is a lack of knowledge regarding the effects of sport in moderate-to-vigorous physical activity levels and shoulder muscle strength.

**METHODS:** To compare shoulder muscle strength and physical activity levels in sportive and non-sportive individuals with spinal cord injury. **RESULTS:** This is a cross-sectional study encompassing 14 sportive (41.07 ± 9.99 yrs.) and 4 non-sportive men (32.0 ± 6.97 yrs.) with spinal cord injury (between T3 and L1). Sports participation was determined by questionnaire. Physical activity was measured with triaxial accelerometer worn on wrist during 7 consecutive days. Data was expressed as average in moderate-to-vigorous physical activity. Shoulder strength was assessed in an isokinetic dynamometer at 60°/second. Shoulder movements considered were flexion/extension (range 0 – 45º), and abduction/adduction (range 25 – 75º). Non-parametric statistics (Mann-Whitney) was used to compare differences between sportive and non-sportive men. **CONCLUSIONS:** Total moderate-tovigorous physical activity of sportive compared to non-sportive individuals was significantly higher (126.50 ± 53.26 and 61.82 ± 28.8 minutes/day, respectively; U=52.00: p=0.008), and the same pattern was observed when considering only weekday moderate-to-vigorous physical activity (131.81 ± 58.66 and 62.47 ± 30.29 minutes/day, respectively; U=52.00: p=0.008). Regarding to isokinetic strength, the peak torque of the right and left shoulder extension was significantly higher (right: 72.45 ± 11.8 Nm and 73.95 ± 12.0 Nm, respectively) compared to non-sportive men (59.97 ± 7.46 Nm and 62.90 ± 12.42 Nm, respectively).

**Purpose:** To pilot test worksite wellness exercises for individuals who use wheelchairs for mobility. **Method:** Five worksite wellness exercises were chosen from surveys including: air pushes, arm circles, chair push-ups, forward/ lateral raises, and desk push-ups. The five exercises were pilot tested using the COSMED K4 portable metabolic cart in individuals who use wheelchairs of working age. Participants first rested for five minutes to measure resting energy expenditure. Exercises were performed for intervals of 60 seconds of work and 60 seconds of rest in a randomized order. Feasibility of worksite wellness exercise movement performance and trends in changes in energy expenditure were analyzed across the entire sample. **Results:** Participants included 14 individuals who use wheelchairs for mobility between 18 and 60. On average resting energy expenditure equaled 1.33(SD=0.35) Mets and 1.64(SD=0.39) Kcal/min and exercise energy expenditure equaled 2.38(SD=0.81) Mets and 3.08(SD=1.06) Kcal/min. Greatest increases shown in chair push-ups and desk push-ups. Three participants were unable to perform chair push-ups due to injuries or strength. Therefore, performing worksite wellness exercises for 13 minutes per weekday could result in an extra 100 Kcal/week expended per week. **Conclusion:** Worksite wellness exercises are a feasible option for energy expenditure in the workplace for individuals in wheelchairs. Specific worksite wellness exercises are needed to suit their needs that could also be performed outside the workplace as an exercise regimen. This was a small, feasibility pilot study and larger studies need to be done to show reliability and validity of these exercises across diverse populations of individuals who use wheelchairs for mobility.

**Purpose:** To test the feasibility of a sedentary lifestyle program to induce physical activity. **Method:** A sedentary lifestyle program was implemented during 6 months (3 time-week; 2 hour per session). Motor performance was assessed at baseline and post-intervention through the Movement Assessment Battery Children-2 (MABC2-checklist) evaluating the following variables: manual dexterity, accuracy and catches, and balance. A pair sample t-test was conducted to compare the differences between baseline and post-intervention on motor performance variables means. **RESULTS:** Time to perform the test of Manual Dexterity significantly decreased post-intervention (baseline=155.82±94.06-seconds vs post-intervention=149.29±90.19-seconds; p<0.001). The number of successful attempts in the test of accuracy and catches significantly improve post-intervention (baseline=3.17±1.98 vs post-intervention=3.9±0.62; p<0.001). In the balance test, time in balance state post-intervention (baseline=11.23±10.18 seconds vs post-intervention=149.29±90.19-seconds; p<0.001). **Conclusion:** 6-month physical education program could improve motor performance (manual dexterity, accuracy and catches, and balance) in children with Down’s Syndrome.
for Life for Seniors (PALS) group exercise and lifestyle behavior change program. Ten exercises were performed in a circuit in 1 minute intervals over 40 minutes 3 days: \( \text{Wednesday, May 31, 2017} \)

11:00 AM

WEDNESDAY, MAY 31, 2017

WEDNESDAY, MAY 31, 2017

significant predictors of PA level \( (F=19.43, p<0.01, \text{adj. } R^2=0.61) \). Short answer

with intellectual disability (ID)

Dance/Movement Therapy (DMT). This connection promotes the integration of the

emotional, cognitive and physical dimensions of a person.

PURPOSE

RESULTS: A strong correlation was found between PA and all variables of interest

examine the extent of the relationships between variables of interest and participant PA

sport participation. Spearman’s rho and multiple regressions analysis were used to

Wallis tests were used to examine differences in survey outcomes between gender and

participants to expand on answers and provide more detailed information. Kruskal-

format provided.

CONCLUSIONS: These results suggest that a 10-

week group exercise intervention that includes a SR behavior change component was

effective in improving physical function and moderate intensity and total PA in this

population of older adults. Participants indicated they liked the socialization group

format provided.

PURPOSE: The purpose of this study was to investigate the participation rates and
determinants of physical activity (PA) participation of university students with physical

disabilities (SWD).

METHODS: 40 SWD from 16 U.S. universities completed a mixed-methods online

survey regarding their LTPA practices and influences to participation on their campus.

Surveys used to measure variables of interest included LTPAQ-SCI and PASPID (PA), WHO QOL-BREF (quality of life), ESES (exercise self-efficacy), SCOPE (social inclusion opportunities), B-PEDS (barriers to exercise), and Self-Regulation (SR) questions (intent to exercise). Short answer questions were included to allow

participants to expand on answers and provide more detailed information. Kruskal-Wallis tests were used to examine differences in survey outcomes between gender and

sport participation. Spearman’s rho and multiple regressions analysis were used to

examine the extent of the relationships between variables of interest and participant PA levels. Short answer responses were analyzed using thematic analysis strategies.

Results: A strong correlation was found between PA and all variables of interest \( (p<0.05) \). Variables found to have the strongest correlation with PA included ESES \((r=0.63, p<0.01)\), SR \((r=-0.74, p<0.01)\), WHO QOL-BREF \((r=-0.45, p<0.01)\), and perceived opportunities for LTPA on campus \((r=-0.51, p<0.01)\). Multiple regressions analysis revealed gender, SR, and perceived social inclusion on campus were significant predictors of PA level \((F=19.43, p<0.01)\). Adj. \(R^2=0.61\). Short answer responses reflected quantitative findings and provided rich elaboration on these constructs.

Conclusions: Results indicated SWD may be more active than previously thought, yet

still critically low relative to physical activity guidelines for aerobic health. Although all

e xternal and internal variables examined had significant relationships to PA level, internal variables had the strongest correlations to PA level. It was also found that significant internal variables had strong correlations to external variables, indicating a complex relationship between SWD external-environmental influences, internal-personal influences, and PA levels.

Table 1. Characteristics of the participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control Group ( (n=13) )</th>
<th>Intervention Group ( (n=15) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>53 (9)</td>
<td>52 (7)</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>9/4</td>
<td>7/8</td>
</tr>
<tr>
<td>ID level (%)</td>
<td>66.5 (11.0)</td>
<td>71.2 (7.7)</td>
</tr>
</tbody>
</table>

Table 2. Cognitive values for participants by Pre-Posttests

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control Group ( (n=13) )</th>
<th>Intervention Group ( (n=15) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evolutionary Indicator</td>
<td>T1: Mean (SD)</td>
<td>T2: Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>31.6 (3.9)</td>
<td>18.9 (3.9)</td>
</tr>
<tr>
<td></td>
<td>.014</td>
<td>.000</td>
</tr>
<tr>
<td>Picture’s Memory</td>
<td>T1: Mean (SD)</td>
<td>T2: Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>34.2 (2.2)</td>
<td>42.7 (2.3)</td>
</tr>
<tr>
<td></td>
<td>.007</td>
<td>.014</td>
</tr>
<tr>
<td>Word verbal expression fluency</td>
<td>T1: Mean (SD)</td>
<td>T2: Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>14.9 (3.5)</td>
<td>14.9 (4.5)</td>
</tr>
<tr>
<td></td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>Body part verbal expression fluency</td>
<td>T1: Mean (SD)</td>
<td>T2: Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>10.0 (5.5)</td>
<td>10.0 (4.1)</td>
</tr>
<tr>
<td></td>
<td>.014</td>
<td>.000</td>
</tr>
</tbody>
</table>

Abbreviations: \( T_1 \): pre-test; \( T_2 \): post-test

\( P_1 \) : within-group differences for CG

\( P_2 \) : within-group differences for IG

\( P_3 \) : ANCOVA between-groups differences, controlling for baseline values, age, gender and Intellectual Disability level.

INTRODUCTION: There is a constant connection between mind and body in Dance/Movement Therapy (DMT). This connection promotes the integration of the emotional, cognitive and physical dimensions of a person.

PURPOSE: to evaluate the cognitive improvement after a DMT program in adults with intellectual disability (ID)

METHODS: 28 adults with moderate-severe ID (16 men, 46-66 yr), recruited from a workshop center, participated in the study after obtaining their legal/tutors and their own informed consent. They were divided into Intervention group (IG; \( n=15 \)) and Control group (CG; \( n=13 \)). The IG followed a DMT program of 26 sessions of 1 hour 2 day/w plus their regular work, meanwhile the CG continued with their regular activities. The sessions were structured as proposed by Chace (1953). Human Figure drawing test, Illinois test for Psycholinguistic aptitudes and Pictures memory test were applied before and after the DMT program. Descriptive for all variables were obtained. 7-test was applied to study within-group differences. ANCOVA was applied to study between-groups differences.

RESULTS: Significant deterioration for evolutionary indicator (EI), word verbal expression fluency (WVFEF) and body part expression fluency (BPEF) were found in the CG. The IG significantly improves EI and picture’s memory (PM). When controlling for age, gender, ID level and baseline values, a significant difference \( (p<0.05) \) between IG and CG in the EI was found.

CONCLUSIONS: Even only EI showed between-groups significant differences, there is a cognitive improvement in persons with ID after following a DMT program. More research is needed with a larger sample and/or a longer DMT program.

Partially supported by: MEC (Ref: DEP2012-35335) & AGAUR (Ref: 2013FI_820091)

Current functional measures for adults with spinal cord injury are limited in their ability to assess person-environment interaction as defined by the World Health Organization. The Movement and Activity in Physical Space (MAPS) score, an objective functional measure encompassing physical activity and person-environment interaction, has been successfully applied to measure various patient populations. However, the validity of the MAPS score in adults with incomplete spinal cord injury (iSCI) has not been evaluated.

PURPOSE: To validate the MAPS score in adults with iSCI using evidence of convergent and known-group difference validity.

METHODS: 9 adults (48.1±16.4 yrs) with iSCI were recruited into a 3 week intervention study. Participants were randomly assigned to a 10 minute intervention (Experiment group, \( n=8 \)) or a control group (Control group, \( n=1 \)). The iSCI sample included 5 men, 47-74 yrs, living independently and had a mean of 12 (SD 4.3) years of education. The average time since injury was 10 (SD 7.1) years. All participants had complete cord lesions at T4 or below and were wheelchairbound. The control group (CG) received no treatment and continued with their regular activities. Participants were instructed to increase time spent in walking as much as possible during the intervention period. The IG was exposed to an iSCI program of 3 sessions per week, totaling 30 minutes of supervised PA. Participants were asked to keep a log of walking activities for 2 months. The control group was not allowed to participate in any other PA activities. The sessions were structured as proposed by Chace (1953). Human Figure drawing test, Illinois test for Psycholinguistic aptitudes and Pictures memory test were applied before and after the DMT program. Descriptive for all variables were obtained

7-test was applied to study within-group differences. ANCOVA was applied to study between-groups differences.

RESULTS: Significant deterioration for evolutionary indicator (EI), word verbal expression fluency (WVFEF) and body part expression fluency (BPEF) were found in the CG. The IG significantly improves EI and picture’s memory (PM). When controlling for age, gender, ID level and baseline values, a significant difference \( (p<0.05) \) between IG and CG in the EI was found.

CONCLUSIONS: Even only EI showed between-groups significant differences, there is a cognitive improvement in persons with ID after following a DMT program. More research is needed with a larger sample and/or a longer DMT program.

Partially supported by: MEC (Ref: DEP2012-35335) & AGAUR (Ref: 2013FI_820091)

| Board #143 |
| May 31 9:30 AM - 11:00 AM |
| Determinants of Leisure-Time Physical Activity Participation in University Students with Physical Disabilities: A Multi-University Study |
| Jennifer Dysterheft, Gioella Chaparro, Ian Rice |
| Hamline University, St. Paul, MN. University of Illinois, Urbana-Champaign, Urbana, IL. (Sponsor: Robert Pettitt, FACSM) |
| No relationships reported |

| Board #145 |
| May 31 9:30 AM - 11:00 AM |
| Cognitive Benefits of a Dance Movement Therapy Program in Adults with Intellectual Disabilities |
| Miriam Guerra-Balic, Silvia Barnet-López, Sara Signo-Miguez, Susana Pérez-Tesforal, Olga Braña, Luis Solano, Guillermo R. Oviedo |
| FPCEE Blanquerna (University Ramon Llull), Barcelona, Spain. FPCEE Blanquerna, University Ramon Llull, Barcelona, Spain. |
| Email: miriamelisabg@blanquerna.edu (No relationships reported) |

| Board #145 |
| May 31 9:30 AM - 11:00 AM |
| Intellectual Disability Level of the Maps Score: An Action-Related Measure in Adults with Incompelete Spinal Cord Injury |
| Heontae Kim, Don W. Morgan, FACSM, Sandra L. Stevens, John M. Coons, Minsoo Kang, FACSM, Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM) |
| Email: hk3m@mtmail.mtsu.edu (No relationships reported) |
Convergent validity evidence was obtained by quantifying the relationship between MAPS score and the three functional ambulation measures using Pearson product moment correlations. Significant correlations were observed indicating that the MAPS score was a relevant measure of functional ambulation (r = 0.76, p < 0.01).

RESULTS: The MAPS score was moderately correlated with walking index (r = 0.74), walking speed (r = 0.64) and 6MWD (r = 0.56). A significant difference in走 动 rates was also observed between the two groups (F[2, 7] = 11.67, p < 0.01). These findings suggest that the MAPS score is a valid measure of functional ambulation.

CONCLUSIONS: These findings support the use of the MAPS in research and clinical settings. The MAPS is a simple and practical measure that can be easily administered to assess the functional ambulation of individuals with mobility limitations.

SEX DIFFERENCES IN RESTING HEART RATE AND HEART RATE RECOVERY IN LOW BACK PAIN SUBJECTS
Alexey Milian, Marlon L. Wong, Jessica Bolanos, Teresa Glynn, Siva Kirk-Sanchez, Magno F. Formiga, Lawrence P. Cahalin. University of Miami, Miami, FL. (Sponsor: Dr. Thomas Best, FACSM)

(Relationships reported)

Resting heart rate (RHR) and heart rate recovery (HRR) are two easy to obtain measures providing a quick estimate of cardiovascular health (CVH). There is conflicting and inconclusive evidence regarding the association of CVH and low back pain (LBP), although it is known that deconditioning is prevalent in this population.

PURPOSE: To examine sex differences in RHR and HRR, and the relationship between RHR and HRR in subjects with LBP.

METHODS: RHR and 1 minute HRR were assessed via Polar heart rate monitoring in 31 patients (18 females) seeking therapy for chronic non-specific LBP. HRR was assessed after repeatedly lifting a 25-pound weight from a 1 foot stool to chest height in an erect posture (Rep Lift) for 1 minute at a self-selected cadence, using self-selected biomechanics, as well as after 15 minutes of steady state treadmill walking (TMW) at a self-selected brisk pace.

RESULTS: Males and females were similar in age (55.4±14 years), BMI (28.6 ± 5.4 kg/m²), resting blood pressure (127.7±111, mean±SD), resting heart rate of Rep Lift and TMW (107.0 ± 20.0 and 96.0 ± 13.7 bpm respectively), and HRR after Rep Lift and TMW (18.0 ± 10.3 and 15.8 ± 6.4 beats, respectively). However, HRR predicted HRR after Rep Lift and TMW in males (p<0.01, R²=55 and 46 respectively) but not in females (R²=0.01, p=11 and R²=0.03, p=48 respectively).

CONCLUSIONS: RHR is often measured and interpreted as a sign of CVH, or rather deconditioning, in patients with LBP. However, it appears that RHR predicts diagnoses per rider were as followed: one (n = 1896), two (n = 639), three (n = 100), two.652 boys (n = 1,705) and girls (n = 947) with varying diagnoses. The amount of program and the quantity of participant diagnoses. METHODS: Participants were physically challenged individuals how to ride a two-wheeled bicycle as a means to may decrease overall well-being. The iCan Bike program, a subdivision of the iCan style is an effective way for individuals with any amount of diagnoses to learn how to ride a two-wheeled bicycle. Interestingly, participants with three diagnoses saw a higher success rate (primarily due to a higher male success rate) when compared to the participants that had one, two, or four diagnoses. More research needs to be conducted to better define the relationship between success rate, quantity/combination of diagnoses, and gender differences among iCan Bike participants.

SEX DIFFERENCES IN RESTING HEART RATE AND HEART RATE RECOVERY IN LOW BACK PAIN SUBJECTS
Alexey Milian, Marlon L. Wong, Jessica Bolanos, Teresa Glynn, Siva Kirk-Sanchez, Magno F. Formiga, Lawrence P. Cahalin. University of Miami, Miami, FL. (Sponsor: Dr. Thomas Best, FACSM)

(Relationships reported)

Resting heart rate (RHR) and heart rate recovery (HRR) are two easy to obtain measures providing a quick estimate of cardiovascular health (CVH). There is conflicting and inconclusive evidence regarding the association of CVH and low back pain (LBP), although it is known that deconditioning is prevalent in this population.

PURPOSE: To examine sex differences in RHR and HRR, and the relationship between RHR and HRR in subjects with LBP.

METHODS: RHR and 1 minute HRR were assessed via Polar heart rate monitoring in 31 patients (18 females) seeking therapy for chronic non-specific LBP. HRR was assessed after repeatedly lifting a 25-pound weight from a 1 foot stool to chest height in an erect posture (Rep Lift) for 1 minute at a self-selected cadence, using self-selected biomechanics, as well as after 15 minutes of steady state treadmill walking (TMW) at a self-selected brisk pace.

RESULTS: Males and females were similar in age (55.4±14 years), BMI (28.6 ± 5.4 kg/m²), resting blood pressure (127.7±111, mean±SD), resting heart rate of Rep Lift and TMW (107.0 ± 20.0 and 96.0 ± 13.7 bpm respectively), and HRR after Rep Lift and TMW (18.0 ± 10.3 and 15.8 ± 6.4 beats, respectively). However, HRR predicted HRR after Rep Lift and TMW in males (p<0.01, R²=55 and 46 respectively) but not in females (R²=0.01, p=11 and R²=0.03, p=48 respectively).

CONCLUSIONS: RHR is often measured and interpreted as a sign of CVH, or rather deconditioning, in patients with LBP. However, it appears that RHR predicts cardiac recovery after activity in males but not females with LBP. Thus, assumptions of exercise tolerance and CVH in females with LBP should not be based on RHR, but rather on HRR. The reason for the above findings in women compared to men is unclear and warrants further investigation. This study also highlights the potential value of HRR after functional tasks such as repetitive lifting and steady state walking.
TABLE 1. Descriptive characteristics of the participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>All n = 84</th>
<th>Males n = 49</th>
<th>Females n = 35</th>
<th>Adults n = 42</th>
<th>Older adults n = 42</th>
<th>P1</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>44 (12)</td>
<td>45 (11)</td>
<td>43 (13)</td>
<td>35 (7)</td>
<td>54 (6)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>160.5 (11.3)</td>
<td>165.5 (9.7)</td>
<td>155.3 (9.5)</td>
<td>161.0 (12.8)</td>
<td>159.9 (9.7)</td>
<td>0.642</td>
<td>0.624</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.5 (14.4)</td>
<td>72.4 (12.0)</td>
<td>75.2 (17.3)</td>
<td>70.3 (14.0)</td>
<td>76.8 (14.3)</td>
<td>0.087</td>
<td>0.087</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.8 (6.5)</td>
<td>26.5 (4.1)</td>
<td>32.1 (7.9)</td>
<td>27.1 (4.6)</td>
<td>30.5 (7.7)</td>
<td>0.016</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Note: data are expressed as mean (SD). Abbreviations: BMI, body mass index; WC, waist circumference.

TABLE 2. Time in sedentary, percentage of sedentary behavior day¹, number of sedentary bouts day¹, and number of breaks per sedentary hour.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sedentary behavior (min/day)²</th>
<th>Percentage of time in sedentary behavior day¹</th>
<th>Number of sedentary bouts/day¹</th>
<th>Number of breaks per sedentary hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>612.9 (80.1)</td>
<td>79.4 (6.5)</td>
<td>64.8 (11.7)</td>
<td>6.2 (0.7)</td>
</tr>
<tr>
<td>Age group¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>599.7 (76.8)</td>
<td>79.1 (5.6)</td>
<td>64.1 (9.5)</td>
<td>6.4 (0.6)</td>
</tr>
<tr>
<td>Older</td>
<td>626.0 (82.2)</td>
<td>79.7 (7.3)</td>
<td>65.5 (13.7)</td>
<td>6.1 (0.7)</td>
</tr>
<tr>
<td>Gender²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>607.7 (86.9)</td>
<td>78.9 (7.4)</td>
<td>64.1 (12.1)</td>
<td>6.3 (0.6)</td>
</tr>
<tr>
<td>Females</td>
<td>620.2 (71.6)</td>
<td>80.1 (4.9)</td>
<td>65.8 (11.4)</td>
<td>6.2 (0.7)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>0.039</td>
<td>0.111</td>
<td>0.005</td>
<td>0.138</td>
</tr>
<tr>
<td>Normal</td>
<td>577.2 (90.8)</td>
<td>77.0 (8.1)</td>
<td>57.9 (11.1)</td>
<td>6.5 (0.6)</td>
</tr>
<tr>
<td>Overweight</td>
<td>619.4 (74.1)</td>
<td>79.9 (5.5)</td>
<td>66.7 (10.4)</td>
<td>6.2 (0.6)</td>
</tr>
<tr>
<td>Obese</td>
<td>634.0 (71.1)</td>
<td>80.7 (5.8)</td>
<td>68.0 (11.9)</td>
<td>6.1 (0.7)</td>
</tr>
</tbody>
</table>

Note: data are expressed as mean (SD). Abbreviations: BMI, body mass index; WC, waist circumference.

P1: Between age groups, gender, BMI category and WC category difference in sedentary behavior (min/day)².
P2: Between age groups, gender, BMI category and WC category difference in sedentary behavior day¹.
P3: Between age groups, gender, BMI category and WC category difference in the number of sedentary bouts per sedentary hour.
P4: Between age groups, gender, BMI category and WC category difference in the number of breaks per sedentary hour.

Multiple Sclerosis is a neurodegenerative disease of the central nervous system. Symptoms include fatigue, depression, and cognitive changes, all which affect quality of life (QOL). Heart Rate Variability (HRV), an indicator of cardiac autonomic balance, can be altered in persons with Multiple Sclerosis (PwMS) and has been associated with depression and other health risks in other populations. In turn, depression as well as HRV, can be improved with aerobic exercise. The relationships between depression, QOL, and other self-reported measures to HRV in PwMS are largely unknown. We previously showed that ballroom dance (BD) may improve physical fitness, cognition, fatigue, depression, and QOL in PwMS.

PURPOSE: The purpose of this study was to investigate the relationship of depression with HRV in PwMS and test whether BD can improve HRV concurrent with depression. METHODS: Thirteen PwMS participated in an 8-week BD program (MSD). Twelve PwMS served as a control group (C). BD classes were 1 hour/day, 2x/week and taught by a professional BD instructor. Each MSD subject was paired with a non-MS partner. All subjects were ambulatory, independent to modified independent. Patient Determined Disease Steps (PDDS) did not differ between groups (MSD = 2.06 ± 1.9, C = 1.4 ± 1.3). Pre- and post-measures included QOL (PROMIS Global Well Being), Fatigue Impact Scale (FIS), Beck Depression Inventory (BDI), Heart Rate Variability (HRV), and 6-minute walk test (6MWT). Nonparametric and parametric statistics were used with p < 0.05. Data are mean (SD) or median (Q1,Q3) for self-report measures. RESULTS: In both MSD and C groups prior to BD, QOL correlated with FIS (rs = -0.63) and BDI (rs = -0.70). FIS correlated with BDI (rs = 0.72). HRV correlated with QOL (rs = -0.47) and BDI (rs = -0.45) but not with FIS (rs = -0.32). No variables correlated with 6MWT. For the MSD group, HRV (pre = 31 (19) post = 38 (19) m, p = 0.03) and 6MWT (pre = 432 (114) post = 462 (126) m, p = 0.03) increased. Of the self-report outcomes, BDI improved (pre - 9 (5.13) post = 4 (10.1), p = 0.04). There were no changes in any measured outcome for the C group.

CONCLUSION: BD can lead to significant improvements in HRV and depression. Further, HRV but not 6MWT might mediate improvements in QOL through depression in PwMS. This study was supported by the Greater Milwaukee Foundation.
daily life. This secondary data analysis was conducted to examine a potential relationship between increase in physical activity and health-related quality of life for people living with HIV/AIDS (PLWHA).

Methods: Participants were recruited as part of a home-based PA intervention aimed to reduce risk factors of cardiovascular disease for PLWHA taking ART. A secondary data analysis was conducted by separating participants into groups according to increases in step count. Clinical and psychological assessments were conducted at baseline and 18 week follow-up. Self-reported mental health was measured using the SF-36 and its specific subscales were used. This analysis focuses on the subscale role limitations due to emotional wellbeing (RE). PA levels were measured via accelerometer. Accelerometer data was considered compliant if the participant had a total on-body time of at least 10 hours a day for 4 days. PA was determined by using the average step count per day. The comparison group consisted of those who increased daily steps by 10% or more.

Results: 34 females and 28 males with valid armband data were used for final data analysis. No significant differences were observed between groups at baseline. Those who increased their PA from baseline to follow-up had an average increase of 1502 ± 6.84 at baseline to 40.91 ± 7.89 at 18 weeks on the SF-36 form (p = 0.03), whereas those with no changes in and/or who decreased daily PA by an average of 1195 steps/day showed no change.

In conclusion, people living with HIV/AIDS who increased their step count by 10% after 18 weeks showed a significant increase in RE. A relationship between physical activity and emotional well-being could provide a foundation for further study aimed to increase health-related quality of life for people with chronic disease, especially considering the impact it can have on activities or daily living. This project was supported by funding through the NIH/NINR R21 Grant 1R21NIO11281 and Theraband®.

Purpose: Type 1 Diabetes (T1D) is rising globally. Youth with T1D have poorer health and lower levels of physical activity (PA) than those without diabetes. The ActivPals study aimed to support youth with T1D to increase PA levels. The intervention incorporated a PA consultation, key behaviour change techniques and a wearable PA self-monitoring device. The aim of this study was to qualitatively explore the impact of the ActivPals pilot PA intervention on youths with T1D.

Methods: Semi-structured interviews with participants and one of their parents (N=16) were carried out between May and July 2016. Participants were recruited after delivery of the ActivPals 4-week intervention. Interviews were recorded, transcribed verbatim and analysed thematically using a six-stage iterative process. Codes were applied to data extracts in an inductive manner as recurring ideas, events or beliefs were identified.

Results: Factors contributing to intervention effectiveness are presented as three main themes. Each main theme had two sub-themes. The themes were: 1) Intervention impact (sub-themes: new ways to exercise and sustained exercise); 2) Intervention components (sub-themes: behaviour change techniques and one to one consultation); and 3) Intervention technology (sub-theme: barriers/issues and recommendations for future interventions). The ActivPals intervention had a positive impact on young people with Type 1 diabetes. Most notably, the PA consultation and behaviour change techniques were important for increasing PA levels. The intervention technology was seen as both a facilitator and a barrier to PA. Participants provided important feedback on the intervention. For example, role modelling and self-monitoring were seen as critical to the intervention and the wearable activity monitors were problematic and should be redesigned or an alternative used, for future work with this population.

Conclusion: This research will contribute to the development of evidence-based, user informed and pragmatic interventions leading to healthier lifestyles in youths with T1D.

This study was funded by Yorkhill Children’s Charity.
corresponding to 4.1 g/L; P = 0.012) of the mean serum ferritin levels. In addition, WBC count tended to increase at post administration (6.7 ± 0.9 × 10^3 vs. 7.3 ± 1.5 × 10^3; P = 0.09), while urinary markers were not affected by GAA intervention (P > 0.05).

CONCLUSION: It appears that dietary GAA might have a pro-inflammatory effect during medium-term intake in healthy humans. GAA-driven elevation in serum ferritin = 0.09), while urinary markers were not affected by GAA intervention (P > 0.05). Additionally, the ergogenic effect of CE supplement is associated with an increase in peak power and average work performed during repeated cycling sprints interspersed with 2-minute recovery periods.

METHODS: Peak power and average work performed by 38 recreational cyclists (CE group: n = 17; 23.4 ± 4.0 years; placebo (P) group: n = 18; 23.4 ± 4.0 years) were measured on a Velotron ergometer as they completed five, 15-s cycling sprints, with two minutes of recovery between sprints, pre- and post-supplementation. Peak power was the highest overall power measured across the sprints. Average work was the mean of total work performed across the five sprints. Participants’ body composition was estimated using three site skinfold measurements. Mixed-model ANOVA was used for statistical analyses.

RESULTS: For almost all participants, the peak power was generated during the first sprint. A recovery of 2-minutes is adequate for phosphocreatine resynthesis and may allow for maximal performance during repeated cycling sprints.

CONCLUSION: To investigate the effect of a 6-week CE supplementation intervention on cycling sprint performance. Creatine absorption is increased in the presence of electrolytes. Research examining the effect of a creatine-electrolyte (CE) supplement on repeated sprint cycling performance failed to show post-supplementation improvement. These results can be attributed to inadequate recovery periods between repeated sprints. A recovery of 2-minutes is adequate for phosphocreatine resynthesis and may allow for maximal performance during repeated cycling sprints.

Purpose: The research literature suggests that amino acid supplementation may be beneficial for many different modes of exercise. Thus, the purpose of this study is to determine if a pre-exercise amino acid supplement improves performance of a 5-mile time trial test and to assess whether there are changes in cognition.

Methods: Eight recreationally active male college students were recruited for this repeated measures design study. Participants consumed either a commercially available BCAA supplement (BCAA) or placebo (CON) 15 minutes prior to performing a Wingate test, followed by a brief break and then a 5-mile time trial test. Blood samples were collected before, during and after exercise to measure glucose, lactate and insulin levels. The Go/No Go and Stroop tests were used to assess cognition before and after exercise.

Results: There were no significant performance differences between BCAA and CON treatments for the Wingate test (Pre-Exercise: BCAA 10.7 ± 0.5 W/kg vs. CON 11.1 ± 1.2 W/kg, Post-Exercise: BCAA 11.4 ± 1.1 W/kg vs. CON 10.8 ± 1.5 W/kg; P < 0.05). Also there were no significant difference in performance for the time trial test (BCAA 26.7 ± 0.9 min vs. CON 25.9 ± 1.4 min; P < 0.05). Furthermore, blood glucose, lactate and plasma insulin levels were similar at each time point for both treatments.

Conclusion: Under these testing conditions BCAA supplementation does not appear beneficial for 5-mile time trial performance, on physiological markers or cognition. However, the effects of BCAA supplements under different conditions is warranted.

Purpose: To compare the co-administration of the probiotic Bacillus coagulans (BC30) with HMB calcium (CaHMB) to CaHMB alone on the inflammatory response and muscle integrity during 40-days of intense military training.

METHODS: Soldiers from the same unit were randomly assigned to one of two groups: CaHMB with BC30 (CaHMBBC30; n=9) or CaHMB with placebo (CaHMBPL; n=9). A third group of participants from the same unit served as a control (CTL; n=8). During the 40-day study, all participants performed the same daily protocol. During the first 28 days soldiers were garrisoned on base and participated in the same training tasks. During the final 2-weeks soldiers navigated 25-30 km per night in difficult terrain carrying ~35 kg of equipment. All assessments (blood draws and diffusion tensor imaging to assess muscle integrity) were conducted prior to and at approximately 12-hours following final suppletion consumption. Analysis of covariance was used to analyze all blood and muscle measures. RESULTS: Significant attenuations were noted in IL-10, IL-2, IL-6, CXCL1, and TNF-α for both CaHMBBC30 and CaHMBPL compared to CTL. The response of plasma IL-10 concentrations was significantly attenuated for CaHMBBC30 compared to CTL only. A significant decrease in apparent diffusion coefficients was also observed for CaHMBBC30 compared to CaHMBPL.

CONCLUSION: Results of this study provide further evidence that HMB supplementation may attenuate the inflammatory response to intense training, and that the combination of the probiotic Bacillus coagulans with CaHMB may be more beneficial than CaHMB alone in maintaining muscle integrity during intense military training.
Energy expenditure (REE) and respiratory exchange ratio (RER). REE and RER were measured through indirect calorimetry for 20 minutes while participants laid in a supine position. Body composition was measured by seven site skinfolds and bioelectric impedance analysis to determine body fat percentage (%BF).

Questionnaires using Likert scales were completed to evaluate hunger and satiety. Participants were then randomly stratified to either the treatment group of BCAAs (28.5 g/day) or placebo group (4 g/day non-caloric sweetener), and consumed the supplement three times daily mixed with 12 oz. of water. Between meals (between breakfast and mid-day meal, between mid-day meal and evening meal, and between evening meal and sleep) for 21 days. After supplementation, participants repeated baseline testing. Prior to the first testing visit and during the last week of consuming the supplement, participants completed two separate 3-day diet logs. RESULTS: There were no significant differences pre- to post-testing in weight, %BF, or RER for either group (p>0.05). There was no main effect for treatment (p=0.01) or time (p=0.84) for REE. There was a significant interaction between groups for RER (p=0.005) with RER increasing after BCAA supplementation (Δ85.5 ± 142.2 kcal) and RER decreasing after placebo consumption (Δ-74.5 ± 139.5 kcal). Confidence intervals (95% CI) demonstrated a significant increase in REE after BCAA supplementation (p<0.05).

The BCAA group reported feeling more satiated in the evening, according to 95% CI (p<0.005). CONCLUSIONS: Supplementing with BCAAs between meals resulted in a higher resting metabolic rate and greater feelings of satiety in women. Initial results suggests consuming BCAAs between meals may have positive implications for weight maintenance or loss in women, due to increases in resting energy expenditure and satiety.

**340 Board #161**
**May 31 11:00 AM - 12:30 PM**
**Effect of Creatine Supplementation on Exercise Performance following a Short-term Low Carbohydrate Diet**

Stephanie A. Born, Timothy R. Rotarius, Barry W. Scheuermann. The University of Toledo, Toledo, OH.

(No relationships reported)

Consumption of a low carbohydrate (low-CHO) diet typically leads to fatigue and decreases in exercise performance. **Purpose**: This study determined if a creatine supplement (CS) prevents the decrease in exercise performance associated with consuming a low-CHO diet. Compared to the placebo (PL) group, we hypothesized that CS would prevent the decline in performance as demonstrated by an equal or improved time to task failure (completed intervals). **Methods**: Fourteen healthy subjects (5 males, 9 females; 25.7 ± 5.4 yrs) were randomly assigned to either CS or PL group. Each subject performed 2 high intensity interval exercise sessions at 90% peak work rate. The test sessions were separated by a 10 day low-CHO diet and either CS or PL supplementation. Peak work rate was determined using a 25 W/ min ramp test to volitional fatigue. Baseline aerobic fitness (as peak oxygen uptake (VO2peak)) was determined as the highest 10 s average obtained during the ramp test. The high intensity interval session (i.e. performance trial) consisted of a 1:1 ratio of 30 s at exercise 90% peak work rate followed by 30 s of loadless cycling. Heart rate was collected at baseline and during each interval of the performance trial using a standard electrocardiogram. Subjects consumed a loading dose of creatine monohydrate (20 g/day) or placebo, while adhering to a low-CHO diet (~25% CHO total daily consumption). Subjects kept detailed food and exercise logs for the duration of the study. **Results**: Results of the preliminary exercise test indicated that the baseline fitness of the CS group (36.1 ± 5.3 ml/kg/min) was similar (p=0.005) to the PL group (36.9 ± 5.8 ml/kg/min). There was a significant improvement in the CS group compared to the PL group for the high intensity interval exercise performance pre- and post-diet (p<0.001). On average, the CS group improved 20.8 ± 27.7% for the total number of exercise bouts performed, whereas the PL group demonstrated a 35.9 ± 14.5% decrease in the total number of bouts performed post-diet. No change in body composition (% body fat) was observed between groups (CS, 1.4 ± 1.5% vs PL; 1.3 ± 0.8%, p>0.05). **Conclusion**: Results of the present study suggest that creatine loading may effectively attenuate the fatigue associated with a low-carbohydrate diet, and may, in fact, improve high-intensity interval exercise performance.
Most pre-workout supplements have various ingredients that when ingested together claim to have positive ergogenic effects. However, many supplements lack scientific evidence from independent research. PURPOSE: To determine the acute effect of a pre-workout supplement on lower body muscular endurance in college aged males. METHODS: This study was a double-blind, crossover design. Twenty-five participants (23.8 ± 1.3 years) visited the University Fitness Center on two separate occasions. Each visit was one week apart. During both visits participants completed the same warm up and maximal repetition seated leg press test at 75% of their body weight. Treatment order for each participant was randomized prior to testing. The control treatment consisted of a placebo supplement and the experimental treatment included a pre-workout supplement. Both treatments consisted of consuming eight fluid ounces, 15 minutes prior to testing, as recommended by the manufacturer. The supplement treatment included four main ingredients comprising beta alanine, creatine nitrate, N-Acetyl L-tyrosine, and caffeine. RESULTS: No significant difference in maximum repetitions was observed between the control treatment (56.56 ± 24.74) and the experimental pre-workout supplement (60.56 ± 26.20), F(1,24) = 1.481, p=0.235. CONCLUSION: Despite popularity for pre-workout supplements while weight training, acute positive effects may not be realized. Recommendations for future research may evaluate timing of consumption and long term effects of particular pre-workout-supplements. 

343 Board #164 May 31 11:00 AM - 12:30 PM Effects of a Pre-Workout Supplement on Hyperemia Following Leg Extension Resistance Exercise at Different Intensities

Jeffrey S. Martin1, Petey W. Mumford2, Cody T. Haun2, Paul A. Roberson3, Ryan J. Colquhoun1, Mary P. Freenemy2, Michael J. Luera2, Cameron S. Mackey2, Tyler W. Duddell1, Joshua J. Riffe2, Kaelin C. Young1, David D. Pascoe, FACSM2, Jason M. Defreitas3, Nathaniel D. M. Jenkins3, Michael D. Roberts2.

PURPOSE: We sought to determine if a multi-ingredient pre-workout supplement (PWS) given prior to resistance exercise was effective in increasing post-workout reactive hyperemia compared to placebo (PBO). METHODS: Thirty, recreationally trained males participated in this double-blinded, PBO controlled study. All participants reported for two visits, separated by one week. At visit 1, participants consumed a multi-ingredient PWS with seventeen active ingredients (including citrulline, norvaline, caffeine, creatine and anti-oxidant blends) or PBO. 45-min after consumption of PWS/PBO, participants performed four sets of leg extension resistance exercise to failure at 30 or 80% of their 1-RM. At visit 2, subjects consumed the same supplement as in visit 1, but exercised at the alternate intensity. Heart rate (HR), blood pressures, and femoral artery blood flow were assessed at baseline (BL), 45-min following PWS/PBO consumption (PRE), and at 5-min following the last set of resistance exercise (POST). Repeated measures ANOVA was performed with time, supplement, and training intensity as the independent variables. Data are reported as mean ± sem. RESULTS: Significant main effects of time (p<0.01), but no interactions were observed for blood pressures, femoral artery diameter, and retrograde femoral artery blood flow. A significant time*supplement interaction (p=0.05) was observed for HR and anagtrade and mean femoral artery blood flow. Change in HR from BL and PRE to the POST time point was significantly greater in the PWS group compared to the PBO group (+27.3 ± 3.2 vs. +19.8 ± 2.2 bpm and +34.6 ± 2.1 vs. +25.0 ± 2.3 bpm for change from BL and PRE, respectively; P<0.03). Similarly, change in mean femoral artery blood flow from BL and PRE to the POST time point was significantly greater in the PWS group compared to the PBO group (+590.56 ± 24.74 vs. +404.52 ± 56/min and +687 ± 60 vs. +494.50 ± 56/min for change from BL and PRE, respectively, P<0.02). CONCLUSIONS: The PWS did increase the reactive hyperemia response observed following resistance exercise though no specific interactions with the intensity of the resistance exercise were observed. 

344 Board #165 May 31 11:00 AM - 12:30 PM Nighttime Consumption of Whey and Casein Protein: Effects on Morning Metabolism and Resistance Exercise Performance

Takudzwa A. Madzima, Jared T. Melanson, Jonas R. Black, Simon C. Locke, Svetlana Nepocatych, Elon University, Elon, NC. (Sponsor: Paul Miller, FACSM)

Email: tmdazima@elon.edu

No relationships reported.

Whey protein (WP) and casein protein (CP) consumed at night before sleep has been shown to have positive satiating and metabolic effects the next morning. No data exist regarding the effect of nighttime consumption of WP and CP on the ability to perform resistance exercise (RE) the following morning. PURPOSE: To determine the effect of WP and CP at two different doses, when consumed before sleep on next morning appetite, resting metabolic rate (RMR), and RE volume compared to a non-caloric placebo (PLA). METHODS: Eleven physically active men and women (age, 24 ± 5yrs; body fat, 18.8 ± 4.9%) participated in this randomized, double blind, crossover study. One-repetition maximums (1-RM) were performed on six exercise machines to determine RE intensity. A single dose of 24g WP, 48g WP, 24g CP, 48g CP, or PLA was consumed 30 minutes prior to sleep and each trial was separated by 48-72 hours. Measurements of appetite (visual analogue scales (VAS) for satiety, hunger, and desire to eat), RMR (indirect calorimetry), and RE volume were performed the next morning (0600-0900 hours). Appetite was assessed immediately before and after RMR measurements, and immediately after RE. RMR measurements were collected for 30 minutes and the last 25 minutes were analyzed. Outcome variables were oxygen consumption (VO2), RMR, and respiratory quotient (RQ). RE was performed for 2 sets of 10 repetitions and a 3rd set to failure at 60% of 1-RM. Statistical analyses were conducted using 5 x 3 (group by time) repeated-measures ANOVA for appetite variables and one way ANOVA for metabolic variables and RE volume. All significance was accepted at p < 0.05. RESULTS: There were no time effects and no group x time interactions in satiety, hunger, and desire to eat. There were no significant differences in VO2, RMR (24g WP: 1795 ± 517 kcal/d; 48g WP: 1810 ± 371 kcal/d; 24g CP: 1691 ± 351 kcal/d; 48g CP: 1855 ± 416 kcal/d; PLA 1775 ± 346 kcal/d; p > 0.05) and RQ. In addition, there was no significant difference in RE volume (24g WP: 1812 ± 2797 kcal; 48g WP: 11913 ± 2575 kcal; 24g CP: 12664 ± 3759 kcal; 48g CP: 11753 ± 2456 kcal; PLA: 11680 ± 2654 kcal; p > 0.05). CONCLUSION: Varying doses of WP and CP prior to sleep did not have an effect on morning appetite, RMR, and RE volume. Nighttime consumption of WP and CP can be consumed without impeding next morning metabolism and training volume, but does not improve exercise performance.
Creatine is an effective supplement for improving strength, power, and reducing fatigue, especially in high intensity, repeated activities. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

**Purpose:** This study examined the effects of two different formulated creatine supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), compared to placebo (P) on fatigue, work, and power during knee extension exercises.

**Methods:** The study evaluated effects in resistance-trained participants, repeating measures after six-weeks of supplementation. Participants (n=23; 21.9±1.8 years) were randomized to receive supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

Creatine is an effective supplement for improving strength, power, and reducing fatigue, especially in high intensity, repeated activities. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

**Purpose:** This study examined the effects of two differently formulated creatine supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), compared to placebo (P) on fatigue, work, and power during knee extension exercises.

**Methods:** The study evaluated effects in resistance-trained participants, repeating measures after six-weeks of supplementation. Participants (n=23; 21.9±1.8 years) were randomized to receive supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

Creatine is an effective supplement for improving strength, power, and reducing fatigue, especially in high intensity, repeated activities. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

**Purpose:** This study examined the effects of two differently formulated creatine supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), compared to placebo (P) on fatigue, work, and power during knee extension exercises.

**Methods:** The study evaluated effects in resistance-trained participants, repeating measures after six-weeks of supplementation. Participants (n=23; 21.9±1.8 years) were randomized to receive supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

Creatine is an effective supplement for improving strength, power, and reducing fatigue, especially in high intensity, repeated activities. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

**Purpose:** This study examined the effects of two differently formulated creatine supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), compared to placebo (P) on fatigue, work, and power during knee extension exercises.

**Methods:** The study evaluated effects in resistance-trained participants, repeating measures after six-weeks of supplementation. Participants (n=23; 21.9±1.8 years) were randomized to receive supplements, creatine monohydrate (CM) or creatine-magnesium chelate (CC), carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

Creatine is an effective supplement for improving strength, power, and reducing fatigue, especially in high intensity, repeated activities. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.
expression (CARN, TauT, ABAT, CNDP2, PHT1, PEPT2, PAT1). RESULTS: Carnosine content was increased from baseline at every time point in BA (all P<0.001; Week 4: +11.4±2.0 mmol·kg·dm, Week 8: +13.9±7.8 mmol·kg·dm, Week 12: +17.0±8.6 mmol·kg·dm, Week 16: +17.6±3.4 mmol·kg·dm, Week 20: +21.2±7.9 mmol·kg·dm, Week 24: +20.2±7.6 mmol·kg·dm), but not PL (all P>0.05). Maximal changes ranged from +17.1 to +41.3 mmol·kg·dm, and absolute maximal content ranged from 31.8 to 63.9 mmol·kg·dm. There was an effect of supplement (P<0.002) on TauT in BA (-57%, -46%, and -35% for Weeks 4, 8, 12, 16, 20 and 24); no further differences in gene expression were shown. CONCLUSION: Twenty-four weeks of beta-alanine supplementation increased muscle carnosine content in all individuals at all time points, although absolute maximal changes were variable. Downregulation of the beta-alanine transporter TauT suggests it plays an important role in muscle carnosine accumulation with beta-alanine supplementation. These data demonstrate that individuals who supplement with beta-alanine for prolonged periods can maintain elevated muscle content throughout supplementation, despite downregulation of beta-alanine transporter expression.

Beta-alanine supplementation has been proposed as a means to improve exercise performance by increasing intramuscular buffering capacity. By increasing buffering capacity, exercise performance should improve by delaying the onset of fatigue. PURPOSE: The purpose of this study was to determine if beta-alanine supplementation is able to reduce fatigue associated with incremental exercise to exhaustion among males and females. METHODS: 25 (12 male and 13 female) healthy, recreationally active volunteers completed this study. Subjects were age 22.6 ± 3.5 years with a BMI of 24.4 ± 3.9. A double blind study was conducted over a 6-week period. Each subject completed an incremental exercise bout on an electromagnetically braked cycle ergometer once every 2 weeks for 6 weeks. Timing of data collection was as follows: week 0 (no supplementation/ baseline measure), end of week 2, 4, and 6. Supplementation consisted of either a 400 mg capsule of beta-alanine (treatment) or 400 mg capsule of dextrose (placebo) taken 4 times per day for 6 weeks. RESULTS: Performance and physiological measures collected included time to exhaustion (TTE), maximum power output (PO max), VO2 peak, Ventilatory Threshold (VT), and peak heart rate (HR peak). Results were analyzed using repeated measures ANOVA with significance set at p < 0.05. There were no significant differences over time or within sex, therefore data is collapsed and is presented as treatment vs. placebo (mean ± SE). TTE (seconds) 1051.1 ± 39.1 vs. 1054.7 ± 37.6; PO max (Watts) 206.7 ± 6.7 vs. 195.5 ± 6.5; VO2 peak (ml/kg/min) 3.4 ± 1.4 vs. 3.5 ± 1.3; VT (L/min) 1.84 ± .08 vs. 1.83 ± .07; and HR peak (beats/min) 180.3 ± 3.4 vs. 178.2 ± 3.3. CONCLUSIONS: Assessed variables showed no significant differences (p>0.05) between treatment and placebo at time points 2, 4, and 6. This finding was also found when isolating assessment to males and females. These results suggest that beta-alanine supplementation was not effective in improving exercise performance as used in this study.

Supplemented with L-alanine and L-glutamine, in their free form or as dipeptide (AL, GLN+AL and DIP groups, respectively), or water (SED and CTRL group). RESULTS: Maximal cardiac output (25% to 100% of body weight). In the last 21 days of training, supplements were given in a 4% solution dissolved in drinking water. SIRT1 and HSP70 concentration and DNA binding activity of NF-κB were determined in liver. RESULTS: RE slightly decreased HSP70 concentration in liver of CTRL group. However, all supplementation promoted a 3-fold increase in HSP70 levels (P<0.05 vs. CTRL group), denoting liver protection. Trained groups exhibited significantly increased level of SIRT1, consistent with the reduction of NF-κB activation. Interestingly, DIP supplementation induced higher level of SIRT1 (by 280%, P<0.05 when compared with trained groups), as well as greater cytoprotection demonstrated by suppression of NF-κB activation (by 52%, compared with GLN+AL and ALA groups) in liver of trained rats. CONCLUSIONS: Chronic oral supplementation with L-glutamine given with L-alanine or as dipeptide, induced cytoprotective effects mediated by increased HSP70 and SIRT1 concentrations, which may have attenuated NF-κB activation in liver of rats submitted to progressive RE. Financial support: FAPESP, CAPES and CNPQ.
Genetic predisposition has a substantial role in the development of athletic physical performance and is characterized by a large number of gene polymorphisms and the interaction of these variations.

PURPOSE: (1) to examine the prevalence of genotypes of 6 genes related to physical performance (ACE, AGT, ACTN3 R577X, PPARGC1A G422R, ACTN3 R577X, OR2H2, and ACTN3 R577X) in Estonian elite athletes; (2) to compare the distribution of gene variations between representatives of 2 sports groups (predominantly endurance-oriented and mostly for speed and/or power-oriented sports group).

METHODS: the study group consisted of 130 elite athletes (23 females and 107 males); current and former Estonian national team members; in age range 23.8±5.6 years; involved in 19 different sports disciplines. There were 77 representatives of endurance-oriented sports (17 females and 60 males) and 53 representatives of speed and power-oriented sports (6 females and 47 males). 26 athletes of the study group were medallists or finalists in the Olympic Games, World or European championships. Peripheral venous blood samples were collected for DNA extraction and genotyping (6 candidate genes) from all study subjects. For statistical analysis, a descriptive analysis and p2 test were used to determine significant differences between the frequencies of gene variations. P-values of ≤ 0.05 were set as statistically significant.

RESULTS: the highest prevalence of the RR genotype of the ACTN3 gene among athletes of endurance-oriented sports compared to athletes of speed and power-oriented sports was statistically significant (p=0.025). We did not find any significance in the distribution of other gene variations between the two sports groups. We observed the trend of a higher prevalence of the NO33 TT genotype (p=0.076) and a lower prevalence of the AMID1 TT genotype (p=0.090) in the endurance-oriented sports group compared to the speed and power-oriented sports group, but it was not statistically significant.

CONCLUSIONS: our study results reveal a significantly higher prevalence of the ACTN3 RR genotype in athletes of the endurance-oriented sports group, which is in accordance with our previous study among young skiers and this may be an advantage for the explosive speed and power capacity in endurance sports.

There is a known relationship between inflammation and its alteration in exercise performance. In addition, a number of inflammatory processes are linked to the major histocompatibility complex (MHC) on the short arm of chromosome 6. As our understanding of genetics expands, over 140 genes have been linked with exercise performance; however, the role of inflammatory pathways remains unclear.

PURPOSE: The purpose of this study was to examine whether 3 genes, unique to the elite athletes, and located on the short arm of chromosome 6 are connected to the immune/inflammation MHC genes cluster.

RESULTS: the highest prevalence of the RR genotype of the ACTN3 gene among athletes of endurance-oriented sports compared to athletes of speed and power-oriented sports was statistically significant (p=0.025). We did not find any significance in the distribution of other gene variations between the two sports groups. We observed the trend of a higher prevalence of the NO33 TT genotype (p=0.076) and a lower prevalence of the AMID1 TT genotype (p=0.090) in the endurance-oriented sports group compared to the speed and power-oriented sports group, but it was not statistically significant.

CONCLUSIONS: our study results reveal a significantly higher prevalence of the ACTN3 RR genotype in athletes of the endurance-oriented sports group, which is in accordance with our previous study among young skiers and this may be an advantage for the explosive speed and power capacity in endurance sports.

The molecular mechanisms influencing the initiation and progression of osteoarthritis (OA) are unclear. Therefore, current clinical management of predominately involves symptomatic treatment of end-stage diagnosed OA. Understanding the pathogenesis of OA at the pre-clinical stage may aid in both diagnostic and preventative modalities in the management of this chronic disease. PURPOSE: To determine the synovial extracellular RNA (exRNA) changes associated with OA. METHODS: Synovial fluid was collected from the injured knee of a cohort of 14 individuals (ages 15-47, 10 males and 4 females) undergoing surgical repair following ACL and/or meniscus injuries. Each knee had arthroscopically graded OA and divided the cohort into 5 individuals in the OA group (OA in ≤1 knee compartment) and 9 individuals in the non-OA group (OA in ≥1 knee compartment). Total exRNA was extracted from the synovial fluid collected at the time of surgery, >30 million reads generated per sample using massively parallel sequencing, and differential abundance of RNA was calculated between the two groups. RESULTS: A total of 19 protein coding exRNAs were significantly different (FDR ≤ 0.05) between the two groups: 13 increased in the OA group, 6 decreased. While no specific pathways were enriched, these genes included several genes known to influence OA pathways including ADAM12 (metalloprotease-disintegrin 12) and BMP1Ra (bone morphogenetic protein receptor type 1A). In addition, 3 miRNAs were different: 2 increased, 1 decreased. One of these increased miRNAs was miR30a which has a known role in promotion of extracellular matrix degradation. CONCLUSIONS: These data suggest that the profile of extracellular RNA molecules are dysregulated arthroscopically diagnosed OA. While the specific intercellular signaling role of these exRNA are yet to be elucidated, they offer intriguing biomarkers and suggestions of dysregulated molecular pathways in OA. Changes in the genes ADAM12, BMP1Ra, and miR30a suggest that exRNA markers of extracellular matrix degradation are biomarkers for the initiation and/or progression of OA. These findings have the potential clinical utility to differentiate patients at risk for the development of OA, introducing the possibility for intervention at pre-symptomatic stages.
**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**357 Board #178**  
**May 31 9:30 AM - 11:00 AM**  
**Acute Exercise Induced Changes of Gene-Specific DNA Methylation in Natural Killer Cells**  
Christina Koliamitra1, Wilhelm Bloch1, Alexander Schenk1, Walter Pulverer1, Philipp Zimmer1.  
1Cardiovascular Research and Sports Medicine, Cologne, Germany.  
2Austrian Institute for Technology, Vienna, Austria. (Sponsor: Prof. Dr. Steinacker Jürgen Michael, FACSM)  
Email: c.koliamitra@dshs-koeln.de

(No relationships reported)

As part of the innate immune system, natural killer cells (NK cells) have the ability to detect and eliminate virus-infected and neoplastic cells. The amount of tumor infiltrating NK cells is connected with the prognosis of various tumor diseases. Acute physical exercise influences the mobilization of NK cells and increases their cytotoxicity. Previous studies indicate that a load-dependent variation of the NK cells is induced by epigenetic modifications.

**Purpose:** The aim of this investigation was to examine to what extent has the promoter methylation of activating (KIR2DS4) and inhibiting (KIR3DL1) NK cell receptors changed after acute exhaustive exercise.

**Methods:** A total of 18 healthy female subjects (age of 55, ± 5, 7) were asked to perform a spiroergometry on a cycle ergometer. The spiroergometry protocol was a step test of 1 min rest measurement at the beginning, followed by a 3 min warm-up phase with 50 watts of power output and an increase of 25 watts for every 2 minutes of the test until exhaustion. Before (T0) and after (T1) spiroergometry test, venous blood was collected from which NK cells were isolated and DNA was extracted. Accordingly, the KIR2DS4 and KIR3DL1 NK cell receptors were examined through Targeted Deep Amplicon Sequencing.

**Results:** The promoter methylation of the activating KIR2DS4 receptor reduced after single exercise load (T0 vs. T1). The significant changes were observed in two close (distance of 4 base pairs), identified CpGs (p=.007 and p=.008). No effects found on the inhibiting KIR3DL1 receptor. There was no correlation found between the promoter methylation and the maximum oxygen uptake of the subjects. However, the data showed a positive correlation of the promoter methylation between both genes at T0 and T1.

**Conclusions:** Acute exercise reduces the promoter methylation of the activating NK cell receptor KIR2DS4. This finding may be related to reduced KIR2DS4 gene expression by natural killer cells. The correlation between the methylation of both genes indicates that reduced methylation of the activating receptor proves to be reduced for the inhibiting receptor as well. However, only the activating receptor is sensitive to epigenetic modulations after exhaustive exercise. Therefore, high-load acute exercise represents a promising positive influence for the innate immune system.

**358 Board #179**  
**May 31 9:30 AM - 11:00 AM**  
**Exercise Induced Natural Killer (NK) Cell Genomic Response in Pediatric Acute Lymphoblastic Leukemia (ALL) Survivors**  
Email: marcos.martinrincon@gmail.com

(No relationships reported)

Despite remarkable success in achieving remission, pediatric ALL survivors face an increased risk of physical activity related metabolic, cardiovascular, and bone disease. The mechanisms of these threats to the healthspan are unknown. NK cells play a role in therapy and immune surveillance in ALL and along with other immune cells, are also involved in the molecular pathways by which exercise benefits health. NK cells increase in the circulation in response to brief exercise to a greater degree than any other leukocyte.

**Purpose:** To examine the effect of brief exercise on NK cell gene expression (RNA seq), in children and adolescents who have survived ALL.  

**Methods:** 9 ALL survivors and 9 sex and age-matched controls (14.8±0.7 and 15.0±0.9 y/o) performed 8, 2-min bouts of cycle ergometer exercise interspersed that had reduced response in ALL.  

**Conclusion:** Exercise altered the expression of thousands of NK cell genes in both ALL and controls with a distinct pattern in ALL. Among several possible health effects, exercise may improve NK cell function in immune surveillance in ALL survivors. Supported by UCT SOM Faculty Research Grant, PERC System Biology Fund, and NIH Grant P01HD-048721

359 Board #180  
**May 31 9:30 AM - 11:00 AM**  
**FGF21 is Produced By Active Skeletal Muscle during Intense Exercise in Humans: Influence Of P_O2**  
Marcos Martin-Rincon1, Alberto Perez-Lopez2, Marco Azzinari1, Mercedes Said-Quintana1, Alfredo Santana1, David Morales-Alamo3, Cecilia Dorado-Garcia1, Jose A L Calbet1.  
1University of Las Palmas de Gran Canaria. Instituto Universitario de Investigaciones Biomedicas (IUIBS), Las Palmas de Gran Canaria, Spain. 2Faculty of Medicine and Health Sciences. University of Alcalá. CIBER-BBN, Madrid, Spain.

(No relationships reported)

Fibroblast growth factor 21 (FGF21) is a peptide produced mostly by the liver and other tissues as skeletal muscle. Recent work supports that the main source of circulating FGF21 during exercise is the hepatop-splanchnic circulation. Nevertheless, increased FGF21 mRNA has been reported in human skeletal muscle after prolonged exercise. Given the great increase of skeletal muscle blood flow during exercise, a small amount of FGF21 released by active skeletal muscles could have escaped detection by -a-v differences.

**PURPOSE:** To determine whether skeletal muscle produces FGF21 in response to exercise and the influence of muscle metabolism and oxygenation on this process.

**METHODS:** Eleven volunteers performed incremental exercise (IE) to exhaustion in normoxia (Nx, P_O2=143 mmHg) and hypoxia (Hyp, P_O2=73 mmHg) while muscle metabolites and FGF21 protein expression (Western Blot) were measured before (control) and immediately after IE in N and Hyp. Immediately after IE, the circulation of one leg was instantaneously occluded (300 mmHg) and vastus lateralis muscle biopsies obtained after 10s from the occluded leg, and simultaneously from both legs at 60s.

**RESULTS:** At 10s muscle lactate ([La]) was increased and phosphocreatine (PCR) and ATP reduced in N and Hyp, without differences between conditions. Muscle [La] was increased by 25% from 10 to 60s in the occluded leg (P<0.05) and unchanged in the non-occluded leg (+5% P<0.71). After 60s, PCR was reduced by 94 and 48%, in the occluded and non-occluded leg, respectively (P<0.05). Compared to pre-exercise, FGF21 protein expression was increased in the occluded leg by 55 and 57% at 10s and 60s, respectively (time effect P<0.02) and by 10% (P=0.42) in the non-occluded leg at 60s, without influence of P_O2. No association was observed between metabolite accumulation and FGF21 expression.

**CONCLUSIONS:** FGF21 is produced during intense exercise in human skeletal muscle. The fact that FGF21 was not increased 60s after the end of exercise in the leg recovering with free circulation highlights the utility of total occlusion of the circulation to trap in the muscle myokines released in small amounts by the muscle during contractile activity.

Funding: MINECO Ref.: DEP2015-71171-R

360 Board #181  
**May 31 9:30 AM - 11:00 AM**  
**The Effect Of Normobaric Hypoxic Endurance Training On Forearm Muscle Blood Flow**  
Simon M. Fryer1, Keeran J. Stone2, Tabitha G. Dickson1, Andrew Wilhelmsen1, Daniel S. Cowen1, James Faulkner2, Danielle Lambrick3, Lee Stoner4, Andrew Wilhelmsen1, Daniel S. Cowen1, James Faulkner2, Danielle Lambrick3, Lee Stoner4.  
1University of Gloucestershire, Gloucester, United Kingdom. 2University of Winchester, Winchester, United Kingdom. 3University of Southampton, Southampt, United Kingdom. 4University of North Carolina at Chapel Hill, Raleigh, United Kingdom.

(No relationships reported)

The effects of intermittent hypoxic exposure (live low train high) on skeletal muscle oxygenation kinetics remain poorly understood. However, recent developments in technology have meant that the monitoring of skeletal muscle blood flow in response
to training is possible. PURPOSE: The aim of the current study was to determine whether handgrip dynamometry (HGD) training in normobaric hypoxia (14% FiO2) altered blood flow in the non-dominant flexor digitorum profundus (FDP) at rest and during exercise.

METHODS: Following institutional ethical approval, 7 healthy males who were not forearm trained (mean age: 20.7 ± 1.1 years; stature: 1.77 ± 0.08 m; body mass: 84.0 ± 14.2 kg) volunteered to take part in the study. In a randomized, crossover design participants completed 4 weeks of progressive HGD endurance training (0.3Hz in week one increasing to 1.2Hz in week 4) in both normoxia and hypoxia. There were four training sessions per week and each consisted of 30 min intermittent handgrip exercise at 30% of maximal voluntary contraction (MVC), followed by a 60s maximal ‘sprint’. A six week washout period separated normoxic and hypoxic training. Before and after the training intervention, forearm muscle blood flow was determined at rest and during exercise (25% MVC) using near-infrared spectroscopy and venous occlusion method. Forearm blood flow was calculated by evaluating the rate of increase in total haemoglobin (Hb) during the first two seconds of venous occlusion (60 mmHg).

RESULTS: Two-way repeated measures ANOVA revealed a significant interaction (time x condition; p = 0.028) in blood flow during exercise at 25% MVC, but not during rest (p = 0.014); further there was no significant main effect for condition (p = 0.059) or time (p = 0.077). Follow up paired samples t-tests revealed that forearm muscle blood flow during exercise was greater than baseline following normobaric hypoxic training (p = 0.049, MD = 1.59, 95% CI = -0.24 to 3.21 ml min⁻¹ 100ml⁻¹), but not following normoxic training (MD = 0.03, 95% CI = -0.45 to 0.54 ml min⁻¹ 100ml⁻¹). CONCLUSIONS: Thirty minutes of handgrip dynamometry training a day for 4-weeks in normobaric hypoxia has the potential to increase forearm muscle blood flow. Future studies should seek to determine whether these hypoxic induced changes translate to an enhanced endurance performance.

361 Board #182 May 31 9:30 AM - 11:00 AM The Effect of Hypoxia on PGC-1α

Roksana Zak, Robert Shute, Dustin Slivka, FACSM. University of Nebraska-Omaha, Omaha, NE. (Sponsor: Dustin Slivka, FACSM)

Markers for mitochondrial function in the skeletal muscle appear to be reduced after extended exposure to altitude. However, short term training at altitude enhances aerobic capacity. Further investigation is needed to determine the skeletal muscle response to altitude.

PURPOSE: The purpose of this study was to determine the impact of exposure to normobaric hypoxia after exercise on the gene expression and subcellular location of PGC-1α protein compared to a normoxic environment.

METHODS: Six male participants (age 25 ± 2, height 180 ± 4 cm, weight 82 ± 2 kg) completed two 90 min cycling trials in laboratory conditions followed by a 6 h rest period. Biopsies were taken from the vastus lateralis at baseline and following each exercise trial and to confirm hypoxia during recovery. Six muscle biopsies were obtained from the vastus lateralis at baseline and following each exercise trial and to confirm hypoxia during recovery. Six muscle biopsies were recovered in an environmental chamber for 4 hours in three conditions; 1000m normobaric normoxia (NN), 18.8% FiO2, a simulated 4400m normobaric hypoxia (NH, 765mmHg, 12% FiO2), or a simulated 4400m normobaric hypoxia (HH, 440mmHg, 12% FiO2). Pulse oximetry was used to measure O2 saturation throughout the exercise trials and to confirm hypoxia during recovery. Six muscle biopsies obtained from the vastus lateralis at baseline and following each exercise recovery were examined for hypoxia and redox sensitive transcripts including endothelial PAS domain factor-1 (EPAS-1), hemeoxygenase-1 (HMOX1), superoxide dismutase-2 (SOD2), and nuclear factor erythroid-derived 2-like 2 (NFE2L2).

RESULTS: No sex-dependent differences in gene transcripts were observed for any markers examined (p>0.05). No differences were observed for EPAS-1 (variable 2 fold increase, p>0.05) or NFE2L2 (2 fold increase, p>0.05). Time-, but not trial-, dependent differences existed for HMOX1 (8.4 fold increase, p=0.000) and SOD2 (1.4 fold increase, p=0.017) and indicate a similar redox stimulus was present 4 hours post exercise in all three recovery condition.

CONCLUSIONS: These data suggest exercise recovery in simulated conditions of NH and HH do not impact EPAS-1, HMOX1, SOD2 or NFE2L2. Additional redox-sensitive markers in blood and muscle should be examined to determine whether additional adaptive responses are impacted by NH and HH recovery conditions.

363 Board #184 May 31 9:30 AM - 11:00 AM Hypoxic Training Promotes Apelin Expression In Skeletal Muscles Of High Fat Diet-induced Obese Mice

yin zhang, Beijing Sport University, Beijing, China. Email: zhy9256@126.com

(NO relationships reported)

PURPOSE: To investigate the effects of hypoxia, and exercise hypoxic training on the expression of apelin and APJ in skeletal muscle of obese mice.

METHODS: 60/2-month old C57BL/6mice were randomly divided into two groups: 10 in normal diet group (N) and 50 in the high fat diet (HFD) groups. After two months of feeding, the HFD mice whose body weight 20% higher than the average weight of N group were selected as obese mice and were furtherrandomized into four groups: Control (C), Exercise (E), Hypoxia (H), Exercise plus Hypoxia (E+H), at 8-9 mice/group. Besides body weight, measured variables in skeletal muscle were protein/nRNA levels of apelin/APJ, AMPKα-Thr172 phosphorylation, hypoxia inducible factor-1α (HIF-1α), mRNA levels of peroxisome proliferator-activated receptor (PPARα), estrogen-related receptor (ERRα), and nuclear respiratory factor 1 (NRF1).

RESULTS: Obese mice had significantly lower mRNA and protein expressions of apelin/APJ in skeletal muscles than the normal body weight mice. After four weeks of interventions, hypoxic exercise training decreased body weight and increased mRNA and protein expressions of apelin and APJ, mRNA expression of ERRα, and protein expression of HIF-1α.

CONCLUSIONS: These results indicate that changes of body weight may be associated with the levels of apelin/APJ expressions in skeletal muscle.

364 Board #185 May 31 9:30 AM - 11:00 AM Metabolomic Analysis Of Skeletal Muscle In Horses Trained In Hypoxia.

Hajime Ohnoura1, Kazutaka Mukai2, Yuji Takahashi3, Toshiyuki Takahashi3, James H. Jones1,1 Japan Racing Association, Shimotsuke-shi, Japan. 2University of California, Davis, Davis, CA. 1University of California, Davis, Davis, CA. (No relationships reported)

Hypoxic training is effective for improving athletic performance. In horses, hypoxic training increases maximal oxygen consumption (VO2max) more than normoxic training. However, the effects of hypoxic training on well-trained horses is unclear, and its effects on muscle metabolism have not been investigated. We hypothesized that VO2max of well-trained horses would increase and muscle metabolomics would differ before and after hypoxic training. PURPOSE: To describe the effects of hypoxic training on VO2max and muscle metabolomics of well-trained horses.

METHODS: We studied 5 well-trained horses in which VO2max had not increased over 3 consecutive weeks of supramaximal treadmill training in normoxia twice a week. Horses trained with hypoxia (15% O2) twice a week. Before and after 3 weeks of hypoxic training, VO2max was measured on the treadmill and biopsy samples for metabolomics analyses were taken from the gluteus medius muscle at rest. Data were analyzed with Welch’s-t-test. RESULTS: VO2max increased after 3 weeks of hypoxic training (176 vs. 194 ml/(kg·min), p<0.05) even though all-out training in normoxia had not increased VO2max. From metabolomics analysis, Acetyl-CoA (0.150 vs.0.048...
Long road marches carrying heavy loads are a common military task. While it is anecdotally accepted that discomfort related to physical pain and soreness increases during long marches, there is little data available which has quantified this discomfort or determined its effect on march performance. PURPOSE: To quantify pain and soreness (P&S) during a 12-mile march and determine how it affects pacing. METHODS: While carrying a load weighing 46.4 kg, 46 male and 26 female Soldiers performed a 12 mile foot march. A mandatory rest break of 10 minutes was enforced at the 3, 9 and 16 mile marks, and a 30 minute break was enforced at the 6 mile mark. Time splits were taken every 3 miles. At the start, each rest point, and finish, soldiers quantified their P&S from 0 (No Discomfort) to 3 (Extremely Uncomfortable) using an image of the body mapped into 21 regions (scale adapted from Dimov et al., AIHAJ 2000). Increases in P&S overtime were assessed using rmANOVA. Correlations were examined between changes in P&S (finish-start) for each site and changes in pace (first 3 miles vs. last 3 miles). RESULTS: Total march time was 244 ± 35 minutes (mean ± SD). Average overall P&S of the 21 body regions increased during the march from 0.13 ± 0.11 prior to the march to 0.46 ± 0.24 at the end (p<0.01 for trend), and did not significantly differ by sex (p=0.24). Of the 71 soldiers, 64 (90%) reported a P&S of 2 or 3 for at least one body region, with 36 (51%) reporting a P&S of 3. The sites of the greatest soreness were the shoulders (End P&S 1.99±0.96) and the feet (End P&S 2.40±0.80). Average overall P&S of the 21 body regions increased during the march from 0.13 ± 0.11 prior to the march to 0.46 ± 0.24 at the end (p<0.01 for trend), and did not significantly differ by sex (p=0.24). Of the 71 soldiers, 64 (90%) reported a P&S of 2 or 3 for at least one body region, with 36 (51%) reporting a P&S of 3. The sites of the greatest soreness were the shoulders (End P&S 1.99±0.96) and the feet (End P&S 2.40±0.80). Significant increases in P&S were observed in the neck, shoulders, mid-to-lower back, hips/waist, thighs, legs/feet, and ankles (p≤0.05 for trends). Load carried per body mass correlated with changes in neck P&S (r=0.24, p=0.04). Increases in P&S of the hips/waist associated with decreasing their pace (r=0.32, p=0.01). DISCUSSION: Due to the high load over a long distance, P&S increased over the march and may have interfered with performance. These data provide quantitative evidence of the changes in reported physical discomfort during long marches. To minimize soldier discomfort and improve performance, improvements in road march policy, equipment ergonomics, and training of proper gear fitting should target these body regions.

Aerobic fitness is vital for military personnel to perform their physically demanding job tasks. The Army currently uses a two-mile run (TMR) as part of the Army Physical Fitness Test to measure aerobic fitness levels. The Best Test (BT) is also currently being used by the Army as a pre-enlistment screening test. Both tests have been validated to predict an individual’s aerobic capacity. An advantage of the BT is that it can be performed indoors, offering an alternative to the TMR when outdoor conditions could affect performance. A comparison of the results of these two tests has not been made. PURPOSE: To determine the relationship between the TMR and BT and to compare their VO2max estimates. METHODS: 404 male and 128 female soldiers participated in this study. The TMR results were self-reported from their most recent physical fitness test. RESULTS: The mean TMR time was 15.01 min (range: 10.9-22.2 min). The mean BT score was 61 shuttles (range: 16-113 shuttles; test duration: 2.2-12.2 min). There is a significant moderate correlation between the TMR and BT estimated VO2max (R²=0.64; p<0.001), with TMR estimated VO2max being 22% higher than what was predicted by BT performance. Reason for this large discrepancy could include inflation of their performance on the TMR due to subject recall, motivational differences to perform to their maximum, and differences in the ability of these two tests to actually estimate VO2max. Additional studies are needed to concurrently measure TMR, BT, and a laboratory measure of VO2max in the same individual.
Knee extensor and flexor muscles were studied at 0, 60, 180° ±s-1.1. Measurements were taken pre and post load carriage confinement and day two. Torque was recorded as PT and at 5° intervals during isokinetic contraction. RESULTS: Statistically significant reductions in PT were observed post load carriage on day one and two in the dorsiflexors at 60° and 180° ±s-1(P<0.05) and knee flexors and extensors at 60° and 0° ±s-1(P<0.05), these are supported by torque reductions throughout the movement (70° to 0°P<0.05). PT returned to baseline hours post exercise while torque at serial muscle lengths remained reduced. No changes were observed between unloaded and loaded walking.

CONCLUSIONS: Findings indicate that two hours of treadmill load carriage causes a bimodal change in neuromuscular function of the knee extensors and flexors and the ankle dorsiflexors, characterised by a reduction in the PT and torque over two days of repeated exercise. However, no significant difference was observed between loaded and unloaded groups. While temporal results suggest the inclusion of an exercising control group, that demonstrates no significant change, suggests that they fail to observe that load carriage causes no greater reduction in neuromuscular function than unloaded walking.

All U.S. Army soldiers must perform the physically demanding tasks of their job prior to graduation from initial entry training. Armored personnel are required to conduct a tank ammunition loading task (TAL), while Field Artillery (FA) personnel perform the FA Ammunition Supply Vehicle recharging task (FAR). As these are graduation requirements, it is important to determine the influence of practice on performance of the TAL and FAR to guide training. PURPOSE: To determine the number of practices needed to optimize performance and pass rates of the TAL and FAR in soldiers unfamiliar with the tasks. METHODS: A sample of 45 soldiers (22 men, 21 women) performed the TAL 4 times and 41 (23 men, 18 women) also performed the FAR 4 times. Tasks were performed on four different days over a two week period with ≥48 hours rest between trials (T). To perform the TAL a soldier lifted and carried 18, 25 kg rounds a distance of 5 m, and handed them to another crewmember standing with ≥48 hours rest between trials (T). To perform the FAR 4 times.Tasks were performed on four different days over a two week period with ≥48 hours rest between trials (T). To perform the TAL a soldier lifted and carried 18, 25 kg rounds a distance of 5 m, and handed them to another crewmember standing with ≥48 hours rest between trials (T). To perform the TAL a soldier lifted and carried 18, 25 kg rounds a distance of 5 m, and handed them to another crewmember standing with ≥48 hours rest between trials (T). To perform the FAR a soldier lifted and carried 18, 25 kg rounds a distance of 5 m, and handed them to another crewmember standing with ≥48 hours rest between trials (T).

RESULTS: The scores were significantly improved (p<0.01) from T1 to T4 for TAL (T1= 3.54 and T4=3.36 rounds min) and from T1 to T3 for FAR (T1=2.45 and T3=3.47 rounds min). FAR plateaued T3 to T4 at 3.64 rounds min. The number of failures decreased with each trial on the TAL (T1=17, T2=14, T3=10, T4=6) and on the FAR (T1=19, T2=16, T3=11, T4=10). CONCLUSIONS: For trainees, it is important to provide 2-3 trials on each of these tasks to maximize the number passing, while not utilizing an inordinate amount of time training. Soldiers who are unable to perform to standard after 3 practices may need remedial progressive resistance training to be successful.

Combat arms are now open to women across all Armed Forces. Identifying physicality of men and women with enhanced, cumulative physiological and musculoskeletal fitness may optimize Force Readiness.

PURPOSE: To assess body composition and physical characteristics of male and female Marines from the Marine Corps’ Ground Combat Element Integrated Task Force classified by performance clusters.

METHODS: 302 Marines (age=22.0±2.7 yrs, height=1.5±1.0 m, mass=76.1±12.2 kg) underwent body composition testing (air displacement plethysmography); arm span and leg length; and a battery of laboratory and field strength, aerobic/anerobic, balance, biomechanics, and flexibility tests. A K-means cluster analysis was performed to characterize Marines with similar lab and field characteristics, regardless of sex, body composition or physicality. Twenty-three clustering validity indices were calculated to determine the optimal cluster number using R. One-way ANOVA or Kruskal Wallis tests were utilized to test for group differences, as appropriate, followed by Bonferroni adjusted pair-wise comparisons (p<0.05, two-sided).

RESULTS: Three clusters (C) were identified: C1 with the best strength and aerobic/anerobic characteristics, C3 with the worst strength and aerobic/anerobic characteristics, and C2 between C1 and C3; clusters were then stratified by sex (Men: C1M, C2M, C3M; Women: C2W, C3W). C1M, C2M, and C3M had significantly less BF% than C2W and C3W. Fat free mass was significantly different among all groups. C1M and C2M had significantly greater fat mass than C3M. C1M and C2M had significantly greater arm span and leg length than all other groups. (Table 1) CONCLUSIONS: Fat free mass may have a stronger association with performance on strength, aerobic, and anaerobic tests than BF% or fat mass. These results can assist in developing tools to identify Marines with enhanced physiological and musculoskeletal readiness. Supported by ONR Award #N00014-14-1-0021
Preliminary evidence suggests that electrodermal activity (EDA) is a prospective surrogate marker of sympathetic nervous system (SNS) activity during exercise. However, the validity of EDA in the context of aerobic exercise must be established before its translational potential can be realized. PURPOSE: To evaluate the validity of EDA as a measure of SNS activity during exercise and the moderating effects of aerobic fitness utilizing absolute (AW) and relative (RW) workloads. METHODS: Forty healthy, U.S. Navy active duty males (age: 36.2±6.9 yrs) completed a graded exercise test to assess maximal oxygen consumption (VO2max). EDA was recorded at baseline, during exercise, and seated recovery. Relative changes were compared with baseline. A median split established the high-fit (AW: n=11, VO2max: 48.9±1.9; RW: n=20, VO2max: 50.5±4.3) and low-fit groups (AW: n=13, VO2max: 43.6±2.1; RW: n=20, VO2max: 41.1±2.7). A 2 (group) x 6 (stage) repeated measures ANOVA evaluated EDA changes across stages of exercise, as well as between fitness levels. To evaluate validity, EDA responses of high-fit and low-fit men measured by AW and RW were then compared to the established literature characterizing plasma catecholamine responses during exercise. RESULTS: Mean percent changes from baseline for AW were +71.1 to +107.4% from stages 1–4, with a decrease in seated recovery (+88.3%) (p<0.001, ηp2=0.38), and for RW were +78.1 to +120.3% from 25% to 100% VO2max, with a decline in seated recovery (+105.5%) (p<0.001, ηp2=0.24). A significant interaction between fitness and workload was observed for RW (p=0.003, ηp2=0.11). Specifically, high-fit showed a linear increase in EDA from 25 to 100% VO2max with a steady decrease into seated recovery. By contrast, low-fit maximal EDA response occurred at 75% VO2max followed by a blunted decline in seated recovery. This interaction did not prevail using AW (p=0.05). CONCLUSION: Similar dose dependent increases in EDA were observed utilizing AW and RW, although RW alone captured a rise in high-fit EDA above low-fit at maximal exertion. The noted differences between high-fit and low-fit men measured by AW and RW emulate the established literature characterizing plasma catecholamine responses during exercise. These findings imply that EDA is a potentially valid proxy of SNS activity during exercise.

CONCLUSION:

This interaction did not prevail using AW (p>0.05).

CONCLUSION: Similar dose dependent increases in EDA were observed utilizing AW and RW, although RW alone captured a rise in high-fit EDA above low-fit at maximal exertion. The noted differences between high-fit and low-fit men measured by AW and RW emulate the established literature characterizing plasma catecholamine responses during exercise. These findings imply that EDA is a potentially valid proxy of SNS activity during exercise.

The Royal Air Force Regiment (RAF Regt) delivers the ground close combat role for the RAF, protecting airfield assets and personnel. There is a requirement for a Physical Employment Standard for the RAF Regt and identifying the critical tasks is the essential first step in this process. PURPOSE: To identify the critical tasks of the RAF Regt including the method of best practice (MOBP) and minimum acceptable standard (MAS) for undertaking these tasks. METHOD: Task Analysis Questionnaires (TAQ), were sent to 13% (n=530) of the RAF Regt. SME focus groups were conducted to describe the critical tasks in a realistic scenario and identify a MOBP and MAS. A Military Judgement Panel (MJP) was asked to review the proposed critical tasks. The authorised critical tasks were presented to a further focus group of SME to finalise the scenario for each task, the MOBP and MAS. RESULTS: 279 TAQ were returned providing 1849 task descriptions, allocated to 22 generic task categories. SME identified the most physically demanding critical tasks, which were presented to the MJP for endorsement. A final SME focus group provided the following description, including a MOBP and MAS, for each endorsed task as follows:

- Tactical Advance to Battle: Carrying total weight 47.1 kg, walk over mixed terrain for 16 km at 2-4 km/h, moving tactically including pausing to make observations and taking regular navigation checks.
- Point of Entry: climb over/through 1.2 m wall/window unaided.
- React to Effective Enemy Fire: assault and withdraw, conduct fire and movement over 200 m in 5-10 m bounds, zig-zag movement.
- Casualty Evacuation (CASEVAC) - One person drag under fire: sprint to casualty 15 m away then drag casualty (total weight 116.5 kg), for 15 m to a point of cover.
- CASEVAC - Fireman’s carry: after removing casualty’s daysack, lift with assistance a casualty weighing 107.9 kg, then fireman carry 100 m out of immediate danger area.
- CASEVAC by stretcher: in a team of 4, carry a casualty (total weight 107.9 kg) on a stretcher over difficult terrain for 1 km.
- Construct a defensive position: as part of a section, for 6 h period construct a sangar on the second floor of a building, including fill, lift and carry sandbags.

CONCLUSION: The critical tasks of the RAF Regt have been established. The MOBP and MAS are currently being established for these tasks.
Table 1 - RM tasks with survey data [data presented as mode (range)]

<table>
<thead>
<tr>
<th>TASK DESCRIPTION</th>
<th>COMPLETED THE TASK? (%)</th>
<th>IMPORTANCE (1-6)</th>
<th>PHYSICAL DEMAND (1-6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battle Preparation – Moving Stores and Equipment</td>
<td>89</td>
<td>6 (5)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Establish a Company Defensive Position</td>
<td>89</td>
<td>5 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Reconnaissance Patrol from a Harbour Area / Defensive Location</td>
<td>100</td>
<td>6 (2)</td>
<td>4 (6)</td>
</tr>
<tr>
<td>Establish an Observation Point (OP) Screen</td>
<td>81</td>
<td>6 (5)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>Company Attack</td>
<td>96</td>
<td>6 (4)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>Casualty Drag from Point of Wounding to Point of Cover</td>
<td>91</td>
<td>6 (3)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Casualty Evacuation – Fireman’s Carry</td>
<td>97</td>
<td>6 (4)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Casualty Evacuation by Light Weight Stretcher</td>
<td>95</td>
<td>6 (3)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Movement Through Ship With Load</td>
<td>79</td>
<td>5 (5)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Amphibious Transit by Small Craft</td>
<td>83</td>
<td>6 (5)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Re-emark an Offshore Raiding Craft from the beach</td>
<td>97</td>
<td>6 (5)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Vertical Assault</td>
<td>95</td>
<td>6 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Ski March</td>
<td>37</td>
<td>5 (5)</td>
<td>5 (4)</td>
</tr>
<tr>
<td>Snow Shoe March</td>
<td>34</td>
<td>5 (5)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Ski-joring (on skis, pulled by vehicle)</td>
<td>30</td>
<td>5 (5)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Long Distance Insertion March</td>
<td>98</td>
<td>6 (5)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Boarding Operations – Surface to Vessel</td>
<td>41</td>
<td>5 (5)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Boarding Operations – HELO to Vessel</td>
<td>42</td>
<td>5 (5)</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Barrel Change in a Jackal</td>
<td>30</td>
<td>6 (5)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Lift HMG on to Viking/ Jackal</td>
<td>37</td>
<td>5 (5)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>River crossing</td>
<td>98</td>
<td>5 (5)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Ice Breaking</td>
<td>33</td>
<td>5 (5)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Urban Operations</td>
<td>98</td>
<td>6 (5)</td>
<td>4 (5)</td>
</tr>
</tbody>
</table>

Conclusion: The essential physically demanding tasks identified in this study can be used to select those most critical to the RM role, and underpin the development of future relevant role-related PES.

Physical employment tests often create job-related tasks. The implementation of such tests can be constrained by cost, ease, and simplicity, which may unintentionally create a sex bias. **PURPOSE:** To investigate potential sex bias in prototype UK Royal Navy (RN) physical employment tests. **METHODS:** One hundred and fifty RN personnel volunteered (men n=75, women n=75). Physical characteristics, mean ± SD were (men vs. women): age 32 ± 8 vs. 29 ± 6 years; stature 1.77 ± 0.06 vs. 1.65 ± 0.09 m; body mass 81.0 ± 10.7 vs. 67.5 ± 9.8 kg. Five tests were developed with cylindrical, sand-filled Powerbags that simulated manual handling tasks performed onboard RN warships. Tests included two variants of an Aft Casualty Carry (35.0 kg and 41.5 kg, 10 m), Fore Casualty Carry (27.0 kg, 10 m), Foam Drum Carry (2 × 21.6 kg, 60 m), and Damage Control Timber Carry (28.4 kg, 50 m). Loads and distances were derived from equipment, infrastructure, Subject Matter Expert opinion, and anthropometric norms. Tests were performed as quickly as possible. A sub-sample of women (n=19) also performed a modified Aft Casualty Carry test using a Barbell (circumference 0.08 m) instead of a Powerbag (circumference 0.91 m). Cut-scores were developed for all tests. **RESULTS:** All men (100%) passed all tests. Compared to men the pass rates of women were above 80% in three tests (Fore Casualty Carry (88%), Foam Drum Carry (92%), Damage Control Timber Carry (89%)), but lower than 80% in both Aft Casualty Carry tests (29% 35.0 kg test; 8% 41.5 kg test). The lifting phase accounted for the majority of Aft Casualty Carry failures (49% 35.0 kg test; 47% 41.5 kg test). Within the sub-sample (n=19), 80% of women successfully lifted the Barbell Aft Casualty Carry loads, but markedly less lifted the same loads in the Powerbag version of the test (58 % and 32 % in the 35.0 kg and 41.5 kg tests, respectively). **CONCLUSIONS:** The larger circumferential girth of the Powerbag in the Aft Casualty Carry test was not representative of the anthropometric dimensions of a casualty, and appeared to create a sex bias against women. This highlights the potential risk of sex bias of physical employment test implementation considerations are prioritised above the faithful replication of simulated job-based tasks.

The full integration of women into combat arms & relatively limited force structure demands every Soldier be a premium physical performer. **PURPOSE:** Investigate the role of fitness & gender integration of unit Soldier Performance Index (SPI) scores of a “mock” Airborne unit. **METHODS:** 71 subjects; 69 Airborne men: 26 officers (Rock LT), 43 soldiers (Rock S), 2 selected U.S. Service Academy female cadets (FC); tested on the SPI: Strength: Cadence Pull-ups (CPU); 155-lb Bench Press (155BP); Muscular Endurance: 65-lb BP (65BP); 45-lb Dumbbell Squat (45SQ); Endurance/Mobility: 2 Mile Run (2MR); 300-Meter Forward/Backward Run (300M). **RESULTS:** Using SPI as true indicator of robust fitness profile, group affiliations & mean performances revealed HOS as highest physical performance. No significance was found between 3 groups (HOS, HBF, 72F), LOS group was significantly lower (p = .001) versus all 3 former groups. **DISCUSSION:** Universal indicators of fitness, (i.e. SPI) are more critical to predicting performance in ground combat units than gender as a single variable. SPI indicated 2 FC were 19.1% higher than 9 LOS, however related to strength (155BP), the fit FC had 2 reps compared to mean of 5.2 reps for LOS. APFT, devoid of a strength measure, indicates FC to be 29.4% greater than LOS. **CONCLUSIONS:** In physical performance of ground combat units, SPI is more illuminative than either gender or current APFT. Integration of Airborne units should be based on an index similar to the SPI; minimally, the index should include valid measures of endurance, mobility & perhaps most importantly a strength metric.
also completed the SL and JCC RMTs and a 2.4 km run to an individual best effort. Session 2: Participants completed a 12.8 km LM carrying 25 kg (6.4 km paced in 60 min and 6.4 km individual best effort). Participants wore a heart rate monitor during all physical tests. Differences between genders were compared using independent sample t-tests. Data are presented as the mean ± SD and significance set at p < 0.05. Results: Compared to female participants, male participants had faster 2.4 km run times (p < 0.01), greater body mass (p < 0.01), greater total lean body mass (p < 0.01), higher SL scores (p < 0.01) and achieved greater ICC distances (p < 0.01) and faster LM times (p < 0.01). All male participants and 13% of female participants achieved the Infantry standard across all three RMTs. A greater proportion of male compared to female participants achieved the Infantry RMT standards for the SL (97 vs 15%), Carry (99 vs. 58%) and LM (100 vs. 83%). Conclusion: Male personnel had higher RMT performance scores than females, however some women outperformed the men. The greatest gender differences detecting Infantry RMT pass standards was for the SL. Therefore, future physical training programs to support female personnel to meet Infantry RMT standards should focus on developing muscle strength.

378 Board #199 May 31 9:30 AM - 11:00 AM
Sex Differences in Training Load During British Army Phase One Training
Stephen J. McGuire, Samantha C. Saunders, Thomas J. O’Leary, Rachel M. Izard. HQ Army Recruiting and Training Division, Ministry of Defence, UK. Uttarpon, United Kingdom. Email: ARTD-OccMed-RA2@mod.uk (No relationships reported)

The initial weeks of British Army Phase One training are characterised by unaccustomed exercise and rapid increases in training load. Quantifying training load can aid in managing fatigue and minimising the risk of developing illness and injury whilst maximising training adaptation. Women are at increased risk of musculoskeletal injury during British Army Phase One training compared to men, however the differences in absolute external and relative internal training loads between sexes during the first few weeks of training is unknown. PURPOSE: Quantify the sex differences in external (distance and speed) and internal (ratings of perceived exertion [RPE] and heart rate [HR]) training loads during the first two weeks of British Army Phase One training. METHOD: Following completion of an initial medical assessment, 26 female (21 ± 4 yrs, 61.8 ± 8.4 kg, 1.64 ± 0.05 m, 12:29 ± 1:01 min 1.5 mile run time) and 24 male recruits (22 ± 4 yrs, 77.6 ± 9.7 kg, 1.78 ± 0.08 m, 10:30 ± 1:03 min 1.5 mile run time) were fitted with a combined HR and GPS device (Polar Team Pro, Polar Electro Oy, Finland) and monitored during waking hours (06:00 – 22:00 hrs) for the first 10 days of training. Daily self-reported RPE, muscle soreness and fatigue (all 0-10) were recorded. Independent samples t-tests were conducted to examine sex differences. RESULTS: Male recruits covered significantly more distance per day than female recruits (13.31 ± 0.83 km vs. 10.85 ± 0.70 km, P < 0.001) and at a greater mean speed (0.88 ± 0.05 km·h⁻¹ vs. 0.74 ± 0.03 km·h⁻¹, P< 0.001). Mean % HR reserve (%HRr) and RPE were not significantly different between men and women (4%HRr: men 31 ± 3 vs. women 32 ± 4; RPE: men 4 ± 1 vs. women 4 ± 1). However, female recruits reported significantly greater physical fatigue (men: 4 ± 1; women: 6 ± 2, P < 0.001) and muscle soreness (men: 4 ± 1; women: 5 ± 2, P < 0.05). CONCLUSION: Despite a lower absolute external training load and similar internal training loads, women reported greater fatigue and muscle soreness, which could be linked to a higher injury risk. Future work should examine the links between fatigue and muscle soreness with injury risk during the first few weeks of initial military training.

This research has been sponsored by the UK MOD (Army).

379 Board #200 May 31 9:30 AM - 11:00 AM
Diurnal Pattern of Salivary C-Reactive Protein and Associations with Biobehavioral Correlates in Military Men
Lisa M. Hernández, Marcus K. Taylor, FACSM. Naval Health Research Center, San Diego, CA. (Sponsor: Marcus K. Taylor, FACSM) Email: lisa.m.hernandez75.ctt@gmail.com (No relationships reported)

C-reactive protein (CRP), a systemic inflammatory biomarker, is positively associated with the development of disease and inversely correlated with regular physical activity. CRP has been previously reported to have a diurnal rhythm with higher levels upon awakening and lower levels thereafter. PURPOSE: To characterize the pattern of salivary CRP and evaluate associations with sedentary and active behaviors in U.S. Navy men. METHODS: Healthy, active duty men (n = 17; mean ± SD age = 36.1 ± 6.0 yr) self-collected samples in a free-living setting using oral swabs in consecutive workdays at Wake, Wake + 30 min and Wake + 60 min, +1600, 2100 for a total of 10 samples. Following our prior published study, CRP variables and summary parameters were computed. Stability across both days was evaluated via Pearson product-moment correlational analyses. Stable measures were then correlated to self-reported percent time (%time) spent sedentary, or active, in a typical workday for the previous week. Three non-responders, defined as having an absolute change from screening to final measures (AR) > 0, were excluded from analyses. RESULTS: Stability was high between both days at all time points (r-value range = .75–.92, all p < .001). CRP was highest at Wake, decreased on average by 42.8 ± 5.7% at Wake + 30, and then plateaued for the rest of the day. The stabilities of Wake mean (r = .89, p < .001) and AR (Wake + 30 - Wake), a measure of CRP pattern (r = .48, p = .053), were determined. Reduced salivary CRP at Wake mean (6 ± 9 pg/mL) and 1600 LT times (p < 0.01). All male participants and 13% of female participants achieved the Infantry standard across all three RMTs. A greater proportion of male compared to female participants achieved the Infantry RMT standards for the SL (97 vs 15%), Carry (99 vs. 58%) and LM (100 vs. 83%). Conclusion: Male personnel had higher RMT performance scores than females, however some women outperformed the men. The greatest gender differences detecting Infantry RMT pass standards was for the SL. Therefore, future physical training programs to support female personnel to meet Infantry RMT standards should focus on developing muscle strength.

380 Board #201 May 31 9:30 AM - 11:00 AM
The “Yin and Yang” of the Adrenal and Gonadal Systems in Elite Military Men
Marcus K. Taylor1, Lisa M. Hernández2, Shiloah A. Kvintkovsky3, Matthew R. Schoenherr4, Michael S. Stone1, Paul Sargents1. Naval Health Research Center, San Diego, CA. 1Purdue University, San Diego, CA. 2Naval Special Warfare Center, San Diego, CA. Email: marcus.k.taylor2.civ@mail.mil (No relationships reported)

We recently established daily, free-living profiles of the adrenal hormone cortisol (Cort), the (primarily adrenal) anabolic precursor dehydroepiandrosterone (DHEA), and the (primarily gonadal) anabolic hormone testosterone (Testo) in elite military men. A prevailing view is that adrenal and gonadal systems reciprocally modulate each other; however, recent paradigm shifts prompted the characterization of these systems as parallel, cooperative processes (i.e., the “positive coupling” hypothesis). PURPOSE: To test the positive coupling hypothesis in elite military men by evaluating associations between adrenal and gonadal biomarkers across the day. METHODS: Fifty-seven healthy, active duty men (mean ± SE age = 33.4 ± 1.0 yr) self-collected salivary hormone samples in a nondeployed, free-living setting on two consecutive midweek workdays upon waking, +30 min, +60 min, 1600, and 2100 (10 samples total). Hypotheses were tested using correlational and linear regression models. RESULTS: DHEA was positively coupled with Cort (r range: 0.28 - 0.30, all p < 0.05) as was Testo (r range: 0.43 - 0.59, all p < 0.01). Anabolic processes (i.e., DHEA, Testo) were also positively and reliably coupled across the day (r range: 0.31 - 0.39, all p < 0.05). In multivariate models, DHEA and Cort combined to account for 27 - 43% variance in Testo across the day, which was driven primarily by DHEA. DHEA and Testo modestly and less robustly predicted Cort concentrations; this was confined to the morning (area under the curve, ground F1(3,51) = 2.9, p = 0.05). CONCLUSION: To our knowledge, this is an unprecedented test of the positive coupling hypothesis in elite military men, a group at an elevated risk for chronic stress exposure. This study showed that adrenal and gonadal systems were positively coupled. Altogether, top-down co-activation of adrenal and gonadal hormone secretion may complement bottom-up counter-regulatory functions to foster anabolic balance and neuronal survival; hence, the “yin and yang” of adrenal and gonadal systems. This may be an adaptive process that is amplified by stress, competition, and/or dominance hierarchy.
either 1000 IU vitamin D₃ (n=73) or placebo (n=76) for 12-weeks. At baseline, weeks 4, 8 and 12 (post-training) subjects provided saliva samples (passive drool) to determine secretory immunoglobulin A secretion rates (SlgA-SR) by indirect ELISA. The incidence of URTIs was assessed by administering a survey at weeks 4, 8 and 12. Serum vitamin D status (25(OH)D) was measured by radioimmunoassay. Longitudinal linear models were created using a simple-effects model to estimate symptoms. To determine whether supplementation altered SlgA-SR during training, a two-way repeated measures ANOVA was used. RESULTS: The proportion of recruits reporting URTI symptoms at any time during training was 72%. Baseline SlgA-SR were similar between placebo (65.4 ± 52.0 µg·min⁻¹) and vitamin D groups (51.9 ± 41.9 µg·min⁻¹). The relative changes in SlgA-SR were significantly greater with vitamin D supplementation at weeks 4 (Δ ± 29.8%) and 8 (Δ ± 31.0%) compared to placebo at the same time points (week 4, Δ ± 2.6 ± 22.9% and week 8, Δ ± 1.3 ± 22.9%), p < 0.001. Baseline 25(OH)D was significantly lower during winter (59.2 ± 22.5 nmol·L⁻¹) compared to summer (80.4 ± 21.0 nmol·L⁻¹), p < 0.001. When accounting for treatment, season and sex, there was no association between 25(OH)D and reported URTIs. CONCLUSION: We report that a high proportion of Marine Corps recruits experience URTIs during 12-weeks of basic military training, and although daily vitamin D supplementation led to a modest increase in SlgA-SR, this did not result in a reduction in the incidence of reported URTIs. Supported by the Defense Health Program. The views expressed are those of the authors and do not reflect the official position of the Uniformed Services University, United States Army, or United States Department of Defense.

A-50 Free Communication/Poster - Muscle and Mitochondria
Wednesday, May 31, 2017, 7:30 AM - 12:30 PM
Room: Hall F

382 Board #203 May 31 11:00 AM - 12:30 PM
Alterations of Mitochondrial Dynamics Proteins in Primary Human Myotubes Following Roux-en-Y Gastric Bypass Surgery
Kai Zou¹, J. Matthew Hinkley², Sanghee Park², Donghai Zheng², G. Lynis Dohm², Joseph A. Hounard, FACSM². ¹University of Massachusetts Boston, Boston, MA; ²East Carolina University, Greenville, NC.
Email: kaizou1@gmail.com

Mitochondrial dynamics including mitochrondrial fission (e.g., Dynamin-related protein 1 (Drp1) and Fission 1 (Fis1)) and fusion (e.g., Mitofusin 2) regulates mitochondrial homeostasis. Defects in mitochondrial dynamics are suggested to contribute to skeletal muscle mitochondrial dysfunction and insulin resistance associated with obesity and Type 2 Diabetes. Roux-en-Y gastric bypass (RYGB) surgery markedly improves metabolic health as indicated by enhanced substrate oxidation and insulin action in skeletal muscle. However, the underlying cellular mechanisms responsible for these improvements are not clear and could possibly be due to the improvement of mitochondrial dynamics. PURPOSE: The purpose of this study was to determine whether RYGB surgery improves mitochondria dynamics proteins in primary human myotubes derived from severely obese humans. METHODS: Primary human skeletal muscle cells were isolated from muscle biopsies obtained from six lean subjects (BMI = 23.4 ± 0.6 kg/m²) and six RYGB patients prior to, 1-month and 7-months after surgery (BMI = 50.2 ± 2.0, 43.2 ± 2.8 and 35.7 ± 2.2 kg/m², respectively) and were differentiated to myotubes. On day 7 of differentiation, myotubes were harvested for mRNA. The amount of mitochondrial DNA (mtDNA) copy number was also quantified by qRT-PCR. RESULTS: Before surgery, Drp1 Ser616 phosphorylation and Fis1 protein expression were significantly higher in primary myotubes derived from severely obese patients when compared to lean controls (41% and 26%, respectively, p <0.05), and not statistically different from lean controls. However, MFN2 protein expression did not change in primary myotubes derived from severely obese patients at any timepoint post-surgery in comparison to pre-surgery. CONCLUSION: These data suggest that RYGB surgery reduces obesity-induced rise in mitochondrial fission, but not fusion, protein expression in primary human myotubes derived from severely obese humans.

383 Board #204 May 31 11:00 AM - 12:30 PM
Osteocalcin Does Not Increase Insulin Sensitivity or Mitochondrial Biogenesis in Palmitate Treated C2C12 Myotubes
Hailey A. Parry, Roger A. Vaughan, Kyle L. Sunderland. High Point University, High Point, NC.
Email: parryh13@emailhighpoint.edu

(Purpose) Osteocalcin (OC) is a bone matrix protein that has been shown to regulate systemic glucose homeostasis and increase mitochondrial mass in mice fed a high-fat diet, however the mechanisms by which OC stimulates metabolic adaptations in lipid overloaded muscle remain underexplored. This study examined the effects of OC on regulators of insulin signaling, glucose handling, and mitochondrial biogenesis in vitro using palmitate treated C2C12 myotubes. METHODS: C2C12 myotubes were treated with control media, or media containing undercarboxylated OC (100ng/ml) both with and without 2mM palmitate-BSA conjugate (PA+OC and PA, respectively) for 24 hours. Insulin signaling (IRS-1, pIRS-1, Akt, pAkt, and PTP1B), glucose handling (GLUT4 and AS160) and mitochondrial biogenesis (PGC-1α and Citrate Synthase) were measured via western blot. One-way ANOVAs with Tukey’s post-hoc tests performed to determine between treatment differences. RESULTS: IRS phosphorylation and PTP1B protein content remained unchanged. Surprisingly, phosphorylation of Akt significantly increased (52± 33%) with PA+OC compared to OC. Additionally, GLUT4 content decreased significantly in all treatments (≥50%) compared to control with no differences between the treatments. PGC-1α content was significantly elevated (130% ± 158%) following PA+OC compared to OC. No changes in PGC-1α or Citrate Synthase protein content were observed. CONCLUSIONS: Overall, treatment with OC was unable to improve markers of insulin signaling and mitochondrial biogenesis in palmitate-treated C2C12 myotubes. Moreover, GLUT4 content and possibly translocation may be negatively affected by OC treatment in PA-treated cells.

384 Board #205 May 31 11:00 AM - 12:30 PM
MKP-5 Establishes Skeletal Muscle Metabolic Quiescence by Negatively Regulating MAPK-dependent Mitochondrial Function
Kisuk Min, Anton M. Bennett. Yale University, New Haven, CT.
Email: Kisuk.Min@yale.edu

(Purpose) The mitogen-activated protein kinases (MAPKs) represent a central signaling pathway in the regulation of skeletal muscle function. It is also known that MAPKs are required to promote mitochondrial biogenesis in skeletal muscle. Mitochondrial dysfunction underlies numerous diseases including those of skeletal muscle. The MAPKs are negatively regulated by MAPK phosphatases (MKPs). We have demonstrated that MKP-5 regulates regenerative myogenesis and rescues muscle degeneration by inactivating and dephosphorylating both p38 MAPK and JNK. However, the physiological and molecular roles of MKP-5 in regenerative myogenesis and progression of skeletal muscle degeneration have remained unclear. We tested the central hypothesis that MKP-5 regulates mitochondrial function and thus contributes to enhanced myogenesis and regeneration in mice lacking MKP-5. METHODS: To test our hypothesis, we induced skeletal muscle damage by cardiotomy (CTX) injection into both mkp-5 knockout and mkp-5+/+ mice. Mitochondrial respiratory function in permeabilized muscle fibers was assessed in regenerating skeletal muscles from mkp-5−/− and mkp-5+/+ mice. Mitochondrial biogenesis was determined by quantitative PCR for mRNA. The amount of mitochondrial DNA (mtDNA) copy number was also quantified by qRT-PCR. RESULTS: Our data show that MKP-5-deficient mice exhibited 49% enhanced ADP-stimulated mitochondrial respiratory function in regenerative skeletal muscle compared with mkp-5−/− mice (P<0.05). Furthermore, expression of genes associated with mitochondrial biogenesis such as PGC1α, NRF-1, Tfam, and subunits of complex I were significantly increased in regenerating skeletal muscles of animals lacking MKP-5. The amount of mitochondrial DNA copy number was also significantly increased in mkp-5−/− mice, compared with mkp-5+/+ mice (P<0.001).

Conclusions: Collectively, these results demonstrate that MKP-5 negatively regulates mitochondrial function and biogenesis in skeletal muscle during myogenesis and regeneration.

Abstracts were prepared by the authors and printed as submitted.
Endurance exercise studies involving animals typically measure muscle mitochondria content to verify intensity of training. Most use one of the three calf ankle extensor muscles, which vary in fiber type. The soleus is all slow twitch fibers (SO) while the plantaris and gastrocnemius are a mixture of fast twitch glycolytic (FG) and fast oxidative glycolytic (FOG) fibers.

**PURPOSE:** To compare mitochondria content changes in the soleus, plantaris, and gastrocnemius in response to a widely used moderate intensity exercise program. **METHODS:** Male, 8-9-month-old, Sprague-Dawley rats were divided into two groups: sedentary (S) and exercised (E) on a treadmill 5 d/ wk for 6 wk. Exercise duration and intensity were progressively increased to 1 h at 30 m/min up to a 10.5% inclination (75-80% VO2 max). Whole muscles plus specific FG and FOG regions of gastrocnemius were homogenized (9-10 for each muscle or fiber type) and cytochrome c oxidase activity, a marker of mitochondria content, was determined using a Clark-type oxygen electrode.

**RESULTS:** Significantly increased oxygen consumption in intact canine myoblasts and myotubes. Chronic FSTL1 treatments (250 ng/ml, 64 hours) significantly increased mitochondrial respiration in canine myoblasts. Acute FSTL1 treatment (up to 500 ng/ml) had no significant effect on mitochondria content changes in the soleus, plantaris, and gastrocnemius in response to a widely used moderate intensity exercise program.

**CONCLUSIONS:** Adipose tissue is known to be a key organ for energy homeostasis during exercise and physical activity. The present study is the first to investigate the influence of exercise on the expression of myokines and their receptors in adipose tissue. These results suggest a potential role for FSTL1 in modulating the response of adipose tissue to exercise, which may have implications for energy metabolism and exercise performance.
the recorded EEE. EB was calculated by subtracting EE from TEE. EA was calculated as follows: EI - EE/ fat free body mass. RESULTS: Mean daily EI was 2946 ± 358 kcaL (64 ± 6 kcal/kgBM/d). Mean daily EEE was 3006 ± 1030 kcal (62 ± 13 kcal/ kgBM/day). This resulted in a total energy deficit of 9609 kcal with a mean daily energy deficit of 1922 ± 952 kcal/day. Mean EA was -0.97 ± 15.4 kcal/kgBFM/d.

The participant did not report any subjective feelings of hunger at any point during the event. CONCLUSIONS: The athlete was unable to consume enough food/fluid to meet estimated energy requirements during all five days of the SSUM, resulting in sub optimal EA and EB throughout the event. Relying on subjective perception of hunger to modulate energy intake is not an effective strategy during a SSUM. Athletes competing in a SSUM are likely to benefit from a strategic diet plan to minimise daily energy deficit and maximise performance.

389 Board #210 May 31 11:00 AM - 12:30 PM Nutrition Education Improves Nutrition Knowledge, Not Dietary Habits In Female Collegiate Distance Runners
Marissa Bongers, Bryce M. Abbey, Kate A. Heelan, FACSM, Janet E. Steele, Gregory A. Brown, FACSM, the University of Nebraska Kearney, Kearney, NE. (Sponsor: Gregory A. Brown, FACSM)

(No relationships reported)

BACKGROUND: In order to meet the physical demands of training for and competing in sports, athletes need to fuel their body adequately on a daily basis. Previous research, however, has indicated that the dietary habits of athletes are often insufficient regarding total energy and carbohydrate intake. Furthermore, athletes often do not know what or how much food they should eat in order to meet the nutritional demands of their sport. PURPOSE: The purpose of this study was to assess the effect that nutrition education focusing on total energy, carbohydrate, fat, and protein requirements has on the nutrition knowledge and dietary intake of female collegiate distance runners. METHODS: Eleven female collegiate Division II cross-country runners (age: 19.4 ± 1.1 years, mass: 56.65 ± 4.9 kg, height: 163.50 ± 5.22 cm) completed a nutrition knowledge for athletes survey consisting of 10 background information questions and 76 true/false statements and recorded a 3-day diet record prior to the start of the intervention. Participants were then presented with four 1-hour nutrition education sessions covering energy balance, carbohydrates, proteins, fats, and hydration. After the nutrition education intervention, participants completed the same nutrition knowledge survey and 3-day diet record. RESULTS: The nutrition education sessions increased (P<0.05) the participants' correct answers on the nutrition knowledge survey regarding dietary carbohydrate (45.5 ± 24.5% vs. 68.2 ± 29.8%), fat (57.6 ± 21.6% vs. 72.7 ± 20.1%) and protein (76.6 ± 9.6% vs. 93.5 ± 9.8%) intake (for pre vs. post, respectively). Although the participants were not meeting recommendations regarding total energy and carbohydrate intake before the nutrition education sessions, there were no changes in dietary composition following the nutrition education sessions. CONCLUSION: The present data are in agreement with previous findings indicating that enhanced nutrition knowledge does not translate to enhanced dietary practices, even when improved dietary practices could result in improved sports performance.

390 Board #211 May 31 11:00 AM - 12:30 PM In Race Nutritional Strategies Comparing Ironman Wisconsin Athletes to Ironman World Championship Athletes
Stephanie Harpenau, Elaina Biechler, Lauren Sutton. Loras College, Dubuque, IA. (Sponsor: Vincent Paolone, FACSM)

Email: stephanie.harpenau@loras.org

(No relationships reported)

PURPOSE: The purpose of the current investigation was to compare the nutritional plans of Ironman Wisconsin athletes to elite Ironman World Championship athletes and to determine if differences exist between the two groups.

METHODS: Athletes competing in Ironman triathlons were surveyed at Ironman Wisconsin (N=73) and the Ironman World Championships (N=79) to determine their in-race nutrition plans. Unpaired t-tests were run to examine the differences in overall finish time, calories consumed per hour on the bike, fluid consumed while biking, and caffeine consumption during the biking portion of the race.

RESULTS: Athletes participating at the Ironman World Championships consumed significantly more (p < .01) calories per hour on the bike compared to Wisconsin Ironman athletes (299.9 kcal/ ± 126.6; 239.5 kcal/ ± 130.5, respectively). Ironman World Championships athletes consumed significantly more (p < .01) fluid on the bike compared to Wisconsin Ironman athletes (3827 mLs/ ± 1693; 3327 mLs/ ± 1874, respectively). Ironman World Championships athletes consumed significantly more (p < .01) caffeine while biking in comparison to Ironman Wisconsin athletes (110.7 mg ± / - 172; 65.9 mg ± / 100.8, respectively).

CONCLUSIONS: Ironman World Championships athletes consumed higher amounts of calories per hour, fluid, and caffeine during the bike in comparison to the Ironman Wisconsin athletes. This suggests that elite Ironman athletes consume more calories, caffeine, and fluids during their races when compared to average Ironman athletes, and hence increased calorie and caffeine consumption may contribute to faster performances for the elite athletes.

391 Board #212 May 31 11:00 AM - 12:30 PM Vitamin D Awareness and Intake in Collegiate Athletes
John S. Fitzgerald¹, Bennett A. Leitch¹, Patrick B. Wilson², Tanis J. Walch¹, Sandra E. Short¹, Kelsey Uhrholz³, James N. Roemmich, FACSM.¹ ¹University of North Dakota, Grand Forks, ND. ²Old Dominion University, Norfolk, VA. ³Grand Forks Human Nutrition Research Center, USDA, Grand Forks, ND. (Sponsor: James Roemmich, FACSM)

Email: John.s.fitzgerald@und.edu

(No relationships reported)

Approximately 56% of athletes worldwide are vitamin D deficient which may negatively influence health and physical performance. Lack of knowledge about the importance of vitamin D may be contributing to the high prevalence of deficiency.

PURPOSE: To assess vitamin D awareness in NCAA athletes and examine its association with total dietary vitamin D intake. METHODS: 52 women (mean ± SD: age = 20.0 ± 1.5 yr, 4 cross country, 4 golf, 8 hockey, 1 soccer, 6 softball, 8 swim and dive, 6 track and field, 2 tennis) and 29 men (age = 22.1 ± 1.9 yr, 4 baseball, 3 cross country, 9 football, 1 swim and dive, 7 track and field, 5 tennis) competing at the University of North Dakota completed an online survey between November 1, 2015 and January 30, 2016. Vitamin D awareness was assessed using five vitamin D-specific questions related to the following: 1) familiarity with vitamin D; 2) concern about levels; 3) risk of deficiency; 4) importance for health; and 5) importance for physical performance. Responses were scored using a 5-point Likert Scale. Total dietary vitamin D intake was assessed using the vitamin D-specific Diet and Lifestyle Questionnaire. Spearman’s rank correlation coefficients were used to evaluate the association between Likert scores for each awareness question and total dietary vitamin D intake. RESULTS: Overall, 21% of athletes reported “rarely” hearing anything about vitamin D. The majority of athletes responded that vitamin D “probably” or “definitely” will play a role in their health (88.9%) and physical performance (71.6%). However, only 23.4% and 28.4% of athletes reported concern for their vitamin D levels or believed they were at risk for deficiency, respectively. The RDA for vitamin D was met by 30% of women and 62% of men. Familiarity with vitamin D in women (r = 0.33, p = 0.02) and concern about vitamin D levels in men (r = 0.45, p = 0.02) were positively associated with total dietary vitamin D intake. CONCLUSIONS: The majority of collegiate athletes believed vitamin D plays a role in their health and physical performance; however, most expressed low concern for their vitamin D levels. Increased familiarity with vitamin D and concern for vitamin D levels were associated with increased total intake of vitamin D, and thus, interventions addressing these factors could reduce the prevalence of vitamin D deficiency in athletes.

392 Board #213 May 31 11:00 AM - 12:30 PM Food Servings Habitually Ingested By Mexican Varsity Athletes Depending On The Type Of Sport

(No relationships reported)

Several studies have reported the macronutrient intake in different types of sports, however, the type and amount of food that is needed for achieve these quantities is not commonly reported.

PURPOSE: To describe the habitual amount of food servings ingested in varsity athletes depending on the type of sport performed.

METHODS: 365 varsity athletes were polled. They were asked about their habitual amount of food servings ingested in varsity athletics. The participant did not report any subjective feelings of hunger at any point during the event. CONCLUSIONS: The majority of collegiate athletes believed vitamin D plays a role in their health and physical performance; however, most expressed low concern for their vitamin D levels. Increased familiarity with vitamin D and concern for vitamin D levels were associated with increased total intake of vitamin D, and thus, interventions addressing these factors could reduce the prevalence of vitamin D deficiency in athletes.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: In our population, the amount of food servings commonly ingested by varsity athletes were very similar between these two types of sport classification. These data could help as a reference for comparing the habitual amount of food servings’ ingested (25th to 75th centile) in different types of sports.

Table 1. Amount of food servings ingested per type of sport.

<table>
<thead>
<tr>
<th>Food group</th>
<th>Quartile</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25th</td>
<td>50th</td>
<td>75th</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team</td>
<td>Individual</td>
<td>Team</td>
<td>Individual</td>
<td>Team</td>
</tr>
<tr>
<td>Cereals</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>ASF</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Fats</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Fruits</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Dairy</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Veggies</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sugars</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Seeds</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

There is huge evidence regarding the macronutrient intake in athletes, however there is little research about the food groups and amount of food servings ingested by athletes.

PURPOSE: To describe the habitual amount of food servings by food group ingested in male and female varsity athletes.

METHODS: 365 (206 males, 159 females) varsity athletes were evaluated anthropometrically and for dietary habits. They were asked about their habitual food intake by trained nutritionists using a food frequency questionnaire, which includes 75 common local foods divided in 9 food groups (Table 1). Each athlete described how many days per week he/she usually ate each food and the usual amount they consumed on those days. The servings’ amount were calculated for each food weekly as a total weekly servings per food group, finally a daily average was calculated.

RESULTS: Subjects’ age, body weight and stature were 21 ±2 and 21 ±2 years old, 76 ±15 and 61 ±11 kg, 177 ±7 and 163 ±7 cm, for males and females respectively. Considering the 50th centile, the most ingested food groups were cereals, animal source foods (ASF) and fats. The less consumed food group was legumes (its quartile was 0 serving/day at the 50th centile and 1 servings at 75th centile).

CONCLUSIONS: Male and female varsity athletes had the same pattern of food intake but in different amount. Further research is needed for assessing if these servings are enough to achieve the macronutrient daily needs.

Table 1. Amount of food servings habitually ingested by male and female varsity athletes.

<table>
<thead>
<tr>
<th>Food group</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>10</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>ASF</td>
<td>6</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Fats</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Fruits</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Dairy</td>
<td>2.5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Sugar</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Veggies</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Seeds</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

There are 246 American College of Sports Medicine (ACSM) May 30 – June 3, 2017 Denver, Colorado

ACSM May 30 – June 3, 2017 Denver, Colorado

393 Board #214 May 31 11:00 AM - 12:30 PM

Amount Of Food Servings By Food Group Commonly Ingested In Mexican Varsity Athletes


Email: sergiocopadoaguila_cucs@hotmail.com (No relationships reported)

There is huge evidence regarding the macronutrient intake in athletes, however there is little research about the food groups and amount of food servings ingested by athletes.

PURPOSE: To describe the habitual amount of food servings by food group ingested in male and female varsity athletes.

METHODS: 365 (206 males, 159 females) varsity athletes were evaluated anthropometrically and for dietary habits. They were asked about their habitual food intake by trained nutritionists using a food frequency questionnaire, which includes 75 common local foods divided in 9 food groups (Table 1). Each athlete described how many days per week he/she usually ate each food and the usual amount they consumed on those days. The servings’ amount were calculated for each food weekly as a total weekly servings per food group, finally a daily average was calculated. Servings’ size were determined according to Mexican System for Equivalent Foods. The sample was divided by sex and then the servings were calculated as quartiles.

RESULTS: Subjects’ age, body weight and stature were 21 ±2 and 21 ±2 years old, 76 ±15 and 61 ±11 kg, 177 ±7 and 163 ±7 cm, for males and females respectively. Considering the 50th centile, the most ingested food groups were cereals, animal source foods (ASF) and fats. The less consumed food group was legumes (its quartile was 0 serving/day at the 50th centile and 1 servings at 75th centile).

CONCLUSIONS: Male and female varsity athletes had the same pattern of food intake but in different amount. Further research is needed for assessing if these servings are enough to achieve the macronutrient daily needs.

Table 1. Amount of food servings ingested per type of sport.

<table>
<thead>
<tr>
<th>Food group</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>10</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>ASF</td>
<td>6</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Fats</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Fruits</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Dairy</td>
<td>2.5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Sugar</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Veggies</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Seeds</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
composition and performance among dancers. METHODS: Female dancers (n = 25; age 20.7 ± 1.8 years; mean ± SD) were recruited to complete a 3-day food log, body composition analysis (DXA), and performance testing for muscular endurance, power, and strength. Protein was expressed as g/kg/day and three equal groups were created (Low protein: LP, <1.2 g/kg/day; Moderate protein: MP, 1.2-1.6 g/kg/day; High protein: HP, >1.6 g/kg/day). Data were analyzed using one-way ANOVA to compare group means (SPSS v.21.0, Chicago, IL). Significance was set at p < 0.05. RESULTS: Total caloric intake was significantly greater in HP when compared to LP only (LP: 1,883.5 ± 500.1 kcal; HP: 2,439.8 ± 348.5 kcal, p = 0.01). Protein consumption was greater in HP compared to MP and LP, and for MP compared to LP (p < 0.05). Additionally, 22 participants (88% of all participants) fell below the protein recommendation (2.3 g/kg/day) for athletes to maintain lean mass during weight loss. There were no differences between LP, MP, and HP for all body composition and performance measurements. Although not significantly different, HP had lower body weight compared to LP despite consuming more calories. Additionally, although not significant, fat mass (%) was lower and lean mass (%) was greater in HP compared to both LP (fat: ~8%; lean: ~7%) and MP (fat: ~4%; lean: ~10%). CONCLUSIONS: Tertiles of protein intake in the female collegiate dancers participating in this study were not significantly associated with more desirable body composition and performance. However, trends for improved body composition observed with HP may be physiologically relevant for dancers. Further research should focus on achieving adequate protein spread between groups to determine the impact higher protein intake may have on dancers’ body composition and performance.

**Table 1.** Protein intake (daily and per meal) and prevalence of inadequate protein intake per meal.

<table>
<thead>
<tr>
<th></th>
<th>LLBM Median (interquartile range, n=31)</th>
<th>HLBM Median (interquartile range, n=31)</th>
<th>p-value (between groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein intake (g/day)</td>
<td>105.5 (90.0-128.7)</td>
<td>129.7 (93.3-197.5)</td>
<td>0.04</td>
</tr>
<tr>
<td>Relative protein intake (g/kg/day)</td>
<td>1.8 (1.3-2.3)</td>
<td>1.5 (1.2-2.6)</td>
<td>0.55</td>
</tr>
<tr>
<td>Breakfast protein intake (g)</td>
<td>22.3 (12.0-35.3)</td>
<td>28.0 (16.4-35.9)</td>
<td>0.28</td>
</tr>
<tr>
<td>Lunch protein intake (g)</td>
<td>31.8 (16.9-51.1)</td>
<td>42.2 (27.4-66.9)</td>
<td>0.13</td>
</tr>
<tr>
<td>Dinner protein intake (g)</td>
<td>21.9 (8.0-28.1)</td>
<td>19.6 (12.4-60.5)</td>
<td>0.29</td>
</tr>
<tr>
<td>INPI at breakfast (%)</td>
<td>45.2a</td>
<td>35.5b</td>
<td>0.44</td>
</tr>
<tr>
<td>INPI at lunch (%)</td>
<td>25.8a</td>
<td>12.9b</td>
<td>0.20</td>
</tr>
<tr>
<td>INPI at dinner (%)</td>
<td>48.4a</td>
<td>51.6b</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Different capital letters mean significant differences (p<0.05) in protein intake between meals within groups. Different lower case letters mean significant differences (p<0.05) in INPI prevalence between meals within groups.

**PURPOSE:** To compare the protein intake per meal in varsity athletes with low and high lean body mass index (LBMI).

**METHODS:** Protein intake per meal and LBMI were assessed in 94 varsity male athletes. Protein intake was evaluated with a 24-h dietary recall by trained nutritionists. To compare the protein intake per meal and LBMI were assessed in 94 varsity male athletes. The protein amount per meal was estimated for each subject and was classified as low protein: LP (<1.2g/kg/day); moderate protein: MP (1.2-1.6g/kg/day); high protein: HP (>1.6g/kg/day). Data were analyzed using one-way ANOVA to compare group means (SPSS v.21.0, Chicago, IL). Significance was set at p < 0.05. RESULTS: Total caloric intake was significantly greater in HP when compared to LP only (LP: 1,883.5 ± 500.1 kcal; HP: 2,439.8 ± 348.5 kcal, p = 0.01). Protein consumption was greater in HP compared to MP and LP, and for MP compared to LP (p < 0.05). Additionally, 22 participants (88% of all participants) fell below the protein recommendation (2.3 g/kg/day) for athletes to maintain lean mass during weight loss. There were no differences between LP, MP, and HP for all body composition and performance measurements. Although not significantly different, HP had lower body weight compared to LP despite consuming more calories. Additionally, although not significant, fat mass (%) was lower and lean mass (%) was greater in HP compared to both LP (fat: ~8%; lean: ~7%) and MP (fat: ~4%; lean: ~10%). CONCLUSIONS: Tertiles of protein intake in the female collegiate dancers participating in this study were not significantly associated with more desirable body composition and performance. However, trends for improved body composition observed with HP may be physiologically relevant for dancers. Further research should focus on achieving adequate protein spread between groups to determine the impact higher protein intake may have on dancers’ body composition and performance.

**Table 1.** Protein intake (daily and per meal) and prevalence of inadequate protein intake per meal.

<table>
<thead>
<tr>
<th></th>
<th>LLBM Median (interquartile range, n=31)</th>
<th>HLBM Median (interquartile range, n=31)</th>
<th>p-value (between groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein intake (g/day)</td>
<td>105.5 (90.0-128.7)</td>
<td>129.7 (93.3-197.5)</td>
<td>0.04</td>
</tr>
<tr>
<td>Relative protein intake (g/kg/day)</td>
<td>1.8 (1.3-2.3)</td>
<td>1.5 (1.2-2.6)</td>
<td>0.55</td>
</tr>
<tr>
<td>Breakfast protein intake (g)</td>
<td>22.3 (12.0-35.3)</td>
<td>28.0 (16.4-35.9)</td>
<td>0.28</td>
</tr>
<tr>
<td>Lunch protein intake (g)</td>
<td>31.8 (16.9-51.1)</td>
<td>42.2 (27.4-66.9)</td>
<td>0.13</td>
</tr>
<tr>
<td>Dinner protein intake (g)</td>
<td>21.9 (8.0-28.1)</td>
<td>19.6 (12.4-60.5)</td>
<td>0.29</td>
</tr>
<tr>
<td>INPI at breakfast (%)</td>
<td>45.2a</td>
<td>35.5b</td>
<td>0.44</td>
</tr>
<tr>
<td>INPI at lunch (%)</td>
<td>25.8a</td>
<td>12.9b</td>
<td>0.20</td>
</tr>
<tr>
<td>INPI at dinner (%)</td>
<td>48.4a</td>
<td>51.6b</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Different capital letters mean significant differences (p<0.05) in protein intake between meals within groups. Different lower case letters mean significant differences (p<0.05) in INPI prevalence between meals within groups.

**PURPOSE:** To determine macronutrient consumption and body composition in male and female collegiate competitive soccer players.

**METHODS:** Participants were 22 male (mean age = 21.4 ± 1.9 yr.) and 19 female (mean age = 20.1 ± 1.7 yr.) varsity team soccer players who were interviewed for dietary assessment using a 7-day diet history questionnaire. Body composition was obtained by a full-body dual-energy X-ray absorptiometry (DXA) scan. Total energy and macronutrient analysis was performed following the nutritional interview, and body height, weight, lean mass, fat mass (%), and intermuscular adipose tissue-free skeletal muscle mass (IMAT-SMM) were obtained from the DXA scan. Gender differences were obtained by independent samples t-tests.

**RESULTS:** Energy intake was higher in males (19 377 ± 5 514 kJ) than in females (13 066 ± 4 610kJ; p ≤ 0.001). Carbohydrate intake was higher in males (103 ± 3.2 g/kg) than in females (7.9 ± 3.8 g/kg; p = 0.010). Protein intake was higher in males (2.2 ± 0.8 g/kg) than in females (1.6 ± 0.5; p = 0.031). Fat consumption was similar between males (1.9 ± 0.8 g/kg) and females (1.7 ± 0.6 g/kg; p = 0.117). Body height (176.0 ± 6.1 vs. 160.4 ± 3.4 cm), weight (69.3 ± 7.7 vs. 59.2 ± 6.5 kg), lean mass (26.0 ± 2.0 vs. 16.1 ± 4.4 kg), and IMAT-SMM (31.0 ± 2.3 vs. 20.2 ± 1.6 kg) mean values were higher in males than in females (p ≤ 0.001 for all). Fat mass was higher in females (31.4 ± 6.4 %) than in males (14.8 ± 5.2 %; p ≤ 0.001).

**CONCLUSIONS:** An excessive energy and carbohydrate intake was found in both genders. Protein and fat intake were appropriate for both genders. Body composition in males showed similar values compared to previously reported literature; however, females showed poor body composition compared to international values.
data of ballet dancers was crosssectionally studied in 17 girls (19.1 ± 1.7 yrs). Statistical analysis was done by Pearson’s correlation and Multiple Stepwise Regression (p < 0.05).

RESULTS: The availability of energy (22.48 ± 13.1 kcal/kgFFM/d) was inadequate for 82.3% of the dancers once their energy intake (1248 ± 385 kcal/d) achieved only 56% of the total energy expenditure. However, 24.5% showed high body fatness although 52.9% referred episodes of amenorrhea. Overall, their diet was classified as low quality (HEI 67.9). More than 50% of the dancers worried about body image. A Mann-Whitney U Test was conducted with the scores obtained by both genders. A general linear model one-way ANOVA with Tamhane post hoc test for unequal variances was used to compare the scores obtained by the three following groups: regional-, national-, and international-level competitors. The same procedure was used to compare scores between athletes from different weight classes (P < 0.05).

CONCLUSIONS: These results suggest that rapid weight loss is highly prevalent in youth Taekwondo athletes. The level of aggressiveness in weight management behaviors is likely to be influenced by the competitive level.

Vitamin D deficiency is associated with increased bone remodelling activity. Quantification of reference-standard bone turnover markers total procollagen type 1 N-terminal propeptide (PINP) (bone formation) and beta C-terminal telopeptide of type 1 collagen (beta-CTx) (bone resorption) therefore enable detection of subtle perturbations in bone remodelling that may result from vitamin D inadequacy and indicate an increased risk of stress fracture in athletes. PURPOSE: To investigate the effect of wintertime vitamin D supplementation using an oral spray on bone turnover markers in Irish athletes compared to placebo. METHODS: Stored osteocalcin from a randomised, double-blind, placebo-controlled trial conducted in Gaelic footballers (3000IU (75μg) vitamin D3 daily versus placebo for 12-weeks, n = 42) were analysed for PINP and beta-CTx. Dietary vitamin D and calcium intake as well as total 25-hydroxyvitamin D (25(OH)D) data were available from the previous study. RESULTS: Overall, 72% of athletes presented with a 25(OH)D concentration <50nmol/L, and 5 exhibited vitamin D deficiency (<30nmol/L) at baseline. Dietary vitamin D and calcium intakes averaged 5.9±4.3μg/day and 1037±65mg/day respectively. Daily supplementation with 3000IU (75μg) vitamin D significantly increased mean ± SD 25(OH)D compared to no significant change in the placebo group (vitamin D: 47.37±13.29 to 83.68±32.98nmol/L (+79%) vs. placebo; 43.10±22.00 to 49.22±25.40 (+14%) P =0.000). ANCOVA revealed no significant difference in mean ± SD change from baseline for PINP (8.72±18.83 vs. –5.04±21.33μg/L, P =0.413) or beta-CTx concentrations (-0.09±0.18 vs. –0.10±0.21µg/L, P =0.627) when compared to placebo. CONCLUSION: In this study, 12-weeks vitamin D supplementation using an oral spray solution did not influence bone turnover when compared to placebo, despite increasing vitamin D3 concentration. However, vitamin D inadequacy (<50nmol/L) is apparent in collegiate Gaelic footballers, however future interventions, aiming to test change over time in bone turnover as a primary outcome, should consider a longer intervention in athletes with vitamin D deficiency (<30nmol/L).

WEDNESDAY, MAY 31, 2017

401 Board #222 May 31 11:00 AM - 12:30 PM

Twelve-weeks Oral Spray Vitamin D Supplementation Does Not Alter Bone Turnover Markers In Collegiate Gaelic Footballers

Sharon M. Madigan1, Joshua Todd2, Emeir McSorley2, L. Kirsty Poursaiah1, Eamon Laird1, Martin Healy1, Mark Kilbane3, Malachi McKenna3, Pamela Magee2, 1Sport Ireland Institute, DUBLIN, Ireland. 2Ulster University, Coleraine, United Kingdom. 3Trinity College, DUBLIN, Ireland. 4St. James’ Hospital, DUBLIN, Ireland. 5St. Vincent’s University Hospital, DUBLIN, Ireland. (Sponsor: Dr. Giles Warrington, FACS) Email: smadigan@institutesofsport.ie


PurPOSE: To investigate dietary, training, demograhic, anthropometric, pharmacological, and psychological predictors of gastrointestinal (GI) symptoms in distance runners. METHODS: A total of 150 runners (74 men) completed a prospective journal recording daily running duration and intensity (Rating of Perceived Exertion [RPE]), as well as GI symptoms experienced during each run. At month’s end, participants completed a survey inquiring about demographics, anthropometrics, running experience, analgesic use, antibiotic use, probiotic consumption, fluid/food intake during runs, caffeine intake before and during runs, stress, and anxiety. Stress and anxiety were measured via the Perceived Stress Scale (PSS) and Beck Anxiety Inventory (BAI). Significant GI distress was defined as a run with at least one GI symptom ≥3 on a 0 to 10 scale. RESULTS: On average, participants reported experiencing substantial GI distress during 44.1% of runs. Age (rho = –0.30, p<0.01) and years of running experience (rho = –0.17, p = 0.04) were negatively correlated

Board #223 May 31 11:00 AM - 12:30 PM

Anxiety and Stress Predict Gastrointestinal Symptoms During One Month of Running

Patrick B. Wilson. Old Dominion University, Norfolk, VA. Email: pbwilson@odu.edu

Reported Relationships: (No relationships reported)

PURPOSE: To investigate dietary, training, demographic, anthropometric, pharmacological, and psychological predictors of gastrointestinal (GI) symptoms in distance runners. METHODS: A total of 150 runners (74 men) completed a prospective journal recording daily running duration and intensity (Rating of Perceived Exertion [RPE]), as well as GI symptoms experienced during each run. At month’s end, participants completed a survey inquiring about demographics, anthropometrics, running experience, analgesic use, antibiotic use, probiotic consumption, fluid/food intake during runs, caffeine intake before and during runs, stress, and anxiety. Stress and anxiety were measured via the Perceived Stress Scale (PSS) and Beck Anxiety Inventory (BAI). Significant GI distress was defined as a run with at least one GI symptom ≥3 on a 0 to 10 scale. RESULTS: On average, participants reported experiencing substantial GI distress during 44.1% of runs. Age (rho = –0.30, p<0.01) and years of running experience (rho = –0.17, p = 0.04) were negatively correlated

400 Board #221 May 31 11:00 AM - 12:30 PM

Inadequacy Of Food-Energy Supplying To The Energy Requirements Of Female Ballet Dancers

Caroline Bernardino1, Rodrigo M. Manda1, Naíla Maesta1, Roberto C. Burini, FACSM1,2. (Sponsor: Roberto Carlos Burini, FACSM) Email: Caa.bernardino@hotmail.com

Reported Relationships: (No relationships reported)

PURPOSE: Nowadays athletes use to control strictly their body weight focusing on convenient weight-dependent competing categories or simply for their sports performance, as commonly seen in dancers. Understanding how this information is used in their training.

CONCLUSIONS: The existence of a presently energy-insufficient diet intake was investigated, the awareness on the importance of nutritional information and knowledge in young ballet dancers. Given the prevalence of these practices in female ballet dancers as well as by athletes from different weight classes. International- and national-level dancers scored significantly higher in the questionnaire than regional-level athletes (P < 0.05). CONCLUSION: These results suggest that rapid weight loss is highly prevalent in young Taekwondo athletes. The level of aggressiveness in weight management behaviors is likely to be influenced by the competitive level.

With the recent increase in ultra-endurance competitions, the role of nutrition in performance has garnered significant attention. While the ACSM, AND, and DC have a joint position stand on nutrition for endurance performance, recent data has demonstrated that many ultra-endurance athletes do not meet the recommendations for athletic performance. PURPOSE: The purpose of this study was to understand common sources of nutrition information among recreational ultra-endurance athletes, and determine how this information is used in their training. METHOD: Recreational ultra-endurance athletes were recruited to participate in one of two focus groups (N = 8, mean age = 38.2 years), which followed pre-scripted questions to guide discussion. Participants also completed a demographic questionnaire. Focus group data was transcribed and reviewed by multiple researchers, and common themes were identified. RESULTS: The sample was 50% female, 100% white or non-Hispanic, 68% attained a college degree or higher, and 62.5% are married/partnered. Regarding their perception of the ideal diet for an ultra-endurance athlete, 87.5% of respondents discussed a “whole foods” diet with little processed food. Most of the participants (62.5%) were aware of the ACSM recommendations, but did not follow them. The most common reason was a belief in individual responsiveness to diet (50%) or the perception that it was too difficult to follow (50%). The most commonly used sources of nutrition information were through experienced athletes (87.5%) or personal relationships (62.5%), followed by magazines and non-academic books (50%). CONCLUSION: Overall, the focus group discussion revealed that recreational athletes, while aware of the dietary recommendations, do not believe they are accessible or worth their effort. As many participants look to personal relationships and successful athletes for advice, researchers and dietitians may reconsider how nutritional information is most effectively disseminated.
with the percentage of runs with substantial GI distress. Mean run RPE (r = 0.23, p<0.01), frequency of probiotic food consumption (r = 0.20, p = 0.02), PSS scores (r = 0.29, p<0.01), and BAI scores (r = 0.27, p<0.01) were positively associated with the percentage of runs with substantial GI distress. CONCLUSIONS: Several factors are associated with substantial GI distress over one month of running, including perceived stress and anxiety, which have largely been neglected in previous research.

**A-52** Free Communication/Poster - Occupational/ Firefighter Physiology

**Wednesday, May 31, 2017, 7:30 AM - 12:30 PM**
**Room: Hall F**

**403** Board #224 May 31 9:30 AM - 11:00 AM
The Physiological Responses of Specialist-Role Paramedics Undertaking a Simulation Treating Casualties Exposed to Hazardous Materials

Jane ES Thompson1, Mark Rayson2, Ella F. Walker3, Carla A. Gallagher4, Julianne Doherty1, Stephen D. Myers1, Sam D. Blacker1. 1University of Chichester, Chichester, United Kingdom. 2Mark Rayson Consulting Limited, Bristol, United Kingdom. 3Email: j.thompson@chi.ac.uk

The National Ambulance Resilience Unit (NARU) works on behalf of each National Health Service Ambulance Trust in England to strengthen national resilience and improve patient outcome in challenging pre-hospital scenarios. Specialist ambulance responders (HART) are trained to deal with mass casualty incidents, during which they may need to wear Breathing Apparatus (BA) inside fully encapsulated Gas Tight Suits (GTS) to treat casualties in a hazardous area. PURPOSE: To measure the physiological strain of paramedics during a simulated task to treat casualties exposed to hazardous materials. METHODS: Six participants (5 male / 1 female; age 39 ± 8 y; body mass 80.1 ± 7.9 kg; VO2max 38.05 ± 4.31 ml·kg·min-1) wearing BA and GTS (36.7 ± 1.3 kg) undertook a 30 min simulated task, which included walking 200 m to an incident, moving casualties and administering CPR for approximately 14 min. Participants’ urine osmolality was measured before the task. Sweat losses during the task were estimated by changes in body mass, with participants unable to drink due to the BA. Participants wore a heart rate monitor, rectal thermistor, and skin thermistors (neck, hand, scapular and shin). The day before the simulation, participants completed an incremental shuttle run test to measure VO2max and maximum heart rate (HRmax). Data are presented as the mean ± SD; differences were compared using paired sample t-tests with significance set at P<0.05. RESULTS: Urine osmolality at the start of the task was 380 ± 150 mOsm.kg-1. Total estimated sweat losses during the simulation were 0.47 ± 0.39 L. Mean heart rate during the simulation was 75 ± 15 %HRmax. During the simulation both rectal (start and end; 37.45 ± 0.03 to 38.13 ± 0.19 °C, p<0.05) and mean skin temperature (31.57 ± 0.23 to 34.04 ± 0.06 °C, p<0.05) increased. The range of peak rectal temperatures was 37.8 ± 3.8 °C. CONCLUSION: Participants started the simulated task in a hydrated state and sweat losses were unable to be matched by fluid intake. Although cardiovascular strain during the task was “moderate” to “very hard” and body temperature increased, all participants successfully completed the 30 min simulation. These data can be used to inform interventions to enhance physical performance and to develop physical competency assessments for specialist ambulance responders.

**404** Board #225 May 31 9:30 AM - 11:00 AM
The Physiological Responses of Specialist-role Paramedics Treating Casualties in a Simulated Firearms Incident

Carla A. Gallagher1, Mark P. Rayson2, Ella F. Walker3, Jane ES Thompson1, Julianne Doherty1, Stephen D. Myers1, Sam D. Blacker1. 1University of Chichester, Chichester, United Kingdom. 2Mark Rayson Consulting Limited, Bristol, United Kingdom. 3Email: C.Gallagher@chi.ac.uk

The National Ambulance Resilience Unit (NARU) works on behalf of each National Health Service Ambulance Trust in England to strengthen national resilience and improve patient outcome in challenging pre-hospital scenarios. Specialist ambulance responders are trained to deal with mass casualty incidents, during which they may need to wear Breathing Apparatus (BA) inside fully encapsulated Gas Tight Suits (GTS) to treat casualties in a hazardous area. PURPOSE: To measure the physiological strain of paramedics during a simulated task to treat casualties exposed to hazardous materials. METHODS: Six participants (5 male / 1 female; age 27 ± 3 y; body mass 80.4 ± 11.8 kg; VO2max 46.5 ± 16 ml·kg·min-1) wearing ballistic personal protective equipment (19.1 ± 1.0 kg) undertook a 120 min scenario, which included a 400 m approach walk, casualty drags, sprints, and stretcher drags. Participants’ urine osmolality was measured before the scenario. Sweat losses during the scenario were estimated by changes in body mass with ad libitum fluid intake measured. Participants wore a heart rate monitor, rectal thermistor and skin thermistors (neck, hand, scapular and shin). The day before the simulation participants completed an incremental shuttle run test to measure predicted VO2max and maximum heart rate (HRmax). Data are presented as the mean ± SD; and analysed with paired sample t-tests with significance set at P<0.05. RESULTS: Urine osmolality at the start of the simulation was 450 ± 160 mOsm.kg-1. Total estimated net sweat losses during the scenario were 2.23 ± 0.34 L which was not different to fluid intake of 2.43 ± 0.42 L (P>0.05). Mean heart rate during the scenario was 73 ± 11 %HRmax. During the simulation both rectal (start to end; 37.54 ± 0.29 to 38.34 ± 0.51 °C, P<0.24) and mean skin temperatures (32.04 ± 1.08 to 30.85 ± 0.68 °C, P=0.78) did not change significantly. The range of peak rectal temperatures was 37.10-39.15 °C. CONCLUSION: Participants started the scenario in a hydrated state and sweat losses were matched by fluid intake. Although cardiovascular strain during the simulation was “moderate” to ‘hard’, body temperature did not rise significantly and all participants successfully completed the two-hour scenario. These data can be used to inform interventions to enhance physical performance and develop physical employment standards for specialist ambulance responders.

**405** Board #226 May 31 9:30 AM - 11:00 AM
The Physiological Response of Specialist-role Paramedics Undertaking a Casualty Decontamination Scenario.

Julianne Doherty1, Mark P. Rayson2, Ella F. Walker3, Jane ES Thompson1, Carla A. Gallagher4, Stephen D. Myers1, Sam D. Blacker1. 1University of Chichester, Chichester, United Kingdom. 2Mark Rayson Consulting Limited, Bristol, United Kingdom. 3Email: j.doherty@chi.ac.uk

The National Ambulance Resilience Unit (NARU) works on behalf of each National Health Service Ambulance Trust in England to strengthen national resilience and improve patient outcome in challenging pre-hospital scenarios. Specialist ambulance responders are trained to wear Powered Respirator Protective Suits (PRPS) to move, treat and decontaminate casualties exposed to hazardous materials. PURPOSE: To measure the physiological strain of paramedics during a scenario to move and decontaminate multiple casualties exposed to hazardous materials. METHODS: Eight participants (7 male / 1 female; age 38 ± 10 y; body mass 90.4 ± 16.2 kg; VO2max 34.5 ± 5.6 ml·kg·min-1) undertook a 193 min scenario involving erecting a decontamination tent, then donning PRPS (11.9 ± 4.4 kg) to work for ~120 min to move and decontaminate multiple casualties. Urine osmolality was measured before the scenario. Sweat losses during the scenario were estimated from changes in body mass, with ad libitum fluid intake recorded. Participants wore a heart rate monitor, rectal thermistor, skin thermistors (neck, hand, scapular and shin). The day before the scenario participants completed an incremental shuttle run test to measure VO2max and maximum heart rate (HRmax). Data are presented as the mean ± SD; differences were compared using paired sample t-tests with significance set at P<0.05. RESULTS: Urine osmolality at the start of the scenario was 350 ± 170 mOsm.kg-1. Estimated sweat losses during the scenario were 1.40 ± 0.36 L which were less than fluid intake 2.43 ± 0.46 L (p<0.05). Mean heart rate during the scenario was 73 ± 11 %HRmax. During the scenario rectal temperatures increased (start to end; 37.51 ± 0.32 to 37.88 ± 0.19 °C, p<0.05) and mean skin temperature was unchanged (31.16 ± 0.10 to 31.67 ± 1.23 °C, p>0.05). The range of peak rectal temperatures was 37.95-38.60 °C. CONCLUSIONS: Participants started the scenario in a hydrated state and sweat losses were lower than fluid intake. Cardiovascular strain during the scenario was “moderate” and body temperature increased slightly. One participant was withdrawn during the scenario by the investigators due to becoming excessively fatigued. These data can be used to inform interventions to enhance physical performance and develop physical employment standards for specialist ambulance responders.

**406** Board #227 May 31 9:30 AM - 11:00 AM
A Case Report: The Physiological Strain Incurred by Electrical Utility Workers During Consecutive Work Days

Andrew W. D’Souza1, Robert D. Meade1, Lovely Krishna2, Martin P. Poirier2, Glen P. Kenny3. 1University of Ottawa, Ottawa, ON, Canada. 2Electrical Power Research Institute, Knoxville, TN. 3Email: adsou102@uottawa.ca

(No relationships reported)

Heat strain in electrical utilities workers has been assessed in a single work day and it has been shown that workers can experience high levels of thermal and cardiovascular strain. However, the impact of consecutive work shifts performed in hot conditions on the level of physiological strain remains unclear. PURPOSE: To examine the influence...
of working consecutive shifts in hot conditions on the physiological strain experienced by electrical utility workers. METHODS: Four male electrical utility workers (age 33 ± 9 years, 215 ± 21 kg, 5’11” tall) were monitored as they performed their normal work duties for five 8-hr trials in a semi-recumbent position. RESULTS: Total sweat loss was calculated using body weight change and peak HR during the work shift were 137 ± 18 and 165 ± 11 bpm, respectively. VO2 range: 38-38.2°C; range: 37.8-38.2°C; (P<0.08), whereas the peak HR response was similar between days (Day 1: 91 ± 7%HRmax, range: 83-100%HRmax; Day 2: 87 ± 11%HRmax, range: 74-98%HRmax; P<0.57). CONCLUSION: Our case report findings suggest that despite the fact that work effort is decreased over consecutive work shifts, thermal strain continues to be elevated in electric utility workers. Funding support by the Electrical Power Research Institute.

407 Board #228
May 31 9:30 AM - 11:00 AM
Heat Stress, Dehydration and Cardiovascular Responses in Sugar Cane Cutters in Brazil
Fabiano T. Amorim1, Flávio C. Magalhães2, Caiope Diniz2, Christiano M. Moreira1, Elisa Shibuya3, Irun Cunha1, Paulo Maia1, Rodrigo Roscani1, Daniel Bitencourt1. 1University of New Mexico, Albuquerque, NM. 2Federal University of the Jequitinhonha and Mucuri Valleys, Diamantina, Brazil. 3Federal University of Juiz de Fora, Goiânia, Goiás, Brazil.

Current evidence demonstrates that the planet’s climate is warming and that extreme heat waves are occurring more frequently. Outdoor workers are vulnerable to climatic changes and are subject to risk of heat-related illness. Sugar cane cutters represent a physically demanding occupation performed in a hot environment and heat exposure threshold of 25°C for 1 hour of heavy work. CONCLUSIONS: No. 5 Supplement

ACSM May 30 – June 3, 2017 Denver, Colorado

408 Board #229
May 31 9:30 AM - 11:00 AM
Thermal Exposure Limit for Mine Refuge Chambers: A Pilot Study
Candi D. Ashley, Rebecca M. Lopez, FACSMB, Danielle Aguillard, Thomas E. Bernard. University of South Florida, Tampa, FL. (Sponsor: Marcus Kilpatrick, FACSMB)

Refuge chambers (RCs) provide shelter to miners trapped during a disaster. Industry standards mandate that RCs not exceed a Steadman Apparent Temperature (AT) (also known as Heat Index) of 95°F (35°C). This limit is designed for adults performing moderate work and maintaining thermal equilibrium at a core temperature ≤ 37°C. However, occupants in a RC spend most of their time at rest, and are able to maintain thermal equilibrium at a core temperature > 37°C. Thus, the temperature limit may be unnecessarily restrictive. PURPOSE: To determine the upper limit of sustainable heat stress that is protective for most individuals during long-term heat exposure at rest. METHODS: In Phase 1, five men (age = 23.6 ± 3.2; BMI = 23.6 ± 2.5) underwent 4-hr trials in a semi-recumbent position (mean VO2 = 0.43 L/min) at ATs of 39.4, 40.0, 42.5 and 46.9°C, 90% rh. In all trials, gastrointestinal temperature (Tgi) and heart rate (HR) were assessed every 15 min. Oxygen uptake was assessed at the midpoint of each trial. Fluids were offered ad libitum. Sweat rate (SR) was determined from pre- and post-body weights. Repeated measures ANOVA was used to assess differences between trials. T-tests were used to assess pre- to post-trial differences. Significance was set at 0.05. RESULTS: Maximum AT of 56.1°C had an ending HR of 76 ± 1 bpm and ending Tgi of 37.5 ± 0.3°C; well below the assumption of the Steadman AT limit. There were no differences (p>0.05) in Tgi at 45.6°C at 4 hrs in Phase 1 (Tgi = 37.0 ± 0.6°C) or Phase 2 (Tgi = 37.2 ± 0.1°C) or at 8 hrs in Phase 2 (Tgi = 37.1 ± 0.3°C). As AT increased, the difference in Tgi from 4 to 8 hrs increased (p<0.05). There was no difference in HR (p>0.05) and no between-phase difference in Tgi (p>0.05). CONCLUSION: As there were no differences in Tgi at 4 hrs and a greater difference from 4 to 8 hrs as AT increased, 4 hrs may not be long enough to detect a change in Tgi. The effect of climate evidenced by increasing Tgi which occurred between 43.4 and 46°C-AT provides support for sustainable exposure greater than 35°C-AT with a likely ceiling below 46°C-AT.

409 Board #230
May 31 9:30 AM - 11:00 AM
The TLVs Fail to Maintain Body Core Temperature within Safe Limits in Older Adults
Glen P. Kenny, Dallton T. Lamarche, Robert D. Meade, Andrew W. D’Souza. University of Ottawa, Ottawa, ON, Canada. Email: gkenny@uottawa.ca (No relationships reported)

Industries rely on the American Conference of Governmental Industrial Hygienists Threshold Limit Values (TLVs) to manage the health and safety of workers in hot conditions. A key shortcoming of the TLVs is the assumption that the guidelines are generalizable to broad population groups and do not consider age-related impairments in heat dissipation. PURPOSE: To evaluate core temperature and change in body heat storage during work in the heat using the TLVs, which are designed to ensure that a stable core temperature (and therefore heat balance) is achieved and remains below 38°C. METHODS: Nine older (58 ± 5 yrs) males performed three 120-min work bouts consisting of cycling at a fixed rate of heat production (360 W) under increasing ambient temperatures. Based on the TLVs, each protocol consisted of different work-to-rest (WR) ratios performed at different wet-bulb globe temperatures (WBGT). The first was 120-min of continuous (CON) cycling at 28°C WBGT while two protocols consisted of intermittent work bouts (15-min duration) adjusted for heat dissipation. CONCLUSIONS: No. 5 Supplement

S80 Vol. 49 No. 5
Exercise while carrying an external load upon the thoracic cavity imposes extra stress on the cardiopulmonary and limb locomotor systems. This in turn, negatively impacts exercise tolerance and performance, as well as pulmonary and respiratory muscle function. Thoracic load carriage exercise (LC) has been shown to induce global respiratory muscle fatigue as assessed by volitional mouth pressures, with a concomitant impairment in running time-trial performance. Inspiratory muscle training (IMT) has been shown to improve performance in a running time-trial with thoracic LC; however, in many occupational and recreational activities that require thoracic LC, the capacity to sustain prolonged exercise may be of equal or greater importance than performance in a time-trial. PURPOSE: To determine the efficacy of 6 weeks of flow-resistive IMT on running time to exhaustion with thoracic LC; and to determine whether 6 weeks of flow-resistive IMT moderates diaphragmatic fatigue that may occur following a thoracic LC running time to exhaustion test. METHODS: Twelve recreationally active males completed two runs to exhaustion (T_{ex}) at a fixed speed eliciting 70 % of VO$_2_{max}$ while carrying a 10 kg backpack. Visits were completed at baseline and after 6 weeks of either IMT or placebo-IMT. Exercise metabolic and ventilatory measures were recorded and diaphragm strength was measured using bilateral phrenic nerve stimulation in conjunction with esophageal balloon-tipped catheters to measure intrathoracic pressures. Twitch transdiaphragmatic pressure amplitude and rectified, root mean square (RMS) of EMG activity were measured. RESULTS: Mixed-effects model analysis revealed main effects of both training and condition, with a significant T$_{ex}$ lower (p < 0.05) for placebo-IMT compared to IMT. There was no significant change in the %Δ in VO$_2_{max}$ between conditions (p = 0.622). No other variables showed significant differences between groups. CONCLUSIONS: IMT improves exercise tolerance with thoracic LC, but does not attenuate the severity of diaphragmatic fatigue following a running time to exhaustion test.

Board #233
May 31 9:30 AM - 11:00 AM
Flow-resistive Inspiratory Muscle Training Improves Running Time To Exhaustion With Thoracic Load Carriage
Ren-Jay Shei, Robert F. Chapman, FACSM, Allison H. Gruber, Daniel P. Wilhite, Timothy D. Mickleborough, FACSM. Indiana University, Bloomington, IN. (Sponsor: Timothy D. Mickleborough, FACSM)

(NO relationships reported)
CONCLUSION: The assessment of the physical demands of the BTPPP allowed the creation of a JRPT based on the proper abilities and tuned to the energy expenditure and critical physically demanding tasks taught during the training.

414 Board #235 May 31 9:30 AM - 11:00 AM Development of a New Job-Related Physical Test for the Basic Training Program in Police Patrolling Claude Lajoie1, Sébastien Poitier1, Annie Gendron1, Louis Laurenccelle1,2 UQTR, Trois-Rivières, QC, Canada. 1École Nationale de Police du Québec, Nicolet, QC, Canada. (Sponsor: François Trudeau, FACSM) Email: claude.lajoie@uqtr.ca (No relationships reported)

Purpose: Based on previous observation and analyses of the basic training programs in police patrolling, the main physical abilities required to successfully accomplish the critical and essential tasks of the program were identified. The objective of the study was then to develop and validate a new physical test for the École Nationale de Police du Québec (ENPUQ) based on a job related approach sustaining the bona fide occupational requirements criteria. Methods: Our approach focused both on job task simulation and assessment of specific motor and physiological abilities. Seventeen tasks representing the main physical abilities elicited in the training program were evaluated throughout the test circuit, especially: lower and upper limb power, upper limb strength, global coordination and agility. To validate the test, 184 male and 56 female police students were recruited. Students executed the new ENPUQ test and also a series of six ‘convergent’ measures (C1: Edgren agility test (C1), dynamometer test for strength (C2), seated medicine ball throw for upper body power (C3), vertical (C4) and horizontal (C5) jump tests for lower limb power, and a maximal aerobic power estimation (C6)). Among the experimental group, 39 male and 9 female police students did twice the ENPUQ test for establishing test-retest reliability. Results: The new ENPUQ test consists of a time circuit including various tasks in continuity, separated by 3 laps: lap 1 (8 tasks), lap 2 (7 tasks) and lap 3 (7 tasks). Mean completion time was significantly different (p<0.001) between male (210± 25 sec) and female participants (282 ± 52 sec). Correlation between the ENPUQ test time and the six convergent tests were all significant (p<0.01) and moderately high: C1 (r=-0.43), C2 (r=-0.62), C3 (r=-0.59), C4 (r=-0.50), C5 (r=-0.71) and C6 (r=-0.49). Test-retest reliability (n=48) was r=0.81. Conclusion: The construction design used for the development of the new test insures per se its content (face) validity. On the other hand, the correlations obtained between the independent six ‘convergent’ ability measures and the new test’s time performance confirm its multi-faceted concurrent validity. As for its predictive, or practical, usefulness for the tightening and betterment of the training standards of future police officers, this remains to be investigated.

415 Board #236 May 31 9:30 AM - 11:00 AM DEXA Body Composition and Cardiovascular Risk Factors are Weakly Related in Police Officers Alison McGuire, Stephen F. Crouse, FACSM, Steven Martin, Allison Donnell, Daniel Mohr, John S. Green, FACSM, Texas A&M University, College Station, TX. (Sponsor: Dr. Stephen Crouse, FACSM) (No relationships reported)

There is currently little research on whether fat mass and distribution are predictors for cardiovascular risk. PURPOSE: To determine if obesity measures, such as fat mass and distribution (e.g. android vs gynoid), could be used to predict cardiovascular risk, particularly lipid levels, systolic blood pressure (SBP) and blood glucose. METHODS: 182 police officers (166 males, 16 females; age 37.6±8.1 yrs; ht=179±6.6 cm; wt=94±16 kg; BMI=29.9±4.6; SBP=128±9 mmHg; fasting blood samples were drawn and analyzed by a clinically certified lab to determine total blood cholesterol (TC) (192±37 mg/dL), LDL (119±35 mg/dL), HDL (46±10 mg/dL), triglycerides (129±99 mg/dL), and glucose (87±19 mg/dL). Correlations were determined by using a bivariate Pearson correlation matrix, significance was set at and p<0.01*. RESULTS: As fat mass increased, total cholesterol and LDL increased and HDL decreased. Triglycerides, glucose, and SBP also increased as fat mass increased. There were also significant increases in total cholesterol, LDL, triglycerides, glucose and SBP as android fat percentage increased. HDL decreased significantly as android fat percentage increased.

CONCLUSION: There are currently little research on whether fat mass and distribution are predictors for cardiovascular risk. PURPOSE: To determine if obesity measures, such as fat mass and distribution (e.g. android vs gynoid), could be used to predict cardiovascular risk, particularly lipid levels, systolic blood pressure (SBP) and blood glucose. METHODS: 182 police officers (166 males, 16 females; age 37.6±8.1 yrs; ht=179±6.6 cm; wt=94±16 kg; BMI=29.9±4.6; SBP=128±9 mmHg; fasting blood samples were drawn and analyzed by a clinically certified lab to determine total blood cholesterol (TC) (192±37 mg/dL), LDL (119±35 mg/dL), HDL (46±10 mg/dL), triglycerides (129±99 mg/dL), and glucose (87±19 mg/dL). Correlations were determined by using a bivariate Pearson correlation matrix, significance was set at and p<0.01*. RESULTS: As fat mass increased, total cholesterol and LDL increased and HDL decreased. Triglycerides, glucose, and SBP also increased as fat mass increased. There were also significant increases in total cholesterol, LDL, triglycerides, glucose and SBP as android fat percentage increased. HDL decreased significantly as android fat percentage increased.

There is currently little research on whether fat mass and distribution are predictors for cardiovascular risk. PURPOSE: To determine if obesity measures, such as fat mass and distribution (e.g. android vs gynoid), could be used to predict cardiovascular risk, particularly lipid levels, systolic blood pressure (SBP) and blood glucose. METHODS: 182 police officers (166 males, 16 females; age 37.6±8.1 yrs; ht=179±6.6 cm; wt=94±16 kg; BMI=29.9±4.6; SBP=128±9 mmHg; fasting blood samples were drawn and analyzed by a clinically certified lab to determine total blood cholesterol (TC) (192±37 mg/dL), LDL (119±35 mg/dL), HDL (46±10 mg/dL), triglycerides (129±99 mg/dL), and glucose (87±19 mg/dL). Correlations were determined by using a bivariate Pearson correlation matrix, significance was set at and p<0.01*. RESULTS: As fat mass increased, total cholesterol and LDL increased and HDL decreased. Triglycerides, glucose, and SBP also increased as fat mass increased. There were also significant increases in total cholesterol, LDL, triglycerides, glucose and SBP as android fat percentage increased. HDL decreased significantly as android fat percentage increased.

CONCLUSION: Fat mass and distribution are significantly, but weakly related to blood lipids/lipoproteins and blood pressure. We suggest that factors other than fat mass affect these cardiovascular disease risk markers, such as genetics, lifestyle, and diet. More research is needed to see if this correlation holds or is stronger in similar and different populations.

416 Board #237 May 31 9:30 AM - 11:00 AM DXA Body Composition Is Weakly Related To Blood Lipids, Blood Pressure, And Glucose In Firefighters Kalen A. Johnson, Daniel Mohr, Allison Donnell, Steven E. Martin, John S. Green, FACSM, Stephen F. Crouse, FACSM, Texas A&M University, College Station, TX. (Sponsor: Stephen F. Crouse, FACSM) Email: kjohns15@tamu.edu (No relationships reported)

Current published data are inconclusive regarding whether DXA body composition measures of fat, lean, and regional fat mass are predictive of other CVD risk factors. PURPOSE: To determine if DXA measures can be used in a cardiovascular risk-predictive manner to indicate unhealthy levels of circulating lipoproteins in firefighters. METHODS: 256 male firefighters (age=35±10; ht=179±6.6 cm; wt=94±16 kg; BMI=29.9±4.6; SBP=128±9 mmHg) underwent an annual cardiovascular risk profile screening and DXA scan; resting BP was also measured. We collected fasted blood samples and a clinically certified lab analyzed them to determine glucose, HDL, LDL, total cholesterol, and triglycerides. Statistics included simple statistics and Pearson’s correlations. RESULTS: Table (*p<0.01)

CONCLUSIONS: Though the correlations were statistically significant, none of the DXA body composition measures explained a physiologically relevant portion of the variance in the CVD risk markers measured. We suggest that factors other than body fat contribute to lipid and blood pressure profiles in firefighters, a population at high risk for CVD.

417 Board #238 May 31 9:30 AM - 11:00 AM Analysis of Dietary Intake in Volunteer Firefighters Kelly C. McLaughlin1, Lauren N. Chavis1, Rachel Dickinson1, Emily Reeve1, Christian K. Roberts, FACSM1, Deborah L. Feariheller1, Ursinus College, Collegeville, PA. 2Occidental College, Los Angeles, CA. (Sponsor: Christian Roberts, FACSM) (No relationships reported)

Cardiovascular disease remains the leading cause of death in the United States. Dietary patterns can influence many risk factors for cardiovascular disease, such as blood pressure, lipid levels, body composition and glucose metabolism. Cardiac events are the leading line-of-duty deaths in firefighters. Due to the fast-paced and unpredictable
nature of the work as well as lack of proper kitchen equipment, firefighters often rely on quick, easy meals that may not be optimally nutritious. Limited research has examined firefighter’s dietary intake and preferences. PURPOSE: To analyze the dietary intake of volunteer firefighters. METHODS: Seemingly healthy male volunteer firefighters (n=18, 34 ± 11.7 years of age) participated in a dietary workshop. Height and weight of each participant was measured. Participants were asked to collect a three-day diet recall which was analyzed using Diet Analysis Plus. RESULTS: The prevalence of overweight (BMI ≥ 25 kg/m^2) was 45.5% of the participants, participants consumed 1753 ± 503 kcal daily. The macronutrient breakdown was 197.8 ± 83.8 g (45.1%) carbohydrates, 71.6 ± 19.6 g (36.8%) fats and 75.6 ± 18.3 g (17.2%) protein. The number of food groups was: saturated fat (24.8 ± 6.7 g), monosaturated fat (20.5 ± 7.8 g), polyunsaturated fat (11.5 ± 6.9 g), and trans-fat (2.0 ± 0.5 g) per day. In addition, 14.1 ± 6.2 g of dietary fiber, 70.9 ± 57.6 g of sugar, and 3008 ± 1231 mg sodium was consumed. Furthermore, the firefighters reported intakes of 10.0 ± 6.0 g linoleic acid, 1.0 ± 0.7 g linolenic acid, 735 ± 466 mg calcium, 170 ± 78 mg magnesium, 677 ± 850 mg potassium, and 3 ± 2 μg vitamin D. CONCLUSION: Our results suggest volunteer firefighters do not consume diets in line with the 2015 Dietary Guidelines for Americans; however, additional data is needed to completely understand the dietary preferences of firefighters.

**Board #240**
May 31 9:30 AM - 11:00 AM
Efficacy of a Goal Setting Intervention on Firefighters’ Cardiorespiratory Fitness: A Pilot Randomized Controlled Trial
Dierdra Bycura, Natalia Dmitrieva, Anthony Santos, Kelsey Waugh, Kamiko Ritchey. Northern Arizona University, Flagstaff, AZ. (Sponsor: Jean-Pierre Boucher, FACSM)
Email: dierdra.bycura@nau.edu

**Board #248**
May 31 9:30 AM - 11:00 AM
Heart Rate Recovery As Part Of Firefighters’ Selection Process?
Jean-Guy Handfield1, Vincent Gosselin Boucher2, Alain Steve Comtois2. 1Optimum Consultants, Montréal, QC, Canada. 2University of Québec à Montréal, Montréal, QC, Canada. (Sponsor: Jean-Pierre Boucher, FACSM)
Email: vincent.gosselin.boucher@gmail.com

The protection of firefighters is physically demanding, requiring a high level of both cardiorespiratory and muscular fitness. However, some studies have examined these fitness components among female firefighters (FF) and it remains unclear if this population is meeting minimum standards adopted by the National Fire Protection Association (NFPA). PURPOSE: To describe cardiorespiratory and muscular fitness of female career FF, and to determine if age affected their achievement of recommended profession standards. METHODS: A cross-sectional analysis of age groups (25-34, 35-44, 45-54, >55) was conducted on 49 female FF over a ten-year span. Outcomes included cardiorespiratory fitness (CRF) expressed as maximum METs achieved during graded exercise to volitional fatigue, and muscular fitness (push-ups, sit-ups, and Sorenson test). A one-way analysis of variance (ANOVA) with Bonferroni post-hoc comparisons was used to determine mean (± SD) differences (alpha level of 0.05) between age groups. RESULTS: The mean maximum METs achieved was significant across age groups, decreasing from 14.0 ± 2.2 in the 25-34 age group to 12.8 ± 1.4 in the 55+ age group (p<0.001). The maximum number of push-ups was significant across age groups, decreasing from 34.0 ± 13.8 in the 25-34 age group to 31.6 ± 16.1 in the 45 to 54 age group, but increased to 35.8 ± 13.2 in the 55+ age group (p<0.02). Mean differences between age groups for sit-ups and the Sorenson test were not significantly different (p>0.05). CONCLUSION: While the mean values for age-groups consistently met or exceeded the 12-MET minimum CRF standard of the NFPA, the percentage of FF that fell below this cut-off ranged from 13% in the 25-34 age group to 39% in the 45-54 age group. Strategies to maintain fitness among all female FF are needed to ensure safe and effective job performance.

Abstracts were prepared by the authors as submitted.
staircase with hose, forced entry simulations with a sledgehammer, portable ladder manipulation, exploration work with a gaff pole and transporting an unconscious victim. Each participant was equipped with a HR monitor. A performance index, using heart rate at minute two of a 4 minute recovery period sitting down immediately after the course test and time of completion, was created to determine if a participant could in theory pass to the next stage of a hiring process. RESULTS: The maximal heart rate was $197 \pm 2.6$ bpm and represented the HR reached during the course test. The percentage of HR recovery after 2 min was $30 \pm 4.1\%$ for participants who passed (n=40) and $20 \pm 2.6\%$ for participants who did not pass (n=8) (p<0.001). Decrease of relative recovery was significantly different for the participants who passed or did not pass (p < 0.05), between 8 and 10 %. The index identified the overall performance with discrimination (p<0.001) for the two groups (7.70 ± 0.52 and 6.14 ± 0.52, respectively). CONCLUSIONS: The evaluation of firefighters reveals the high intensity of effort required during intervention situations and the need to consider the moments of pauses, duration of pauses and aerobic fitness.

POLICING IS A DANGEROUS ACTIVITY WITH INTENSE PHYSICAL AND PSYCHOLOGICAL DEMANDS THAT MIGHT IMPACT POLICE OFFICERS (PO) QUALITY OF LIFE. PURPOSE: To evaluate physical fitness (PF), body composition (BC) and quality of life (QL) among Brazilian male police officer recruits METHODS Participants were 219 male PO recruits of a northern state of Brazil engaged on a mandatory 6-month training course before admission in the Police Department. The course is a 6-month full-time activity that includes 3 sessions of physical training/week and other police tasks. During the early part of the course, cardiorespiratory fitness (CRF) and muscle strength (MS) were evaluated by means of the Cooper running test (CRF), curl up, pull up and push up tests (MS). BC was evaluated by BMI, body fat percentage (BF% - Jackson & Pollock 3 skin fold) and waist circumference (WC). In the same evaluation, QL was assessed by the WHOQOL-Bref, that ascertains the QL in four domains: physical, psychological, social, and environmental. We compared the QL by BMI categories (normal vs overweight vs obese) using Mann-Whitney test. We also evaluated the correlation between PF tests and QL (Spearman test), always applying 5% level of significance RESULTS Mean (±SD) PO age and BMI were 25.5±3.6 years and 24.4±2.5 kg/m². PO showed high level of PF and reduced QL (Table 1). There was no association between all PF components and all QL domains (r<0.1, p>0.12). Using BMI, 33% of PO would be classified as overweight and 2.7% as obese, but all participants were in the normal range for BF% and WC (<20% and <94cm, respectively) CONCLUSION We observed high levels of PF and a relatively impaired QL among young PO recruits. Contrarily to previous findings, QL was not correlated to PF which may be related to high demands during the course. Therefore, considering BF% and WC values, the adequacy of using BMI for BC evaluation in the population (young well fit PO recruits) needs further investigation.

| Table 1 Descriptive values of physical fitness, BC and QL among 219 Brazilian male PO recruits |
|---------------------------------|---------------------------------|
| Push up (repetitions)           | 30.4 ± 2.32                     |
| Curl up (repetitions)           | 34.4 ± 3.58                     |
| Pull up (repetitions)           | 7.3 ± 3.68                      |
| CRF (VO2max·ml·kg⁻¹·min⁻¹)      | 48.5 ± 3.65                     |
| BF (%)                         | 11.2 ± 3.8                      |
| WC (cm)                        | 80.3 ± 5.5                      |
| QL Physical domain             | 66.5±15.17                     |
| QL Psychological domain        | 75.6±17.06                     |
| QL Social domain               | 69.5±18.33                     |
| QL Environmental domain        | 54.4±13.48                     |

The central governor theory (CGT) states that metabolites that act through sensory feedback mechanisms act on the brain and spinal cord, allowing the nervous system to decide the extent of skeletal muscle recruitment during exercise. This ensures that homeostasis is maintained throughout exercise, regardless of the conditions of the exercise. Few studies have examined the role of the CGT and teleoanticipation during resistance training. PURPOSE: Evaluate the role of the CGT and teleoanticipation during resistance training. METHODS: A convenience sample of 26 participants (age= 21.31 ± 1.99 yrs, ht 175.08 ± 9.15 cm; mass 81.04 kg ± 13.16 kg) completed three testing sessions: 1) 1 RM BF determination; 2) Submaximal BF tests to fatigue (100% BF); 3) Submaximal BF tests to fatigue unknown weight (UW). KW and UW sessions were randomized and completed at 70% 1RM. RESULTS: One-way ANOVA revealed no significant effects for testing order. Repeated measures t-tests revealed no significant differences in number of repetitions (KW 14.23 ± 2.76 v. UW 14.73 ± 2.24 t = 1.18, df = 25, p = .25), CRF (KW 13.37 ± 14.0 v. UW 13.00 ± 1.66; t = 1.26, df = 25, p = .22) or attentional focus (%associative v. %dissociative) (KW 68.46 ± 12.87 v. UW 68.85 ± 13.36, t=0.15, df = 25, p = .88). CONCLUSIONS: While completing the BF participants used more associative rather than dissociative attentional strategies. RPE, reps to fatigue, and attentional did not differ across KW and UW conditions. Load knowledge did not influence performance.
Biomechanical energy harvesting from elastically-suspended load carriage is a promising source of power for Soldiers, who often march with heavy loads at varying speeds on various terrains. An energy harvesting backpack (EHB) has been developed which generates power from vertical oscillations during locomotion. Ideally, the EHB should not increase psycho-physiological burden compared to the standard military assault pack (AP). PURPOSE: To compare ratings of perceived exertion (RPE) while walking with an EHB and an AP at different speeds on different grades. METHODS: 16 subjects (M±SD; 28.6±4.9 years; 173.4±10.6 cm; 78.7±16.4 kg) walked on a treadmill with each pack for 5 minutes at each of three grades (+5%, 0%, and -5%) and each of two speeds (1.34 m/s and self-selected faster speed). Both the AP and EHB contained a 15.9 kg load, but the design of the EHB made it 4.4 kg heavier than the AP. A Borg RPE score was taken during the last 10 seconds of walking at each grade and speed. A within-subjects ANOVA was used to determine effects of pack, grade, and speed on log-transformed RPE. Alpha level was set a priori at p<0.05. Post-hoc comparisons were explored using Bonferroni corrections. RESULTS: There were main effects for pack, speed, and grade (F1,152=14.3, F1,152=100.1, and F1,152=346.3, respectively; p<0.001) with no interaction effects. Subjects reported a greater sense of exertion with the EHB (11.9±2.8) than with the AP (11.2±2.6) regardless of speed and grade. Faster speeds elicited higher RPE scores than slower speeds (13.1±2.4 and 10.1±2.1, respectively), while the incline grade produced higher RPE scores (13.1±2.5) than decline and level grades (10.3±2.3 and 11.2±2.5, respectively). CONCLUSIONS: The EHB caused greater levels of perceived exertion that were not altered by walking speed or grade. This may be due to the extra stabilization required or the extra weight cost of the EHB. Kinematic variables (trunk lean) related to this research suggest potential non-linear effects of EHB use, which may also be related to the increased perceptions of exertion found here. This may affect trade-offs between power generation, perceived exertion, and metabolic cost that warrants further research and may ultimately affect user-acceptance of suspended-load energy harvesting systems in the field.

INTRODUCTION: Poor exercise adherence is resulting in a rise of chronic diseases. High intensity interval training (HIIT) may improve adherence as it takes less time and is less monotonous. Beneficial physiological effects have been measured, but perceptual responses to HIIT have not been researched in overweight and obese (OW/ OB) individuals.

PURPOSE: To analyze whether participants prefer HIIT in comparison to continuous aerobic exercise (CON). METHODS: OW/OB individuals (30-55 years old) completed, in a randomized order: CON) a 45 minute walk at 65% of the age predicted maximal heart rate (APMHR), HIIT60 a 20 minute exercise in which the intensity alternated between 80% APMHR and 60% APMHR every 60 seconds, and HIIT90 a 21 minute exercise in which the intensity alternated between 80% APMHR and 60% APMHR every 90 seconds. Heart rate (HR), ratings of perceived exertion (RPE), and exercise enjoyment were measured during the exercise. Feeling scale (FS) and physical activity enjoyment scale (PACES) was measured 5 and 35 minutes post exercise.

A qualitative (QUAL) interview was conducted 35 minutes post exercise.

RESULTS: HIIT was more preferred than CON as evidence by a higher (p<0.05) Friedman’s rank score in HIIT90 and HIIT60 compared to CON. Post exercise PACES was higher in HIIT60 and HIIT90 (p<0.05) and CON compared to HIIT60. Higher HR during HIIT60 and HIIT90 (p<0.05) indicate higher intensities during the exercise. Perceived exertion was higher (p<0.05) in HIIT90 and HIIT60, as evidence by Friedman’s rank scores of 2.36, 2.29, and 1.36 in HIIT90, HIIT60, and CON. QUAL data showed a feeling of passive exercising among CON compared to dynamic exercising among HIIT. Inability to self-regulate and safety concerns were felt in regards to HIIT. Lack of time and energy were factors for not exercising; HIIT was seen to be an effective method for time compared to CON for lack of energy.

CONCLUSIONS: HIIT was a more preferred exercise, both during and after the exercises, regardless of the higher intensities. Greater challenges as well as dynamic changes in intensity were referenced as positive exercise perceptions. Both exercises were seen to be utilized in different scenarios such as lack of time for HIIT and a family activity for CON. Thus, HIIT is a preferred exercise within those who are OW/ OB.

Work-to-rest ratios (W:R) are designed to allow optimal recovery in sequential exercise bouts with particular consideration of intensity and duration. Emerging evidence supports the use of perceptual measures of recovery as valuable training tools in human performance. However, the efficacy of a perceptual measure of recovery compared to pre-established W:R during bouts of repeated sprint work has not been explored. PURPOSE: To compare performance during identical bouts of repeated sprints using either a previously tested W:R methodology or the use of a perceptual measure to gauge recovery. METHODS: Eight sprint-trained individuals completed two repeated sprint trials consisting of 3 sets of 8, 30-meter sprints on a non-motorized treadmill.

Between each set of sprints, participants were given either a standard 5-min recovery whereupon the next set of sprints began or they were allowed to gauge recovery using the previously tested 0-10 Perceived Recovery Status (PRS) scale. When using the PRS, once a participant estimated a recovery level ‘5’ they began their next set of sprints. Performance measures included power (watts), decrements in power (DEC), recovery of power between sets (REC), and acute RPE estimated per sprint, but averaged to represent RPE in a set. RESULTS: When using the PRS, individuals self-selected longer recovery times than the standard 5 minutes (on average 24 sec longer between sets 1 and 10 min 54 sec between sets 2 and 3). Performance measures ANOVA revealed no significant differences (p > 0.05) in performance measures. However, performance was improved, albeit not significantly, when participants used the PRS method vs. the traditional W:R. In general, when using
the perceptually-regulated recovery strategy, improvements (~8-12%) were observed in power, DEC, REC, and RPE vs. a set 5-min recovery period. CONCLUSIONS: Results indicate that perceptually-regulated recovery strategies are effective but produce, at a minimum, statistically similar repeated sprint performance results. In addition, greater consistency associated with subjective markers, increased adherence to exercise associated with this form of training is plausible when using perceptual markers to set intensities during exercise.

429 Board #250 May 31 11:00 AM - 12:30 PM Comparison Of Different Instructional Sets For Patient-Generated Indexes Of Pain Severity
Email: dannecker@missouri.edu

Patient-Generated Indexes (PGIs) are a form of individualized patient-reported outcome measure that request patients to self-identify a predetermined number of health concerns and then rate the severity of the concerns. PGIs have been used to measure such concerns as quality of life, physical function, disability, and pain. The instructional sets of PGIs vary, but no studies were located that have tested the impact of different PGI instructional sets on severity ratings. PURPOSE: This study directly compared a PGI instructional set that requested painful activities (PGI-pain) to a PGI instructional set that requested activities from within the patients’ daily routines (PGI-painrelief). METHODS: The sample consisted of cohorts of patients with knee osteoarthritis (OA) who were either non-surgically managing their OA (n = 31, 62 yrs old (SD = 10.18), 64.5% women) or scheduled for their first joint replacement's (n = 30, 56 yrs old (SD = 6.45), 70.0% women). During a single visit, patients completed both PGIs without any activity prompts. Also, they completed a numeric pain scale for rating the highest pain in the most painful knee. RESULTS: Both PGIs correlated with the numeric pain ratings (r’s = .76 & .80, p < .01). No significant differences in the patients’ pain ratings were detected between the two PGIs (t60 = 0.35, p > .05), but the numeric pain ratings (r’s = .76 & .80, p < .01). The importance of the activities that the patients identified for the PGI-painrelief was higher than for the PGI-pain (t60 = 4.28, p < .01) and the pre-surgical patients’ ratings of activity importance were higher than the non-surgical patients using both PGIs (t60 = -6.94 & -5.55, p < .01). CONCLUSIONS: The results support the construct and concurrent validity of both PGIs. Although ratings of pain severity did not differ between the two PGIs, the importance of the self-selected activities varied between them. Thus, the instructional set of PGIs may influence the criteria respondents use for identifying their concerns. These findings contribute to previous reports from qualitative studies that people prefer to assess activities they view as important. Future studies should test the impact of PGI instructional sets on responsiveness to change across time.

430 Board #251 May 31 11:00 AM - 12:30 PM Predicting Affective Exercise Responses from a Submaximal Exercise Test Using the Feeling Scale
Emilee Traxler1, Robert W. Pettitt, FACSM1, Mark Hartmann2, Cherie D. Pettitt1. 1Mississippi State University-Manhattan, Manhattan, MN. 2Iowa State University, Ames, IA. (Sponsor: Robert W. Pettitt, FACSM)

The feeling scale (FS), rated -5 to +5, where -5 is an affective state of very bad and +5 is very good, has been validated across the moderate to severe exercise domains during incremental exercise; however, little has been reported on constant-load exercise.

PURPOSE: To examine the FS during the Mankato submaximal exercise test (MSET) and predict FS responses at intensities above and below gas exchange threshold (ET).

METHODS: A total of nine adult athletes (19.9±1.7 years old) completed the MSET using stages of 35 and 65% of estimated maximal work capacity (Wpeak). Participants returned for 10-minute constant-load bouts at 50 and 70 or 72% estimated Wpeak (PGI-painrelief) was assessed at the end of each minute of the MSET and constant-load bouts. Linear regression of different PGI instructional sets on severity ratings. PURPOSE: To determine if: 1) CAF and/or a low dose of CHO (equivalent to CHO contained in ergogenic mouth rinse and insufficient to trigger a peripheral metabolic response) improves endurance capacity in sedentary adults (SED) similar to ET and 2) potential ergonomic mechanisms differ based on fitness status. METHODS: Using a double-blind crossover design, ET and SED (n=12 each) completed four exercise trials consisting of 30 min cycling at 90% lactate threshold followed by cycling time to fatigue (TTF) at 105% lactate threshold. The following solutions were ingested after standardized 43 g CHO breakfast: CAF (3 mg/kg), low (<1%) CHO (LCHO), combined CAFeLCHO, and placebo (PLA). RESULTS: ET and SED did not differ in overall mean (±SD) TTF (23±8 vs 24±1 min). TTF improved (p=0.05) in CAFeLCHO vs LCHO. When averaged across both CAF treatments (CAFeLCHO and CAF), perceived exertion was lowered and TTF was increased by 21% (26±3 vs 21.7±9 min) compared to the two no-CAF treatments (PLA and LCHO), but CAF did not alter muscle strength/activation. Blood glucose, lactate, and CHO oxidation were higher with CAF vs. no-CAF treatments. Fat oxidation was higher in ET compared to SED, but CAF did not alter fat oxidation. CONCLUSIONS: The ergogenic benefit and action of CAF appears to be independent of fitness status. The addition of LCHO ingestion, previously observed to act centrally, did not further augment benefits of CAF in the fed state.

432 Board #253 May 31 11:00 AM - 12:30 PM Fatigue as a Rehabilitation Strategy to Reduce Quadriceps Inhibition Following Anterior Cruciate Ligament (ACL) Reconstruction
Timothy Lowe1, Qi Zhang1, Xuanliang Dong1. 1University of Texas at Tyler, Tyler, TX. 2Binahebda University, Beijing, China. (Sponsor: Yong Tai Wang, FACSM)

Arthrogenic muscle inhibition (AMI), an inability to fully activate the quadriceps muscles, has been consistently observed in patients with anterior cruciate ligament reconstruction (ACLr) surgery. Reductions in quadriceps activation may be partly due to the flexion reflex pathway, which includes the activation of the hamstrings and reciprocal inhibition of the quadriceps. Central fatigue has been shown to reduce muscle activation, change movement strategy, and shift loading to other muscles. Therefore, we hypothesized that the fatigue of the hamstrings could be used to alleviate the quadriceps muscle inhibition by countering the flexion reflex. PURPOSE: To determine the effects of fatigue on reducing quadriceps muscle inhibition after ACL reconstruction.

METHODS: A total of nine adult controls (19.9±1.7 years old) with unilateral ACLr and nine control athletes (24.0±2.4 years old) with no previous history of knee injury were recruited. Fatigue was induced by performing tempo squats, in which the ACLr group tended to use hamstrings for more hip flexion and trunk forward flexion than the control group. Quadriceps inhibition was assessed through the central activation ratio (CAR), measured by twitch interpolation, before and after the fatigue for each subject. A Mixed ANOVA was performed to examine the effect of fatigue on the CAR between pre- and post-fatigue, and among ACLr and control groups. RESULTS: The CAR of the quadriceps was significantly greater post-fatigue than pre-fatigue for the ACLr group (96.0±7.6% vs. 81.2±15.8%, p=0.010) whereas no significant differences were observed for the control group between post-fatigue and pre-fatigue (96.9±9.6% vs. 97.0±17.1%, p=0.969). Additionally, in post-fatigue trials the ACLr group had marginally significant less CAR (81.2±15.8% vs. 97.0±17.1%, p=0.067) than the control group; after fatigue trials no significant differences of CAR were observed among the ACLr and control groups (96.0±7.6% vs. 96.9±9.6%, p=0.838).

CONCLUSION: These results suggest that fatigue training can be used as a rehabilitation strategy to restore normal quadriceps function at the knee joint following ACL reconstruction by relaxing the hamstrings and overcoming the inhibition of the quadriceps.
Previous research indicates that recreationally-trained subjects are able to attenuate the slow component of oxygen uptake (VO2) during heavy intensity exercise using rating of perceived exertion (RPE). Little is known, however, about the use of RPE to attenuate the slow component when exercising in the severe exercise domain. PURPOSE: The present study examined the degree to which recreationally-trained subjects could attenuate the VO2 slow component while cycling in the severe exercise domain. METHODS: A total of 15 volunteer subjects, 9 males, and 6 females (mean age ± SD = 22.3 ± 1.8), completed a 3-minute all-out exercise test for the determination of critical power (CP) and the curvature constant (κ). Subjects then returned and completed two separate bouts at 10% > CP. The constant bout required subjects to sustain their preferred cadence until exhaustion. The rest of the subjects were divided into trained group (TR, n=10, maximal oxygen uptake (VO2max): 43.1 ± 7.4 ml·kg−1·min−1) or untrained group (UT, n=10, VO2max: 40.5±1.0ml/kg/min). All subjects completed two trials in random order, consisting of HIT (10 × 1 min pedaling at 90% of VO2max) with 1 min of active rest and CP (modified 10 scale) were recorded. RESULTS: The constant bout evoked a VO2 value (43.3 ± 7.3 ml·kg−1·min−1) that was different from VO2max (43.1 ± 7.4 ml·kg−1·min−1) (t = 0.17, p = 0.87), confirming that the intensity was in the severe exercise domain. In the regulation bout, there was a significant gain (−7 ml·kg−1·min−1) in VO2 between 2 min and the end of exercise (t = 6.25, p < 0.01). A wide range of utilization for the work capacity above CP was observed (2.0 - 13.7 kJ). CONCLUSION: In contrast to exercise in the heavy domain, recreationally-trained subjects are unable to attenuate the VO2 slow component using their RPE in the severe domain. Future research is needed on fitter subjects and/or different psychometric scales.

Although exercise has been shown to alter transiently affective variables, the impact of fitness levels on affective response to high-intensity interval training (HIT) remains unclear. PURPOSE: The present study was designed to compare affective responses between HIT and continuous exercise at low-intensity in trained and untrained men. METHODS: Twenty male subjects (21.2±0.34 years) were divided into trained group (HIT, n=10, VO2max: 55.6±1.1 ml·kg−1·min−1) or untrained group (BT, n=10, VO2max: 52.7±1.1 ml·kg−1·min−1). All subjects completed two trials in random order, consisting of HIT (10 × 1 min pedaling at 90% of VO2max) with 1 min of active rest at 30% of VO2max or 60% of pedaling at 50% of CP (LOW). Systolic blood pressure, heart rate, muscle soreness, fatigue, vitality and desire for exercise were evaluated using visual analog scale before exercise and during 60 min of post-exercise period. Moreover, two-dimensional mood scale (TDMDS) was conducted to assess vitality, stability, pleasure and arousal. Blood samples were also collected to determine blood lactate concentrations. During exercise, heart rate (HR) and rating of perceived exertion (modified 10 scale) were recorded. RESULTS: Exercise-induced blood lactate elevation was significantly greater in the TR group than in the UT group (group × time, P < 0.05). The results of TDMDS revealed that exercise altered significantly arousal, vitality, stability and pleasure (main effect for time, P < 0.05) after HIT and LOW. However, scores of vitality, stability and pleasure were significantly (P < 0.05) elevated 60 min after HIT in the UT group, whereas the TR group did not show similar change. CONCLUSIONS: These findings suggest that exercise improves acutely affective variables. However, the affective response to exercise appears to be particularly influenced by fitness levels, and HIT augments vitality, stability and pleasure during post-exercise period only in untrained men, not in trained men.
RESULTS: Injuries were sustained by 14 of 43 players (33%). Univariable associations of binary risk classification with injury occurrence were: SFI ≥ 86 (OR=1.77), UFS Jerk RMS ≥ 0.06 (OR=4.19), RPR ≤ 11 Hits (OR=2.95), and Games Played ≥ 8 (OR=3.16). A large SFI X UFS X RPR interaction effect was identified (OR=11.20). Logistic regression results for the combination of the 3-way interaction (Adjusted OR=21.32) with Games Played ≥ 8 (Adjusted OR=6.19) yielded a strong prediction model $p^2 = 0.94, p < .001; R^2=0.65$. Cox regression results for a binary SFI X UFS X RPR classification, adjusted for the potentially confounding effect of differential game exposure among players (0-13 games), demonstrated a strong association with time to injury occurrence (HR=4.65; 90% CI: 1.74, 12.44).

CONCLUSIONS: The findings support the potential for reduction of football injury risk through targeted interventions that address modifiable deficiencies in peripheral visual awareness, reaction time, and postural stability.

437 Board #258
May 31 11:00 AM - 12:30 PM
Relationships Among Lower Extremity Range Of Motion, Postural Control, And Power Generation Asymmetries: The FPPE Project
Daniel R. Clifton, Cambrie Starkel, James A. Onate. The Ohio State University, Columbus, OH. Email: dcliffton88@gmail.com

Lower extremity (LE) musculoskeletal (MSK) injury risk factors are often examined in isolation without regard to how their interrelationships may influence injury risk. Developing a better understanding of relationships among MSK injury risk factors may help inform future injury risk assessment models. Purpose: Identify relationships among LE range of motion (ROM), postural control and power generation asymmetries. Methods: Prior to the start of their competitive sports seasons, high school football, soccer, basketball and lacrosse athletes completed the ankle dorsiflexion weight-bearing lunge (DF), single leg anterior reach (SLAR), and anterior single leg hop for distance (SLHOP) tests as part of the Functional Pre-Participation Physical Evaluation project. These tests were used as assessments of LE ROM, postural control, and power generation, respectively. DF measurements were recorded in centimeters while SLAR and SLHOP distances were recorded in centimeters and normalized to the participants’ leg lengths. Limb symmetry indices (LSI) were calculated for all tests as the minimum score of the two legs divided by the maximum score. Linear regression was used to assess direct effects of DF LSI and SLAR LSI on SLHOP LSI. A linear regression-based mediation analysis was performed to determine if DF LSI was indirectly related to SLHOP LSI through an effect on SLAR LSI. Statistical significance of the indirect effect was assessed using a 95% bias-corrected bootstrapped confidence interval (CI) with 50,000 samples. A 95%CI that did not include 0.00 was considered statistically significant. Alpha level was set a priori at p<0.05. Results: 3,765 male (15.65=1.23 years, 177.170.9mm, 74.34=16.38kg) and 1,874 female (15.51=1.17 years, 165.05=0.7mm, 60.26=9.9kg) high school athletes participated in this study. DF LSI (coefficient: 0.03, 95%CI=0.02-0.04; p<0.001) and SLAR LSI (coefficient: 0.21, 95%CI=0.17-0.24; p<0.001) were directly related to SLHOP LSI. DF LSI was indirectly related to SLHOP LSI (coefficient: 0.005, 95% bootstrapped CI=0.003-0.007) through its effect on SLAR LSI. Conclusion: LE ROM, postural control, and power generation asymmetries are related through a combination of direct and indirect effects. Future research should examine how these interrelationships influence LE MSK injury risk.

438 Board #259
May 31 11:00 AM - 12:30 PM
The Comprehensive High-level Activity Mobility Predictor-Sport (CHAMP-S): A Performance-Based Outcome Measure to Quantify High-level Mobility and Assist with Return to Sport for Division I Collegiate Football Players
Ignacio A. Gaunaurd, Michele Raya, Luis Feigenbaum, Christopher L. Bennett, David Viggiano, Lee Kaplan, Robert Gailey. University of Miami, Coral Gables, FL. Email: igaunaurd@med.miami.edu

The Comprehensive High-level Activity Mobility Predictor (CHAMP) is a reliable and valid outcome measure that assesses high-level mobility in Service Members (SM) with traumatic lower limb loss. The CHAMP has the potential to be used to assess current high-level mobility capabilities in healthy, athletic individuals, to determine those athletes that may be at risk for injury, can be administered throughout rehabilitation process, and can assist with return to play decision making for collegiate athletes that suffer lower limb injuries. Purpose: To develop the reliability and validity of the Comprehensive-High-Level Activity Mobility Predictor-Sport (CHAMP-S) in Division I Collegiate Football Players. Method: 206 student athletes participated in the study. 97 were tested at one time by three testers (two using the paper format and one using a mobile device application) to determine CHAMP-S interrater reliability. 115 had completed CHAMP-S, anthropometric measures, upper and lower limb power, speed, and agility measures and a sport-specific 3-way interaction (OR=4.19) underwent correlation analysis. 206 underwent ANOVA followed by post hoc analysis to determine differences between CHAMP-S scores between different football positions. Twenty athletes who underwent season ending injury were administered the CHAMP-S every 4-5 weeks throughout rehabilitation to assess change in high-level mobility and determine return to sport.

Results: The ICC’s for the CHAMP-S items ranged from 0.90 (95% Confidence Interval, CI: [0.85, 0.93]) to 0.98 (95% Confidence interval, CI: [0.97-0.99]) for Single Limb Stance, Four-meter side step test, L-Test, and Illinois Agility Test. The CHAMP-S was significantly correlated with BMI, % Body Fat, Vertical Jump, Broad Jump, 40-yard dash, and shuttle run. The CHAMP-S demonstrated differences between linemen and skilled position players in all planes of movement. All 20 athletes returned to play safely and had not suffered re-injury to the ipsilateral contra-lateral lower extremity. The athletes achieved 103% ± 5% (95-109%) of their baseline CHAMP-S score (p = 0.09). Conclusion: The CHAMP-S is a reliable and valid measure of high-level mobility in Division I Collegiate Football Players that can help determine differences by position and assist return to sport following lower limb injury.

440 Board #261
May 31 11:00 AM - 12:30 PM
Test-Retest Reliability of Functional Tasks in Healthy High School Athletes: The FPPE Project
Cambrie Starkel1, Daniel R. Clifton1, Thomas M. Best, FACSM2, James Borchers, FACSM3, Ajiit Chaudhari, FACSM4, R. Dawn Comstock1, Nelson Cortes5, Jay Hertel, FACSM6, Xueliang Pan7, Bonnie Van Lunen8, James Onate9, 1The Ohio State University, Columbus, OH; 2University of Miami, Miami, FL; 3University of Colorado-Anschutz, Denver, CO; 4George Mason University, Manassas, VA; 5University of Virginia, Charlottesville, VA; 6Old Dominion University, Norfolk, VA. (Sponsor: James Borchers, FACSM)

The 4th edition of the Pre-Participation Physical Evaluation (PPE) recommends functional testing for the musculoskeletal portion of the examination. However, limitations exist concerning recommended functional test components and the feasibility of implementing this test battery in the secondary school setting. In particular, test-retest reliability for recommended functional tests across secondary school settings has yet to be established.

439 Board #260
May 31 11:00 AM - 12:30 PM
Predicting Knee and Thigh Injury Risk Using Scaled Vertical Jump and Standing Long Jump Power
Suzanne M. Konz, Marshall, Huntington, WV. Email: konz@marshall.edu

Movement tests, such as the VJ and SL, are used to determine power, athlete development, and quantify training protocol effectiveness. An idea exists to compare the power outputs from a VJ and a SLJ to give a picture of lower extremity injury risk, cost ability to use easy and inexpensive common movement tests could greatly enhance the capabilities of allied health care professionals. Purpose: to examine the ability to predict knee and thigh injury based upon an allometrically scaled ratio of VJ and SLJ power. Methods: Participants included 26 female NCAA-I athletes from soccer and volleyball teams. The study examined testing data on the athletes before an off-season training cycle. Previous thigh or knee injury was compared to scaled Avg. power ratio, scaled peak power ratio, and z-scores for Avg. power and peak power. Conclusion: ROC curves analyzed the relationships. Significance was set at the .01 level. Results: There were no correlations between the variables of interest and an athlete’s past injury history. The individual team variables also revealed no correlation. ROC curves indicated: VJ Avg. power (.631), VJ peak power (.663), SLJ Avg. power (.622), and the VJ/SLJ peak power ratio (.663) indicated individuals who are at risk for injury. Conclusion: Correlation indicates that ratios of power output for VJ and SLJ are not effective for predicting injury potential. A reason for the lack of correlation could be due to the crossover in vertical and horizontal components of VJ and SLJ success. The crossover of the horizontal components in the VJ jump is not as impactful as the vertical pieces of the SLJ. Each sport has different skills involved The ROC curves do not provide strong specificity or sensitivity for predicting injury risk. The peak power ratio does not provide a solid means to predict injury risk. The z-scores of the Avg. power ratio failed and the peak power power ratio failed in sensitivity and specificity. However, using the individual outputs of each revealed interesting information. VJ Avg. power, VJ peak power, and SLJ Avg. power provide a degree of prediction capability. The data confirms that the two sports are different from each other in power needs. Using the performance tests of the VJ and the SLJ to determine injury risk does seem to predict the possibility of a knee or a musculoskeletal thigh injury.
Purpose: Determine test-retest reliability of three functional tests utilized in the Functional Pre-Participation Physical Evaluation (FPPE) project.

Methods: A convenience sample of four high schools currently enrolled in the FPPE project participated. Prior to the start of their competitive sports seasons, high school athletes completed a weight-bearing lunge to assess ankle dorsiflexion range of motion (DF) as well as the single leg anterior reach (SLAR) and anterior single leg hop for distance (SLHOP) tests as part of the FPPE project. Athlete testing was conducted by the head Certified Athletic Trainer (AT) at each high school and was repeated one week after the initial test date. Intraclass correlation coefficients (ICC) using a two-way mixed effects model and an absolute agreement definition were calculated for each functional test. Separate ICCs were calculated for each AT. ICC(3,1) values were interpreted as: excellent (>0.75), fair to good (0.40-0.75), and poor (<0.40).

Results: 40 athletes (m:23/17; 16:4:1:1; 1.78±0.11 m, 70.1±13.1 kg) participated in this study (10 athletes per high school). Test-retest reliability was excellent for all raters for both the DF (ICC(3,1): range: 0.817-0.975) and SLHOP tests (ICC(3,1): range: 0.832-0.963). Test-retest reliability of the SLAR was found to be excellent for two raters (ICC(3,1)): 0.813, 0.876 and fair to good for two raters (ICC(3,1): 0.583, 0.693).

Conclusions: Test-retest reliability for functional tasks utilized in the FPPE project was generally excellent across a sample of high school ATs, supporting the utility of these tasks in longitudinal assessments in secondary school settings. Supported by NIH Grant 5R01-AR062578-02.

Board #262
May 31 11:00 AM - 12:30 PM
Injury And Illness Profiles During The 2014 South African Ironman Ultra-distance Triathlon
Louis J. Holtzhausen, FACSM, Charles R. Smir, Gina Joubert, Konrad Von Hagen, University of the Free State, Bloemfontein, South Africa.
Email: holt.louis@gmail.com
(No relationships reported)

Purpose: High physiological demands on ultra-endurance triathletes and potentially serious medical complications require scrutiny of illness and injury profiles. Accurate data are required for planning of medical services. The aims of the study were to record medical history, illness and injuries of athletes receiving medical attention during the 2014 Ironman South Africa (IMSA) triathlon, and to investigate the temporal presentation of medical encounters, to optimise deployment of medical services for IMSA events.

Methods: A retrospective, cross-sectional study of all medical encounters and associated factors during the 2014 IMSA was conducted.

Results: The incidence of medical encounters was 7.8%. A significantly higher percentage of younger participants encountered medical problems (p=0.04). The majority of patient encounters (80.1%) occurred after completion of the race, and 49.2% of patient encounters were exertion-related (71.2%), followed by gastro-intestinal (16.4%) and respiratory (9.6%). The most common medical conditions were dermatological (11.9%), musculoskeletal (9.6%) and cardiorespiratory conditions (7.7%). Conclusions: Test-retest reliability for functional tasks utilized in the FPPE project was generally excellent across a sample of high school ATs, supporting the utility of these tasks in longitudinal assessments in secondary school settings. Supported by NIH Grant 5R01-AR062578-02.

Board #263
May 31 11:00 AM - 12:30 PM
Adding BMI to Electrocardiographic Criteria Improves Accuracy of Predicting Left Ventricular Mass in Football Athletes
Stephen F. Crouse, FACSM1, John P. Erwin, III2, Stephanie White3, Joshua Hoffman1, Michael Krill1, Toren Moore1, James Borchers, FACSM1, Timothy Hewett, FACSM,1 The Ohio State University, Columbus, OH:Mayo Clinic, Rochester, MN.
(No relationships reported)

Purpose: To improve player safety, medical professionals use questionnaires, pre-participation physicals, screening tests, biomechanical analyses, and strength testing to describe characteristics of high risk athletes. The seven-test Functional Movement Screening (FMS) is widely used in current practice, and research efforts have demonstrated the efficacy of the FMS to predict future injury. However, the effect of previous injury on FMS scores has not been defined. Because previous injury is a significant predictor of subsequent injury, an understanding of the effects of previous injury on total FMS score is critical to assess the efficacy of the test to predict future injury.

Method: From 2012-2015, 58 incoming football athletes completed the FMS and a medical history questionnaire. Trained sports medicine researchers performed the screens and distributed questionnaires. Descriptive statistics were calculated to assess the effectiveness of total FMS results to predict previous injury. The previously established ≤ 14 score cut-off was used to establish the two groups’ at-risk levels. The established cut-off was reported to indicate football players at-risk for serious injury defined as out of physical participation for > 2 weeks.

Results: 46 athletes reported a prior musculoskeletal injury compared to 12 that did not. The group of 46 athletes was equally split on FMS scores with 23 athletes that recorded a score of ≤ 14 and 23 athletes that recorded a score > 14. The group that denied previous injury (N=12) was also evenly split with 6 athletes that recorded of score of ≤ 14 and 6 with a score > 14. The FMS with a cut-off score of 14 recorded a sensitivity and specificity of 0.500. The positive predictive value was 0.793 with a negative predictive value of 0.207.

Conclusions: Prior history of musculoskeletal injury as reported on the incoming medical questionnaire did not affect total score on the FMS with specificity or sensitivity. Future studies should evaluate the effects of previous injury on other current screening tools. In addition, future screening tools could be developed that assess the incidence of previous injury and risk of future injury.

Board #264
May 31 11:00 AM - 12:30 PM
High School Preparticipation Evaluation Screenings: Do States Include Mental Health Recommendations?
Jacey Keeney,1 Josh Kaplan2, Kristin L. Schneider1, Rosalind Franklin University of Medicine & Science, North Chicago, IL, 1Wittenberg University, Springfield, OH.
Email: Jaclyn.Keeney@my.rfums.org
(No relationships reported)

7.7 million high school students participate in sports annually and are required to have a physical. Given the focus on illness and injury, physicians may be more likely to focus on physical health than mental health. ACSM recommends the Preparticipation Evaluation, 4th Edition (PPE-4), which is the standard assessment tool and includes 444 Board #264
May 31 11:00 AM - 12:30 PM
Effect of Previous Injury on Functional Movement Screening Outcomes
Joshua Hoffman1, Michael Krill1, Toren Moore1, James Borchers, FACSM1, Timothy Hewett, FACSM,1 The Ohio State University, Columbus, OH:Mayo Clinic, Rochester, MN.
(No relationships reported)

Purpose: Determine the efficacy of the FMS evaluation to assess prior musculoskeletal injury.

Method: From 2012-2015, 58 incoming football athletes completed the FMS and a medical history questionnaire. Trained sports medicine researchers performed the screens and distributed questionnaires. Descriptive statistics were calculated to assess the effectiveness of total FMS results to predict previous injury. The previously established ≤ 14 score cut-off was used to establish the two groups’ at-risk levels. The established cut-off was reported to indicate football players at-risk for serious injury defined as out of physical participation for > 2 weeks.

Results: 46 athletes reported a prior musculoskeletal injury compared to 12 that did not. The group of 46 athletes was equally split on FMS scores with 23 athletes that recorded a score of ≤ 14 and 23 athletes that recorded a score > 14. The group that denied previous injury (N=12) was also evenly split with 6 athletes that recorded of score of ≤ 14 and 6 with a score > 14. The FMS with a cut-off score of 14 recorded a sensitivity and specificity of 0.500. The positive predictive value was 0.793 with a negative predictive value of 0.207.

Conclusions: Prior history of musculoskeletal injury as reported on the incoming medical questionnaire did not affect total score on the FMS with specificity or sensitivity. Future studies should evaluate the effects of previous injury on other current screening tools. In addition, future screening tools could be developed that assess the incidence of previous injury and risk of future injury.

Board #265
May 31 11:00 AM - 12:30 PM
High School Preparticipation Evaluation Screenings: Do States Include Mental Health Recommendations?
Jacey Keeney,1 Josh Kaplan2, Kristin L. Schneider1, Rosalind Franklin University of Medicine & Science, North Chicago, IL, 1Wittenberg University, Springfield, OH.
Email: Jaclyn.Keeney@my.rfums.org
(No relationships reported)
guidelines for assessing mental health. However, little is known about the inclusion of mental health recommendations in state PPE forms. Screening mental health among athletes may prevent psychological and performance-related difficulties.

**PURPOSE:** This study examines the inclusion of mental health in PPE forms in the US. We describe the mental health content of state PPE forms and consistency with the PPE-4. The content of the PPE-4 suggests that eating disorder symptoms be assessed using yes/no questions and other topics (e.g., mood, anxiety, stress, home safety, and suicide risk) be included as prevention content for athletes (modified). **METHODS:** PPE forms were retrieved via the National Federation of State High School Associations website (n=47; 4 states did not have forms). Two raters independently coded PPE forms to evaluate adherence to the PPE-4. PPE forms were coded as whether mental health issues were not addressed, addressed as a question, or addressed as a reminder. **RESULTS:** There was acceptable agreement between coders (Kappa range: 0.71-1.10; McNemar's p<0.001). Thirty-three percent of forms included a question about history of an eating disorder, 83.0% included a question pertaining to worry about weight, 83.0% included a question about presence/frequency of menstrual period, and 70.2% included a question about attempts at weight loss/gain. The physician reminders were used in less than 60.0% of forms. 46.8% of forms provided a reminder to physicians to assess substance use and safety at home. Stress was included as a reminder on 59.6% of forms. 59.6% of states included a reminder to assess for sad, hopeless, depressed, or anxious mood, with only 8.5% including a question about mood or anxiety. **CONCLUSIONS:** The PPE-4 is used to ensure safe participation in high school sports, but most state forms omit questions related to mental health. Future studies should examine physician assessment of mental health during PPE, as well as the course of treatment following a positive screen for mental health issues.

**Predicting Musculoskeletal Injuries from Psychological, Neurocognitive and Physical Factors in Collegiate Athletes Without Injury History**

Monique Mokha, 33128, Peter Sprague, 33128, Dustin Gatens, Steve Orris, Steve Russo. Nova Southeastern University, Ft. Lauderdale, FL.

**PURPOSE:** To determine if body fat percentage (high or low BF%), ImPACT reaction time (RT in sec), ImPACT visual motor speed (VMS in sec), Functional Movement Screen (FMS) scores, Beck’s depression indices (BDI), and/or Beck’s anxiety indices (BAI) could predict MSI in athletes without MSI history. **METHODS:** Seventy-one NCAA Division I football players completed a medical history questionnaire. Descriptive statistics were calculated to measure athlete safety. Movement patterns. Future work should continue to evaluate variables that may affect lower extremity injury had a higher positive predictive value (0.586) than negative predictive value (0.414) with a sensitivity of 0.500 and specificity of 0.703. The self-reported previous lower extremity injury history of our incoming freshman football student-athletes for the 2012-2015 seasons were collected during pre-participation examinations as part of standard protocol. Twenty-seven athletes (38.0%) sustained a MSI. The relative risks for an FMS asymmetry and high BF% were 1.89 (CI 1.22-2.94, p=0.001) and 1.99 (1.06-3.75, p=0.05), respectively. **CONCLUSIONS:** The self-reported previous lower extremity injury history of our incoming football student-athletes was not specific or sensitive for prediction of score on the functional movement screening evaluation to identify high risk lower extremity movement patterns. Future work should continue to evaluate variables that may affect results of screening tests for athletes at high risk of injury to continue to optimize athlete safety.

**Predicting Musculoskeletal Injuries from Psychological, Neurocognitive and Physical Factors in Collegiate Athletes Without Injury History**

Monique Mokha, 33128, Peter Sprague, 33128, Dustin Gatens, Steve Orris, Steve Russo. Nova Southeastern University, Ft. Lauderdale, FL.

Email: gm586@nova.edu

(No relationships reported)

Musculoskeletal injury (MSI) risk in athletes is thought to be multifactorial in nature and to include psychological, neurocognitive and physical sources. However, most researchers lack the time and resources to assess these multiple factors in large groups of athletes. Examining multiple factors at once may yield improved injury prediction. **PURPOSE:** To determine if body fat percentage (high or low BF%), ImPACT reaction time (RT in sec), ImPACT visual motor speed (VMS in sec), Functional Movement Screen (FMS) scores, Beck’s depression indices (BDI), and/or Beck’s anxiety indices (BAI) could predict MSI in athletes without MSI history. **METHODS:** Seventy-one NCAA Division I football players completed a medical history questionnaire. Descriptive statistics were calculated to measure athlete safety. Movement patterns. Future work should continue to evaluate variables that may affect lower extremity injury had a higher positive predictive value (0.586) than negative predictive value (0.414) with a sensitivity of 0.500 and specificity of 0.703. The self-reported previous lower extremity injury history of our incoming freshman football student-athletes for the 2012-2015 seasons were collected during pre-participation examinations as part of standard protocol. Twenty-seven athletes (38.0%) sustained a MSI. The relative risks for an FMS asymmetry and high BF% were 1.89 (CI 1.22-2.94, p=0.001) and 1.99 (1.06-3.75, p=0.05), respectively. **CONCLUSIONS:** The self-reported previous lower extremity injury history of our incoming football student-athletes was not specific or sensitive for prediction of score on the functional movement screening evaluation to identify high risk lower extremity movement patterns. Future work should continue to evaluate variables that may affect results of screening tests for athletes at high risk of injury to continue to optimize athlete safety.

**Prediction of Previous Lower Extremity Injury on Functional Movement Screening Results**

Michael K. Krill1, Joshua T. Hoffman2, Toren Moore2, James R. Borchers, FACSM, Timothy E. Hewett, FACSM1. ‘Florida Atlantic University Charles E. Schmidt College of Medicine, Boca Raton, FL. ’The Ohio State University Wexner Medical Center, Columbus, OH. ’Mayo Clinic, Rochester, MN.

Email: krill.11@buckeyemail.osu.edu

(No relationships reported)

Background: Functional movement screening (FMS) is a seven-movement screening test frequently utilized as a component of pre-season physicals. Individual tests evaluate movement patterns to identify athletes potentially predisposed to injury and 17 of those athletes demonstrated scores below the lower extremity cut-off was utilized to establish the two groups’ level of risk. Results: of the 51 players that performed the 6TH, 14 reported a previous lower extremity injury. 14 of the 52 players that performed the TXH reported previous lower extremity injury. Sensitivity, specificity, PPV, and NPV are reported for the 6TH (Figure 1a) and TXH (Figure 1b).

<table>
<thead>
<tr>
<th>a.</th>
<th>Injury (+)</th>
<th>Injury (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symmetry &gt;= 10%</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Symmetry &lt; 10%</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td>Specificity</td>
<td>0.703</td>
<td></td>
</tr>
<tr>
<td>PPV</td>
<td>0.389</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td>0.788</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b.</th>
<th>Injury (+)</th>
<th>Injury (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symmetry &gt;= 10%</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Symmetry &lt; 10%</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.143</td>
<td></td>
</tr>
<tr>
<td>Specificity</td>
<td>0.711</td>
<td></td>
</tr>
<tr>
<td>PPV</td>
<td>0.154</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td>0.692</td>
<td></td>
</tr>
</tbody>
</table>

**The Efficacy Of Performance On Clinical Hop Tests To Predict Previous Lower Extremity Injury**

Toren Moore. The Ohio State University, Columbus, OH.

(No relationships reported)

Background: Clinical hop tests, such as the 6-meter timed hop (6TH) and single-leg triple crossover hop (TXH) evaluate strength and neuromuscular coordination in athletes’ lower extremities. Clinicians use symmetry in performance of these tests as a return to sport criteria after an injury, such as an anterior cruciate ligament (ACL) rupture. In addition, symmetries have been identified as a risk factor for lower extremity injury. However, the efficacy of clinical hops to identify athletes with a history of previous injury is not well defined.

**Board #267 May 31 11:00 AM - 12:30 PM**

**Predicting Musculoskeletal Injuries from Psychological, Neurocognitive and Physical Factors in Collegiate Athletes Without Injury History**

Monique Mokha, 33128, Peter Sprague, 33128, Dustin Gatens, Steve Orris, Steve Russo. Nova Southeastern University, Ft. Lauderdale, FL.

Email: gm586@nova.edu

(No relationships reported)
Chronic ankle instability (CAI) is associated with reduced proprioception and range of motion, which often results in postural control deficits. The Y-Balance Test has been used to assess lower extremity mobility, functional performance, and risk of injury. An inability to maintain single leg stance, a component of the Y-Balance Test, is associated with CAI. The Y-Balance Test has not been examined to determine performance differences in cases of CAI.

**PURPOSE**: To assess maximum reach distance (MRD) differences of the Y-Balance Test in CAI participants and healthy controls.

**METHODS**: A case control study of 28 subjects (14 healthy [age: 27.57±3.23 years; height: 169.61±8.33 cm; weight: 76.99±17.95 kg], 14 CAI [age: 24.07±4.46 years; height: 175.06±5.09 cm; weight: 82.24±10.38 kg); CAI participants were recruited per International Ankle Consortium guidelines using the Foot and Ankle Ability Measure (FAAM) and Cumberland Ankle Instability Tool (CAIT). Subjects performed three trials in each direction (Anterior [ANT], Postero-medial [PM], Posterolateral [PL]) of the Y-Balance Test. The trials were averaged and normalized for limb length to produce a MRD value for each direction. Independent sample t-tests were used to compare MRD differences between groups. Alpha was set at p < .05; an effect size above .8 was considered clinically meaningful.

**RESULTS**: Significant differences were not found for MRD in the ANT (mean difference = −1.23, p = .61, Cohen’s d = −0.20, 95% CI for Cohen’s d = −0.94 - 0.05), PM (mean difference = −0.43, p = .27, Cohen’s d = −0.43, 95% CI for Cohen’s d = −0.32 - 1.17), or PL (mean difference = −0.20, p = .26, Cohen’s d = −0.43, 95% CI for Cohen’s d = −0.32 - 1.18) directions. The control group exhibited higher scores in the PM and PL directions by being clinically meaningful. Clinicians may need to consider PM and PL MRD deficiencies on the Y-Balance Test when treating CAI patients; however, further research is needed to determine the sensitivity of the Y-Balance Test for identifying CAI.
CONCLUSIONS: These data indicate that some SC measures correlate well with on-court performance and are specific by position. A prudent training approach may be for SC coaches to focus on improving specific measures by position, which could then translate to improved game performance.

Resistance training improves muscular strength and hypertrophy, as well as cardiometabolic biomarkers. However, results in the literature have been inconsistent which may relate to the heterogeneity in training protocols. PURPOSE: This single-group pilot study defined a standardized barbell-based linear periodization full-body resistance training program and assessed its effect on muscular strength and biomarkers. METHODS: Ten healthy, untrained males (26.4±7.5 y) underwent 4 weeks of a barbell-based, full-body, linear periodization program 3×/week. Exercises included the squat, standing press, bench press, and deadlift. Participants performed 3 sets of 5 repetitions on the squat, bench press, and standing press and 1 set of 5 repetitions on deadlift. Weight was incrementally added each training session. Maximum dynamic strength was assessed by 5-repetition maximum (5RM), and biomarkers (lipids, insulin, HOMA-IR, CRP, and glucose) were assessed. The study was IRB approved. RESULTS: 5RM increased on squat (79.4%; p=0.005), bench press (25.9%; p=0.005), standing press (45.3%; p=0.004), and deadlift (52.9%; p=0.005). The sum of four lifts also increased after 4 weeks of training (50.3%; p=0.005). Over the 4 weeks, lean body mass (LBM) increased (1.5%; p=0.025). Total and HDL cholesterol decreased significantly (-14.4% and -11.7% respectively) and LDL cholesterol trended downward (-15.8%) but the total HDL cholesterol ratio was unchanged. CONCLUSION: It appears that untrained males can increase body strength on a 4-week full-body, barbell-based linear periodization training program. Changes in LBM occurred sooner than previously reported. A standardized resistance training protocol for building strength would facilitate research interpretation in this field. Randomized control trials with larger samples over longer time periods are needed to further investigate the effects of full-body barbell exercise training on changes in muscular strength, LBM, and cardiometabolic biomarkers.

Board #273
May 31 9:30 AM - 11:00 AM
Robert S. Santana, Carol Johnston. Arizona State University, Phoenix, AZ.

REFERENCES

Board #274
May 31 9:30 AM - 11:00 AM
Eccentric Resistance Training in Adults with and without Spinal Cord Injuries
Whitley J. Stone, Sandra L. Stevens, Dana K. Fuller, Jennifer L. Caputo. Middle Tennessee State University, Murfreesboro, TN. Email: wjs3e@mtmail.mtsu.edu

Following incomplete spinal cord injuries (SCI), individuals lose motor control, muscle fiber cross sectional area, and contractile force capacity, ultimately resulting in compromised functional independence. An innovative exercise modality for populations with impaired functional capacity is eccentric resistance training (ERT). PURPOSE: The purpose of this study was to examine the effects of active lower body ERT using a seated eccentric ergometer in individuals with SCI and controls (CON). Specifically, the study was designed to determine if those with SCI adapt similarly to ERT as CON participants, as well as the overall safety and efficacy of ERT in this population. METHODS: This pilot investigation involved the recruitment of persons with SCI (n = 3) and age- and sex-matched able-bodied CON (n = 3). The 8-week intervention focused on building lower extremity eccentric strength by progressively increasing the duration and intensity of the three training sessions per week. Control participants completed the same training intervention. Main outcome measures were eccentric strength (eccentric ergometer), isometric strength (hand held dynamometer), and leg muscle mass (DEXA). RESULTS: All participants completed all sessions of the ERT. At posttest, eccentric strength improved from pretest (p = .044, n = .68) with similar changes between groups (p > .05). The percent improvement in isometric strength for those with SCI (41.5%) was different than CON (2.8%) after training (p = .044). Neither group demonstrated a change in grams of muscle mass in the legs at posttest (p > .05). CONCLUSION: Active lower body ERT is well tolerated and effective at increasing lower extremity strength in those with SCI. These adaptations are likely attributable to neuromuscular development rather than a hypertrophic response.

Strength is a vital component in the performance of police duties to ensure the safety of officers and those they serve. Therefore, the initial strength the officers brings to the training program predicts the level of strength they will maintain throughout their careers. PURPOSE: To evaluate bench press strength changes that occur in police recruits from 1990 to 2013 with gender comparisons. METHODS: During the first week of police recruit training in a large southeastern metropolitan area, bench press strength and bench press weight ratio were evaluated in 2,460 recruits. ANOVA and Bonferroni post hoc procedures were used to evaluate data. RESULTS: The initial ANOVA indicated significant differences in males for both variables at p<0.05. Males tended to increase in bench press strength from 1990 to 2007 (83.7±2.0 kg to 95.9±2.1 kg, p<0.01). Male bench press strength tended to plateau after 2007. No discernible pattern was seen in females for both variables and little change was observed in males weight press ratio. CONCLUSIONS: Overall, males had a tendency to become stronger over time when considering their initial test scores in recruit school. However, females tended to remain at approximately the same muscular strength across the 23 years.

**S92 Vol. 49 No. 5 Supplement**

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**452**

**Board #273**

May 31 9:30 AM - 11:00 AM

Robert S. Santana, Carol Johnston. Arizona State University, Phoenix, AZ.

(No relationships reported)

**453**

**Board #274**

May 31 9:30 AM - 11:00 AM
Eccentric Resistance Training in Adults with and without Spinal Cord Injuries

Whitley J. Stone, Sandra L. Stevens, Dana K. Fuller, Jennifer L. Caputo. Middle Tennessee State University, Murfreesboro, TN. Email: wjs3e@mtmail.mtsu.edu

(No relationships reported)

**454**

**Board #275**

May 31 9:30 AM - 11:00 AM
Bench Press Strength Changes Over 23 Years in Police Recruits with Gender Comparisons

Elizabeth H. Seldomridge, Robert W. Boyce, FACSM, Austin C. Smith, Haley O. Norris, Glenn R. Jones, Michele A. Parker. University of North Carolina Wilmington, Wilmington, NC. City of Charlotte Police Department, Charlotte, NC. Email: cbhs3188@uncw.edu

(No relationships reported)

Recent evidence suggests that Superslow resistance training (SS), involving low intensity workloads and slow repetitions, has potential to produce improvements in muscular strength similar to traditional high intensity resistance training (TR). Few studies have compared endocrine responses to SS and TR protocols. PURPOSE: To compare acute hormonal responses to two resistance exercise protocols that have similar exercise volumes, but differ in intensity and contraction speed. METHODS: Thirteen males (18-35 years) participated in this randomized crossover study. Participants performed two protocols in random order separated by 3-week washout periods. For TR, participants completed 3 sets of 8 reps at 80% 1-RM for four upper and lower body exercises with 1.5 seconds of concentric and eccentric contraction speeds. For SS, participants performed 1 set of each exercise to voluntary failure at 50% 1-RM with 10 seconds concentric and 5 seconds eccentric contraction speeds. Fasting morning blood draws were taken before (Pre), immediately post exercise (IP), and 15 min post exercise (15P). Serum samples were analyzed for testosterone (TES) and cortisol (Cor) concentrations using ELISA. Lactate and hematocrit were also measured for each condition. RESULTS: There were no significant differences in baseline values between the two conditions. There was a significant (p<0.05) time effect for raw concentrations of TES and Cor. TES significantly (p=0.05) decreased from IP to 15P for both conditions (SS- 8.25 ± 1.37 ng/ml to 7.38 ± 1.26 ng/ml; TR- 8.50 ± 1.25 ng/ml to 6.94 ± 0.88 ng/ml). There was a trend (p=0.059) for Cor to increase from Pre to IP for both conditions (SS - 166.66 ± 15.15 ng/ml to 216.08 ± 18.16 ng/ml; TR- 157.55 ± 8.77 ng/ml to 201.03 ± 19.84 ng/ml). TES % change showed a significant time effect as it increased from Pre to IP (SS- 9.5% ± 4.39% ; TR- 15.39 ± 7.73%) and decreased from Pre to 15P (SS- −5.48 ± 6.70% ; TR- −5.41 ± 3.79%). Cor % change was not different between the two conditions. Correcting for hemocentration eliminated the significant responses. CONCLUSION: Both protocols showed similar patterns of hormonal responses, which may have been mediated by plasma volume shifts. This finding supports that SS exercise could be a beneficial alternative for those unable to perform high-intensity resistance exercise.
Official Journal of the American College of Sports Medicine

Vol. 49  No. 5  Supplement  S93

May 31 9:30 AM - 11:00 AM

Board #277

Comparison Of Peak Power In The High Bar And Low Bar Squat Across Eight Loads

Jacob R. Goodin, Caleb D. Bazyler, Jake R. Berndams, Joseph Walters, Satoshi Mizuguchi, Michael H. Stone. East Tennessee State University, Johnson City, TN. (No relationships reported)

PURPOSE: To examine differences in peak power output between high bar (HBS) and low bar squats (LBS).

METHODS: Six trained males (25 ± 3.1 years, 1.78 ± 0.04 m, 87.6 ± 7.5 kg) with previous squatting experience (experience: 7.5 ± 4.1 years, HBS 1RM: 157.0 ± 15.3 kg, squat/bodyweight: 1.8 ± 0.18) completed the study using a crossover design. Subjects completed a 4-week familiarization phase with both conditions. Peak power data was collected over 2 sessions using dual uniplanar force plates synchronized with 2 string potentiometers on each side of the bar collecting at a sampling frequency of 1000 Hz using a BNC 2110 connector with an analog to digital converter. Subjects were randomly assigned to the HBS or LBS for 1 set of 3 repetitions at 20, 30, 40, 50, 60, 70, 80, and 90% of their most recent HBS training 1RM with 3 to 5 minutes’ rest between sets and 72 hours between testing conditions. A 2x8 repeated measures analysis of variance was used to determine interactions and main effects for condition and load with post-hoc tests conducted for statistical main effects.

RESULTS: Analysis revealed significant main effects for load (p < 0.01) but not for condition. Peak power output was greatest at 70% of HBS 1RM for the LBS, and 80% of HBS 1RM for the HBS.

CONCLUSIONS: According to this pilot data, athletes seeking to increase power production ability should choose a squatting style in which they feel most proficient and comfortable. Furthermore, either the HBS or LBS can be used as the primary squating movement, or as a secondary movement to provide variation and remove linearity from the training program. However, based on previous research it is likely that sport specific biomechanical parameters will influence the squatting style selection for the majority of athletes who participate in sports that involve jumping, sprinting, and change of direction. Training with loads between 70% and 80% of HBS 1RM may be optimal for increasing power production ability. Further research using a larger population of well-trained athletes is suggested in order to more precisely compare HBS and LBS power outputs.

May 31 9:30 AM - 11:00 AM

Board #279

Increased Performance of Upper-Body Strength Exercise: Effect of Leg Induced Increase in Blood Lactate Concentration

Philipp Birnbaumer1, Alexander Müller1, Gerhard Tschakert1, Serge P. von Duvillard, FACSM2, Peter Hofmann, FACSM3. 1Institute of Sports Science, Graz, Austria. 2Institute of Sports Science Salzburg, Austria. (Sponsor: Serge P. von Duvillard, FACSM)

Email: pbirnbaumer@gmx.at (No relationships reported)

Studies have shown that high systemic blood lactate concentrations led to inhibition of glycolysis and an increase of oxidative metabolism in subsequent anaerobic exercise. PURPOSE: The aim of this study was to examine the effect of increased blood lactate (La) concentration induced by high intensity leg exercise on net lactate production and performance in subsequent dynamic arm pull-ups. METHODS: Nine trained sport students (age: 25 ± 1.9 yr; BMI: 21.7 ± 1.4) performed arm pull-ups on a horizontal bar with legs placed on a box either with or without pre-load (PRE) in a randomized order. PRE was a 26.6±2s all out shuttle run to increase La to ~8 mmol.l⁻¹. A greater volume of training may need to be performed for H to elicit greater performance in subsequent dynamic arm pull-ups.

CONCLUSION: These findings suggest that all training protocols may increase MT of H and Q similarly, which may not lead to improvements in H:Q muscle ratio. A greater volume of training may be required for H to elicit greater H:Q muscle size balance.
Resistance training (RT) has been shown to have numerous health and performance benefits across varied populations; however, the majority of the research conducted on the general population has focused on machine-based RT protocols. PURPOSE: To evaluate the chronic effects of a standardized whole body barbell training program on healthy participants. METHODS: 51 subjects (age 21.4 ± 4.7 yrs, ht 170.3 ± 10.6 cm, body mass 69.6 ± 15.2 kg, waist 73.6 ± 9.3 cm, and hip 96.1 ± 8.0 cm, 22♀) were familiarized and a five repetition training load was titrated to the point the subject reached a load that they could lift safely 5 times without any degradation of form. Subjects performed the barbell squat (BS) (50.5 ± 28.8 kg), standing shoulder press (P) (26.2 ± 10.1 kg), barbell deadlift (DL) (60.2 ± 3.13 kg), and the barbell bench press (BP) (56.1 ± 29.5 kg). Following warm-up, all exercises were performed for 3 sets of 5 repetitions except DL was performed for a single set of 5 repetitions. Subjects were asked to perform a full-body resistance training protocol two or three times per week. BS was performed at each session, the P and BP alternated at each session, and the DL was performed a minimum of once per week. The training load was increased at each session that followed the attainment of 5 repetitions for each set. The progression continued until the subject was unable to make linear progress on the BS exercise. RESULTS: The mean duration of the intervention was 11.1 ± 3.46 weeks. Statistical analysis by t-test (P<0.05) was applied to both the anthropometric and RT data. Despite no significant difference between anthropometric measurements, strength showed dramatic improvement across all lifts. Final BS (80.9 ± 33.6 kg) improved an average of 60.2%, P (38.2 ± 17.1 kg) improved an average of 45.8%, DL (87.4 ± 40.6 kg) improved an average of 45.2%, and BP (56.2 ± 29.5 kg) improved an average of 32.2%. No subjects suffered an acute injury throughout the duration of the intervention. CONCLUSION: A barbell-based, full-body RT protocol utilizing a linear approach to loading can be a safe and effective means of rapidly improving strength in a novice population.
Despite significant progress, cardiovascular (CV) disease remains the leading killer in the US, with lack of physical activity being a primary risk factor. Research suggests that 4 weeks of exercise training reduces blood pressure (BP) and fat mass, as well as improves fitness; yet it is unclear whether circuit training (CT) or resistance training (RT) yields better short-term improvements. PURPOSE: To compare changes in CV and fitness measures after a 4-week CT or RT program. METHODS: Eighteen middle-aged adults (CT: N = 9, 49.7±8.4 yrs; RT: N = 9, 49.3±11.7 yrs) completed 4 weeks of either CT or RT exercise. Pre- and post-intervention, CV health measures, including fasting glucose, blood lipids, carotid artery intima medial thickness (IMT), body composition by bioelectrical impedance analysis (BIA) and central and brachial BP were determined. Fitness testing involved measurement of maximum minute oxygen consumption (VO2max), and indices of balance and strength. RESULTS: Between group analyses revealed no differences between groups with exercise training, although several variables tended to improve in both groups. In the CT group, we noted improvements in central BP (SBP: 108.9±11.6 to 104.9±7.8; DBP: 76.1±8.2± to 72.3±5.6 mmHg, p<0.05). No changes in body weight, lean mass or fat mass occurred in the CT group; however, body weight (84.5±20.7 to 83.8±20.7 kg), lean mass (57.5±15.8 to 59.5±15.8 kg), and body fat (31.9±8.6 to 29.0±7.9 %) all changed in the RT group (p<0.05). For fitness measures, the CT group improved balance performance (left leg: 78.3±17.0 to 152.2±122.1, left leg: 41.2±39 to 167.9±206.6 sec) and 2-min stair climb (266.1±37.8 to 314.1±46.7 stairs), while the RT group improved 12-step sprint (3.3±0.5 to 2.7±0.4 sec) and maximum strength measures (leg press: 164.3±91.0 to 178.9±92.9 kg; bench press: 29.1±43.3 to 32.9±43.9 kg) (all p<0.05). Both groups improved wall sit (CT: 44.5±18.2 to 96.4±56.9; RT: 69.6±42.5 to 100.1±65.7 sec) and maximum strength measures (leg press: 164.3±91.0 to 178.9±92.9 kg; bench press: 29.1±43.3 to 32.9±43.9 kg). CONCLUSION: Our results suggest that 4 weeks of CT or RT improves CV health and fitness measures, with no differences between these two types of training.

INTRODUCTION: The vertical jump is one movement used to train and assess power output of the legs. Specifically, loaded vertical jumps have been proven to increase vertical jump performance in a training environment. PURPOSE: The purpose of this study is to evaluate three loaded vertical jump training methods: the barbell back squat jump (BB), the goblet squat jump (GB) and the dumbbell squat jump (DB) on lower limb peak force. METHODS: Nine male volunteers (age: 22.1±1.2 yrs; Ht: 1.75 ± 0.05 m; Wgt: 76.0 ± 10.0 Kg) with at least 2 yrs experience in weight lifting performed 5 trials in each condition of the goblet, back and dumbbell squat jumps (randomized order) utilizing 10% of their 1RM back squat as the experimental weight. Ten infrared cameras (200Hz) and an AMTI force plate (1,000Hz) collected a full body, 3-marker per segment model and ground reaction force data. All data were smoothed using a 4th order Butterworth filter of 20Hz. GRF data were interpolated down to 200Hz to temporally align camera and force data. Commercial software was used to calculate 3D lower limb joint angles, moments and powers via inverse dynamics. Difference in peak ankle, knee and hip power values during the jump were compared with RMANOVA (alpha ≤ 0.05) with Bonferroni post hoc tests. RESULTS: DB resulted in greater COM maximal jump height compared to BB (p < .0001) and GB (p = .005). No differences were noted for peak hip joint power (p = .23). Peak knee power was larger for DB compared to BB (p = .01) but not GB (p = .06). At the ankle, DB produced greater power than BB (p < .01) and GB (p < .001), but no differences were noted between GB and BB (p > .40). CONCLUSION: DB produced a greater COM maximal jump height, and greater knee and ankle powers. DB may be a superior training tool to produce increased knee and ankle joint powers.

Postactivation potentiation can increase a muscle’s ability to generate force. In practical terms, this may mean that acute weight lifting could improve vertical jump performance. PURPOSE: To examine vertical jump performance after performing prior power snatch exercises. METHODS: Following a standardized warm up, ten trained Olympic-style weight lifters performed power snatch exercises at increasing intensities (40% 1 repetition max [RM], 60% 1RM, and 80% 1RM) followed by vertical jump performance. Their vertical jump was measured using a Vertec in a control condition and following each power snatch intensity. All testing sessions took place at the same time of day (44.5±18.2 to 96.4±56.9; RT: 69.6±42.5 to 100.1±65.7 sec, p<0.05). No changes in lipids or glucose were found in either group. CONCLUSION: Our results suggest that 4 weeks of CT or RT improves CV health and fitness measures, with no differences between these two types of training.
To study muscle damage recovery, firstly muscle damage has to be induced by an exercise. A specific drop jumps protocol has been largely used in previous studies. However, all participants studied were untrained.

**PURPOSE:** To assess muscle strength, muscle power and muscle swelling after two different load drop jump protocols in well-trained athletes.

**METHODS:** Eighteen strength and/or power-trained male athletes (4.31±2.75 years of training experience) were randomly assigned into one of two groups. DJ100 consisted in 5 sets of 20 drop jumps from a 60-cm box with 2-minute rest interval (n=9, 23.00±2.74yrs). DJ140 consisted in seven sets of 20 drop jumps also (n=9, 22.89±3.37 yrs). Volunteers performed a maximally explosive vertical jump. Both groups performed the assessment of indirectly markers of muscle damage before and immediately after exercise protocol. Muscle thickness of knee extensors was measured using B-mode ultrasound. Maximal isometric muscle strength (PT) was measured by 2 sets of 4 seconds maximal isometric knee extension at 60º. For vertical jump, the athletes performed three countermovements jumps as high as possible, with one minute rest between jumps. After normal distribution confirmed by Shapiro-Wilk tests, independent samples T-tests were used to compare the magnitude of changes of muscle thickness, isometric strength and vertical jump between groups. A p-value of ≤0.05 was adopted.

**RESULTS:** There was no significant difference (p>0.05) in sample’s baseline characteristics between groups. There was no significant difference in the increase of muscle thickness (DJ100: 6.47 ± 1.67 (16.50%) vs. DJ140: 7.51 ± 2.31 mm (17.82%); p = 0.286). The decrease of isometric strength was significantly greater in DJ100 than DJ100 (DJ100: 34.24 ± 22.30 (11.20%) vs. DJ140: 67.06 ± 38.79 N.m (22.41%); p = 0.043; ES = 1.037). The decrease of vertical jump was also significantly greater in DJ100 than in DJ140 (DJ100: 0.48 ± 2.89 (0.99%) vs. DJ140: 7.72 ± 7.44 cm (17.42%); p = 0.015; ES = 1.283).

**CONCLUSIONS:** The main finding of this study was that an exercise protocol composed by 100 drop jumps did not decrease lower limb muscle power in well-trained athletes. Furthermore, 140 drop jumps induced a decrease in muscle performance greater than 100 drop jumps in well-trained athletes.
adults. Training effects was equivalent using machine or dumbbell as equipment for limb muscle mass. Circuit training with dumbbell required core stability lead to more hypertrophy of trunk muscle than training with machine.

472 Board #293 May 31 9:30 AM - 11:00 AM Effects of Different Resistance Training Protocols on Performance, Metabolic and Perceptual Responses in Trained Men Andrés Santos Martorelli1, Nathália Dias1, Vitor Cleto1, Sávio da Silva1, Andrew Fonseca2, Amilton Vieira3, Rodrigo Silva1, Carlos Ernesto1, Martim Bottaro1. 1Federal Institute of Goiás, Valparaíso de Goiás, Brazil. 2University of Brasilia, Brasilia, Brazil. 3Federal University of Ouro Preto, Ouro Preto, Brazil. (No relationships reported)

Monitoring the intensity of resistance training (RT) is essential for the effectiveness of training periodization. Athletes have been using power, hypertrophy and strength training protocols to improve performance. However, the effects these protocols on physiological stress are still unknown. PURPOSE: To compare the effects of three different protocols of RT on total volume (TV), session rate perceived exertion (SRPE) and lactate concentration (LAC). METHODS: Nine resistance trained men (22 ± 3.87 years, 79.53 ± 13.28 kg and 176.59 ± 7.53 cm) performed three training sessions on different days separated by at least 72 hours in a counterbalance fashion. After determining one maximum repetition (1-RM) on a squat (SQ) and bench press (BP) exercises, each volunteer performed three different training protocols: 1) power training session (PTS, performed 6 sets of maximum repetitions on SQ and 6 sets of 6 reps on BP at 50% of 1-RM), 2) hypertrophy training session (HTS, performed 5 sets of maximum repetitions on SQ and 5 sets on BP at 75% of 1-RM) and 3) strength training session (STS, performed 5 sets of maximum repetitions on SQ and 5 sets on BP at 90% of 1-RM). The three sessions were performed with 2-min rest interval between sets and 5-min between the two exercises. The SRPE was measured 15-min after each training session by the CR-10 RPE scale. Statistical analysis was done by means of repeated measures ANOVA. The probability level of statistical significance was set at p < 0.05 in all comparisons. RESULTS: The STS showed lower TV (2493.00 ± 948.79 kg) in comparison with HTS and PTS (5169.75 ± 1340.20 and 4428.00 ± 701.94 kg, respectively). However, the STS and HTS showed higher LAC at the end of the sessions (p < 0.05). Moreover, in the HTS the SRPE (6.33 ± 1.87 and 7.89 ± 1.17, respectively) was significantly lower than the others (p < 0.05 for each set). No significant differences (p > 0.05) in percent decline of intra-set MV were observed between the conditions at each time point. Additionally, there were no significant differences in MV between the first and last reps of each set in either condition (p > 0.05 for each time point).

CONCLUSION: Although high-load resistance training leads to significantly higher MV’s than low-load resistance training, percent decline during and between sets was similar in both conditions, indicating similar levels of fatigue were accumulated during the bouts. Given the vast difference in MV between conditions, future research into the mechanisms of fatigue during each condition may be warranted.

474 Board #295 May 31 9:30 AM - 11:00 AM Percentage-based and Autoregulated-based Resistance Training Loading Produce Similar Lower Body Hypertrophy Outcomes Ryan K. Byrnes1, Eric R. Helms2, Daniel M. Cooke1, Michael H. Haitscher1, Trevor K. Johnson1, Jose C. Velazquez1, Joseph P. Carzoli1, John B. Cronin1, Adam G. Storey1, Michael C. Zourdos1. 1Florida Atlantic University, Boca Raton, FL. 2Auckland University of Technology, Auckland, New Zealand. (Sponsor: Michael Whitehurst, FACSM) Email: rbyrnes2012@fau.edu (No relationships reported)

Researchers and practitioners have used the resistance training-specific rating of perceived exertion (RPE) scale to individualize load prescription. PURPOSE: To compare changes in muscle thickness (MT) of the vastus lateralis at 50% (VL50) and 70% (VL70) and vastus medialis at 70% (VM70) femur length between percentage-based training (PBT) and autoregulated-based training (ABT) via RPE. METHODS: Eleven males (22.3±5.9 years, body mass: 77.4±7.7 kg, body fat: 9.5±3.8%) with at least two yrs. of training experience and a minimum one-repetition maximum (1RM) of 1.5 and 1.25x bodyweight on the squat and bench press respectively, were assigned to one of two groups: PBT (n=6) or ABT (n=5) for 8 weeks. Forty eight hours following pre-testing MT via ultrasound, both groups performed the squat and bench press 3x wk, on non-consecutive days (i.e. Mon., Wed., Fri.) using the same number of sets and repetitions following an undulating resistance training program, which linearly increased load and decreased repetitions throughout. Weeks 1-3 consisted of 8, 6, and 4 repetitions on Mon., Wed., and Fri., while weeks 4-5 consisted of 7, 5, and 3 repetitions, with 6, 4, and 2 repetitions being performed during weeks 6-7. Week 8 served as a taper with 4 and 3 repetition days on Mon. and Wed. and post-testing on Fri. Load increased during each week in PBT from 65, 70 and 75% in week 1 to 82.5±9.2% of 1RM in week 7. In ABT there was no prescribed load but subjects were instructed to select a load in which the set ended with a 5-7 RPE in week 1 and progressed to an 8-10 RPE in week 7. A 2x2 repeated measures ANOVA was used with significance set at p≤0.05. RESULTS: There was a significant time effect for VL50 (25.4±3.28 to 28.1±4.64 mm; p=0.04; +10.42%) in PBT but not in ABT (26.72±3.75 to 28.45±3.42 mm; p=0.16; +6.47%). The time effect for VL70 in PBT approached significance (23.69±3.42 to 26.31±2.89 mm; p=0.06; +13.17%), and there was no significant change for VL70 in ABT (24.61±3.59 to 26.31±4.06 mm; p=0.33; +6.91%). There was a significant time effect for VM70 in PBT (19.25±3.36 mm to 22.05±3.78 mm; p=0.05; +7.36%), but not in ABT (19.63±4.30 to 20.50±4.00 mm; p=0.17; +4.43%). Additionally, there were no group differences (VL50: p=0.72; VL70: p=0.92; VM70: p=0.54). CONCLUSION: Our findings indicate that PBT and ABT strategies produce similar lower body hypertrophy.

475 Board #296 May 31 9:30 AM - 11:00 AM Inter-limb Differences When Using A Passive-dynamic Ankle-foot Orthosis For Running Elizabeth Russell Espinote, Jason M. Wilken. Center for the Intrepid, Fort Sam Houston, TX. (No relationships reported)

Recent advancements in surgical care have improved the ability to salvage, versus amputate, severely injured limbs but many patients are still left with severe functional impairments. Passive-dynamic ankle-foot orthoses (PD-AFO) have enabled some injured individuals to regain many of their functional abilities, including a return to running. The PD-AFO’s semi-rigid structure provides the external support that is essential for many of these activities, but it limits motion and affects movement mechanics. There is a paucity of information on running with PD-AFOs and how their patterns during running in PD-AFO users.

INTRODUCTION: Recent investigations have examined the effects of high- and low-load resistance training on skeletal muscle hypertrophy and strength. However, few investigations have examined the velocity parameters between these two conditions. PURPOSE: The purpose of this study was to examine the velocity characteristics during high- and low-load barbell back squatting to failure. METHODS: Eleven resistance-trained males (Age: 22 ± 3 years, Body Mass: 84.3±7.6 kg) who had undergone unilateral lower limb salvage and who were prescribed custom PD-AFOs (Intrepid Dynamic Exoskeletal Orthosis) for running training were recruited to participate in this study. During the initial visit participants completed a one-repetition maximum (1RM) testing session to assess lower extremity muscle strength. Following 1RM testing, participants were instructed to return for two additional sessions scheduled no more than eight days apart. Following a designated warm-up, subjects were randomly assigned to squat either 80% (high-load) or 30% (low-load) of their squat 1RM for three sets to failure with 3 minutes’ rest between sets. Mean velocity (MV) was recorded during each set using a linear position transducer (GymAware, Canberra, Australia). RESULTS: Individually-tailed one-sample tests were conducted to assess differences between conditions. Initial analysis displayed a significantly higher MV for the low-load condition (0.06 ± 0.08 m/s) when compared to the high-load condition (0.40 ± 0.12 m/s; p = 0.001) across all time points. Follow-up analysis revealed a significant decrease in MV during each set during both conditions (p = 0.001) with no significant differences between groups (p = 0.05 for each set). No significant differences (p > 0.05) in percent decline of intra-set MV (Low-load: 30.3-34.8%; High-load: 30.4-37.4%) were observed between the conditions at each time point. Additionally, there were no significant differences in MV between the first and last reps of each set in either condition (p > 0.05 for each time point). CONCLUSION: Although high-load resistance training leads to significantly higher MV’s than low-load resistance training, percent decline during and between sets was similar in both conditions, indicating similar levels of fatigue were accumulated during the bouts. Given the vast difference in MV between conditions, future research into the mechanisms of fatigue during each condition may be warranted.
Running involves unique contributions of joint work in order to absorb forces and subsequently propel the body forward. When compared to the hip and knee, the ankle contributes the greatest negative (W) and positive (W') work during running. Changes in work have been linked to increases in velocity (sprinting) and intensity (incline). The mechanics of running has been examined primarily in athletes who are runners. However, other athletes utilize running during their practice and competition. The specific movements of these sports may result in different mechanical demands on the lower extremities and therefore different running mechanics. PURPOSE: To compare differences in individual joint work and total work (Wt) during steady state running in a group of female athletes from 3 different sports (running=RN, lacrosse=LX, basketball=BB). METHODS: Forty-eight female athletes volunteered (RN: n=12, ht=1.68±0.1m, mass=62.1±10.8kg; LX: n=24, ht=1.64±0.1m, mass=64.1±6.6kg; BB: n=12, ht=1.76±0.1m, mass=72.3±13.4kg). Sagittal plane kinematics and kinetics were assessed while running on an instrumented treadmill (Treadmill, Park City, Utah) at a constant speed using a 5 camera motion analysis system (Qualysys, Goteborg, Sweden). Joint powers and joint work for the hip, knee and ankle were calculated using Visual 3D (C-Motion Inc., Bethesda, MD). W was defined as the absolute value of W + W'. Independent variables included X, Y, Z at the hip, knee and ankle. Two-factor analyses of variance (ANOVA) were employed using SPSS 24.0 for W, W' and Wt. Post-hoc analyses (Tukey HSD) were performed as appropriate. All significance levels were set at α=0.05. RESULTS: A significant interaction between sport and joint existed with W' (p=0.01) and with W (p=0.01) at the ankle. Specifically, RN had more W' (0.71±0.29) than LX (0.50±0.12, p=0.02) at the ankle. W at the ankle was greater in RN (1.31±0.05) compared to both LX (0.96±0.21, p=0.01) and BB (0.97±0.23, p=0.02). CONCLUSION: Overall, W and W' at the ankle is greater in RN compared to LX and BB. The contribution of the ankle to the lower extremity is 60% in RN compared to 54% in LX and 45% in BB. These differences in work may result in possible inefficient gait patterns. Implications of altered mechanics are possible increases in energy demand or neuromuscular fatigue.
A new running shoe design called ‘maximalists’, which claims to provide maximal cushioning with its oversized midsole and thereby lower the impact loading, becomes more popular among trail runners. Downhill running is an essential component of trail races but may lead to a greater loading than level running. However, the effects of maximalism on the running biomechanics, especially during downhill running, remain unexamined.

**Purpose:** To compare vertical loading rates, stride length and footstrike angle in runners with traditional running shoes (TRS) and maximalists (MAX) during level and downhill running. **Methods:** Twelve regular shod runners (9 males, 32.5±8.9 years) were asked to run on a self-paced instrumented treadmill at 0% and 10%-declination with TRS (Adizero boost), and MAX (Clifton 3, Hoka) in a randomized sequence for 5 minutes. Kinematics and force data were sampled at 200 and 1,000 Hz respectively. The average (AVILR) and instantaneous vertical loading rates (VILR), along with the stride length and footstrike angle, were extracted and averaged over the last minute in each condition. Results: VILR, stride length, and footstrike angle were similar between TRS and MAX during both level and downhill running (p>0.372, Table 1). **Conclusion:** These findings suggest that additional cushioning of maximalist running shoes do not lower impact loading. In addition, maximalists do not change the stride length and footstrike pattern in shod runners.

### Table 1. Average (AVILR) and instantaneous vertical loading rates (VILR), stride length, and footstrike angle when running with maximalists (MAX) and traditional running shoes (TRS)

<table>
<thead>
<tr>
<th>Level running</th>
<th>Downhill running</th>
<th>Cohen’s d</th>
<th>P-value</th>
<th>Level running</th>
<th>Downhill running</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAX (BW)</strong></td>
<td><strong>TRS (SD)</strong></td>
<td><strong>TRS (SD)</strong></td>
<td><strong>P-value</strong></td>
<td><strong>MAX (BW)</strong></td>
<td><strong>TRS (SD)</strong></td>
<td><strong>P-value</strong></td>
</tr>
<tr>
<td><strong>VILR (BW)</strong></td>
<td>57.5 (16.5)</td>
<td>56.3 (18.3)</td>
<td>0.07</td>
<td>84.5 (21.6)</td>
<td>79.4 (18.8)</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>STRIDE (m)</strong></td>
<td>1.72 (0.14)</td>
<td>1.72 (0.14)</td>
<td>0.02</td>
<td>1.78 (0.13)</td>
<td>1.78 (0.13)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>FOOTSTRIKE ANGLE (degree)</strong></td>
<td>7.7 (7.0)</td>
<td>7.6 (7.3)</td>
<td>0.02</td>
<td>14.6 (6.4)</td>
<td>14.0 (11.1)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

**Results:** Maximalists had lower VILR (p=0.02), STRIDE (p=0.01), and FOOTSTRIKE ANGLE (p=0.02) compared to TRS during level running. During downhill running, maximalists had lower VILR (p=0.04), STRIDE (p=0.04), and FOOTSTRIKE ANGLE (p=0.04) compared to TRS. **Conclusion:** These findings suggest that additional cushioning of maximalist running shoes do not lower impact loading. In addition, maximalists do not change the stride length and footstrike pattern in shod runners.

### Board #300
**May 31 9:30 AM - 11:00 AM**

**Maximalist Shoes Do Not Reduce Impact Loading During Level And Downhill Running**

Roy T.H. Cheung, Fannie O.Y. Lau, Eric Ching, Zoe Y.S. Chan, Janet H.W. Zhang, Ivan P.H. Au. Hong Kong Polytechnic University, Hong Kong, China. (Sponsor: Prof. Irene S. Davis, FACSM)

Email: Roy.Cheung@polyu.edu.hk

**Abstract:** These data demonstrate that OA have smaller compressive JRFs and anteroposterior shear forces than YA. Therefore, it can be suggested that the greater incidence of bony and cartilage injuries experienced by older runners is not due to greater forces applied to the lower extremity joints during running.
483 Board #304 May 31 9:30 AM - 11:00 AM Sagittal Plane Peak Knee Angle Variability During Distance Running Training And Race Speeds

Christopher T. Robertson, Jaclyn O’Loughlin, Jeffrey T. Wight. Jacksonville University, Jacksonville, FL. Email: crobert17@ju.edu

(No relationships reported)

PURPOSE: To analyze peak knee angle variability during distance running to determine if significant differences exist between the stance and swing phases at training and race paces. METHODS: Twenty-six highly-trained (30-80 miles per week) adult runners participated in the study (9 females, 17 males, 36.1±10.8 years). For gait analysis, 9mm spherical retro-reflective markers were applied according to Pohl et al., (2010). Data were collected at 200 Hz for 25 seconds using 6 Vicon Bonita cameras. Ten strides were analyzed and normalized to 100 points for both the stance and swing phases. To assess variability, standard deviation (SD) was calculated across the 10 strides for each of the 100 data points. Peak variability was identified by taking the maximum value of the 100 SDs. The occurrence of peak variability in each phase was extracted as a percentage of each normalized phase. A 2 by 2 repeated measures factorial ANOVA was used to test for main effects and interaction (phase x velocity) at p<0.05 for both variables. RESULTS: There were significant phase main effects (p<0.001) for both variables. Peak knee angle variability was significantly greater in the swing phase compared to the stance phase (7.88° vs 4.22°, respectively). Peak knee angle variability occurred at 74% of the swing phase compared to 19% of the stance phase. CONCLUSION: Peak knee angle variability is greater throughout the swing phase compared to the stance phase and this peak occurs at specific, but different, percentages of each phase regardless of running speed. Peak knee angle variability occurs just before and after foot contact so it is likely relevant to consistency of landing mechanics during running and therefore may be an important factor in the occurrence and/or prevention of running injuries.

484 Board #305 May 31 9:30 AM - 11:00 AM Use Of Inertial Magnetic Sensors To Implement Kinematic Methods To Detect Foot Contact During Running

Erik Maantens1, Max Paquette1, Jaap Buurke1, Jasper Reenaard1, 1Roessingh Research and Development, University of Twente, Enschede, Netherlands. 2University of Memphis, Memphis, TN. (Sponsor: Paul DeVita, FACSM)

Email: e.maantens@rnd.nl

(No relationships reported)

Biomechanics of the stance phase of running is of interest in relation to injury development. Studying the stance phase requires proper detection of foot contact (FC). The onset of vertical ground reaction force (GRF) is considered the gold standard in a laboratory setting to detect FC. In the absence of GRF data, motion analysis can be used to measure peak downward velocity of the pelvis (PDVP) with a 15ms offset which showed good relation with FC during treadmill running at one speed (1). Inertial sensors can measure kinematic parameters like PDVP outside the laboratory setting. Peak tibial acceleration (PTA) is a parameter of interest in running injury development which can be measured with inertial sensors and may also be used to detect FC outside the laboratory.

PURPOSE: To assess the effectiveness of these kinematic methods using inertial measurement units (IMUs) to detect FC during running at different speeds.

METHODS: 3 male runners (28 ± 8.5 yrs) ran on an instrumented treadmill at 6 speeds (10-15 km/h) for 1 minute each, wearing a suit equipped with IMUs at the tibia and sacrum. FC was determined based on GRF data of the treadmill (1000 Hz; threshold of 20N) and IMU data (240Hz). PDVP was obtained from a single integration of pelvic acceleration in the global frame. PTA was determined from the acceleration data measured in the local tibia frame. The 95% limits of agreement were calculated across the 10 strides for each of the 100 data points. Peak variability was calculated across the 10 strides for each of the 100 data points. Peak variability was identified by taking the maximum value of the 100 SDs. The occurrence of peak variability in each phase was extracted as a percentage of each normalized phase. A 2 by 2 repeated measures factorial ANOVA was used to test for main effects and interaction (phase x velocity) at p<0.05 for both variables. RESULTS: There were significant phase main effects (p<0.001) for both variables. Peak knee angle variability was significantly greater in the swing phase compared to the stance phase (7.88° vs 4.22°, respectively). Peak knee angle variability occurred at 74% of the swing phase compared to 19% of the stance phase. CONCLUSION: Peak knee angle variability is greater throughout the swing phase compared to the stance phase and this peak occurs at specific, but different, percentages of each phase regardless of running speed. Peak knee angle variability occurs just before and after foot contact so it is likely relevant to consistency of landing mechanics during running and therefore may be an important factor in the occurrence and/or prevention of running injuries.

485 Board #306 May 31 9:30 AM - 11:00 AM Superficial Sensory Feedback Is Not Responsible For Gait Alterations Associated With Barefoot Running

Melissa A. Thompson1, Kristine M. Hoffman2. 1Fort Lewis College, Durango, CO. 2Denver Health Medical Center, Denver, CO.

Email: mathompson@fortlewis.edu

(No relationships reported)

Of the many sensory modalities, cutaneous sensory feedback is thought to play a primary role in locomotor patterns. It has long been proposed that gait alterations, when changing from shod to barefoot, are mediated by alterations in sensory feedback. While the theory of sensory mediated gait adaptations associated with barefoot running is plausible, there has been no data to support this claim. PURPOSE: To examine the role of superficial plantar cutaneous feedback in barefoot and shod running in order to substantiate the claim that sensory feedback triggers the gait alterations associated with barefoot running. METHODS: 10 healthy active subjects (6 male, 4 female); mass: 65.2±9.7 kg; age: 27.7±1.3 years participated in this study. 10 over-ground running trials were completed in each of the following conditions: barefoot (BF), shod (SHOD), anesthetized barefoot (ANEST BF) and anesthetized shod (ANEST SHOD). For the anesthetized conditions 0.1-0.3 mL of 1% lidocaine was injected into the dermal layer of skin on the plantar foot below the metatarsal heads, lateral column and heel. 3-dimensional motion analysis and ground reaction force (GRF) data were captured as subjects ran over a 20m run way with a force plate at 120 Hz. Kinematic and kinetic differences were analyzed via two-way repeated measures ANOVAs. RESULTS: The differences in the gait between the BF and SHOD conditions were consistent with previous research with subjects exhibiting decreased stride length (BF: 2.07±0.24m, SHOD: 2.21±0.24m, p<0.001) and changing from rear footstrike when SHOD to fore/mid footstrike when BF (BF: 5.5±1.5°, SHOD: 7.5±3.8°, p<0.001). Similarly, BF running was associated with decreased peak vertical GRFs and impact peak magnitudes (vGRF BF: 2.19±0.24 BW, SHOD: 2.32±0.19 BW, p<0.02; impact peak BF: 1.65±0.22 BW, SHOD: 1.89±0.25 BW, p<0.001). Despite anesthetizing the plantar surface, there was no difference between the BF and ANEST BF conditions in terms of stride length (BF: 2.07±0.24m, ANEST BF: 2.01±0.27m, p<0.05), footstrike (BF: 5.5±1.5°, ANEST BF: 5.4±3.2°, p<0.05) or GRFs (vGRF BF: 2.19±0.24 BW, ANEST BF: 2.15±0.28 BW, p<0.05; impact peak BF: 1.65±0.22 BW, ANEST BF: 1.59±0.25 BW, p<0.05). CONCLUSION: Superficial cutaneous sensory receptors are not primarily responsible for the gait changes associated with barefoot running.

Table 1: The offset and 95% limits of agreement for the two kinematic methods with respect to the gold standard for 6 running speeds.

<table>
<thead>
<tr>
<th>Running Speed</th>
<th>Kinematic method</th>
<th>Offset</th>
<th>95% limit of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>10 km/h</td>
<td>PDVP</td>
<td>5 frames</td>
<td>(21.0 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>5 frames</td>
<td>(21.0 ± 0.5 ms)</td>
</tr>
<tr>
<td>11 km/h</td>
<td>PDVP</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
<tr>
<td>12 km/h</td>
<td>PDVP</td>
<td>7 frames</td>
<td>(29.4 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>7 frames</td>
<td>(29.4 ± 0.5 ms)</td>
</tr>
<tr>
<td>13 km/h</td>
<td>PDVP</td>
<td>8 frames</td>
<td>(33.6 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>8 frames</td>
<td>(33.6 ± 0.5 ms)</td>
</tr>
<tr>
<td>14 km/h</td>
<td>PDVP</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
<tr>
<td>15 km/h</td>
<td>PDVP</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>6 frames</td>
<td>(25.2 ± 0.5 ms)</td>
</tr>
</tbody>
</table>
It is known that sagittal plane kinematics are able to predict loading in runners. This may be of use to clinicians who don’t have access to force measurement devices. However, running biomechanics differ between genders and age groups. Thus it may be that models used to predict loading in demographically distinct groups of runners need to be specific to age and gender. PURPOSE: To determine if kinematic predictors of kinetic variables during running apply across genders and age groups. METHODS: Sagittal plane kinematics and kinetics were assessed in young male (YM: n=13, age=23.1 ± 2.3 yrs, mass=77.0 ± 12.1 kg, height=1.79 ± 0.08 m, velocity=3.32 ± 0.48 m/s) and middle-aged female runners (MF: n=28, age=47.3 ± 7.0 yrs, mass=63.7 ± 7.8 kg, height=1.66 ± 0.07 m, velocity=2.55 ± 0.37 m/s) using a 5 camera motion analysis system (Qualysis, Gothenberg, Sweden) running on an instrumented treadmill (Treadmills, Park City, Utah) at their preferred running pace. Kinematics (knee flexion at initial contact, foot angle at initial contact, step position, peak knee flexion and COM excursion) were the independent variables; kinetics (average vertical loading rate, braking impulse and peak ground reaction force and peak vertical ground reaction force) were the dependent variables. Linear regression models were developed to predict loading in both groups (p<0.05). RESULTS: In both YM and MF, sagittal plane kinematics were useful in predicting peak knee moment (YM: R²=0.56, p<0.002; MF: R²=0.47, p<0.0002), knee power absorption (YM: R²=0.78, p<0.0002; MF: R²=0.55, p<0.001), braking impulse (YM: R²=0.66, p<0.01; MF: R²=0.67, p<0.0001), and peak vertical ground reaction force (YM: R²=0.31, p<0.03; MF: R²=0.23, p<0.02). Peak knee flexion appeared in the most models (peak moment knee, power absorption and braking impulse for both men and women), and thus may be the most useful single kinematic variable to assess loading across age groups and genders. In all models, greater knee flexion was associated with increased magnitude of loading. Average vertical loading rate could not be predicted using the chosen kinematics in either group. CONCLUSIONS: When equipment for kinematic assessment is not available, sagittal plane gait analysis may be a useful tool for clinicians to estimate loading in runners.

Maximum cushioned shoes could reduce the peak vertical Ground Reaction Force (GRF) during running, but it may increase the foot instability in horizontal directions, especially at the initial foot contact. Sample entropy (SampEn) has been adopted to define the irregularity to quantify levels of complexity of movement and examine the fluctuations in GRF within a time series. The foot instability would be better represented by the index of SampEn within a stance phase instead of variation among different stance phases viewing instability as errors. PURPOSE: this study was aimed at examining the complexity of GRF while running on the treadmill with different types of footwear through SampEn. METHODS: 19 experienced runners were recruited and ran on the treadmill at 7.8 mph wearing different types of running shoes: max cushioned shoe, minimalist shoe, and regular shoe. GRF of 10 consecutive steps were collected by the instrumented Tandum treadmill. GRF data were further analyzed to calculate sample entropy for the first 20% stance phase and entire stance phase. Two-way MANOVA was used to examine the effects of independent variables (shoe, step) on sample entropy measures at first 20% stance phase (SampEn_{p=20%}, SampEn_{p=20%}, SampEn_{p=20%}) and entire stance phase (SampEn_{p=100%}, SampEn_{p=100%}, SampEn_{p=100%}). Post hoc Tukey test was applied as needed. RESULTS: a significant shoe effect was observed on the association among dependent variables listed above (P < .05). Cushioned shoes displayed a higher SampEn_{p=20%} (1.162 ± 0.1558) than regular shoes (.1094 ± .0258) and a greater SampEn_{p=100%} (.1553 ± .1556) than minimalist shoes (.1546 ± .0932). Minimalist shoe exhibited greater SampEn_{p=20%} (0.614 ± 0.0310) and SampEn_{p=100%} (0.606 ± .0688) than cushioned shoes (0.577 ± 0.1002, 0.448 ± .0435) respectively. No other significant difference was observed. CONCLUSIONS: in general, cushioned shoes displayed more fluctuations of GRF in the anterior-posterior (AP) direction compared to minimalist and regular shoes, which indicates cushioned shoes may increase the foot instability in AP direction during running. Greater fluctuations of vertical GRF when wearing minimalist shoes may indicate a reduced foot stability that could affect the impact absorption at foot touchdown and force generation in push-off.
**CONCLUSION**

Running overuse injuries are related to the magnitude of impact forces and shocks, loading rates, and the distribution of forces underfoot. Minimalist shoes and barefoot running might reduce or eliminate running impacts by encouraging softer landings. However, reduced cushioning could increase plantar loading and some runners may not alter their habitual running mechanics to account for less cushioning. 

**PURPOSE**

To examine the acute effects of a cushioned neutral shoe (CN), minimal impact, and plantar loading in habitual rearfoot strikers.

**METHODS**

Subjects (n=5, 1 Female and 4 Males; 74.11kg±11.8kg, 1.62 ± 0.27 m) completed a 1 day testing session consisting of establishing the subject’s preferred running speed (PRS) and running at three speed conditions: PRS, PRS+5%, PRS+10%. Subjects were instructed to run over a force platform embedded in the middle of a 5-m runway while wearing ES (Hoka, Bondi 4) or their self-selected shoes (SS) with three speeds (PRS, PRS+5%, PRS+10%).

**RESULTS**

Running velocity was measured using infrared timing gates with velocity controlled within ±5% target velocity with three trials completed per condition. Discrete vertical GRF parameters of impact peak (F1), maximum peak (F2), and average (Favg) were recorded and averaged across the three trials per condition. A 2 (shoe) x 3 (velocity) repeated measures analysis of variance (n=0.05) was used for analysis. 

**RESULTS:** Neither F1, Favg, nor F2 were influenced by the interaction of shoe and velocity (p>0.05) and none had a main effect of shoe (F1: ES 1.78±0.4 BW, SS 1.85±0.3 BW; Favg: ES 1.57±0.1 BW, SS 1.55±0.1 BW; F2: ES 2.68±0.2 BW, SS 2.67±0.2 BW; p>0.05). Favg did increase with velocity (p<0.05) but F1 and F2 did not (p>0.05). 

**CONCLUSION:** F1 was observed less than 30% of the SS trials for two subjects. Nevertheless, as a group, there were no differences in GRF parameters analyzed between shoe conditions.

**Figure Caption:** Population average resultant tibial shock [in units of gravity, g] during running in extreme cushioning running shoes (ES) vs. normal cushioning shoes (NS) at different speeds. 

**Table 1:** Means and Standard Deviations for subject groups and intra-group comparisons

<table>
<thead>
<tr>
<th>Group</th>
<th>ABDH (cm²)</th>
<th>QP (cm²)</th>
<th>FDB (cm²)</th>
<th>FHB (cm²)</th>
<th>Great Toe (kg)</th>
<th>Lateral Toes (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gymnasts</td>
<td>2.16±.57</td>
<td>1.73±.26</td>
<td>1.87±.27</td>
<td>1.57±.07</td>
<td>5.44±3.68</td>
<td>3.76±1.41</td>
</tr>
<tr>
<td>Runners</td>
<td>1.82±.50</td>
<td>1.52±.27</td>
<td>1.62±.17</td>
<td>1.38±.17</td>
<td>4.34±1.37</td>
<td>4.28±2.05</td>
</tr>
<tr>
<td>p-value</td>
<td>.321</td>
<td>.061</td>
<td>.043*</td>
<td>.006*</td>
<td>.012*</td>
<td>.969</td>
</tr>
</tbody>
</table>

 supported by Vibram USA.

**Table 2:** Comparison of peak tibial shock.

<table>
<thead>
<tr>
<th></th>
<th>FFS</th>
<th>MFS</th>
<th>RFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Peak Tibial Shock (g)</td>
<td>10.03</td>
<td>12.13</td>
<td>12.23</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.47</td>
<td>3.01</td>
<td>3.95</td>
</tr>
<tr>
<td>Number of Subjects</td>
<td>23</td>
<td>32</td>
<td>169</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.52</td>
<td>0.53</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Competition of peak tibial shock: FFS-MFS MFS-RFS FFS-RFS**

<table>
<thead>
<tr>
<th></th>
<th>FFS-MFS</th>
<th>MFS-RFS</th>
<th>FFS-RFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Value of Average Difference</td>
<td>2.10</td>
<td>0.10</td>
<td>2.20</td>
</tr>
<tr>
<td>Pooled Standard Deviation</td>
<td>2.80</td>
<td>3.82</td>
<td>3.81</td>
</tr>
<tr>
<td>Effect Size</td>
<td>0.75</td>
<td>0.03</td>
<td>0.58</td>
</tr>
<tr>
<td>F-Value</td>
<td>0.095</td>
<td>0.99</td>
<td>0.021</td>
</tr>
</tbody>
</table>
Recent literature suggests a transition from rear-foot striking (RFS) to mid-foot striking (MFS) may lower injury potential; but transition is difficult. Using a resistive proprioceptive device may facilitate the change. No study has quantified the impact of such a device on foot-strike conversion. **PURPOSE:** To examine the effectiveness of a 6-week MFS drill training program in converting recreational RFS to MFS with and without the use of a proprioceptive resistive device (EZ Run Belt) using changes in cardiovascular, biomechanical, and neuromuscular assessments. **METHODS:** 19 RFS runners were randomly assigned to control (C: M4, F1), drills only (DO: M3, F4), or drills plus belt (DB: M6, F1) groups. Both DO and DB received drill sessions using MFS training over 6 weeks with DB using a resistive belt (EZRB) during training runs. Physiological (VO2max, anaerobic threshold, heart rate, running economy, timed performance), biomechanical (knee flexion and dorsiflexion angles at initial contact (KFA, DFA), cadence (CAD), stride length) and electromyographic (EMG) measures of 5 right-leg muscles (rectus femoris (RF), vastus lateralis, biceps femoris (BF), semitendinosus (ST), and lateral gastrocnemius (LG), were recorded as subjects ran under 3 conditions: submaximal (85% lactate threshold heart rate) on a treadmill (BF), semitendinosus (ST), and lateral gastrocnemius (LG), were recorded as subjects ran on an instrumented treadmill while 3D kinematics, ground reactions forces (GRF), plantar pressure, and electromyographic (EMG) were recorded. Differences were examined using: foot and knee angle at contact, vertical GRF loading rate (VLR), the isolated impact component of vertical GRF (IP), and the magnitude of peak positive to negative TA. Peak plantar pressure was compared for the forefoot (FFP), midfoot (MFP), and rearfoot (RFP). Differences were examined comparing: with and without the use of a proprioceptive resistive device (EZ Run Belt) using changes in vertical load rates and greater persistence of these changes over time. **RESULTS:** In all 3 conditions, outcomes reflected significant within-group increases for DO and DB in CAD and EMG and decreases in KFA, DFA consistent with an RFS to MFS conversion, but no significance was detected between DO and DB, except for the RF EMG during TMX5 increasing for DO and decreasing for DB (+0.047±0.005 µV, p<0.05). Greatest changes in DO were observed at TMX5: BF (+66.9%, p<0.001), LG (+70%, p<0.001), RF (+49.6%, p<0.001), and DFA (-34.3%, p<0.001). Greatest changes in DB were observed at TMX5: BF (+84.4%, p<0.001), ST (+85.5%, p<0.001), CAD (-15.3%, p<0.001), KFA (-49.9%, p<0.001). **CONCLUSIONS:** Changes in biomechanics and muscle activation observed in DO and DB indicate a significant shift from RFS to MFS after 6 weeks of MFS drill instruction, unique effectiveness of the proprioceptive device cannot be established, but differences warrant further investigation.
Running is a popular and widely used mode of exercise in the world today. Preferred stride frequency (PSF) is the stride frequency (SF) a runner selects for a given speed. Changes in SF may influence metabolic costs while running (Meardon & Derrick, 2009, MSSE, 41, 512-513), but it is not clear if muscle activity is minimized at PSF compared to running with other SFs. PURPOSE: To determine if muscle activity is minimized while running at PSF. METHODS: 10 healthy participants (24.7±3.8 years; M=7, F=3) ran on a treadmill at PSF-15%, PSF-10%, PSF-5%, PSF, PSF+5%, PSF+10%, PSF+15%. Conditions were randomized for each subject to account for task adaptation. Treadmill running speed was determined initially by each participant instructing the tester to increase or decrease the speed until felt like a speed not experienced in the last 24 hours. In this study, a 10 minute run. During preferred running condition, PSF was calculated by visually identifying the time to complete 20 strides. Target SF’s were then calculated for all other conditions. Participants ran for 5 minutes at each condition with 1-minute rest between conditions. SF was controlled by having the participants match foot strikes to the beat of a metronome set to each desired SF for 15 sec of every minute. Data were collected 4 times throughout each trial for 30’s every minute of the condition. The first collection was used for this analysis. EMG sample rate was 2000Hz from the Rectus Femoris (RF), Biceps Femoris (BF), Tibialis Anterior (TA), and Gastrocnemius (GA). Average and root mean squared (RMS) EMG data were analyzed via repeated-measures ANOVA (p≤0.05). Data were normalized to %PSF to assess minimization. RESULTS: PSF RMS EMG were not minimized in any muscle across all SF conditions. Average EMG for RF (F(1.24, 11.19) = 7.32, p<0.05, η²=0.45) and GA (F(1.49, 1.71) = 21.38, p<0.05, η²=0.70) were both influenced by SF, but PSF EMG were not minimized for either of those muscles. Normalized EMG for BF were 103.90±27.02%, 90.83±26.02%, 98.37±16.19%, 104.20±29.61%, 90.48±3.77% and for GA were 112.73±25.02%, 90.77±24.98%, 95.35±27.33%, 108.35±36.24%, 90.89±19.40%, 106.68±20.33% for PSF +15%, +10%, -5%, +5%, +10%, +15% respectively. CONCLUSION: Muscle activity was not minimized while running at PSF compared across all conditions. Supported by NIH INBRE P20 GM103440 Grant.

ABSTRACT

Previous literature has suggested that increasing running speed is associated with a reduction in cumulative load per distance traveled and thereby a decrease in injury risk. However, the tissue damage incurred by a bout of loading is a function of its stress-life (S-N) behavior which describes the exponential relationship between loading magnitude and cycles to failure. Current cumulative loading measures do not consider the S-N relationship which may in fact lead to erroneous conclusions about tissue damage and injury risk. PURPOSE: The purpose of this study was to examine the influence of running speed on an S-N weighted impulse measure at the Achilles tendon. METHODS: Ten participants ran overground at 2.5, 3.5, and 4.5 m/s while force and motion capture data were recorded. An inverse dynamics analysis was used to calculate joint moments and AT force was calculated from the ankle joint moment and the AT moment arm which was a function of ankle joint angle. AT impulse per step was calculated as the time integral of the AT force curve. A weighted impulse measure was quantified where AT force was raised to the power of 9. This value was derived from in vitro tendon testing and describes the slope of the S-N tendon curve. Impulse and weighted impulse per km were calculated as the respective impulse per step measures multiplied by the number of steps necessary to run 1km. A Friedman test examined the main effect of speed followed by Bonferroni adjusted pair-wise comparisons. RESULTS: A significant main effect of speed was observed for impulse per step (p<0.003), impulse per km (p<0.001) and weighted impulse per km (p<0.001). In general, the impulse per step and impulse per km decreased with running speed (p<0.013); however, no significant differences were observed between 3.5 and 2.5 m/s (p=0.047). On the other hand, the weighted impulse per km increased with running speed (p=0.05). CONCLUSION: Using a traditional measure of cumulative impulse suggests that running faster may decrease the risk of Achilles tendon injury. This counterintuitive conclusion is not reached when using a weighted impulse measure that considers the S-N behavior of the tendon.
Purpose: Repetitive stresses of running can contribute to the onset of musculoskeletal pains, such as those in the foot. The presence of foot pain in one site along the kinematic chain may alter running motion and cause pain to develop in other areas but this is not well-studied. The purpose of this study was to determine the differences in key running motion parameters in runners with and without foot pain, and identify significant contributors to the onset of foot pain.

Methods: This was a cross-sectional study of runners with foot pain (n=24) and age-sex matched runners without foot pain (n=20). Runner characteristics were: 173cm±9 cm; 70kg±14.5 kg; 77.3% long-distance trained. Running experience, history of joint pain and recent changes in training and shoe wear were collected. Foot pain was reported as presence of pain of any severity. A 12 optical camera 3-dimensional motion capture system with a force-plated treadmill were used to collect running motions and forces. Key variables included cadence, stride length, stance time and ground reaction force, rate of development of impact forces.

Results: Foot pain was classified as 33% plantar fasciitis, 8% metatarsal stress fracture, 17% other and 42% had undiagnosed foot pain. In runners with foot pain, 62.5% started running in a new shoe type within the past 6 months (p<0.001). Compared to runners without foot pain, those with pain reported additional musculoskeletal pain at sites along the kinematic chain in the knee, hip, low back and shoulder pain (62.5% versus 15%; p=0.001). 46% of runners with reported foot pain attempted to run with a new foot strike, compared to 25% of runners without pain (p=0.19). Logistic regression revealed that the strongest contributor to onset of foot pain was the use of a new running shoe type within the past six months (β coefficient=−2.265; p=0.003). Temporal spatial measures were not different in runners with and without foot pain.

Conclusion: For foot prevention, proper adaptation to new shoes should be a priority. Running with a chronic foot pain can ultimately become a more systemic problem with the onset of other musculoskeletal pains. If a runner wishes to change shoe type, a slow proper introduction and progression of these changes over a period of time is recommended.

Preliminary Analysis: Variability Between Healthy and Injured Individuals during Running

Amanda Estep1, Steven Morrison2, Shane Caswell, Jatin Ambegaonkar1, Nelson Cortes1. 1George Mason University, Manassas, VA. 2Old Dominion University, Norfolk, VA.

Email: ncortes@gmu.edu (No relationships reported)

Reduced motor variability has been associated with increased risk of lower extremity running-related injuries, such as patellofemoral pain syndrome. Further investigation of lower extremity variability in populations with current lower extremity injury (LEI) is needed to determine the relationship between variability and running-related injuries.

Methods: Thirty-four individuals (17 HE, 17 LEI) volunteered for this study. 3D kinematic data during running was captured at 200Hz using reflective markers placed on lower body. A single 25-second trial was collected. Variables of interest included knee flexion/extension angle, knee abduction/adduction angle, hip flexion/extension angle, and hip abduction/adduction angle; all were measured in degrees. A single 25-second trial was collected. Variables of interest included knee flexion/extension angle, knee abduction/adduction angle, hip flexion/extension angle, and hip abduction/adduction angle; all were measured in degrees. A multivariate analysis of variance (MANOVA) was used to assess differences in SD and extension angle, and hip abduction/adduction angle; all were measured in degrees. A single 25-second trial was collected. Variables of interest included knee flexion/extension angle, knee abduction/adduction angle, hip flexion/extension angle, and hip abduction/adduction angle; all were measured in degrees. A single 25-second trial was collected. Variables of interest included knee flexion/extension angle, knee abduction/adduction angle, hip flexion/extension angle, and hip abduction/adduction angle; all were measured in degrees. A multivariate analysis of variance (MANOVA) was used to assess differences in SD and extension angle, and hip abduction/adduction angle; all were measured in degrees.

Results: Overall, no differences in lower extremity kinematic variability were found between groups. It is plausible that LEI is not manifested by significant changes in the amplitude of lower extremity kinematic variability demonstrated in the sagittal and frontal planes. Future studies should incorporate measures that capture the time-dependent nature in movement variability, rather than restrict analysis to simply assessing magnitude changes.

Board #322
May 31 9:30 AM - 11:00 AM
Risk Factors Associated With Foot Pain In Runners
Joseph Wasser. University of Florida, Gainesville, FL. (Sponsor: Dr. Heather Vincent, FACSM)
Email: wassejg@ortho.ufl.edu

(No relationships reported)

Board #323
May 31 9:30 AM - 11:00 AM
Preliminary Analysis: Variability Between Healthy and Injured Individuals during Running

Amanda Estep1, Steven Morrison2, Shane Caswell, Jatin Ambegaonkar1, Nelson Cortes1. 1George Mason University, Manassas, VA. 2Old Dominion University, Norfolk, VA.

Email: ncortes@gmu.edu (No relationships reported)

Board #324
May 31 9:30 AM - 11:00 AM
Is There a Predictable Value of the Drop Vertical Jump Test for Running Gait Injury Risk?
Ravi Kumar, 32611-2727, Trevor Leavitt, 32611-2727, Cong Chen, Heather K. Vincent, 32611-2727, FACSM, Daniel C. Herman, 32611-2727, FACSM. University of Florida, Gainesville, FL. (Sponsor: Heather K. Vincent PhD, FACSM)
Email: rakumar@ufl.edu

(No relationships reported)

Board #325
May 31 9:30 AM - 11:00 AM
Trunk Kinematics Displayed During Running By Individuals with Adolescent Idiopathic Scoliosis: A Pilot Study
Rumit S. Kakar1, Joshua Tome,2 Tyler J. Denn-Thiele3, Jamie Kronenberg1, Kathy J. Simpson, FACSM. 1Ithaca College, Ithaca, NY. 2University of Georgia, Athens, Athens, GA.

Email: rkakar@ithaca.edu (No relationships reported)

Decreased spinal motions in walking have been reported for Adolescent idiopathic scoliosis (AIS) individuals but how AIS produce the rotational motions needed during high-effort running and thus compensate for the loss of spinal flexibility is not known. Purpose: To compare trunk kinematics displayed by AIS and matched controls (CON) during a perceived maximal effort treadmill running. METHODS: Five skeletally mature AIS individuals (thoracolumbar structural curve with neutral pelvic; primary Cobb angle = 35°±13.6°) and 5 CON (respectively; age: 21.3±1.3 yrs; 20.6±1.1 yrs; height 1.7±0.1m; 1.59±0.01m; mass 52.7±9.4 kg, 57.0±10.8 kg; level of physical activity (IPAQ SF): 7.3±2.6 hrs/wk, 6.67±3.06 hrs/wk) were recruited. Spatial locations of the 24 reflective markers on the trunk and pelvis were captured (Vicon®, 120 Hz) during self-selected maximal running speed for 15 sec on treadmill (BORG RPE > 13). Angular displacements (AngDisp) of the 3 trunk segments (upper trunk [UT: C7-T8], middle trunk [MT: T9-T12] and lower trunk [LT: L1-L5]) for each rotation plane were compared between the groups via Analysis of Covariance (running speed = covariate, p<.05).

Results: Running speeds were not different between the 2 groups (p=0.63). LT lateral flexion AngDisp related to sagittal plane pelvic was significantly lower (p=0.048) for AIS (7.7°±2.7°) compared to CON (14.0°±3.4°). AIS group (14.7±5.0) showed a tendency for clinical significance (p<0.05) for greater sagittal plane AngDisp compared to CON (8.9°±2.8°) but no other significant differences were observed (p>0.19). Conclusion: Minor differences were observed between the groups contrary to those reported in literature for walking motions. One clinical explanation could be the presence of compensatory secondary sagittal spine curve leading to a neutral pelvis. Magnitudes of the group differences observed were very low, and thus may be not clinically relevant when compared to the total available trunk ranges of motion. This could be a result of high inter-participant variability in running technique and low statistical power, and...
Medial tibial stress syndrome (MTSS) is one of the most common overuse injuries in runners. Previous studies have indicated hip muscle strength, passive range of motion (ROM), and running kinematics as possible contributing factors. However, to date, no studies have combined measurements of all these areas into a single prospective study. PURPOSE: To prospectively examine differences in muscle strength, ROM, and kinematics between runners who do and do not develop MTSS. METHODS: 24 runners (sex: 13 male, 11 female; age: 20.1 ± 1.2 years; weekly mileage: 53.2 ± 20.8 miles) participated in this study. Participants underwent a clinical exam documenting lower limb alignment and ROM; were evaluated for hip abductor, external and internal rotator, and extensor strength using a hand held dynamometer; and completed a 3D running gait analysis during which a 12-camera motion capture system was used to record kinematics while they ran on a treadmill. Participants were followed for two years during which time any injuries were diagnosed and recorded by the teams’ athletic trainer. Independent t-tests were used to compare differences between runners who did (INJ) and did not (CON) develop MTSS. Logistic regression was used evaluate which variables were best predictors of group membership. RESULTS: After two seasons 8 of the 24 athletes developed MTSS. There were no differences between INJ and CON groups; however, the INJ group demonstrated weaker hip abductors than the CON group (16.0 ± 3.6 vs 21.9 ± 6.0 % body weight, p = 0.01, ES = 1.4). Compared to the CON group, the INJ group had higher contralateral pelvic drop (6.4 ± 1.4 vs. 4.5 ± 2.0, p = .02, ES = 1.1), higher peak rearfoot eversion (8.2 ± 4.3 vs. 4.6 ± 1.9, p = .02, ES = 1.1), and longer durations of rearfoot eversion (79.4 ± 8.5 vs 55.5 ± 10.3 % stance, p = .001, ES = 2.5) during stance phase. The logistic regression (χ² = 18.1, p < 0.001) revealed every 1% stance increase in duration of rearfoot eversion increased odds of being in the INJ group by 1.26 (95% CI 1.04 - 1.54). CONCLUSION: Both proximal and distal biomechanics appear to contribute to MTSS development. Thus, screening for individuals at risk of developing this common overuse injury should include evaluation of both regions, with particular attention to the duration of rearfoot eversion.

Large peak hip adduction angles in women are prospectively linked to patellofemoral pain and iliotibial band syndromes. Deficits in hip abductor eccentric strength and lower extremity neuromuscular control (NMC) may contribute to the large peak hip adduction angles in female runners. PURPOSE: To compare hip abductor eccentric strength and NMC between female runners with large and small peak hip adduction angles. METHODS: We recruited 11 female runners for this study (26 ± 4 years; 1.65 ± 0.06 m; 58.9 ± 4.0 kg; 19.10 miles per week). Three-dimensional position data were collected during running. Hip abductor eccentric strength was measured using a hand held dynamometer during a break test. NMC was measured using the hip control test, based on Fitts law. A higher score on the hip control test indicated better NMC. RESULTS: The runners with the lowest performance level and the least training volume likely exclusively lean bodies regardless of their performance level and running mileage. The runners with the lowest performance level and the least training volume likely attempted weight reduction practice and complained of fatigue. It was concerned that they might pursue the lower level of percent body fat by restricting energy intake.

**A Prospective Study on Medial Tibial Stress Syndrome in Runners**

James Becker1, Mimi Nakajima2, Will Wu2, 1Montana State University, Bozeman, MT; 2California State University, Long Beach, Long Beach, CA.

**Do Female Runners with Large Peak Hip Adduction Angles Lack Hip Strength and Control?**

Richard A. Brindle, Clare E. Milner, FACSMS. Drexel University, Philadelphia, PA. (Sponsor: Clare Milner, FACSMS)

Email: brindle@drexel.edu

**Ischemic Preconditioning Improves Marathon Trail Running Performance in Endurance-Trained Men**

Samuel S. Van De Velde, Isaiah St. Pierre, Devan E. Haney, Christina A. Buchanan, Lance C. Dalleck. Western State Colorado University, Gunnison, CO.

Email: samuel.vandedvelde@western.edu

**Blood Lactate Values are Significantly Lower in Runners Who Received an IPC Treatment vs. Sham Treatment**

Norimitsu Kinoshita1, Tockita Masaya2, Kenta Okuyama2, Tomoo Tsibota1, Michihiko Narita1, 1Hosei University, Tokyo, Japan; 2Colorado Department of Public Health and Environment, Denver, CO.

Email: sportsmed.kinoshita@hosei.ac.jp

**Board #326**

**May 31 9:30 AM - 11:00 AM**

**Board #327**

**May 31 9:30 AM - 11:00 AM**

**Board #328**

**May 31 11:00 AM - 12:30 PM**

**Board #329**

**May 31 11:00 AM - 12:30 PM**
CONCLUSION: IPC treatment elicited improvements in marathon trail running performance in experienced men trail runners. Moreover, we found that IPC was associated with an attenuated rise in blood lactate concentration. Therefore, utilizing IPC may allow for higher work rates and improved performance in marathon running.

Running for extreme distances or time has become increasingly popular, however, energy balance and its effect on performance is of great concern. PURPOSE: This case study examined the physical performance and energy balance in a 51 year old firefighter completing an 11-day, 439 mile solo run across Texas. METHODS: All food and drink consumed during the 11 day run were recorded to assess energy intake during the run. Energy expenditure and exercise data were recorded via a heart rate/GPS monitor during each run. Nude body weight was recorded each morning. RESULTS: Day 1: The subject completed 39.8±2.6 miles (range 33.26-42.98 mi) in 11.2±1.2 hrs (range 9.74-12.97 hrs) at a 16.8±1.3 min/mile pace (range 15.17-18.45 min/mile). Subject consumed 4388±811 kcals per day (range 3280-5617 kcals/day) and expended 3804±271 kcals per run (range 3280-5617 kcals/run). Over the 11 days, the subject lost 2.6 kg of body weight. Total energy expenditure (5397 ± 271 kcal) was greater than energy intake (4398 ± 812 kcal; p=0.005). Over the 11 days, there was a trend towards a slower mile pace (p=0.032, p<0.001). Heart rate was also lower across the 11 days (range: 95 - 137 bpm; p=0.045). There was no change in core body temperature throughout each run (p=0.125 Time x Day interaction) or across the 11 days (p=0.078). On average, capillary lactate levels increased from 2.3 ± 1.3 mmol/L to 6.5 ± 2.3 mmol/L pre to post run (p=0.005). CONCLUSION: Energy balance is important for sustaining the high training and performance levels required for ultra-endurance events. However, the athlete was not able to consume enough calories to remain in energy balance. Nutritional needs assessments during training and competition should be an integral part of the preparation for participation in an ultra-endurance event. Supported by Valdosta State University Faculty Research Seed Grant.

Oxygen deficit (OD) for the same absolute workload intensity decreases with aerobic training through improved aerobic metabolism and likewise increases with detraining. It is unclear if the amount of increase in OD with detraining is the same in middle distance (MD) and long distance (LD) runners and what training related OD changes occur in these groups with subsequent retraining. PURPOSE: To compare and contrast the changes in OD values of collegiate MD and LD runners which accompany a post-competitive season cessation of training and subsequent endurance retraining. METHODS: Fourteen members of the collegiate track team (7 MD and 7 LD) runners completed a steady-state treadmill test (SS) at their gender-specific mean 5k velocity (15.3 kph for females and 18.5 kph for males) at the conclusion of their track season followed by 3 additional SS tests at 2-week intervals. Participants did not train between SS1 and SS2 and performed identical prescribed training programs between SS2 and SS4. VO2 steady state was identified as the breakpoint of the second phase of the OD curve. OD area under the curve comparisons were made using a 2x4 repeated measures ANOVA. RESULTS: MD demonstrated a significant decrease in VO2 at SS pace over the 6-week study resulting in a reduction of their mean OD (6.4%) versus LD (-0.5%) (P<0.01). Mean anaerobic contributions to reach SS were greater in MD than LD (36.9% vs. 32.2%) at the end of 4-weeks of retraining (P<0.01). CONCLUSION: There are differences in OD patterns that accompany both detraining and endurance retraining in collegiate MD and LD runners. LD runners were more aerobically challenged than MD to maintain SS velocity after detraining and may require a greater volume of anaerobic training than MD runners during the early retraining phase in order to retain a faster training pace.

The mean maximum oxygen uptake (VO2 max) from laboratory testing protocols of elite female long distance runners has been described as 68.4 ml.kg-1.min-1 for 3K to 10K runners (Daniels and Daniels, 1992) and 63.2 ml.kg-1.min-1 for elite female triathletes (Schabert et al, 2000). It is not known how NCAA Division III female cross-country runners compare to these groups. PURPOSE: To describe the pre-season maximum oxygen uptake of NCAA Division III female cross-country runners compare to these groups. METHODS: Eighteen female cross-country runners were recruited from two NCAA Division III teams. After consenting to participating in the study, the subjects completed a progressive protocol to exhaustion. VO2 max and respiratory exchange ratio (RER) were measured at peak. RESULTS: Mean age of subjects was 19.4 years (SD=1.2) and mean VO2 max was 52.2 ml.kg^-1.min^-1 (SD=5.9). The VO2 max range was from 40.3 to 63.5 ml.kg^-1.min^-1 and the median was 52.4 ml.kg^-1.min^-1. The interquartile range was 49.6 to 56.8 ml.kg^-1.min^-1. Mean RER at VO2 max was 1.08 (SD=0.06) and ranged from 1.0 to 1.21. CONCLUSIONS: Mean pre-season VO2 max of Division III cross-country runners was 23.7% lower than reported mean elite distance runners levels and 17.4% lower than mean elite triathlete levels. This is the first pilot study to describe NCAA Division III female cross-country runners, future studies should also describe ventilatory and anaerobic thresholds for this population.

It has been suggested there are two separate breakpoints in the oxygen pulse (O2 pulse = VO2/heart rate) versus workload relationship during incremental cycle ergometry, corresponding to the first and second turn points in the blood lactate response. It is still unclear if these O2 pulse breakpoints can be detected during treadmill running, and if detected, where these thresholds may be located relative to the gas exchange threshold (GET) and respiratory compensation point (RCP). PURPOSE: This study examined the relationship between O2 pulse and exercise intensity to determine if O2 pulse thresholds could be detected during treadmill running, and, if detected, to compare these O2 pulse thresholds to the GET and RCP. METHODS: Twelve, moderately trained runners (6 men and 6 women; age = 23 ± 3 years; height = 175 ± 8 cm; weight = 71 ± 12 kg) completed an incremental treadmill test to exhaustion for the measurement of gas exchange, ventilation, and heart rate variables, as well as the determination of VO2 peak. The GET and RCP were determined from the breakpoint in the VCO2 versus VO2 and V̇E versus V̇CO2 relationships, respectively. The O2 pulse was plotted against VO2 for each subject and the relationship between these two variables was examined using polynomial regression models (linear and quadratic) at an alpha level of p ≤ 0.05. RESULTS: The mean (± SD) VO2 peak was 3.475 ± 0.959 L.min^-1 (48.33 ± 7.30 ml·kg·min^-1). The GET (2.289 ± 0.617 L·min^-1) and RCP (3.029 ± 0.867 L·min^-1) occurred at 67 ± 5% and 88 ± 4% of VO2 peak, respectively. The O2 pulse versus VO2 relationship was best explained by a linear fit (r² = 0.976 ± 0.010) for 9 and a quadratic fit (r² = 0.985 ± 0.006) for 3 of the 12 subjects. Only 1 of the 3 subjects with a quadratic fit for the O2 pulse versus VO2 relationship displayed a response consistent with a plateau in the O2 pulse. CONCLUSIONS: The highly linear relationship between O2 pulse and VO2 for 75% of the subjects indicated that O2 pulse thresholds could not be detected during treadmill running using the O2 pulse versus VO2 relationship. These findings do not support the use of the O2 pulse as a non-invasive measure of fatigue thresholds.
Analysis of critical speed derived from “all-out” shuttle and continuous running
Luke Krynski1, Mark Kramer2, Nicholas A. Jannick3, Robert W. Pettit, FACSM2. 1Minnesota State University, Mankato, Mankato, MN. 2Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 3Victoria University, Melbourne, Australia (Sponsor: Robert Pettit, FACSM).

Email: luke.krynski@msu.edu

(No relationships reported)

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #334
May 31 11:00 AM - 12:30 PM
Analysis of Critical Speed Derived from “All-Out” Shuttle and Continuous Running.

Luke Krynski1, Mark Kramer2, Nicholas A. Jannick3, Robert W. Pettit, FACSM2. 1Minnesota State University, Mankato, Mankato, MN. 2Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 3Victoria University, Melbourne, Australia (Sponsor: Robert Pettit, FACSM).

Email: luke.krynski@msu.edu

(No relationships reported)

Abstract
Time limits associated with short and middle-distance running performances are estimated validity using the critical speed (CS) concept; however, little is known about applications for shuttle running, a feature of team sports. PURPOSE: To evaluate the CS of shuttle versus continuous running. METHODS: A total of 20 varsity, male soccer players wearing global positioning sensors (GPS) engaged in a shuttle 3-min all-out running test (i.e., 70 m switch-backs) followed shortly by a 90 s continuous all-out running test on a 400 m track. Intermittent CS (CSI) and true CS were calculated using the last 30 s of each test and the running capacity at speeds exceeding CS (D’). Results were calculated using: (speed of 150 s - CSi) * 150 s. RESULTS: There was a moderate effect size difference (Cohen’s d = 0.72) between true CS (3.78 ± 0.61) and CSi (3.40 ± 0.46) (t = 6.44, p < 0.01); however, the two parameters were positively, and the measure appears as a distinct metric. Conclusion: Shuttle running evokes a consistent, predictable decline in CS. The CSI method likely reflects the same physiological variables mediating true CS, and the D’ measure appears as a distinct metric.

Cardiovascular endurance is an important aspect in the performance of police duties. Departments have a need to assess ability to run as it is important not only for the officer’s health but also to protect citizens. PURPOSE: To evaluate patterns in cardiovascular fitness of police recruits upon entry into the police academy over 18 years including gender differences. METHODS: During the first week of police recruit training in a large southeastern metropolitan area, physical fitness levels were evaluated. This study’s variable of interest was: 1.5 mile run. ANOVA, and Bonferroni post hoc procedures were used to evaluate data. RESULTS: Initial ANOVA comparisons were significant between years for both males and females (p ≤ 0.001). Post hoc analysis of males indicated that in the first four years 1990 to 1994, there were significant differences in response to marathon training and to determine the relationship between changes in running performance, aerobic capacity, and body composition in this population. METHODS: Students in a marathon training class (n=147, 111 females; 21.0 ± 1.7 years) completed the first running before and after a 20-week marathon training program: 2-mile time trial (2TT) on an indoor 200-m track, underwater weighing (average of 3+ trials calculated with the Brozek equation) for percent body fat (BF), and a VO2max test using a graduated protocol on a treadmill with a Medgraphics Ultra system. Mixed-design ANOVA was used to assess changes and sex differences. Percent change was calculated for 2TT, BF, VO2max and BM, and Pearson’s r was used to assess correlations between the changes. RESULTS: Subjects improved in VO2max (men: 54.0 ± 7.5 to 56.5 ± 7.0 ml.kg⁻¹.min⁻¹; women: 46.8 ± 5.4 to 48.1 ± 5.3 ml.kg⁻¹.min⁻¹; P<0.001), and 2TT (men: 14.5 ± 1.8 min to 13.1 ± 1.6 min; women: 16.8 ± 1.6 to 15.5 ± 1.4 min; P<0.01), reduced BF (men: 15.3 ± 5.2 to 14.3 ± 5.6%; women: 25.0 ± 4.7 to 23.8 ± 4.7%; P<0.001), and did not change in BM (men: 75.0 ± 10.4 to 74.5 ± 10.3 kg; women: 63.1 ± 7.7 to 63.3 ± 7.8 kg; P=0.378). No sex-by-time interactions were found for any of the measures. Changes in all measures were significantly correlated with each other (VO2max and BM: r=0.178, P=0.003; VO2max and 2TT: r=0.311, P<0.001; VO2max and BM: r=0.279, P<0.001; BF and 2TT: r=0.341, P<0.001; BF and BM: r=0.419, P<0.001; 2TT and BM: r=0.208, P=0.012). Conclusion: In a healthy, young population following the same marathon training, both men and women improve 2TT and VO2max and decrease BF with no change in BM.

The Effect of ACTN3 Genotype On Self-reported One-Mile Running Time In Young, Recreationally Active Women
Christopher A. Martinez1, Andreas Kreutzer2, McKenzie Kreutzer3, Jason D. Stone4, Joel Mitchell, FACSM5, Jonathan M. Oliver,6 Texas Christian University, Fort Worth, TX. 1University of Texas Southwestern Medical Center, Dallas, TX. (Sponsor: Joel Mitchell, FACSM)

Email: c.martinez27@tcu.edu

(No relationships reported)

Alpha-actinins form a crosslink between actin filaments and adjacent sarcomeres, and play a role in signaling and energy metabolism. Alpha-actinin-3, is encoded by the ACTN3 gene and only present in Type II muscle fibers. Homozygosity for the 577X allele (XX) results in complete deficiency of α-actinin-3 and a compensatory upregulation of α-actinin-2, whereas heterozygosity (RX) and homozygosity for the 577R allele (RR) provide for the production of α-actinin-3. Research has reported a greater proportion of elite female distance runners are homozygous for the 577X allele compared to controls. However, no study to date has examined that apparent relationship in recreational women runners. PURPOSE: To examine the effect of ACTN3 genotype on self-reported one-mile running personal records (PR) in young, recreationally active women. METHODS: Thirty nine participants, grouped by the presence (RR+RX: n=27, age: 21.7±3.8 years, BMI: 22.9 ± 3.3 kg/m²) or absence (XX genotype: n=12, age: 21.2±3.2 years, BMI: 21.3 ± 1.8 kg/m²) of the 577R allele, reported a one-mile running PR. Genotype effects were examined using independent-sample t-tests and magnitude-based inference (MBI). RESULTS: A trend (p=0.065) toward faster one-mile times was observed in XX genotypes (415.7 ± 78.9 s) when compared to the RR+RX group (480.3 ± 104.8 s). MBI revealed a mechanistically beneficial effect of XX genotype (mean difference; ± 90% CI; -65 s, ± 57 s). Similar observations were made among a subset of thirteen faster runners, who reported a one-mile PR of less than seven minutes (RR+RX: n=7, age: 21.9±5.0 years, BMI: 20.9 ± 3.4 kg/m²; XX: n=6, age: 19.5 ± 0.5 years; BMI: 21.8 ± 1.5 kg/m²). Though not statistically significant (p=0.378), those in the XX group (355.8 ± 46.5 s) reported 5.4% faster times than those in the RR+RX group (376.3 ± 33.6 s). MBI revealed a mechanically beneficial effect of XX genotype (2.0 ± 4.0 s). CONCLUSION: These findings suggest a potential benefit of XX genotype on middle-distance endurance performance.

This is in agreement with prior investigations that have linked XX genotype to beneficial effect of XX genotype (-20 s; ± 40 s). CONCLUSION: These findings suggest a potential benefit of XX genotype on middle-distance endurance performance.

Marathon Training Improves Aerobic Capacity, Running Performance, and Reduces Body Fat in Men and Women
Christopher J. Lundstrom, Austin M. Miller, Morgan R. Betker, Katelyn E. Uthoven, Eric M. Snyder. University of Minnesota, Minneapolis, MN. (Sponsor: Dr. Michael Joyner, FACSM).

Email: lund992@umn.edu

(No relationships reported)

Introduction: Training for a 42.2-km marathon run consists of high volume aerobic training, which may increase VO2max, reduce percent body fat (BF) and body mass (BM), and improve running performance. Previous research has produced mixed results with respect to sex differences in response to training. We hypothesize that in a relatively large population following the same training program, men and women will see similar improvements in 2-mile time trial (2TT), reduce BF and BM, and increase VO2max.

S108 Vol. 49 No. 5 Supplement

Board #335
May 31 11:00 AM - 12:30 PM
Longitudinal Study of Changes in 1.5 Mile Run Times of Police Recruits Over 18 Years
Austin C. Smith1, Robert W. Boyce, FACSM1, Elizabeth H. Seldomridge1, Haley O. Norris1, Glenn R. Jones2, Michele A. Parker. 1University of North Carolina Wilmington, Wilmington, NC. 2City of Charlotte, Charlotte, NC.

Email: acs7105@uncw.edu

(No relationships reported)

Board #336
May 31 11:00 AM - 12:30 PM
Marathon Training Improves Aerobic Capacity, Running Performance, and Reduces Body Fat in Men and Women
Christopher J. Lundstrom, Austin M. Miller, Morgan R. Betker, Katelyn E. Uthoven, Eric M. Snyder. University of Minnesota, Minneapolis, MN. (Sponsor: Dr. Michael Joyner, FACSM).

Email: lund992@umn.edu

(No relationships reported)

Board #337
May 31 11:00 AM - 12:30 PM
The Effect Of ACTN3 Genotype On Self-reported One-Mile Running Time In Young, Recreationally Active Women
Christopher A. Martinez1, Andreas Kreutzer2, McKenzie Kreutzer3, Jason D. Stone4, Joel Mitchell, FACSM5, Jonathan M. Oliver,6 Texas Christian University, Fort Worth, TX. 1University of Texas Southwestern Medical Center, Dallas, TX. (Sponsor: Joel Mitchell, FACSM)

Email: c.martinez27@tcu.edu

(No relationships reported)

Board #338
May 31 11:00 AM - 12:30 PM
Performance Changes in Consecutive Day Marathon Runners
James W. Roberts, Jr, FACSM. Edinboro University of PA, Edinboro, PA.

Email: jroberts@ediboro.edu

(No relationships reported)

Over the last five years, the popularity of marathon running to complete a marathon in each of the 50 states has grown. As such, new businesses have arisen to accommodate completing this faster. There are now multiday marathon series that cover two to seven
states (i.e. seven days, seven marathons, seven different states). There is currently very little in the literature about these types of events and a lack of analyses of the finish times for participants that complete multiple days of marathons. PURPOSE: To determine the performance changes across the multiday marathon events.

METHODS: 145 runners completed between one and seven marathons over a seven day period at the 2016 Mainly Marathons New England Series. Data for all finishers were retrieved after the completion of the series from the series website. Descriptive analyses and a correlation matrix of means were performed on participants who completed one marathon (1MAR, n=63) and those that completed all seven marathons (7MAR) covering the seven different days (n=20).

RESULTS: Descriptive statistics, a paired t-test and independent t-test were performed using IBM SPSS version 21 with significance set at p<0.05. There was no significant difference in age between 1MAR and 7MAR (49.3±13.7 vs. 50.9±14.4 yrs, p=0.653). In addition, no statistically significant difference was found between 1MAR and day one of 7MAR finish times (350.4±96.7 vs. 362.1±80.0 min, p=0.625). However, 7MAR ran 11.7 minutes slower on average for day one. Finally, day one versus day 7 finish times for the 7MAR group were significantly different (362.1±80.0 vs. 390.8±60.2 min, p=0.006).

CONCLUSIONS: Even though the day one finish times were close to six hours on average, the toll of daily marathons still resulted in a significant decline in performance.

519 Board #340 May 31 11:00 AM - 12:30 PM
Standardized MET Overestimates Resting VO2 And Underestimates Energy Cost Of Running In Low Cardiorespiratory Fitness Men
Felipe Amorim da Cunha1, Helouane Ázara2, Adrian Midgley3, Fabrício Vasconcellos1, Patricia Vigário2, Paolo Farinati1,2,3,4 Rio de Janeiro State University, Rio de Janeiro, Brazil; 5Augusto Motta University Center, Rio de Janeiro, Brazil; 6Edge Hill University, Ormskirk, United Kingdom. (Sponsor: Prof. Lars Mc Naughton, FACSM)
Email: felipac@global.com
(No relationships reported)

Multiples of the metabolic equivalent (MET) are widely used to prescribe exercise intensity and quantify the energy cost of physical activities. A growing body of empirical evidence, however, suggests the standardized 1-MET value, represented by a resting oxygen uptake (VO2) of 3.5 mL·kg−1·min−1, significantly overestimates observed resting VO2 in populations with lower cardiorespiratory fitness (CRF). PURPOSE: Comparison of standardized MET and resting VO2 with respect to these two applications and explore the association between CRF and resting VO2. METHODS: A heterogeneous cohort of 114 healthy men, aged 18 to 38 yr, volunteered to participate in two studies. First, 100 men [lower CRF: n = 48, VO2max < 50.0 mL·kg−1·min−1; higher CRF: n = 52, VO2max ≥ 50.0 mL·kg−1·min−1] visited the laboratory twice to explore the association between directly measured VO2 and resting VO2. Second, 14 men performed a 30-min bout of running at 8.0 km·h−1 (8.3 METs according to the Compendium of Physical Activities) to investigate the use of the MET to quantify the energy cost of treadmill running. RESULTS: The VO2max was strongly positively correlated with resting VO2 (R = 0.68, P < 0.001). The mean observed resting VO2 values of 3.28 (e = 100) and 3.07 (e = 14) mL·kg−1·min−1 were significantly lower than the standardized value of 3.5 mL·kg−1·min−1 (P = 0.001 and P = 0.005, respectively). When compared to the standardized value, groups with lower CRF demonstrated significantly lower mean observed resting VO2 values of 3.06 (1* part of the study: P < 0.001) and 2.67 (2nd part of the study, P < 0.001) mL·kg−1·min−1. However, no significant difference was observed between standardized and observed resting VO2 values for the groups with higher CRF (1* part of the study: P = 0.87, 2nd part of the study: P = 0.78). Hence the observed values for the energy cost of treadmill running were significantly underestimated when calculated using the standardized resting VO2 value of 3.5 mL·kg−1·min−1 (P = 0.005 to P = 0.001) only for the groups with lower CRF. CONCLUSION: The standardized MET value considerably overestimated observed resting VO2 in men with lower CRF. Direct determination of resting VO2 is therefore preferred to improve the accuracy of the aforementioned applications in this population.
Effects of Footwear on Running Economy and Preferred Foot Strike Pattern in Collegiate Distance Runners

Donovan S. Conley, FACSM1, Shane A. Warehime2, Kevin L. Hill1, Tammy K. Evetovich, FACSM1, 1Wayne State College, Wayne, NE, 2University of Nebraska Omaha, Omaha, NE.

METHODS: Ten (5 female, 5 male) healthy, trained National Collegiate Athletic Association Division II distance runners were randomly assigned to 3 footwear conditions: 1) barefoot (BF), 2) minimally shod (MS) and 3) traditionally shod (TS). For each condition, running economy (VO2), heart rate (HR), rating of perceived exertion (RPE), and preferred foot strike (FPS) pattern (forefoot, mid-foot, rear foot) were measured between the 5th and 6th min of treadmill running at 0% grade, 3.35 m/s. RESULTS: Repeated measures ANOVA analysis revealed no significant difference (p>0.05) across BF, MS and TS footwear conditions for VO2 (41.1±2.5, 40.7±1.9, 41.6±2.2 mm/kg/min), HR (168.6±17.5, 166.7±15.8, 168.6±16.1 bpm) and RPE (9.6±1.8, 9.3±2.1, 9.5±1.8). There was no magnitude effect between BF, MS and TS conditions for the FPS test. However, the Friedman test showed a significant difference (p<0.05) in FPS patterns across footwear treatments. Subsequently, the Wilcoxon test indicated the FPS pattern for BF was forefoot and, in contrast, for both MS and TS conditions the FPS was rearfoot. CONCLUSION: There is no metabolic advantage to BF, MS, and TS footwear conditions. Despite the absence of significant differences between BF, MS, and TS conditions for VO2, HR, and RPE, the Friedman test showed a significant (p<0.05) difference in FPS patterns across footwear treatments. This shows the importance of considering the whole body when evaluating running economy.

Running economy (RE) has been shown to improve with the addition of concurrent explosive strength training, plyometrics, and heavy load resistance training. However, there is little research to date on the effects of RE with functional resistance training. PURPOSE: The purpose of this study was to determine the effects of a medicine ball training program on running economy and preferred foot strike pattern in collegiate distance runners. METHODS: Twenty (10 female, 10 male) healthy, trained National Collegiate Athletic Association Division II distance runners were randomly assigned to either the intervention (I) or control (C) group (randomly assigned). The I group completed a 6-week progressive medicine ball training program. Statistical analysis was performed using independent t-tests and Pearson product-moment correlations. RESULTS: The following is preliminary data on the 7 participants (4 I, 3 C) that have completed the protocol. The number of push-ups completed following the post testing increased by 6.8±4.1 for the I group and 6.3±9.5 for the C group. The I group increased the number of curl-ups completed by 21.0±19.0 while the C group decreased by 3.0±3.1. Running economy at 187 m/min, decreased by 2.07±1.0 ml/kg/min and 7.4±1.4 ml/kg/min for the I and C groups, respectively. At 204 m/min running economy, decreased by 1.9±1.3 ml/kg/min for the I group and increased by 0.5±2.4 ml/kg/min for the C group. VO2 max decreased by 0.2±1.2 ml/kg/min for the I group and increased by 0.8±7.7 ml/kg/min for the C group. Independent t-test analyses are not currently showing statistically significant changes in the preliminary data (p>0.05). Although not statistically significant, the Δ in push-ups and Δ in curl-ups are showing a positive correlation with RE at both speeds (187/m/min: r=0.762, p=0.238, 204 m/min: r=-0.871, p<0.026, 187 m/min: r=0.788, 204 m/min: r=0.420, p=0.580, respectively).

CONCLUSION: These preliminary data suggest that the inclusion of a medicine ball training program may help improve abdominal endurance (curl-up) and running economy in trained endurance runners.
Run training can improve fitness and performance. Many runners have seen high rates of injury, which can lead to detraining. Cross-training methods attempt to attenuate detraining. A novel outdoor elliptical bicycle (EBIKE) has been designed to emulate the running motion without impact forces. PURPOSE: To determine the effectiveness of replacing 50% run training with elliptical bicycling on maximal oxygen consumption (VO2max), ventilatory threshold (VT), respiratory compensation point (RCP), and 5,000 m time trial (TT) over a 4-week training period. METHODS: Fourteen male (n=9) and female (n=5), experienced runners (age=22.1±3.6 y, running experience=9.6±4.2 y) were classified as healthy and experienced via a health history screening, body composition assessment (skin fold method), and a graded VO2 max test (GXT) on a treadmill during an initial testing session. The TT was performed on an indoor 3000 m track 24-72 hours following the GXT. Each participant was then randomly assigned to either the RUN group (100% normal run training) or COMBINED (CON) group (50% normal run training:50% elliptical bicycle training). An identical testing session was conducted following the 4-week training period. RESULTS: All results are reported as mean±SD. Paired t-tests (p=0.025) were utilized to compare the physiological variables before and after training separately for each group. A Bonferroni correction was performed in order to adjust the alpha value to avoid statistical error. Before training values for VO2 max (ml/kg/ min) [RUN 59.9±4.3 vs CON 62.7±6.4], and VO2 at VT (ml/kg/min) [RUN 59.5±4.1 vs CON 63.1±7.4] were not significantly different (p>0.025) compared to after training values of VO2 max (RUN 60.6±4.1 vs CON 63.1±7.6) for both the RUN and CON groups. No significant differences were seen when VT and RCP were expressed as a percent of relative VO2 max. CONCLUSIONS: In this novel investigation replacing 50% of run training with elliptical bicycle training over a 4-week period was able to maintain physiological and performance variables similar to 100% run training in this population of experienced runners. Coaches and runners should consider the EBIKE as a viable cross-training option for replacing up to 50% of run training.

Aerobic capacity plays an essential role in physical performance. Females have been shown to have lower aerobic capacity during land-based incremental testing when compared to their male counterparts. However, there have been few studies on gender differences in aerobic capacity during water-based incremental swimming. Understanding the gender differences is an important step in coaching/training. PURPOSE: The purpose of this study was to examine aerobic capacity gender differences. METHODS: A total of 15 males (25.6±6.7 yr, 179.3±4.4 cm, 75.2±11.5 kg) and 15 females (22.6±6.6 yr, 176.7±6.4 cm, 65.7±11.9 kg) participated in the study and completed an incremental swimming test to exhaustion. The protocol involved swimming a minimum of 250 meters (10 lengths) using the freestyle stroke. Rest periods following each 22.9 meter length decreased from 3 seconds to 2 seconds throughout the test. Following 9 lengths, subjects continuously swam to maximal velocity until VO2max had been achieved or until exhaustion occurred. Aerobic capacity was measured with a portable metabolic system suspended above the swimmer using a cable pulley system, enabling a standard freestyle stroke with continuous measure of VO2. Ratings of perceived exertion (RPE), blood lactate (BLA), and maximal heart rate (HRmax) were also measured at the end of the test. Data were tested for normality, and independent samples t-tests or Mann-Whitney U tests were used, as appropriate (p<0.05). RESULTS: Males had significantly higher aerobic capacity (males: 48.4±7.4 mL/kg/min, females: 39.8±5.3 mL/kg/min, p=0.001) and lower HRmax (males: 167.3±6.6 bpm, females: 180.7±7.8 bpm, p=0.002) compared to females. There were no gender differences in RPE (males: 6.9±5.0, females: 6.7±4.5, p=0.7). CONCLUSIONS: The current results have revealed significant gender differences in aerobic capacity at the maximal effort (with similar RPE scale and BLA values). These findings are in accordance with other land-based gender studies on aerobic capacity.
Consistent differences between males and females have been shown in land based measurements of anaerobic performance. Evidence shows that a 30-second max tethered swim (TST) is a valid and reliable measure of anaerobic power (Fpeak) and capacity (Fmean) in swimmers. However, gender differences have not been investigated. PURPOSE: To explore gender differences for anaerobic performance, reliability, and validity of a TST. METHODS: 14 males and 14 females completed 4 sessions: Wingate cycling anaerobic test (WAnT), a performance swim (PS) session, and 4 TST over 2 sessions. Gender differences were determined using independent t-tests. Reliability was determined using an ICC (2,1) for Fpeak and Fmean. Criterion validity of the TST was determined using Pearson’s Correlation analysis among Fpeak and Fmean obtained during the TST and WAnT, and the swim velocity obtained during the PS.

RESULTS: Gender differences are shown in Table 1. For males/females respectively, intersession for Fpeak (0.764/0.696) and for Fmean (0.965/0.985), and intrasession for Fpeak (0.645/0.786) and for Fmean (0.920/0.990), were statistically significant (p<0.05). Criterion validity is shown in Table 2.

**CONCLUSIONS:** Although gender differences exist for anaerobic performance of swimmers, the TST is still considered a reliable method with moderate/strong associations between the TST and land based measures in males. Supported by ONR: N00014-14-1-0022/N00014-15-0069

| Males | Females | T-test
|---|---|---
| Mean | SD | Mean | SD |
| TST Fpeak | 277.43 | 54.51 | 191.58 | 37.56 | 0.000 |
| Fmean | 99.31 | 24.58 | 74.30 | 19.67 | 0.006 |
| WAnT Fpeak | 1005.53 | 188.89 | 724.87 | 104.12 | 0.000 |
| Fmean | 707.47 | 99.81 | 443.27 | 96.42 | 0.000 |

**Table 2.**

<table>
<thead>
<tr>
<th>Criterion Validity: TST Fmean Pearson</th>
<th>Criterion Validity: WAnT Fpeak Pearson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males:</td>
<td></td>
</tr>
<tr>
<td>WAnT Fpeak</td>
<td>0.280</td>
</tr>
<tr>
<td>PS 25yd</td>
<td>0.666*</td>
</tr>
<tr>
<td>PS 50yd</td>
<td>0.746*</td>
</tr>
<tr>
<td>PS 100yd</td>
<td>0.763*</td>
</tr>
<tr>
<td>Females:</td>
<td></td>
</tr>
<tr>
<td>WAnT Fpeak</td>
<td>0.775**</td>
</tr>
<tr>
<td>PS 25yd</td>
<td>0.931**</td>
</tr>
<tr>
<td>PS 50yd</td>
<td>0.906**</td>
</tr>
<tr>
<td>PS 100yd</td>
<td>0.869**</td>
</tr>
</tbody>
</table>

**Variable** | **N** | **VO2max_A** | **VO2max_B** | **ICC** | **p-value** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2max (ml·kg·min⁻¹)</td>
<td>29</td>
<td>44.2±7.7</td>
<td>42.9±8.5</td>
<td>0.899**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HRMax (b·min⁻¹)</td>
<td>19</td>
<td>177.5±8.5</td>
<td>178.1±9.0</td>
<td>0.956**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>O2pulse (ml·b⁻¹)</td>
<td>19</td>
<td>0.2±0.0</td>
<td>0.2±0.0</td>
<td>0.833**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Peak RER</td>
<td>19</td>
<td>1.0±0.1</td>
<td>1.0±0.1</td>
<td>0.538**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>VeMax (l·min⁻¹)</td>
<td>29</td>
<td>95.2±20.7</td>
<td>96.3±21.2</td>
<td>0.785**</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 1.**
Although it’s well documented that top-performing swimmers are relatively late matures, it’s not well understood why this is so. One explanation is that there are certain physical traits common to later matures that contribute to better swim performance. And as a result, later matures are more likely to be ‘selected’ for continued sport participation. PURPOSE: To determine if: (1) top-performing swimmers are later matures than lower-performing swimmers; (2) later-maturing swimmers perform better than earlier-maturing swimmers; and (3) there are physical traits common to both top performers and later matures.

METHODS: Maturational timing was estimated using age at menarche (AaM), which was determined retrospectively in collegiate swimmers (N = 273). Each swimmer’s best performance during the 2015-2016 NCAA season was obtained from the USA Swimming database and selected based on Power Point Score (PPS), a standardized score given to all performances in the database. Independent samples t tests were used to compare (1) AaM and BMI (from self-reported height and weight) between bottom-performing (lowest 25% of PPS) and top-performing swimmers (highest 25% of PPS) and (2) PPS and BMI between earlier-maturing (youngest 25% of AaM) and later-maturing (oldest 25% of AaM) swimmers. RESULTS: The top performers were later matures than the bottom performers (AaM 14.0 ± 13.4 years, t = 2.48, P = 0.02, d = 0.46) and had lower BMIs (22.5 vs. 23.5 kg/m², t = 2.30, P = 0.02, d = 0.41). The later matures performed better than the earlier matures (PPS 802.6 ± 753.4, t = 2.11, P = 0.04, d = 0.39) and had lower BMIs (22.5 vs. 23.4 kg/m², t = 2.29, P = 0.02, d = 0.40). CONCLUSION: Previous research has shown that top-performing swimmers and later-maturing women are more linear in body shape than their low-performing and earlier-maturing counterparts. Our results provide evidence that there are physical traits common to top-performing swimmers and later-maturing women. So it’s certainly possible that later matures are being selected (by themselves or others) for continued swim participation on the basis of these traits. But additional longitudinal research is required to determine the extent to which this is the case.

534 Board #355 May 31 11:00 AM - 12:30 PM Associations between Land-Based Laboratory Measures and Freestyle Swimming Performance: A Comparison between Males and Females

Anne Z. Beebe1, Elizabeth Nagle, FACSM1, Christopher Connaboy1, Mitu Lovalekar1, John Abt, FACSM2, Takashi Nagai1, Scott M. Lephart, FACSM2.1 University of Pittsburgh, Pittsburgh, PA. 2University of Kentucky, Lexington, KY. (Sponsor: Elizabeth Nagle, FACSM) (No relationships reported)

Swimming requires technical proficiency to perform effectively and efficiently. Directly analyzing technique and performance is expensive and time consuming. Understanding underlying factors and characteristics which relate to swimming performance is of benefit. To quantify, land-based laboratory measures (LM) can be used, but associations between the LM and swimming times must be established. Further, it is unknown if technique and performance characteristics are equal in both sexes. PURPOSE: To examine associations of LM to swimming performance (SP) in female and male swimmers. METHODS: Fifty female (22.6 ± 6.3 years, 167.6 ± 6.4 cm, 65.7 ± 9.5 kg) and 15 male (23.6 ± 6.7 years, 179.3 ± 6.4 cm, 75.1 ± 11.5 kg) recreational and competitive swimmers completed LM (body anthropometrics/ composition, passive shoulder range of motion, shoulder laxity, and isokinetic scapular strength), and 50 and 200 yd freestyle SP. Spearman correlations were performed comparing LM with SP for each female/male group. Females and males were then split by a median cut point (fastest and slowest) for the 50 (Female = 32.6 s; Male = 30.5 s) and 200 (Female = 168.6 s; Male = 159.3 s) yd swims. After testing for normality, Mann-Whitney tests compared group means (p < 0.05). RESULTS: Correlations were found between female fat free mass (FFM) and 50 yd (r = 0.713; p < 0.003) and 200 yd (-0.724; p < 0.002) freestyle SP. Compared to the slower female, the faster female had greater height (p = 0.021) and leg length (p = 0.015) in relation to 50 yd SP, and greater FFM for both 50 yd (p = 0.001) and 200 yd (p = 0.005) SP. Males showed no sig. correlations in LM, nor sig. associations in LM between the faster and slower swimmers during the SP tests. In both sexes, shoulder girdle LM were not associated with SP. CONCLUSION: Time to completion was the only measure of SP. Therefore, an increase in relative female height may act to reduce the magnitude of wave drag encountered, allowing for faster speeds in relation to a specific propulsive impulse. Correlation between FFM and faster SP demonstrates that females with more muscular mass can compete at higher speeds. To predict capabilities for future SP, and assess associations between LM and SP, studies should examine shoulder biomechanical measurements during the freestyle stroke. Supported by ONR: N00014-14-1-0022/ N00014-15-0069.
calculated using a Monte Carlo simulation method. Residual squared error (RSE), r-squared (r²), confidence interval (CI) length, and absolute difference between observed and predicted of each regression model were compared.

RESULTS: Average RSE, \((1.24 \pm 1.52)\), RSE, \((1.39 \pm 1.15)\). Average r², \((0.76 \pm 0.09)\), r², \((0.72 \pm 0.12)\). There were no statistically significant differences in average RSE \((p=0.35)\) or average r² \((p=0.35)\) between sex models. Average length of the 95% total healthcare costs. Healthcare costs were costs associated with a doctor’s visit, them participated in resistance training. Economic impact was determined by their membership. A total of 498 swimmers (304 female and 194 male) aged 20-86 years athletes to pursue better performance and place economic burden on these athletes. The two most common deficit nutrients were carbohydrates and less than half of the participants met guidelines for the intake of at least two of the four nutrients studied. The two most common deficit nutrients were carbohydrates and fat. Recommended intake guidelines for each athlete were based on their nutritional content. Nutritional analysis was restricted to four nutrients: protein, carbohydrates, fat and calories. Recommended intake guidelines for each athlete were based on average dietary consumption calories. All but one participant met or exceeded guidelines for protein consumption. In general, the nonlinear regression prediction models produce a valid and accurate approximation of Olympic performance progression as reflected by the 2016 Games. However, it is unclear why there is a different accuracy of ‘fit’ for the men and women predictions. Further study is needed to evaluate the potential factors apparently allowing the women to out-perform the ‘best fit’ model.

CONCLUSIONS: In general, the nonlinear regression prediction models produce a valid and accurate approximation of Olympic performance progression as reflected by the 2016 Games. However, it is unclear why there is a different accuracy of ‘fit’ for the men and women predictions. Further study is needed to evaluate the potential factors apparently allowing the women to out-perform the ‘best fit’ model.

CONCLUSIONS: In general, the nonlinear regression prediction models produce a valid and accurate approximation of Olympic performance progression as reflected by the 2016 Games. However, it is unclear why there is a different accuracy of ‘fit’ for the men and women predictions. Further study is needed to evaluate the potential factors apparently allowing the women to out-perform the ‘best fit’ model.
changes in testosterone were not significant over time (456±127; 438±119; 416±111ng/dL; p=0.38). Significant correlations noted between CK vs. MVO (r=0.36), cortisol (r=0.39), alanine aminotransferase (r=0.22), and aspartate aminotransferase (r=0.48) when all data were combined. CONCLUSION: Muscle damage in collegiate male swimmers was modest despite cumulative training which peaked at 20hrs/week. A disconnect was noted between muscle damage (CK, MVO) and (upper and lower) body soreness, at moderate (~5/10) degrees of muscle soreness. Serum cortisol decreased over time, while testosterone remained unchanged, which promoted an anabolic hormonal environment despite gradual increases in high volume training at the commencement of the new (Fall) academic year.

In 2014, three female swimmers were hospitalized with symptomatic exertional rhabdomyolysis (Stanfa M et al 2016). PURPOSE: To serially monitor and assess relationships between skeletal muscle damage, upper and lower body soreness, and physiological stress during the first seven weeks of high volume training in collegiate female swimmers. METHODS: 23 female NCAA D1 swimmers presented to the lab six times during 7-weeks of pre-season training. Blood was drawn at six timepoints for measurement of serum creatine kinase (CK), myoglobin (MVO) and a complete metabolic panel. Serum cortisol (C), testosterone (T) and T/C ratio were assessed at Weeks 1 (baseline), 4 and 7. Upper body soreness (US) and lower body soreness (LS) were assessed, at the six timepoints that blood was drawn, using a visual analogue scale (0-10-inch unmarked scale). A repeated measures ANOVA with Bonferroni correction were performed, with data reported as mean±SD. Correlation analyses performed with significance set at p<0.05. RESULTS: Weekly training load consisted of 88% swimming, 6% running, and 6% weight training which gradually increased from 16 hours to 20 total training hours/week over the first seven weeks of training. Significant changes were noted in CK (135±68; 446±723; 171±83; 202±80; 180±100; p<0.0001), LS (1.3±1.5; 5.0±2.2; 3.4±1.8; 5.0±1.9; 4.8±1.2; p<0.0001), cortisol (19±10; 15±6; 11±5ng/dL; p=0.0001), and T/C ratio (2.4±2.3; 3.0±1.8; 4.1±2.8; p=0.0003) but not in MVO (39±20; 63±141; 30±17; 24±4; 29±14ng/mL; p=0.32) or testosterone (33±14; 37±14; 36±14ng/dL; p=0.29). Significant correlations noted between CK vs. MVO (r=0.84), alanine aminotransferase (r=0.21), and aspartate aminotransferase (r=0.49) when data were combined, but largely driven by an outlier with CK=3558U/L and MVO=691ng/mL at Week 2 (first training week). CONCLUSION: Muscle damage in collegiate female swimmers remained largely within the normal range (CK<200U/L) on average, but was highly variable between individuals. No correlations noted between muscle damage (CK, MVO) and (upper and lower) body soreness, at moderate (~5/10) degrees of muscle soreness. Serum cortisol declined over training, promoting an anabolic hormonal environment.

It is known that in the same way the training provide several adaptations, the interruption or change the types of physical activities can lead to the decline of skills developed. However, there are limited researches that indicate these effects on swimmers. PURPOSE: To evaluate the strengthening of shoulder rotators of recreational swimmers after a swimming activities program, after a similar swimming-training program outside of the pool and after 8-week detraining. METHODS: Ten recreational swimmers (age: 44.0±19.0 years) were used as experimental group and patients as control group. 3-4 intensity levels were used (65%, 80%, 90% and 100%) in a 10-session schedule. RESULTS: Significant differences were noted between swimming (SWI) and detraining (DET) for higher values of external rotation at 60º/s; for internal rotation at 120º/s for external rotation at 180º, and for internal rotation at 180º. Significant differences were noted for most of the measured parameters, with significant differences between swimming and detraining for strength measurements of the shoulder rotators in recreational swimmers. CONCLUSION: The positive effects to maintain strength level acquired after a swimming activities program inside of the pool only for external rotation at 60º/s, indicating that decline of skills previously developed may be muscle and velocity-dependent. Also, 8 weeks detraining was deleterious for strength profiles of the shoulder rotators in recreational swimmers.

Much research and many guidelines exist relating hydration and sport, yet many athletes don’t understand the role it plays with training and performance. Athletes often come to practice or competition dehydrated. Hydration education has been shown to reduce dehydration and potentially improve performance. PURPOSE: To determine if an educational intervention improves the hydration status of collegiate swimmers. METHODS: Participants (N=14) were collegiate level swimmers (n=6 female, n=8 male). Hydration status was determined using urine specific gravity (USG), urine osmolality (UO), and change in body mass. Measurements were taken before and after practice during week one. Athletes dehydrated by any of the measures (n=9) were given an educational intervention during week two. The intervention provided information based on position statements from the American College of Sports Medicine and the National Athletic Training Association. The same hydration measures were made in week three after the educational intervention. A dependent t-test was used to determine any significant differences in pre-post intervention hydration measurements using the dehydrated swimmers to determine the program’s effectiveness.

RESULTS: There was no significant difference in USG or UO (p>0.05). Pre and post-practice USG and UO values from week one were compared to week three. CONCLUSION: While no significant differences were present as a result of the educational intervention, previous research has suggested educational interventions can improve the understanding of hydration and how it impacts performance and elicits positive performance outcomes. (clearly et al., 2012; McDermott et al., 2009) In the present study, daily fluctuations in hydration and practice time, subjects misunderstanding/disregarding information provided during the intervention, or using a single determinant of hydration status, may be possible reasons for no change. Further investigations may want to both account for these variables and extend the educational intervention.

Upper limb strenght muscles. For statistical analysis a two-way ANOVA with repeated measures with Tukey-Kramer post hoc was carried out. RESULTS: It was showed a positive effects to maintain strength level acquired after a swimming activities program inside of the pool only for external rotation at 60º/s, indicating that decline of skills previously developed may be muscle and velocity-dependent. Also, 8 weeks detraining was deleterious for strength profiles of the shoulder rotators in recreational swimmers.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**B-07 Thematic Poster - Cardiac Physiology**

**Wednesday, May 31, 2017 - 1:00 PM - 3:00 PM**

**Room: 304**

**573 Chair:** Serge P. von Duvillard, FACSMS, University of Salzburg, St. Cloud, MN.  
(No relationships reported)

**574 Board #1**  
**May 31 1:00 PM - 3:00 PM**  
**Associations Of Heart Rate Variability Measured During Orthostatic Test And During Daily Routine Activities**  
Ricardo Mesquita¹, Heikki Kyrolainen, FACSMS¹, Daniela S. Ostad², ¹University of Jyväskylä, Jyväskylä, Finland. ²Polar Electro Oy, Kempele, Finland.  
Email: rnomesquita@hotmail.com  
(No relationships reported)

Measuring resting heart rate variability (HRV) indices constitutes an interesting, non-invasive and simple tool to monitor fatigue and performance responses. The orthostatic test (OT) where heart beat-to-beat (RR) intervals are measured is widely used to measure HRV. The feasibility of the OT would, however, increase considerably if vagal related HRV indices could be analysed from free living physical activity. **PURPOSE:** To determine the reliability and validity of HRV indices during daily routine situations. **METHODS:** Eight white-collar workers were recruited to participate in this study. RR intervals were recorded using a personal HR monitor (V800, Polar Electro Oy, Kempele, Finland). Data was collected every morning at home upon awakening and at work during routine situations on 16 different days. A total amount of 127 cycles of sitting periods followed by walking breaks were included for consecutive pairwise analysis of trials for reliability [SD1 (coefficient of variation (CV) and typical error (TE) with confidence limits of 95%) was calculated. When reliability was found, the values from the morning OT were plotted against the corresponding routines at work. **RESULTS:** Mean RR-interval and HR values at work showed high levels of repeatability [CV during sitting and walking was 4.71 and 3.99, respectively, with a TE of 3.73 (3.34-4.25) and 3.65 (3.31-4.09)]. Although reliable, HR data recorded in the morning did not correlate with the corresponding routines at work (r = 0.28 for sitting and r = 0.05 for standing vs. walking, p > 0.05). The root-mean-square difference of successive normal RR (RMSSD) was revealed not to be repeatable in those routine situations [CV during sitting and walking was 19.99 and 29.05, respectively, with a TE of 7.9 (7.15-8.65) and 9.43 (8.53-10.57)]. Furthermore, RMSSD values analyzed from the HRV recordings during standing did not correlate (r = 0.138, p > 0.05) with the respective values during walking. **CONCLUSION:** Analyzing RMSSD from daily routine activities was not reliable or valid. To monitor training status, RMSSD should therefore be calculated from recordings in standardized conditions such as the OT in the morning. It would be much more feasible to get this information from free living activities but it does not seem to be a valid procedure.

**575 Board #2**  
**May 31 11:00 PM - 1:00 AM**  
**The Relationship Between Lifelong Exercise Volume and Coronary Atherosclerosis**  
Vincent L. Aengevaeren¹, Arend Mosterd², Thijss L. Braber¹, Nick HJ Prakken¹, Paul D. Thompson, FACSMS¹, Thijss MH Eijsvogels³, Birgitta K. Velthuis¹, ¹Radboud University Medical Center, Nijmegen, Netherlands. ²Meander Medical Center, Arnhem, Netherlands. ³Amersfoort University Medical Center, Arnhem, Netherlands. 4University Medical Center Utrecht, Utrecht, Netherlands. 5University Medical Center Groningen, Groningen, Netherlands. 6Hartford Hospital, Hartford, CT. 7Liverpool John Moores University, Liverpool, United Kingdom.  
Email: Vincent.Aengevaeren@radboudumc.nl  
(No relationships reported)

Higher levels of physical activity are associated with a lower risk of cardiovascular events. Nevertheless, there is debate on the dose-response curve of exercise and cardiovascular outcomes and whether high volumes of exercise may accelerate coronary atherosclerosis. **PURPOSE:** To determine the relationship between lifelong exercise volumes and atherosclerotic coronary artery disease (CAD) characteristics. **METHODS:** Middle aged men engaged in competitive or recreational leisure sports underwent a non-contrast and contrast-enhanced computed tomography scan to assess coronary artery calcification (CAC) and plaque characteristics. Participants reported lifelong exercise history patterns. Exercise volumes were multiplied by Metabolic Equivalent of Task (MET) scores to calculate MET-min/week. Participants were allocated to <1000 MET-min/week, 1000-2000 MET-min/week or >2000 MET-min/week. **RESULTS:** 284 participants (55.7 years) were included. CAC was present in 150/284 (53%) participants with a median CAC score of 35.8 (9.3-145.8). Athletes with a lifelong exercise volume >2000 MET-min/week (n=75) had a significantly higher CAC score (9.4 [0-66.9] versus 0 [0-45.3], p=0.02) and prevalence of CAC (68%, OR=3.2 (95%CI: 1.6-6.6)) and plaque (77%, OR=3.3 (95%CI: 1.6-7.1)) compared to <1000 MET-min/week (n=88, 43% and 56% respectively). Among participants with CAC=0, there was no difference in CAC score (p=0.20), area (p=0.25) and regions of interest (p=0.20) across exercise volume groups. Among participants with plaque, the most active group had a lower prevalence of mixed plaques (48% versus 58%, OR=0.35 (95%CI: 0.15-0.85) and more often had only calcified plaques (38% versus 16%, OR=3.57 (95%CI: 1.28-9.97)) compared to the least active group. There was no difference in location of CAC or plaque. **CONCLUSION:** Participants in the >2000 MET-min/week group had a higher prevalence of CAC and atherosclerotic plaques. The most active group did however have a more benign composition of plaques, with fewer mixed plaques and more often only calcified plaques. These observations may explain the increased longevity typically observed in endurance athletes despite the presence of more coronary atherosclerotic plaque in the most active participants.

**576 Board #3**  
**May 31 1:00 PM - 3:00 PM**  
**High Intensity Interval Training in a Rat Model of Severe, Angioproliferative Pulmonary Arterial Hypertension**  
Mary Beth Brown¹, Gary Long¹, Andrea Frump², Andrew Wiseman³, Matthew Owens³, Jamie Blessinger³, Taylor Karzhal³, Spencer Studebaker³, Kelly Jay³, Ashley Troutman³, Tim Lahn³, ¹Indiana University, Indianapolis, IN. ²Indiana University School of Medicine, Indianapolis, IN. ³University of Missouri-Kansas City, Kansas City, MO.  
Email: brownmb@iu.edu  
(No relationships reported)

**PURPOSE:** We previously demonstrated superior benefit of high intensity interval training (HIIT) over continuous exercise training (CET) in a monocrotaline rat model of mild pulmonary arterial hypertension (PAH). Here we investigate HIIT in a model that elicits a more severe, angioproliferative PAH. **METHODS:** SD rats (≥200g, male) received Sugen5416 (20mg/kg), followed by 3 wks of hypoxia (Pα̃ =362 mmHg) and 4 wks of room air to induce PAH (SUFx, n=33). Subgroups of SUFx then underwent 6 wks of treadmill training performed as either HIT (2 min at ~80% VO₂max reserve [VO₂R]) or CET (4 min at 30% VO₂R, 35% VO₂max reserve) for 4-5 cycles, n=12), or low intensity CET (45-60 min at 50% VO₂R, n=11), with the remainder untrained (SED, n=10). Values are mean±SE. **RESULTS:** Mortality in SUFx was unexpectedly worse for HIT (4 deaths at 56, 60, 66, and 71 days), vs. CET (2 deaths at 60, and 73 days), and SED (2 deaths at 66 days). While all animals had similar baseline echocardiographic measures of cardiac output (CO, in ul) and stroke volume (SV, in ml/min), SUFx that died prematurely (n=8) had greater impairment in CO (141±19 and 424±52) following PAH induction (at pre-training) compared to surviving SUFx (n=25, 235±26, 598±38). Final CO and SV were higher for both HIT (239±49, 540±58) and CET (207±41, 529±51) vs. SED (122±12, 405±35). Without HIT rats, and were similar to untrained healthy controls (CON, n=6, 268±59, 548±71). SUFx-induced elevation in right ventricular (RV) systolic pressure (mmHg) and RV hypertrophy (as RV mass/LV+septum mass, and as RV thickness on echo in mm) were not improved by training with HIT (61±7, 60±0.07, 2.2±0.02) or CET (60±8, 47±0.04, 2.0±0.02), vs. SED (55±8, 52±0.06, 2.2±0.02), and were higher than CON (28±3, 24±0.01, 1.3±0.1). Final VO₂ max (ml/kg/min) in SUFx was also not improved for either HIT (44±1.9) or CET (46±1.7) vs. SED (46±3.8). **CONCLUSION:** Both HIT and CET promoted better RV function in SUFx rats despite no amelioration of RV hypertrophy, PAH, or exercise impairment. However, in contrast to previous findings in a mild PAH rat model, exercise training, particularly with HIT, increased mortality for animals with poorer cardiac function prior to training onset and suggests that further investigation is needed to optimize training approach for patients with more severe RV dysfunction.  
Funding: NIH-NHLBI R1-5 (to MB Brown)

**577 Board #4**  
**May 31 3:00 PM - 5:00 PM**  
**The Impact of Menopausal Status on Cardiac Responses to Exercise Training and Acute Moderate-Intensity Exercise**  
Amanda Q.x. Nie, Eric J. Stühler, Samantha Rogers, Rachel Myers-Wallace¹, Jane M. Black, Rob Shave. ¹Cardiff Metropolitan University, Cardiff, United Kingdom.  
Email: anio@cardiffmet.ac.uk  
(No relationships reported)

The menopause is generally associated with lower cardiovascular function. However, most investigations have only assessed resting function, and the impact of the menopause on functional capacity and cardiac plasticity is poorly understood. **PURPOSE:** To investigate the impact of menopausal status on left ventricular (LV) function and rotational mechanics in response to exercise training and acute exercise.
METHODS: Eleven pre-menopausal (Pre-M) and 14 post-menopausal (Post-M) middle-aged women (age 45–58 years) completed 12 weeks of exercise training (3 sessions/week consisting of 4 × 4 min intervals at 90–95% maximum heart rate). Maximal aerobic capacity on an upright cycle ergometer was assessed before and after exercise training. LV function was assessed via echocardiography at 20, 40 and 60% peak power output during supine cycling. Due to poor image quality, data on LV rotational mechanics were only reported for 8 pre- and 10 post-menopausal women.

RESULTS: Peak power output and maximal aerobic capacity increased after exercise training (P<0.01), but this increase was greater in pre-menopausal than post-menopausal women (mean±SD; Pre-M-before 147±29 vs. after 179±28, Post-M-before 145±26 vs. after 169±24 W; Pre-M-before 29.5 vs. after 37±5, Post-M-before 29.6 vs. after 34.5 mL/min/kg; respectively, both P<0.05). General hemodynamics, and LV function and rotational mechanics both at rest and up to 60% exercise were mostly similar in pre- and post-menopausal women in response to training (interaction effects P>0.1). Specifically, the increase in peak basal rotation during exercise was smaller in post-menopausal women after training (three-way interaction P<0.01; mean increase from rest to 60%: Pre-M-before 4.0, Pre-M-after 3.9; Post-M-before 3.7, Post-M-after 2.6).

CONCLUSION: Middle-aged pre-menopausal women showed greater adaptability to 12 weeks of interval training than middle-aged post-menopausal women. The functional cardiac reserve up to 60% exercise was largely similar in pre- and post-menopausal women. Future work investigating LV function and mechanics at higher exercise intensities will likely provide further insight into the impact of menopausal status on training adaptations.

Amanda Nio is the beneficiary of a doctoral grant from the AXA Research Fund.

578 Board #5 May 31 1:00 PM - 3:00 PM
Assessment Of Myocardial Mechanics In Renal Transplant Recipients Using Speckle Tracking Echocardiography

Gianni Pedrizzetti1, Laura Stefani2, Stefano Pedri1, Enrico Minetti1, Benedetta Tosi3, Giorgio Galanti1, 1University of Trieste -Italy, Trieste, Italy. 2Sports and Exercise Medicine, Florence, Italy. 3Esaote Spa -Italy -Medical Affairs Manager, Florence, Italy. 4University Hospital Careggi, Florence, Italy. Florence, Italy.

Email: laura-stefani@tiscali.it

(No relationships reported)

PURPOSE: Renal transplant recipients (RTR) have a high risk of cardiovascular mortality, despite surgical treatment and physical exercise is normally allowed to transplanted patients. The aim of this study was to analyze the changes in myocardial strain in RTR before and after training. Quantification of myocardial function by Global Longitudinal Strain (GLS) from 2-dimensional images based on speckle tracking echocardiography plays an important role in detecting the early myocardial dysfunction in many diseases. The aim of this study was to analyze the changes in myocardial strain during 12 months of exercise as prescription model.

MATERIALS AND METHODS: We studied 17 renal transplant recipients, mean age 56±8 years, submitted to the exercise prescription model followed ACSM guidelines. Longitudinal peak systolic strain were determined by velocity vector imaging from apical 4- and 2-chamber views (MyLab seven- Esaote). All the other standard 2D echo parameters to the exercise prescription model followed ACSM guidelines. All the other standard 2D echo parameters to the exercise prescription model followed ACSM guidelines.

RESULTS: Peak power output and maximal aerobic capacity increased after exercise training (P<0.01), but this increase was greater in pre-menopausal than post-menopausal women (mean±SD; Pre-M-before 147±29 vs. after 179±28, Post-M-before 145±26 vs. after 169±24 W; Pre-M-before 29.5 vs. after 37±5, Post-M-before 29.6 vs. after 34.5 mL/min/kg; respectively, both P<0.05). General hemodynamics, and LV function and rotational mechanics both at rest and up to 60% exercise were mostly similar in pre- and post-menopausal women in response to training (interaction effects P>0.1). Specifically, the increase in peak basal rotation during exercise was smaller in post-menopausal women after training (three-way interaction P<0.01; mean increase from rest to 60%: Pre-M-before 4.0, Pre-M-after 3.9; Post-M-before 3.7, Post-M-after 2.6).

CONCLUSION: Middle-aged pre-menopausal women showed greater adaptability to 12 weeks of interval training than middle-aged post-menopausal women. The functional cardiac reserve up to 60% exercise was largely similar in pre- and post-menopausal women. Future work investigating LV function and mechanics at higher exercise intensities will likely provide further insight into the impact of menopausal status on training adaptations.

Amanda Nio is the beneficiary of a doctoral grant from the AXA Research Fund.

The effects of exercise on the heart and its resistance to disease are well-documented. Recent studies have identified exercise-induced resistance to arrhythmia is due to the preservation of mitochondrial membrane potential. PURPOSE: To identify novel metabolic changes that occurred parallel to these mitochondrial alterations, we performed non-targeted metabolomics analysis on hearts from sedentary (Sed) and exercise-trained (Ex) rats challenged with isolated heart ischemia-reperfusion injury (I/R). METHODS: Eight week old Sprague-Dawley rats were treadmill trained five days/week for six weeks (exercise duration and intensity progressively increased to 1 hour at 30 m/min up to 10.5% incline, 75-80% VO2max). RESULTS: The recovery of pre-ischemic function for sedentary rat hearts was 28.8±5.4% (N=12) compared to exercise trained hearts which recovered 51.9%±6.5% (N=14, p<0.001). Non-targeted GC-MS metabolomics analysis of 1) Sedentary rat hearts; 2) Exercise-trained rat hearts; 3) Sedentary rat hearts challenged with global ischemia-reperfusion (I/R) injury; and 4) Exercise-trained rat hearts challenged with global I/R (10/group) revealed 20 statistically significant metabolites between groups by ANOVA using MetaMorphAnalyst (p<0.001). Enrichment analysis of these metabolites for pathway-associated metabolic sets indicated a >10 fold enrichment for ammonia recycling and protein biosynthesis (L-Glutamic acid; L-Proline; L-Histidine; L-Serine; L-aspartic acid; L-Glutamine) (p<0.05, FDR<0.0024). Subsequent comparison of the sedentary hearts post-I/R and exercise-trained hearts post-I/R further identified significant differences in metabolites related to Aminoacyl-tRNA biosynthesis and nitrogen metabolism (p<1.24E-05, FDR<5.07E-4). CONCLUSION: These studies shed light on novel mechanisms in which exercise-induced cardioprotection occurs in I/R which complement both the mitochondrial stabilization and antioxidant mechanisms recently described. These findings also link protein synthesis and protein degradation (protein quality control mechanisms) with exercise-induced cardioprotection and mitochondrial susceptibility for the first time in cardiac I/R.
Maximal fat oxidation (FOX_{max}) is the exercise intensity at which the highest caloric expenditure is attributed to fat metabolism and appears to be influenced by aerobic capacity and obesity. Determining, directly or indirectly, FOX_{max} holds relevance with respect to optimal intensity for exercise prescription for weight loss and maintenance. 

**Purpose:** To determine if FOX_{max} is sex-dependent and its agreement with the anaerobic threshold (AT), another intensity at which exercise can be prescribed to improve aerobic conditioning. 

**Hypothesis:** We hypothesised that: 1) FOX_{max} in obese men and women is similar; 2) FOX_{max} is not concordant with AT; and 3) heart rate (HR) at FOX_{max} relative to real peak HR (HR_{pk}) is equivalent to that relative to HR_{pk} predicted from a recognized prediction formula (208-0.7*age).

**Methods:** Forty obese adults (BMI: 40.3±1.1 kg·m⁻², women, n=20) and men (n=20), aged 20 to 45 years, underwent a cardiopulmonary exercise test (CPX). Oxygen uptake (VO₂), carbon dioxide production (VCO₂), respiratory exchange ratio (RER) and energy expenditure were identified at 77.4±1.4 and 58.6±1.2% of VO₂ Max, respectively (p<0.01). Sex-based comparisons were identified at 80.5±1.2% and 66±1% of VO₂ Max relative to real peak HR (HR_{pk}) and at the peak of the test (T). Fat oxidation rates were calculated (FOX_{R}=1.67*VO₂-1.67*VCO₂) and the highest value was set as the FOX_{max}. AT was defined according to the V-Slope method. T-test, MANCOVA and partial correlations were applied. alpha level was set at 0.05.

**RESULTS:** VO₂ at AT and FOX_{max} were identified at 77.4±1.4 and 80.5±1.2% of VO₂ Max, respectively (p<0.01). Sex-based comparisons showed that OW had higher FOX_{R}, and at the AT higher HR, VO₂, percent of HR_{pk} and VO₂_{max} (p<0.05). However, OM had a higher percent of VO₂_{max} at FOX_{max}. Similar HR, HR_{pk} and percent of HR_{pk} were observed in both groups. HR at FOX_{max} relative to the predicted HR, from the formula 208-0.7*age were 66±1% in OM and 67±1% in OW. 

**Conclusions:** Sex differences exist at AT and FOX_{max} for VO₂. Meanwhile, chronotropic responses (HR at FOX_{max}) are equal for both and can be inferred from a usual formula when CPX is unavailable. 

Maximal Fat Oxidation: Optimal Exercise Intensity for Weight Management and Its Dissociation from Anaerobic Threshold

Livia P. Carvalho¹, Renata G. Mendes¹, Luciana Di Thommazo-Luporini², Renata P. Basso-Vanelli², Paula A. Ricci², José C. Benjornu-Júnior¹, Rafael L. Luporini³, Cláudio R. Oliveira³, Renata Trimer¹, Shane A. Phillips³, RossArena³, Audrey Borghi-Silva¹. ¹Universidade Federal de São Carlos, São Carlos, Brazil. ²University of Illinois Chicago, Chicago, IL. 

Email: livia.pinho.carvalho@gmail.com

(No relationships reported)
Variability in glucose and insulin response to exercise is a largely neglected phenomenon. Here we analyze this variability by measuring the rate of response, defined as the number of individuals with an improvement in glucose and insulin values beyond the day-to-day variability of measurement.

**Purpose:** To determine the separate effects of exercise amount and intensity on the rate of response for glucose and insulin variables.

**Methods:** Participants were 171 sedentary, middle-aged abdominally obese adults who completed at least 90% of 5 weekly exercise sessions prescribed over a 24-week intervention. Participants were randomly assigned to (1) no-exercise control (n=51), (2) low-intensity, high-volume exercise (LILI; n=38), (3) high-volume, low-intensity exercise (HALI; n=52), or (4) high-volume, high-intensity exercise (HAMI; n=30).

Two-hour glucose level, insulin area under the curve (AUC), and fasting insulin were measured at 16 and 24 weeks in response to a 2-hour, 75 g oral glucose tolerance test. Biological variability for these measures was calculated to be ±2.2 mmol/L, ±940.2 pmol/L, and ±38.9 pmol/L, respectively.

**Results:** At 24 weeks, the rate of response for 2-hour glucose was 2.0%, 13.2%, 5.8%, 13.5% in the control, LILI, HALI, and HAMI groups, respectively. The rate of response for insulin AUC was 12.0%, 21.6%, 25.0%, 20.0% in the control, LILI, HALI, and HAMI groups, respectively. The rate of response for fasting insulin was 11.8%, 15.8%, 15.4%, 6.7% in the control, LILI, HALI, and HAMI groups, respectively. The rate of response was not different between control and any of the exercise groups for 2-hour glucose, insulin AUC, and fasting insulin (p>0.05).

Exposure to exercise did not affect the rate of response for 2-hour glucose or fasting insulin between 16 and 24 weeks (p>0.05). Exposure data was not available for insulin AUC.

**Conclusion:** There was substantial variability of response for all measures of insulin and glucose that was not reduced by increasing exercise amount or intensity, where a maximum of 25% of participants improved in these measures beyond the day-to-day variability. This observation underscores the importance of accounting for the variability of measurement when interpreting treatment efficacy for a given individual.

**Method:** An electronic search of the literature was performed from earliest record to September 2016. Eligible trials were RCTs in T2D which included an objective or subjective measure of PA at baseline and at least one follow-up time point ≥ 6 months after enrolment. Mean differences, relative effect sizes (ES; Hedge's) and heterogeneity statistics (I²) were calculated using a random effects model.

**Results:** Among 10779 citations retrieved, 23 RCTs (including 18 RCTs of lifestyle advice and 5 RCTs of exercise) met the inclusion criteria (n=11673, 46.1% men, age 60.0±4.8). All 5 exercise trials demonstrated increased PA relative to control [2.5 reported stable habitual PA plus an additional 3 d/week structured exercise; 3/5 reported moderate to large increases in total PA (relative ESs 0.6 to 1.5)]. The relative ESs for PA advice trials are shown in Fig.1 (pooling not appropriate; F² = 96%). Only 10/18 trials demonstrated significantly increased total PA (ES ranging from 0.3 to 0.8 and one very large ES of 6.6). Subjective PA measurement was used in 60% of trials that reported significant increases in PA vs. only 12.5% of non-significant trials.

**Conclusion:** Supervised exercise was associated with increased overall PA (inclusive of study-related and habitual activity levels) in T2D in 5/5 trials. By contrast, only 55% of PA advice trials reported significant increases in PA. This heterogeneity, plus reliance on subjective reporting methods, limits confidence in the efficacy and consistency of unstructured/unsupervised PA advice in T2D.
Milk consumption post-exercise may provide additional lean mass gains and body fat loss. Such favorable body composition changes could promote further improvements in glycemic control and quality of life (Qol) in exercising older adults with type 2 diabetes (T2D).

**Purpose:** To determine if the addition of post-exercise low-fat milk to high-intensity interval training (HIIT) improves metabolic health more than HIIT and isolated milk-protein, or HIIT alone.

**Methods:** In a proof-of-concept, randomized double-blind controlled trial, 47 adults with physician-diagnosed T2D (58 ± 10 y; A1c: 7.1 ± 0.88%, BM1: 35 ± 7 kg/m²) were randomly assigned to one of three nutritional beverages (500 mL skim-milk, milk-protein isolate or flavored water placebo) after HIIT exercise (2x cardio- and interval training (HIIT)). Gastrocnemius muscle biopsies were collected before and 1 h after exercise. Dependent measures assessed were: muscle glycemic control, glycemic variability, and muscle protein synthesis. 

**Results:** Total milk consumption (±358 ± 405 mL) was associated with improved muscle glycemic control and glycemic variability post-exercise training (1.8 ± 1.7 vs. 2.5 ± 2.1; p < 0.05, respectively). Milk-protein ingestion increased muscle protein synthesis by 2.8 ± 0.9 vs. 2.1 ± 0.8 % at 1 h after HIIT exercise (p < 0.05).

**Conclusion:** Post-exercise milk consumption following exercise training improves glycemic control and reduces glycemic variability. These findings suggest that milk consumption may be a useful nutritional strategy to support glycemic control in patients with T2D.

45 questions about demographics, health and physical activity. 221 individuals were included in the final analysis because 7 were excluded as outliers (≥ 5 SD above mean) or for responding incorrectly on the Godse. The sample was 56% female and 82% Caucasian with 83% between the ages of 18 and 59 years; 33% had some college education while 25% were college graduates. Most respondents reported no current ADHD diagnosis (75%) or medication use to treat ADHD symptoms (83%). ADHD medication use was unrelated to the LTPA (all p values > .40). Past week physical activity occurred: walking (88% of sample), home activities (63%), stretching (35%), jogging (34%), weight lifting (30%), yardwork (27%), bicycling (22%), home repair (20%), yoga/min-body (19%), gardening (16%), swimming (15%), sports (14%), playing music (9%), social dance (5%), aerobic dance (4%) and fishing/hunting (4%). Compared to men, women reported significantly less strenuous (t=4.33, p < 0.001) and overall LTPA (t=2.886, p=0.004) including less engagement in home repair activities (t=2.493, p=0.014), jogging (t=-2.204, p=0.029), sports (t=2.119, p=0.036) and bicycling (t=2.012, p=0.046). Log transformed total LTPA scores were significantly (p<0.05) related to ASRS question 2 (difficulty getting organized, r= -0.18), the inattention subscale (r= -0.18) and total ASRS scores (r= -0.17). CONCLUSION: In a sample of U.S. adults with elevated symptoms of ADHD, LTPA is low and physical activity modes are similar when compared to U.S. samples of adults without ADHD. ADHD symptoms are negatively related to LTPA and unrelated to ADHD medication use.
than 26 weeks (A=0.35; 95%CI: 0.05-0.66) compared with those lasting less than 26 weeks (A=0.26; 95%CI: 0.13-0.39). Session duration (A=0.53), frequency (A=0.25), intensity (A=0.66), anxiety recall time frame (A=0.07), and exercise setting (A=0.45) were not significantly related to effect size (all p<0.07).

Conclusion: Exercise training improves anxiety symptoms among FM patients. Thus, in addition to the physical benefits of exercise, persons with FM should be encouraged to exercise as a potential low-risk, adjuvant treatment for anxiety symptoms. The findings also suggest that larger symptom reductions will be achieved by focusing on longer exercise programs while promoting long-term adherence. Future well-designed investigations are required to examine the potential moderating effect of pain-related improvements in FM patients.

RESULTS: The participants variably reporting being impacted by pain (SF-36 bodily pain 59.4± 8.1 range: 22.5 - 100) during the 4 weeks before testing commenced. Following 2 weeks of training, bodily pain was reported at 41.9 ± 23.8 out of 100. Pressure pain thresholds increased after exercise on day 1 (Mean diff ± SD: 0.54 ± 0.40 kg/cm²; Cohens d (95% CI): 0.2 (0.04 - 0.49), p<0.05), indicative of exercise-induced hypalgesia. This response was similar following 2 weeks of training (mean: SD: 0.52 ± 0.09 kg/cm²; Cohens d (95% CI): 0.43, p<0.001)

CONCLUSIONS: Cancer survivors experienced an analgesic response to a single bout of exercise. This response was stable across a 2 week training period, despite higher levels of self-reported bodily pain.

Chronic medically unexplained muscle pain (CMP) is a primary complaint among the more than 200,000 US Gulf War Veterans (GVs) currently suffering from debilitating multisymptom illnesses. Veterans of the more recent Iraq War are also dealing with CMP. Previously our lab demonstrated a positive relationship between physical activity (PA) and brain responses to pain modulation (PM) in civilian CMP patients. We also reported significant correlations between PA and behavioral indices of PM in healthy GVs. The relationship between PA and the underlying brain responses during PM, however, has not been thoroughly explored.

Purpose: To examine the association between brain responses during PM and objectively-measured PA in GVs with and without CMP.

Methods: Twenty two GVs (12 CMP; 10 healthy) underwent thermal pain testing with and without distraction during an fMRI scan. Veterans were exposed to 15 heat stimuli (0 s) relativization to ‘slightly intense’ pain. Stimuli were administered alone or with distraction (i.e., congruent [CS] and incongruent versions [IS] of the Stroop Task). Pain intensity and unpleasantness ratings were collected for each stimulus. PA was assessed with hip-mounted accelerometers worn for a week. Brain responses during PM were modeled using SPMS12 and correlated to six PA indices derived from the PA data. Voxel-level significance was set to 0.005 with a minimum cluster size of 330 mm³.

Results: Ratings of pain with distraction, CS and IS, were significantly (p<0.01) reduced compared to without for both groups. During CS, healthy GVs exhibited a positive correlation between activity in the right precentral gyrus during PM and sedentary minutes, while activity in the middle and prefrontal cortices was negatively related to PA at light, moderate and vigorous intensities. For IS, positive correlations were found between activity in the contralateral insula and indices of low intensity PA. GVs with CMP had only a negative correlation between activity in the right anterior cingulate cortex during CS and minutes spent in activities of daily living.

Conclusions: Pain modulation during distraction appears uncompromised in GVs with CMP. However, the influence of PA on modulatory responses seems diminished in GVs with CMP compared to their healthy peers.

Supported by Dept. of Veterans Affairs grant: 561-00436

Physical activity (PA) is a significant indicator of present and future health in adolescents. However, it is unknown whether engaging in regular PA is associated with measures of child flourishing as well as bullying and emotional difficulties in children with autism spectrum disorder (ASD).

Purpose: To examine the association between physical activity levels and measures of child flourishing as well as bullying and emotional difficulties

Methods: Analyses include 1, 363 (82% male) aged 6-17 (mean 11.54 ± 3.29 years) with ASD from the 2011-12 National Survey of Children’s Health. Adolescents were grouped into two categories: those who engaged in regular PA (≥ 3 days/week) and those who did not engage in regular PA. Outcomes included measures of child flourishing as well as bullying and emotional difficulties.

Results: Analyses included 1, 363 (82% male) aged 6-17 (mean 11.54 ± 3.29 years) with ASD from the 2011-12 National Survey of Children’s Health. Adolescents were grouped into two categories: those who engaged in regular PA (≥ 3 days/week) and those who did not engage in regular PA. Outcomes included measures of child flourishing as well as bullying and emotional difficulties.

Conclusions: Pain modulation during distraction appears uncompromised in GVs with CMP. However, the influence of PA on modulatory responses seems diminished in GVs with CMP compared to their healthy peers.

Supported by Dept. of Veterans Affairs grant: 561-00436
engaged in regular PA. Additionally, those who engaged in regular PA were 44% more likely to stay calm and in control when faced with a challenge (OR=1.44; p=0.007). Furthermore, those who engaged in regular PA were 75% more likely to show interest and curiosity in learning new things (OR=1.75; p=0.006), and 65% more likely to care about doing well in school (OR=1.65; p=0.004) compared to those who did not engage in regular PA. CONCLUSIONS: Children with ASD that engaged in regular PA were significantly more likely to finish tasks, stay calm when faced with a challenge, show interest and curiosity in learning new things, and care about doing well in school. These findings suggest engaging in regular PA may increase flourishing in children with ASD.

Evidence supports the effects of exercise training on clinical severity, associated signs and symptoms, dimensions of sleep quality and quantity, and health-related quality of life among individuals with Generalized Anxiety Disorder (GAD). However, little is known about the acute effects of exercise among individuals with clinical or subclinical GAD.

Purpose

This study quantified mood responses to either acute aerobic exercise or quiet rest, examined potential sex-related differences in response, and explored potential moderators of response among young adult men and women with worry symptoms indicative of GAD.

Methods

Twenty-five young adults (8 males; 17 females; 21±1±3y) with Penn State Worry Questionnaire scores ≥45 (58±8) completed two 30-min conditions in counterbalanced order: vigorous treadmill running or seated quiet rest. Outcomes included worry symptoms, state anxiety, feelings of tension, depression, anger, energy, fatigue, and confusion, and total mood disturbance. RM-ANOVA examined differences across condition and time and between males and females. Hedges' d effect sizes (95%CI) were calculated to quantify and compare the magnitude of change in response to exercise compared to control. Regression explored potential moderators of mood response.

Results

Average heart rate was 163±5.4 bpm and participants reported an average session RPE of 13±2 (range: 9 to 17). Compared with control, acute exercise significantly improved state anxiety, feelings of depression, anger, energy, fatigue, and confusion, and total mood disturbance (all p<0.05). Moderate-to-large improvements were found for anxiety (d=0.57, 95%CI: 0.01, 1.13), fatigue (d=0.67, 95%CI: 0.10, 1.24), confusion (d=0.87, 95%CI: 0.29, 1.45), and energy (d=0.87, 95%CI: 0.29, 1.45), and total mood disturbance (d=1.10, 95%CI: 0.50, 1.69). The magnitude of improvements were greater (i.e., larger effect sizes) among men for all outcomes except feelings of energy and fatigue and worry symptoms. High trait anxiety, depression, and poor sleep did not moderate exercise effects (all p>0.10).

Conclusion

Findings provide initial support for both the positive effects of acute aerobic exercise on mood and potential sex-related differences in exercise effects among young adults with worry symptoms indicative of GAD.

Physical activity (PA) guidelines for children recommend accruing 60 minutes or more of moderate to vigorous physical activity (MVPA) per day. Rural children accumulate the majority of their PA at school, so PA opportunities, such as physical education (PE), recess, and classroom-based PA (CBPA) in the rural school environment are critical for total PA accumulation. There is limited research exploring these PA opportunities in the rural elementary school setting to understand which opportunities provide the most MVPA. PURPOSE: To determine the proportion of time rural children spend at different intensities during three specific PA opportunities available during the school day: PE, recess, and CBPA. METHODS: Objectively measured PA levels were collected over a period of four school days at six rural elementary schools using research-grade accelerometers. Accelerometers were worn on the waist during school hours by 292 children (grades 1-5). Daily wear times and school schedules were provided by teachers and were matched to the children’s accelerometer data to determine the amount of time spent at different intensities during each PA opportunity. ANOVA was used to detect differences with an alpha level of 0.05. RESULTS: The average duration for each PA opportunity was 44 minutes of recess, 32 minutes of PE, and 19 minutes of CBPA. Children in our sample of rural elementary schools spent 18 ± 14% (M±SD) of recess time in MVPA, 16 ± 15% of PE in MVPA, and 11% ± 15% of CBPA in MVPA. Boys engaged in higher levels of MVPA than girls across all PA opportunities (p<0.001). First grade children accrued more time in MVPA across domains when compared to their fifth grade counterparts (p<0.001). Sedentary and light intensity activities were higher for older children and girls (p<0.001). CONCLUSION: Scheduling PA opportunities with the highest proportion of MVPA may be an effective method to increase activity in rural elementary school children. This sample of children are not meeting the recommendations of 50% for proportion of time spent in MVPA during recess and PE. Targeting approaches to increase MVPA during these already scheduled opportunities may help children reach daily recommendations. Supported by a grant from the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2011-68001-30020.

Rapid weight gain in infancy has been linked to increased risk of obesity in youth. Hence, an increased knowledge on possible strategies to prevent excessive total fat mass (total FM) and trunk fat mass (trunk FM) is important to avoid development of obesity. One possible strategy could be moderate-to-vigorous physical activity (MVPA) or vigorous physical activity (VPA), since MVPA and VPA has been associated with lower levels of adiposity. However, it is unknown whether physical activity may modify the association between rapid infant weight gain and later adiposity. PURPOSE: To examine whether MVPA and VPA moderates the associations between weight gain the first year of life and total FM and trunk FM in youth. METHODS: We used data from a sub-cohort of the Norwegian Mother and Child Cohort Study (MoBa), including assessment of total FM and trunk FM by dual-energy X-ray absorptiometry (DXA), and MVPA (≥2296 cpm) and VPA (≥4012 cpm) assessed by Actigraph accelerometers. Weight gain was calculated as change in weight z-scores between birth and 1 year. We used multiple regression analyses to examine the association between infancy weight gain and total FM and trunk FM (with adjustments for sex, birth weight, gestational age, height and family income), and included the interaction term weight gain x MVPA and weight gain x VPA to
examined the modifying effect of MVPA and VPA (adjustments for monitor wear time included). RESULTS: The mean age (sd) of the 147 participants (45.6% girls) were 11.0 (0.61) years. There was a positive association between infant weight gain and total FM (B=1.1, 95%CI=[0.40, 1.8]) and trunk FM (B=0.5 95%CI=[0.16, 0.89]). MVPA did not modify the association between infancy weight gain and total FM (p=0.157) and trunk FM (p=0.116), whereas VPA modified both total FM (B (gain x VPA) = -0.061, p=0.026) and trunk FM (B (gain x VPA) = -0.034, p=0.014). CONCLUSION: These findings indicate that VPA, but not MVPA, modifies the associations between weight gain during the first year of life and total FM and trunk FM in youth. Vigorous intensity PA may be considered as one of many public health strategies to curb childhood obesity, especially in those who are prone to obesity due to rapid infant weight gain.

RESULTS: Sedentary time was not associated with any of the individual cardio-metabolic risk factors nor clustered cardio-metabolic risk in prospective analyses. Moderate physical activity at baseline predicted higher levels of triglyceride (β = 0.086 (-0.160 - 0.013, p=0.021) and insulin resistance (β = 0.070 (-0.132 - 0.008, p=0.027) at follow-up independent of sex, socio-economic status, Tanner stage, monitor wear time, and waist circumference. One SD increase in moderate-to-vigorous physical activity predicted 0.056 SD lower clustered cardio-metabolic risk at follow-up (p=0.043). However, these associations were attenuated following adjustment for waist circumference.

CONCLUSIONS: Physical activity, but not sedentary time, is prospectively associated with cardio-metabolic risk in healthy children. Public health strategies aimed at improving children’s cardio-metabolic profile should strive for increasing levels of physical activity of at least moderate intensity rather than reducing sedentary time.
Results: No gender differences were detected for ST (4.9±1.2 hrs/day girls, 4.9±1.1 hrs/day boys), ST% (41.1±8.2% girls, 40.5±6.6% boys), STB (4.7±2.1 breaks/day girls, 5.0±1.8 breaks/day boys), LSTB (65.3±2.4 min/day girls, 63.4±2.1 min/day boys), and most anthropometric measurements (BMI percentile (65.7±29.8% girls, 64.5±28.7% boys), waist circumference [75.7±9.8 cm girls, 73.6±8.5 cm boys], waist circumference (0.45±0.08 girls, 0.46±0.03 boys). Percent body fat was higher in girls compared with boys (21.1±5.9% girls, 16.6±7.2% boys; P<0.01). No correlation was observed between sedentary related measurements (ST, ST%, STB, LSTB), anthropometric and body composition measures. However, age correlated with ST (r = 0.27, p < 0.01), ST% (r = 0.30, p < 0.01), STB (r = 0.29, p < 0.01), LSTB (r = 0.24, p < 0.01), BMI percentile (r = 0.19, p = 0.04), percent body fat (r = 0.33, p < 0.01), and waist circumference (r = 0.40, p < 0.01). CONCLUSIONS: Although too much ST is not likely a concern, the observed increase in ST, BMI percentile, percent body fat, and waist circumference with age in this group of young children could represent a future health problem. Interventions must be implemented to help reduce this possible trend. Funded by University of PR-FIPPI Institutional Grant.
production with various ankle taping techniques during athletic tasks. **PURPOSE:**
To examine the effects of an Achilles tendon assistive taping technique and gender on lower extremity joint power generation and peak power absorption during jumping and landing in healthy recreational athletes. METHODS: 29 subjects - 16 males (20.9 ± 2.4 years, 17.9 ± 0.6 m, 79.0 ± 11.9 kg) and 13 females (21.4 ± 3.2 years, 1.66 ± 0.06 m, 66.1 ± 7.6 kg) - participated in the study. Each subject’s dominant limb underwent an Achilles tendon assistive taping procedure by a certified athletic trainer. Subjects performed 5 trials of a stop jump task in both a taped and non-taped condition (randomized test order). The first landing and subsequent jump were analyzed with a 10-camera motion analysis system (240Hz). Joint power was determined based on data from 2 embedded force plates (1920 Hz) using inverse dynamics and was integrated to yield joint work. 2x2 ANOVAs were performed (p<0.05) to determine gender and taping condition effects on peak power generation, power absorption, and work at each joint during landing and jumping. **RESULTS:** Subject height (p=0.001) and mass (p=0.002) differed based on gender, but age (p=0.633) did not. No significant interactions and no taping condition main effects existed for power or work during either jumping or landing. A main effect of gender was identified, with females showing decreased peak power generation at each joint during jumping (Table 1). **CONCLUSIONS:** The assistive taping does not alter peak power generation, power absorption or joint work during landing and jumping in healthy subjects, but gender-specific differences in power generation do exist. Future work is needed to determine the effect of this taping technique in injured athletes.

**Table 1: Peak Power Generation**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Ankle</th>
<th>Jumping</th>
<th>Knee</th>
<th>Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Landing</td>
<td>Jumping</td>
<td>Landing</td>
<td>Landing</td>
</tr>
<tr>
<td>Females</td>
<td>Non-Taped</td>
<td>Taped</td>
<td>Non-Taped</td>
<td>Taped</td>
</tr>
<tr>
<td>Males</td>
<td>Non-Taped</td>
<td>Taped</td>
<td>Non-Taped</td>
<td>Taped</td>
</tr>
<tr>
<td>Non-Taped</td>
<td>-12.3 ± 4.6</td>
<td>-13.3 ± 4.5</td>
<td>-13.0 ± 4.6</td>
<td>-11.6 ± 4.8</td>
</tr>
<tr>
<td>Taped</td>
<td>15.6 ± 5.4</td>
<td>13.4 ± 4.2</td>
<td>18.1 ± 3.8</td>
<td>15.9 ± 4.0</td>
</tr>
<tr>
<td>Non-Taped</td>
<td>-17.3 ± 2.9</td>
<td>-18.6 ± 5.5</td>
<td>-21.0 ± 6.0</td>
<td>-20.0 ± 5.4</td>
</tr>
<tr>
<td>Taped</td>
<td>11.2 ± 2.9</td>
<td>11.5 ± 3.3</td>
<td>15.2 ± 3.5</td>
<td>14.7 ± 3.4</td>
</tr>
<tr>
<td>Non-Taped</td>
<td>-7.6 ± 5.0</td>
<td>-6.1 ± 3.2</td>
<td>-13.3 ± 6.1</td>
<td>-14.9 ± 6.1</td>
</tr>
<tr>
<td>Taped</td>
<td>6.3 ± 5.0</td>
<td>4.6 ± 1.9</td>
<td>10.2 ± 8.1</td>
<td>9.6 ± 6.4</td>
</tr>
</tbody>
</table>

* Units in N*m/(BW*HT)*

A single leg, barefoot landing is a functional movement often executed in athletic events. The inability to quickly stabilize the ankle joint during a landing may contribute to injury risk. **PURPOSE:** To determine whether the size of specific medial and lateral extrinsic foot muscles can be used to predict shorter time to stability in female collegiate gymnasts and cheerleaders (age: 21.2 ± 1.4 years; height: 1.6 ± 0.06 m; weight: 58.1 ± 5.7 kg) completed a dominant single leg, barefoot landing onto a force plate from a height of 28 cm. The time to stability was calculated from the first landing variables between practices (p<0.05), yet substantial variability of landing patterns was identified between individuals, with the percentage of DL landings ranging from 35.8-96.0% of total landings and SL landings ranging from 5.6-97.4% of SL landings. **CONCLUSIONS:** Volleyball players were found to jump significantly more often during practices than games, but DL and SL landing practices than games, but DL and SL landing practices than games, but DL and SL landing practices remained consistent. These data may help clinicians and coaches design training and/or rehabilitation procedures to better simulate the landing demands during volleyball competition.
The Changes in Impacts and Soft-tissue Responses of Lower Limbs between Active and Unanticipated Landings
Shen Zhang, Weijie Fu, Yu Liu. Shanghai University of Sport, Shanghai, China.
Email: zhangshen0708@163.com
(No relationships reported)

Muscle activity patterns can be modulated in response to soft-tissue vibrations of lower extremity induced by the magnitude of the peak impact and the high loading rate of vertical ground reaction force during landing to reduce the high injury risk. However, the sudden changed pattern of unexpected landing would potentially influence the impact force (as a input signal) and the soft-tissue vibration (as a response), which may further affect the landing performance or even cause injury.

**PURPOSE:** To determine the biomechanical differences of impact force and soft-tissue vibration between active landing (AL) and unexpected landing (UL).

**METHODS:** Twelve trained male basketball volunteers were requested to land from self-made elevated platform at three heights (30, 45, and 60cm) in two different landing maneuvers (AL & UL). The 3D force plates and accelerometers were used to collect the impact and soft-tissue vibration characteristics. The variables for AL & UL included: 1) impact characteristics: the peak of impact force (BW), maximum loading rate (kN/s) and impact frequency (Hz); 2) soft-tissue vibration: maximum amplitude (g) and damping coefficient (s⁻¹) of soft-tissue vibration of quadriceps & hamstrings. A 2 x 3 (landing style x height) repeated measures analysis of variance was used to examine the differences between conditions. **RESULTS:** For the impact characteristics, the peak of impact force (30cm: 3.90 ± 1.16 vs. 2.17 ± 0.50; 45cm: 4.35 ± 1.02 vs. 2.82 ± 0.80; 60cm: 4.73 ± 0.84 vs. 3.60 ± 0.64), maximum loading rate (30cm: 240.3 ± 63.8 vs. 88.4 ± 22.5; 45cm: 273.9 ± 77.5 vs. 157.3 ± 36.0; 60cm: 301.6 ± 73.3 vs. 203.3 ± 46.0), and impact frequency (30cm: 15.6 ± 2.3 vs. 7.96 ± 2.24; 45cm: 23.11 ± 2.2 vs. 8.73 ± 1.7; 60cm: 26.1 ± 2.4 vs. 10.38 ± 1.5) in UL was significantly higher than those in AL (p < .05) for all three drop heights, respectively. For soft tissue vibration, UL had a significantly greater maximum amplitudes of vibration of quadriceps (except for 60 cm) and hamstrings (p < .01) and lower damping coefficients (p < .05) compared with AL. **CONCLUSION:** If the neuromuscular system fails to prepare properly for an unexpected landing impact, increased magnitude of impact forces and soft-tissue vibrations emerged which might be detrimental to the impact-related injury.

Supported by NSFC grant (81302131).

614 Board #7 May 31 1:00 PM - 3:00 PM Effect of Different Sports on Hip and Knee Biomechanics in Adolescent Females During a Jump-Landing
Kelci B. Besand1, James M. Bothwell2, J Craig Garrison2, Joseph P. Hannon2, Shihio Goto2, Adam C. King2, Texas Christian University, Fort Worth, TX. 1Texas Health Ben Hogan Sports Medicine, Fort Worth, TX.
(No relationships reported)

Anterior Cruciate Ligament (ACL) injury is common in adolescent female athletes, with those who participate in soccer (SC) being at the highest risk for primary and secondary ACL injury. However, little is known about the biomechanical differences that may contribute to the variance in injury rate between SC and other sports in adolescent females. Previous research demonstrates that college-age females who participate in SC exhibit greater frontal plane projection angle (FPPA) values than those who participate in basketball (BKB). **PURPOSE:** To assess for differences in hip and knee frontal plane kinematics between adolescent female SC and BKB players.

**METHODS:** Cross-sectional study design. Females (N = 30) participating in BKB (Age = 15.33 ± 1.68 yrs; Ht = 167.14 ± 5.91 cm; Mass = 60.49 ± 9.59 kg) or SC (Age = 15.33 ± 1.68 yrs; Ht = 162.86 ± 3.84 cm; Mass = 56.55 ± 5.85 kg). Participants had International Knee Documentation Committee Subjective Knee Form (IKDC) scores ≥ 95, were healthy at the time of testing, and were matched by age and side of dominance (DOM = limb used to kick a ball). During three separate jump-landing tasks, bilateral lower extremity joint angles and moments were assessed at initial contact. Joint displacement (DSP = maximum or minimum - IC) and FPPA (2-dimensional measure of knee valgus) were calculated. Separate independent t-tests were performed to examine differences between groups. **RESULTS:** DOM hip abduction (ADD) DSP was significantly greater in the SC group (9.51 ± 1.3º) compared to the BKB group (4.9 ± 3.1º, t28 = -5.2, p < .001). DOM hip abduction DSP was significantly greater in the BKB group (3.7 ± 3.2º) compared to the SC group (1.0 ± 0.9º, t28 = -3.1, p = .004). DOM FPPA negative DSP (knee varus) (BSK = -9.8 ± 8.0º, SC = -5.29 ± 3.9º, t28 = -1.96, p = .05) and non-DOM FPPA negative DSP (BKB = -13.5 ± 4.7º, SC = -6.3 ± 3.0º, t28 = -2.7, p = .01) was significantly greater in the BKB group compared to the SC group. No other significant differences were observed. **CONCLUSIONS:** Greater hip ADD DSP is associated with higher ACL injury risk. Female SC players may be at increased ACL injury risk partially due to higher hip ADD DSP exhibited during landing as compared to the BKB group. The ability of female BKB players to maintain greater knee varus when compared to SC may also contribute to the variance in ACL injuries in these sports.

615 Board #8 May 31 1:00 PM - 3:00 PM Landing Biomechanics Influence Circulating Stress Hormone Levels
Barrett S. Frank, Claudio L. Battaglini, FACSM, Troy Blackburn, Steven W. Marshall, Anthony C. Hackney, FACSM, Darin A. Padua. The University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Claudio Battaglini, FACSM)
Email: bfrank@email.unc.edu
(No relationships reported)

High training load (HTL) exposure and stiff landing biomechanics increase an individual’s risk of lower extremity injury during sport and physical activity participation. **PURPOSE:** To determine the influence of movement profile on systemic stress response to HTL exposure. **METHODS:** 40 physically active, healthy, college-aged females were enrolled in this study and were assigned to a low-risk / soft (n=19; age=20.5±1.9 yr, height=1.64±0.44 m, mass=64.5±7.8 cm) or a high-risk / stiff (n=21; age=20.4±1.3 yr, height=1.63±0.23 m, mass=64.9±6.1 cm) movement profile group defined by The Landing Error Scoring System. Participants completed five cycles of 5-minute treadmill running at a speed coincident with 110-120% ventilatory threshold and 10 jump-landings from a 30 cm box. Blood samples were collected at baseline and 30 minutes following HTL exposure. Menstrual cycle phase, prior diet and exercise were controlled. Samples were analyzed using commercially available ELISA kits to determine serum cortisol concentrations [C]. A two-way mixed model ANOVA was used to evaluate the effect of movement profile on systemic stress response to HTL exposure. **RESULTS:** No significant movement profile-by-time interactions were observed (F1,38 =0.157, p>0.05). There were significant main effects for group (F1,38 =10.81, p<0.05) and time (F1,38 =9.64, p<0.05), with a high-risk / stiff movement profile being associated with greater overall circulating cortisol, and HTL exposure inducing increases in cortisol in both movement profile groups. Movement profile and time descriptive statistics and effect sizes are presented in table 1. **Conclusions:** A high-risk / stiff movement profile is associated with elevated cortisol, a biomarker of systemic stress. Movement profile may moderate systemic stress levels via a high or low level of biomechanical efficiency and shielding against or amplifying mechanical loads experienced during activities of daily life and physical activity.
Although higher physical activity (PA) levels are associated with lower psychological stress, real-time associations between PA and psychological stress have not been adequately examined. It is unclear whether stress more often serves as a barrier to PA, thus reducing the likelihood of exercising when stress is high, or whether PA is used as a coping strategy for reducing stress. PURPOSE: This study combined objective PA monitors with real-time psychological stress assessments to examine the pattern of stress to prior and following an exercise bout and to determine whether the magnitude of stress predicted PA engagement. METHODS: 52 women with overweight/obesity (BMI: 31.5±4.5 kg/m²; age: 48.9±9.0 years) were instructed to respond to 5 semi-random prompts delivered daily via their smartphone over a 14-day period while simultaneously wearing an objective PA monitor (SenseWear armband). Stress ratings at each prompt were reported using a 1-7 Likert scale (ranging from ‘not at all’ to ‘very much so’). Moderate-to-vigorous intensity PA bouts (MVPA; ≥3 METs & ≥ 10 minutes in duration) were identified and examined in relation to stress ratings. RESULTS: Compliance to answering the surveys (88.0±9.1%) and wearing the armband was high (13.1±1.9 days; 14.1±1.6 hrs/day). On average, participants engaged in 17.3±16.2 min/d of MVPA. Stress ratings ≥5 (31.1%) were classified as high levels of stress. Correlation analyses showed a significant relationship between stress and minutes of MVPA (ρ = − 0.36, p = 0.001). CONCLUSIONS: PA engagement decreased when stress was high. Further, when stress was high during the first prompt of the day (stress≥5, 16% of all prompts), mean MVPA was 19.2±13.7 min. This finding suggests that reducing stress may be a useful strategy for promoting PA adoption. Future studies should examine this relationship in other populations, including those with higher stress levels.

Chronic short sleep increases the risk of a driving accident, obesity and cardiovascular disease mortality. Whether the frequency of stress and aerobic exercise is reduced when stress is high is unclear. It is unknown if stress serves more often as a barrier to PA, thus reducing the likelihood of exercising when stress is high, or whether PA is used as a coping strategy for reducing stress. PURPOSE: To assess relationships between sleep duration and self-reported aerobic or resistance exercise. METHODS: 52 women with overweight/obesity (BMI: 31.5±4.5 kg/m²; age: 48.9±9.0 years) were instructed to respond to 5 semi-random prompts delivered daily via their smartphone over a 14-day period while simultaneously wearing an objective PA monitor (SenseWear armband). Stress ratings at each prompt were reported using a 1-7 Likert scale (ranging from ‘not at all’ to ‘very much so’). Moderate-to-vigorous intensity PA bouts (MVPA; ≥3 METs & ≥ 10 minutes in duration) were identified and examined in relation to stress ratings. RESULTS: Compliance to answering the surveys (88.0±9.1%) and wearing the armband was high (13.1±1.9 days; 14.1±1.6 hrs/day). On average, participants engaged in 17.3±16.2 min/d of MVPA. Stress ratings ≥5 (31.1%) were classified as high levels of stress. Correlation analyses showed a significant relationship between stress and minutes of MVPA (ρ = − 0.36, p = 0.001). CONCLUSIONS: PA engagement decreased when stress was high. Further, when stress was high during the first prompt of the day (stress≥5, 16% of all prompts), mean MVPA was 19.2±13.7 min. This finding suggests that reducing stress may be a useful strategy for promoting PA adoption. Future studies should examine this relationship in other populations, including those with higher stress levels.

Adolescent overweight and obesity in the United States has increased in past decades, resulting in numerous physiological and psychological consequences. Obesity interventions often aim to increase physical activity (PA). Such interventions may strengthen Exercise Identity (EI). A strong EI has been positively related to long-term PA engagement, as individuals seek to engage in behaviors congruent with the role identity of “exerciser.” Greater dosage of PA intervention may progressively increase EI, and enhance future exercise behavior. However, the relationship between PA intervention dosage and EI and obesity adolescent population is unclear. PURPOSE: To determine if a PA intervention, when delivered in varying dosages, may strengthen an overweight or obese adolescent’s EI. METHODS: Fifty overweight and obese adolescents (age: 14.16±1.88 years, BMI=35.66±7.87 kg/m², BMI percentile=97.5%±3.7%) were recruited from a behavior change summer camp, which included a PA intervention component. Age, gender, height, and weight were collected, and BMI was calculated. The participants were categorized into three separate groups, according to length of PA intervention (dosage): 3 week PA dosage, 4.5 week PA dosage, and 6.75 week PA dosage. Participants completed the Anderson Exercise Identity Scale and 3 Dimensional PA Activity Recall (3DPAR) at pre- and post-intervention. Group comparisons of EI were made using two-way ANOVA. Changes in vigorous physical activity (VPA) within groups were calculated using Log-Rank, Kaplan-Meier, and Wilcoxon. Activities on the 3DPAR were categorized and coded to compare exercise behavior within groups. RESULTS: Upon comparison, the mean EI in the 6.7 week intervention group significantly differed from other group means and resulted in a significant increase in EI within groups (p<0.001). All intervention groups demonstrated significant increases in VPA (p<0.05), and complied with National PA Guidelines of 60 + minutes of MVPA daily; VPA performed on at least 3 days/week. CONCLUSION: Exercise Identity may be increased in overweight and obese adolescents following a physical activity intervention. Greater dosage of physical activity intervention will result in greater benefits to Exercise Identity, and may ultimately enhance long-term exercise behavior.

Physical inactivity, overweight, and obesity are major public health problems in the United States and in the developed world, leading to increased morbidity and mortality. More information is needed regarding physical activity beliefs, attitudes, and perceived self-control among those who are currently sedentary, weight-challenged, and who are frequently underserved by the health/fitness industry. PURPOSE: To elicit physical activity beliefs about feasibility, pleasure, and movement descriptions from middle-aged, weight-challenged women with sedentary jobs. METHODS: Open-ended questions were utilized throughout individual 30-minute interviews with 23 female participants (age: M = 52.0, SD = 7.3; BMI: M = 34.2, SD = 9.7). The intention of the questions was to obtain in-depth insights into participants’ beliefs, attitudes, perceived norms, and physical activity behaviors. Questions were asked regarding physical activity descriptions, preferences, plausibility, and motivating phrases used by physicians and fitness professionals. After the interview process, participants were divided into those who reported they were completely sedentary (12 non-doers) and those who reported they regularly engaged in physical activity (11 doers).
Results: A content analysis and independent t-test revealed that non-doers were significantly less active and had more perceived barriers to physical activity (4.58 ± 1.88 vs. 3.53 ± 1.65: p<0.05). Perceived barriers were injuries, caregiving responsibilities, time, age, dislike of sweating, and depression. Non-doers were significantly more likely to prefer easy-to-moderate intensities, while doers preferred moderate-to-vigorous intensities. Non-doers were also significantly less likely than doers to report physical activity as pleasurable, and they were more likely to cite needing an exercise buddy. The most frequently cited pleasurable activities in both groups were yoga, movement to music, stretching, and walking.

Conclusions and implications: This study provides useful information for health educators and health/fitness professionals seeking to promote physical activity among middle-aged women with weight challenges.

Recent work suggests that inhibitory control influences affective regulation and is an important neurobiological mechanism that contributes to physical activity behavior. However, the effects of exercise intensity on this complex interaction between head and the brain remain unclear.

**PURPOSE:** Investigate the effects of exercise intensity on inhibitory control, affect, autonomic function and prefrontal cortex (PFC) oxygenation.

**METHODS:** 37 sedentary young adults were randomly assigned to two experimental conditions (control or exercise). For the exercise condition, a maximum incremental test was performed on a cycle ergometer with continuous measurements of PFC oxygenation, heart rate variability (HRV), inhibitory control (Stroop test), associative and dissociative thoughts (ADT) and affect scale every 2 minutes at each of 8 intensity increments. For the control condition, the same assessments were carried out, but participants sat on a cycle ergometer without active pedaling. We evaluated the effects of a two-way repeated measures ANOVA with Bonferroni adjustments to compare the effects and interactions of condition and intensity. Then, Pearson’s correlations were evaluated to evaluate the relationship between affect and inhibitory control, ADT, HRV and PFC oxygenation.

**RESULTS:** Intensities above the ventilatory threshold (VT) induced poorer inhibitory control (F = 33.64; p < 0.001), more ratings of unpleasantness (F = 200.60; p < 0.001), increased HRV activity (F = 29.96; p < 0.001) and increased oxygenation of the PFC (F = 55.97; p < 0.001). Pleasure perception was correlated with ADT at almost all intensities from 2-VT to VT-2 (r ≈ 0.33, p < 0.05). We also found pleasure correlation with HRV lower frequencies analysis (r ≈ 0.34; p < 0.05) and ratio between low and high frequency (r ≈ 0.33; p < 0.05), in the last stage of intensity, and to PFC deoxy was found at VT-2 intensity (r = 0.37; p < 0.05).

**CONCLUSION:** Exercise at high intensities reduces inhibitory control and affect (ratings of pleasantness). Displeasure correlates to increases in thoughts associated to exercise, and at high intensities, displeasure is correlated with PFC deoxyxygenation and sympathetic activity. These findings strengthen the existence of an integrative body-heart-brain system and suggests a role of the exercise intensity in this interaction.

**METHODS:** We used Healthy Families baseline data from 55 mothers and their children (aged 3-5 years [n=25] and 10-13 years [n=30]). MVPA and ST data were collected using accelerometry over a seven day period. Proportion of time in sedentary behavior and MVPA at 08:00 h and 20:00 h was calculated. Mixed-effects models were used to examine the association between mothers’ levels of ST and MVPA and those of their children.

**RESULTS:** There was little variability in levels of ST and MVPA by time of day among mothers or children, overall while at home together. After controlling for child and parent characteristics, and setting variables, mother-child ST and MVPA levels were positively associated (P = 0.001). The association for ST and MVPA were 2.2 times (β = 0.254 versus β = 0.116) and 1.7 times (β = 0.365 versus β = 0.215) stronger, respectively, when mother and child were at home together (compared to when one or neither was at home). The association did not differ by day of the week.

**CONCLUSION:** MVPA and ST in mothers and their children are directly associated, and that association differed by changes in setting. These results support the rationale for developing a family-centered interventions that take place in the home to increase PA and decrease ST.

Neuromuscular (NM) fatigue has often been measured in human participants through single-joint isometric exercise tests. However, this task is not representative of whole-body exercise (WBE) such as running, and cycling. Furthermore, most studies assessing NM fatigue from WBE have delayed measurement for 1-4 minutes after task failure, despite the knowledge that the NM system can recover quickly.

**PURPOSE:** To demonstrate the reliability of a new cycling ergometer for the measurement of NM fatigue in healthy subjects during and immediately after WBE.

**METHODS:** A sample consisting of 12 healthy adult males and females aged 19 to 32 was recruited. Each subject performed a fatigue test on the new cycling ergometer on two separate occasions. This protocol had subjects pedal until task failure at pre-determined power outputs scaled to their body weight that increased after NM assessments performed at three-minute intervals. NM assessments included voluntary and evoked force production of the quadriceps measured through instrumented pedals within the ergometer. Evoked contractions were achieved through electrical nerve stimulation and transcranial magnetic stimulation. Reliability was determined with intraclass correlation coefficients (ICC) and coefficients of variation (CV).

**RESULTS:** During the two sessions, the new cycling test produced a significant mean percent reduction in maximal voluntary contraction (MVC) force from pre to post test of 36±12% (p<0.0001). There was no significant difference in MVC measured on the ergometer between sessions (p>0.05), with excellent relative (ICC = 0.97±0.06) and absolute reliability (ICC = 0.97±0.16%). Evoked twitch force, a measure of peripheral fatigue, was reduced by 46±14% (p<0.0001) from pre to post test and showed excellent reliability as well (ICC = 0.97±0.06; CV = 5.2±1.5%). There was no significant change (p>0.05) in percent voluntary activation, a measure of central fatigue, within each session, however there was excellent absolute reliability (CV = 1.3±5%; 97.2% vs. 97.2% measured at pre). **CONCLUSION:** The results suggest that the new ergometer is a reliable tool for measuring NM fatigue during and immediately after exercise. Ultimately, a greater understanding and knowledge of the etiology of NM fatigue will be gained by measuring it during WBE.
Variation in lap time (LTV) during a fast pace 400m walk test is a new metric thought to be an early indicator of cognitive decline in older adults. While LTV has been found to associate with executive function, no study has examined the potential for LTV to predict capacity of the brain to divide attention and meet the demand of walking and performing other tasks simultaneously.

**Purpose:** The purpose of this study was to test the hypothesis that greater LTV would associate with larger dual-task cost during walking.

**Methods:** Fifty-two cognitively healthy women (MoCA>25) across a broad age range (30-80y) performed fast pace walking while balancing a tray (Dual1) or balancing a tray while vocalizing serial subtractions by 7’s (Dual2). Task error was quantified by degrees of tray tilt and subtraction error. On a separate day, women completed a fast pace 400m walk test (40m x 10 laps) with time to complete each lap recorded. LTV was defined as standard deviation of residuals estimated from the random effects linear model where each lap time was regressed on a person-specific random intercept and random slope associated with lap. Women were categorized into tertiles based on LTV compared to tertiles based on walking speed with time to complete the 400m walk test. The Dual2 condition, women with greater LTV had faster gait speed (p=0.02), lower percent change in gait speed (tertiles 1 vs. 3: 20.5±2.8 vs. 33.2±2.6%, p=0.02), similar subtraction error (p=0.58), but larger tilt angle (tertiles 1 vs. 3: 1.24±0.19 vs. 2.09±0.17 degrees, p=0.007).

**Conclusion:** Lap time variation identified women that exhibited greater difficulty balancing an object while walking suggesting that LTV may be sensitive to deficits in the ability to share neural substrate for sensorimotor function. Supported by a Women’s Health Research Scholar Grant award from the Laura W. Bush Institute of Women’s Health and University Medical Center in Lubbock, TX.

**B-13 Free Communication/Slide - Fitness Assessment and Training**

**Wednesday, May 31, 2017, 1:00 PM - 3:00 PM**

**Room: 103**

**Chair:** Kimberly Reich. 

**University High Point University, Burlington, NC.**

**No relationships reported**

The intensity of yoga is challenging to assess because the asanas of yoga include aerobic and anaerobic components; both of these components are measured through different methods. **Purpose:** The purpose of this project was to explore a method of assessing the physical activity completed during yoga. This study had two objectives: 1) Quantify characteristics of yoga (number of poses, body posture of a pose), and explore the concept of a pose rate (number of poses per minute of the routine), 2) Compare characteristics between different yoga categories to assess if the measures can differentiate between different yoga practices.

**Methods:** A content analysis was used to assess yoga routines; these routines were categorized by their primary purpose into one of the following groups: weight loss, beginner, or meditation. Researchers recorded the following characteristics from each routine: body position of each pose, number of poses, and duration of the yoga routine. An ANOVA was used to compare routine characteristics between yoga categories.

**Results:** Fifteen yoga routines were assessed (weight loss: 4, beginner: 5, and meditation: 6). The total number of poses completed (p = 0.010), number of total standing poses (p = 0.001), and percent of time in standing poses (p = 0.018) were significantly different between the three categories, with weight loss having the highest values. Significant differences were also observed in the number of body postures completed in standing with the head up (p = 0.001), and ‘other’ body positions (any body posture not explicitly

listed) (p = 0.033). The number of poses and percentage of time spent in the body postures of supine, seated, and standing with the head down were not significantly different between the three routine categories. The pose rate was not significantly different between categories. **Conclusions:** This study demonstrated that assessing certain characteristics of routines may be one way to describe activity performed during yoga. A common method to assess the activity performed during yoga will allow for easy comparisons between studies and provide a basis to better interpret results. Further research could build on similar studies if clear criteria are found between different yoga styles and if the number of poses completed corresponds to larger physiological or metabolic responses.
app against DEXA resulted in an \( R^2 = 0.83 \) and a SEE = 3.4 %BF. The intercept (2.84 %BF) and slope (1.035) of the regression line confirmed the significant bias. Bland-Altman analysis revealed the bias of the LS app estimates of %BF increased with increasing body fatness. Use of the LS app to estimate %BF resulted in high intrarater (0.99) reliability within and between days.

**CONCLUSIONS:** The results of this study show that the LeanScreen app, although highly reliable, significantly underestimated DEXA %BF. We suspect that this is related more to the DOD regression rather than the use of photographs and touchscreen technology.

**Purpose:** To examine positional differences in total and regional body composition in Division I football players using dual X-ray absorptiometry (DXA).

**Methods:** Height, weight, total and regional fat mass, lean mass and bone mineral density were measured on 467 players in the preseason (June-August). Players were categorized by their offensive or defensive position (offensive linemen [OL] and defensive linemen [DL], linebacker [LB], tight end [TE], running back [RB], wide receiver [WR], defensive back [DB], quarterback [QB], kicker/punter/long snapper [ST]). Players were categorized as either 'above average' or 'below average' in DXA %BF.

**Results:** The positions were significantly different (\( p < 0.05 \)). All positions were classified as OL, DB, quarterback (QB), kicker/punter/long snapper (ST).

**Data is from the Consortium of College Athlete Research (C-CAR) group.**

**To examine positional differences in total and regional body composition:**

**Purpose:**

**Methods:**

**Results:**

**Table 1: Positional Body Composition Characteristics (mean ±SD)**

<table>
<thead>
<tr>
<th>Position</th>
<th>OL (n=83)</th>
<th>DL (n=23)</th>
<th>LB (n=39)</th>
<th>RB (n=38)</th>
<th>DB (n=78)</th>
<th>ST (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Fat (%)</td>
<td>23.5 ± 5.3</td>
<td>19.8 ± 4.9</td>
<td>18.9 ± 4.9</td>
<td>13.9 ± 3.9</td>
<td>13.3 ± 3.9</td>
<td>19.9 ± 5.5</td>
</tr>
<tr>
<td>Total Lean Mass (kg)</td>
<td>87.6 ± 6.8</td>
<td>82.9 ± 6.5</td>
<td>79.9 ± 6.8</td>
<td>76.7 ± 6.3</td>
<td>72.1 ± 6.5</td>
<td>74.0 ± 6.3</td>
</tr>
<tr>
<td>Total Fat Mass (kg)</td>
<td>46.1 ± 10.8</td>
<td>25.6 ± 5.3</td>
<td>18.5 ± 5.4</td>
<td>14.1 ± 6.0</td>
<td>11.2 ± 6.5</td>
<td>13.6 ± 5.6</td>
</tr>
<tr>
<td>Trunk Lean Mass (kg)</td>
<td>39.5 ± 3.2</td>
<td>38.3 ± 3.3</td>
<td>37.7 ± 3.3</td>
<td>35.8 ± 3.3</td>
<td>34.5 ± 3.2</td>
<td>32.7 ± 3.2</td>
</tr>
<tr>
<td>Trunk Fat Mass (kg)</td>
<td>21.8 ± 6.1</td>
<td>13.6 ± 3.1</td>
<td>9.7 ± 3.1</td>
<td>8.7 ± 2.8</td>
<td>4.8 ± 2.7</td>
<td>5.4 ± 2.7</td>
</tr>
<tr>
<td>Leg Lean Mass (kg)</td>
<td>33.1 ± 2.7</td>
<td>29.1 ± 2.8</td>
<td>28.4 ± 2.6</td>
<td>27.9 ± 2.5</td>
<td>25.8 ± 2.5</td>
<td>25.8 ± 2.5</td>
</tr>
<tr>
<td>Leg Fat Mass (kg)</td>
<td>13.2 ± 2.1</td>
<td>10.5 ± 1.8</td>
<td>7.5 ± 1.8</td>
<td>6.9 ± 2.1</td>
<td>5.2 ± 1.8</td>
<td>4.3 ± 1.8</td>
</tr>
<tr>
<td>Visceral Fat Mass (g)</td>
<td>811 ± 499</td>
<td>645 ± 491</td>
<td>228 ± 142</td>
<td>241 ± 144</td>
<td>181 ± 124</td>
<td>204 ± 116</td>
</tr>
<tr>
<td>Leg Fat Mass (g)</td>
<td>13.2 ± 3.1</td>
<td>10.5 ± 3.1</td>
<td>7.5 ± 2.1</td>
<td>6.9 ± 2.1</td>
<td>5.2 ± 2.1</td>
<td>4.3 ± 2.1</td>
</tr>
<tr>
<td>Visceral Fat Mass (g)</td>
<td>811 ± 499</td>
<td>645 ± 491</td>
<td>228 ± 142</td>
<td>241 ± 144</td>
<td>181 ± 124</td>
<td>204 ± 116</td>
</tr>
</tbody>
</table>
Instant metabolic power (IMP) to assess energy cost (W) in running tasks with variable velocity (v) has come under critique in terms of substantial underestimations. IMP is based on assumptions that W per meter running distance at constant v (Cr) is invariant on s of v and that acceleration and deceleration can be modelled as constant v uphill and downhill running (CrIMP), respectively. PURPOSE: To test the hypotheses that the observed underestimation of W via IMP is caused by a dependence of Cr on v at running speeds at and above the v corresponding to VO_{2max} (v_{VO_{2max}}) and the limited validity of the IMP-model to acceleration and deceleration less than – 4.4 m/s² under interval training (IT) conditions. METHODS: 9 males (25.6 ± 2.0 years, 176.8 ± 4.2 cm, 76.8 ± 4.1 kg) performed an incremental load test on the treadmill, 15 min constant v runs (2.5 m/s) and IT of 30 s × 10 (average v = v_{VO_{2max}}) with 20 s breaks on treadmill (TM) and outdoor track (OT), respectively. Total energy costs (W_{TOT}) of all tests were calculated from respiratory gas measurements and net lactate appearance. W assessed via IMP (W_{IMP}) for TM and OT was estimated using CrIMP: 1) as published previously using Cr of running at 2.5 m/s on TM and OT, respectively, and the previously published IMP-model (W_{IMP1}), 2) using a modified CrIMP-model considering also acceleration and decelerations higher than – 4.4 m/s² (W_{IMP2}), 3) considering individual dependence of Cr on v at v > v_{VO_{2max}} (W_{IMP3}). RESULTS: W_{IMP1} of running at 2.5 m/s on TM (9210 ± 842 J/kg) and OT (8926 ± 1028 J/kg), and IT on OT (8970 ± 559 J/kg) were not different but all higher (p = 0.05) than W_{IMP1} at IT on TM (7856 ± 515 J/kg). W_{IMP2} (OT: 6363 ± 442 J/kg; TM: 5691 ± 367 J/kg) and W_{IMP3} (OT: 6528 ± 368 J/kg; TM: 5691 ± 367 J/kg) were lower (p < 0.001) than the corresponding W_{IMP1} of TM at IT on TM (8731 ± 484 J/kg; OT: 7009 ± 572 J/kg) and W_{IMP1} on OT but still underestimated (p < 0.001) W_{TOT} of TM possibly due to neglecting W of jumping onto and of the TM. CONCLUSIONS: Realistic estimates of W_{IMP} via IMP require adjustments for increased Cr at high v and accelerations and decelerations higher than – 4.4 m/s².

Comparison of PA And None PA (M±SE)

<table>
<thead>
<tr>
<th></th>
<th>Handgrip (kg)</th>
<th>Pull-up (rep)</th>
<th>Right Leg Extension (lb)</th>
<th>BMI</th>
<th>Waist Circumference (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes- PA</td>
<td>22.0±16.9</td>
<td>8±5</td>
<td>79.2±1.9</td>
<td>22.5±35</td>
<td>79.0±7.8</td>
</tr>
<tr>
<td>No- PA</td>
<td>76.9±3.1</td>
<td>9±9</td>
<td>74.7±1.9</td>
<td>23.0±35</td>
<td>81.0±8.8</td>
</tr>
</tbody>
</table>

632 May 31 2:30 PM - 2:45 PM
Instant Metabolic Power: Yet too Simplified but with High Potential
Ralph Beneke, FACSM, Max Niemeyer. Phillips-University, Marburg, Germany.
Email: ralph.beneke@staff.uni-marburg.de

633 May 31 2:45 PM - 3:00 PM
Muscle-damage Biomarkers, Hydration And Electrolytes Status Associated With Surfing Sessions Of Elite Brazilian Surfers
Franz H. Burini1, Rafael Rezende2, Pedro Rodstein3, Rodrigo Manda4, Oksely Teixeira5, Salete Coelho6, Paulo Mendes2, Roberto C. Burini, FACSM. 1UNESP Medical School, Botucatu, Brazil; 2SURFCO, São Paulo, Brazil. (Sponsor: Roberto C. Burini, FACSM)
Email: fburini@fmb.unesp.br

634 May 31 1:00 PM - 1:15 PM
Asymmetry in Lower Extremity Biomechanics During Walking & Stair Ambulation Following Total Knee Replacement
Tyler Standifird1, Harold E. Cates2, Songying Zhang, FACSM. 1Utah Valley University, Orem, UT. 2Tennessee Orthopedic Clinic, Knoxville, TN. 3University of Tennessee, Knoxville, TN.
Email: tyler.standifird@uvu.edu

635 May 31 1:15 PM - 1:30 PM
Walking Aid Use And Arthritis: Impact On Time Spent In Active Propulsion In Older Adults
Eryn Murphy, David W. Kceley, Robert Wood. New Mexico State University, Las Cruces, NM. (Sponsor: Joseph Berning, FACSM)
Email: emurphy2@nmsu.edu

Abstracts were prepared by the authors and printed as submitted.
United States, completed a brief medical history and gait analysis. Following the collection of these data, subjects were assigned to one of two groups based on having fallen (F; n=90) or not fallen (NF; n=160) in the past year. Independent t-tests were conducted to explore group differences (walking aid, arthritis; α = 0.05) in time spent in active propulsion. For these analyses the F and NF groups were analyzed separately with percentage of time spent in active propulsion as the dependent variable and both walking aid use and self-reported diagnosis of arthritis were the independent variables. RESULTS: Cw, Kvert, and musle activation were studied. A three-dimensional gait analysis was conducted for all subjects. The validity between GAITRite and Zeno walkways to assess spatio-temporal parameters of backwards walking in healthy older adults. Backwards walking was used to determine a significant difference between measurements from both the GAITRite and Zeno walkways to assess spatio-temporal parameters of backwards walking in healthy older adults. METHODS: Twenty healthy young adults (Age = 22 ± 2; 19 kg/m² < BMI < 22 kg/m²)) were studied. A three-dimensional gait analysis was conducted for all subjects. Plantar pressure distribution (the peak pressure of the eight plantar surface areas) and foot kinematics, surface electromyograms from the lateral and medial gastrocnemius, lateral and medial hamstrings, vastus lateralis (VL), vastus medialis (VM), and rectus femoris (RF) were recorded during sagittal and self-selected speed walking. Weight increase (10, 20 and 30% of subject body weight) was achieved by placing a belly bag on the subject’s body attached around the hip and to the shoulders. Principal component analysis was used to extract major features of amplitude and temporal pattern variability from the electromyograms of each muscle group (gastrocnemius, quadriceps, hamstrings). The models tested for gait load effects and interaction effects for these features (α = 0.05). RESULTS: Significant weight load effects were found for features that described more prolonged activation of the gastrocnemius and quadriceps muscles during the stance phase of gait (P < 0.05). Load increase selectively activated the VL compared to the VM during walking and the first 20 degrees of knee flexion during the squat. Load increase was also associated with increased mid-stance foot pressure and delay in both the onset of the second wave of flexion at the knee joint and reduced range of motion of the ankle (P < 0.05). Conclusions: We confirm the effects of increasing body weight on lower extremity muscle activation and foot balance control, both of which may contribute to knee OA development and progression.

Prior research has identified an age-related decline in backward walking performance measured via spatio-temporal parameters using GAITRite walkway. Moreover, it has also been shown that older adults categorized as fallers performed poorly with slower gait compared to non-fallers during backward walking. Zeno and GAITRite are both instrumented walkway systems used to assess spatio-temporal parameters of gait. The Zeno has a wider walkway than the GAITRite but is less portable for similar configurations. The GAITRite has been used extensively for measuring spatio-temporal parameters of backward gait. The Zeno has been less researched. PURPOSE: To determine concurrent validity of the Zeno and GAITRite walkways to assess spatio-temporal parameters of backwards walking in healthy older adults. METHODS: 30 healthy older adults (19 females, 75.1 ± 6.3 years of age) participated in this study. Participants were 65 or older, could walk 30 feet independently, and were not at risk for falls as determined by American Geriatric Society guidelines. The participants walked backwards at a comfortable pace on both the Zeno walkway (16’ × 2’) and GAITRite walkway (14’ × 2’). Participants performed one practice walk and five test walks on each walkway. ICC values (2,5) were calculated using GAITRite compared to Zeno measurements for stride length, width, and velocity, step, stance, and swing time, stance and swing percent, single support time, single support percent, velocity, and cadence. A paired sample t-test was used to determine a significant difference between measurements from both the systems. RESULTS: The ICC values ranged from 0.665 to 0.971. Backwards walking stride width was significantly greater when walking on GAITRite (16.80 ± 4.74cm) compared to Zeno (14.98 ± 3.58cm; P<0.001). CONCLUSION: The validity between the GAITRite and Zeno walkway systems showed excellent correlation on most spatial measurements and moderate agreement for some temporal parameters. Differences in stride width could have been due to method of calculation or perception of participants while walking on a narrower walkway. The results indicate clinicians can use Zeno for clinical assessment of backwards gait, keeping in mind the differences in temporal measurements if compared with published GAITRite results for healthy older adults.

Increased in gait variability measured using instrumented techniques has been associated with increased risk of falls in persons with Parkinson’s disease, decreased
functional performance and increased fall-risk in older adults. Recently research on breast cancer survivors (BCS) has focused on estimating fall-risk in this population attributed to gait performance. However, little is known about gait variability characteristics among BCS. **PURPOSE:** To assess the differences in gait variability among BCS compared to healthy controls during forward, backward, and accelerated forward walking. **METHODS:** 13 postmenopausal BCS (mean age: 58.5±18.5 years) and 8 healthy controls (mean age: 60.8±6.1 years) participated. Participants completed 5 trials each during forward, backward, and accelerated forward conditions on a 16x4’ Zeno walkway with a lead and follow-up distance of 1m to capture steady-state gait. Coefficient of variation (CV) was calculated as % of standard deviation over mean of 5 trials. CV of stride length, stance time, and stride width were used as dependent variables. A Group (BCS vs healthy controls) X Condition (forward, backward, accelerated forward walking) ANOVA was performed. **RESULTS:** Significant interaction for stance time showed that BCS had greater CV during forward (4.89±0.63%) and accelerated forward (6.94±0.78%) but lesser CV during backward walking (6.28±1.09%) compared to healthy controls (forward: 3.81±0.80%; accelerated forward: 4.23±1.00%; backward: 9.20±1.38%; P=0.018). Significant group main effect indicated that BCS (7.09±3.59%) had greater stride length variability compared to healthy controls (3.59±1.32%) across all conditions (P<0.05). Significant condition main effect was observed for stride length and stance time CV (both P<0.02) but not stride width (P=0.06). During forward walking, stride length (by 5%) and stance time (by 3.3%) CV were significantly less compared to backward walking (both P<0.004). There were no other significant differences. **CONCLUSION:** Increased stance time variability during backward walking and overall greater stride length variability may be indicative of increased fall-risk among BCS. Future studies need to examine other balance tests in conjunction with these measures to determine the level of fall-risk among BCS.

**641** May 31 2:30 PM - 2:45 PM
**Upper Body Accelerations During Walking are Altered in Individuals With ACL Reconstruction**

Cornty N. Armitano, Steven Morrison, Daniel M. Russell. Old Dominion University, Norfolk, VA. (Sponsor: David P. Swain, FACSM)

Email: carmito02@odu.edu

(No relationships reported)

One function of the trunk and neck segments is to act as a filter to dampen gait-related oscillations, so ensuring the head is stabilized. While persons with ACL reconstruction exhibit similar overall spatiotemporal gait features to healthy controls, there has been no direct assessment of whether ACL reconstruction impacts the ability of the upper body to attenuate oscillations while walking. **PURPOSE:** This study was designed to assess and compare the pattern of acceleration from the lower trunk, neck and head regions for individuals with reconstructed ACL compared to healthy controls during walking. **METHODS:** Seventeen participants with unilateral ACL reconstruction and 17 control persons matched for age, height, and weight participated in the study. Participants performed 3 trials of over-ground walking at their preferred pace (distance: 55 m). Acceleration were collected using three triaxial accelerometers attached to the head (occipital), neck (C7), and lower trunk (L3). Measures of amplitude (i.e., RMS, peak frequency power) and signal regularity (i.e., ApEn) of the acceleration data were performed. A within-subject, repeated-measures generalized linear model was used to analyze the data. **RESULTS:** Similarities were seen between both groups with regards to the general acceleration patterns in all three axes with trunk acceleration generally being of greater amplitude (both RMS and peak power) than the head (p<0.05). However, the results also revealed that the individuals with ACL reconstruction had significantly greater peak power in the AP and ML directions at higher frequencies (3-10 Hz, p<0.05), indicating a reduced ability to attenuate frequency signals. Further, the ACL group had an increase in ApEn values for VT direction head motion (p<0.05), indicating a reduced ability to control head motion during gait. **CONCLUSIONS:** Both groups demonstrated a similar pattern of gait-related oscillations across the head, neck, and trunk segments. However, adults with a reconstructed ACL demonstrated a reduced capacity to compensate for the higher frequency components of the gait signal, which may have led to a decline in head control. Overall, these findings indicate that previous damage to the ACL is not simply localized to the knee joint, but is widespread, impacting on upper body control as well.

**642** May 31 2:45 PM - 3:00 PM
**Characterizing Shank Angular Velocity During Gait in Individuals Post-ACLr Using IMUs in Ecological Settings**

Paige E. Lin, Gabriel M. Glasser, Ming-Sheng M. Chan, Susan M. Sigward. University of Southern California, Los Angeles, CA.

Email: paigee@usc.edu

(No relationships reported)

Individuals post ACL reconstruction (ACLr) exhibit decreased knee extensor moments during gait in the absence of visible gait deviations that can last up to 2 years post-surgery. Inertial measurement unit (IMU) derived shank angular velocities (skAV) can be used to detect knee extensor moment asymmetries during gait in individuals 3 months post-ACLr providing a clinical tool for identification of altered mechanics. These methods could be expanded to quantify gait mechanics during daily activities if skAV asymmetry can be detected during more ecological gait tasks. **PURPOSE:** To compare skAV asymmetry during ecological gait in individuals 3 months post-ACLr to controls. **METHODS:** 7 individuals (4F, 33 ± 9.6 yrs) 84 ± 20 days post-ACLr without observed deficits and 5 healthy controls (4F, 24 ± 2.8 yrs) performed 2-5 bouts of unconstrained walking intermixed with standing and sitting. Sagittal skAV was measured using IMU tri-axial gyroscopes (128Hz) affixed to lateral shanks bilaterally. Peak negative skAV after heel strike was identified (2°/s order Butterworth filter; high pass 0.25 Hz, low pass 6 Hz) using a previously validated algorithm. skAV for each limb was averaged for 20-231 continuous steps of gait per walking bout. skAV asymmetry was calculated as the ratio between surgical/non-surgical limbs (ACLr) and dominant/non-dominant limbs (control). Independent t-test was used to compare skAV ratios between groups; α ≤ 0.05. **RESULTS:** On average, skAV ratios were 0.89 ± 0.09 and 1.00 ± 0.09 for the ACLr and control groups, respectively (p=0.024). **CONCLUSIONS:** Consistent with previous studies, individuals after ACLr demonstrate reduced skAV in the surgical limb during loading response as evidenced by a smaller ratio compared to controls. Differences between groups during natural gait tasks performed with other daily tasks suggest that skAV asymmetries are detectable in less controlled settings. Given the capabilities of IMUs to collect and store large amounts of data, these data support the use of IMUs for assessing the quality of gait mechanics throughout the day. Understanding the extent to which individuals adopt altered loading outside of the laboratory is needed for the development of training interventions aimed at mitigating altered gait mechanics during early rehabilitation following ACLr.

**643** May 31 1:00 PM - 1:20 PM
**Low Back and Bilateral Posterior Hip Pain in an Adolescent Female**

Jasmin Mosley Gooden, Michael Fong, Marissa S. Vasquez, Kaiser Permanente, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSM)

(No relationships reported)

**HISTORY:** 14-year-old female presenting with persistent low back pain of insidious onset for 1.5 years. Patient initially managed at outside hospital. Work-up included MRI lumbar that noted possible early lumbarocatal facet arthritis. Pain persisted despite oral anti-inflammatory medications, functional modifications, and physical therapy. On presentation to our institution, patient was referred by primary care to rheumatology. Patient’s generalized low back pain noted to progress to involve the posterior aspect of both thighs with occasional weakness of the legs, right more than left. Pain worsened with prolonged walking and sitting. No radiating pain, night time or early morning pain, nor pain swelling or other joint pains. Rheumatologist recommended Naprosyn, advanced imaging, and referral to sports medicine.

**PHYSICAL EXAMINATION:** Normal neck exam; lower motor strength; muscle tone; and hip and back range of motion. No muscle atrophy. She had posterior hip tenderness in the Ischia-gluteal region that worsened with resisted hip abduction. Negative FABERE, OBER, and straight leg raise. Negative FADIR for anterior hip pain; maneuver produced tenderness in gluteal region Femoral stretchequivocal bilaterally Positive Trendelenburg

**DIFFERENTIAL DIAGNOSIS.**

- Spondyloarthopathy
- Bilateral Iliosfoemoral Impingement
- Bilateral Meralgia Paresethica

Abstracts were prepared by the authors and printed as submitted.
History and Presentation:
22-year-old female presented to sports medicine clinic for acute on chronic coccyx pain. She initially sustained an injury 6 years ago when she slipped on some steps, pain resolved until 4 years ago when she slipped stepping out of a car. The pain at that time was identical to previous, with coccygeal pain when seated or supine for extended periods. X-rays were negative at the time, and her pain resolved with PT and melexicon. She was lost to follow up for 2 years after that time, until she presented with increased pain again. No new injury, but pain feels similar. She has been unable to exercise including bike riding since the onset of her pain. She reported no ambulatory pain. She denied radicular symptoms, systemic symptoms, or bowel/bladder incontinence. PMH was unremarkable, non-smoker, no significant family history.

Physical Examination:
Vitals were revealed and normal. No deformity of the lumbar spine, sacrum, or coccyx. She did have some mild tenderness to palpation at the sacral-coccyx joint, but range of motion was normal. Straight leg raise was negative. Distal sacral-plexus sensation intact. Differential Diagnosis: 1. Coccyx fracture 2. Sacroiliitis 3. Rectal abscesses 4. Femoral hernia 5. Soft tissue mass 6. Sacral-coccyx joint dislocation 7. Occult fracture Testing and Results: Repeat x-ray was negative for fracture, dislocation. There was some non-specific soft tissue edema around the sacral-coccyx junction which is unclear. MRI was obtained which revealed a large expansile midline mass occupying the sacrum and coccyx and extending into the anterior pelvis measuring 7.2 x 9 x 8.5 cm. Tissue sampling would confirm a chordoma. Final Diagnosis: Sacral chordoma Treatment & Outcomes: 1. NSAIDs and opioids for pain control 2. Neurosurgical consultation 3. This patient’s treatment is still ongoing at time of abstract submission. Initial surgical resection was modestly successful although the size of the tumor complicated complete resection Possible complications include chronic surgical site pain, nerve damage, continue chronic coccydynia. Median survival rate for sacral chordoma is approximately 7 years.

TREATMENTS AND OUTCOMES:
1. NSAIDs and opioids for pain control
3. Ultrasound guided corticosteroid Injection to right quadratus femoris and relative improved anterior leg pain, but persistent posterior hip pain.

Final Working Diagnosis:
L5-S1 disc herniation with left L5 radiculopathy

Test and Results:
MRI Lumber Spine without Contrast: L4-L5 broad-based left-sided disc herniation extruding inferiorly left paracentral measuring 16 x 14 x 15 mm effacing the thecal sac and displacing the left L5 nerve root.
No findings to indicate transverse myelitis.

**FINAL/WORKING DIAGNOSIS:** T8-9 intervertebral disc herniation resulting in myelopathy.

**TREATMENT AND OUTCOMES:**
1. Neurosurgery consult with no surgical intervention taken. Patient admitted for continued monitoring, PT, and OT.
2. Notable lower limb strength improvement seen over the first three days, however, acute inpatient rehabilitation was needed to assure ability for safe ambulation with impaired lower limb sensation.
3. After 12 days of inpatient rehab, lower body sensation was still impaired, but patient demonstrated improved lower limb strength and was ambulating with proper technique multiple times around the unit without assistance.
4. Patient discharged with outpatient therapy and a follow-up with neurosurgery in one month with repeat spine MRI.
5. Patient instructed to not return to cheerleading until follow-up.

**METHODS:**
A sample of 351 (21.0 ± 2.1 years old, n = 201 females) college students who had downloaded Pokémon Go! on their cell phone for a minimum of two weeks were surveyed for: weekly vigorous, moderate, walking and total physical activity and sedentary behavior via the validated International Physical Activity Questionnaire, exercise identity via the validated Exercise Identity Scale and were asked to report the number of fitness apps they had on their cell phones. Participants were then split into groups of those who use one or more (apps group, dummy coded 1, n = 207) and do not use any (no apps group, dummy coded 0, n = 144) fitness apps.

**RESULTS:**
Correlation analyses revealed that exercise identity was positively associated (r ≥ 0.18, p ≤ 0.02) with all measures of physical activity except walking (r = 0.06, p = 0.31). Exercise identity was inversely associated (r = −0.20, p < 0.001) with sedentary behavior. The app group reported a greater exercise identity (4.61 ± 1.6 app, 3.44 ± 1.8 no app, r = 0.32, p < 0.001) and participated in greater vigorous (2690 ± 2775 MET min per week app, 1651 ± 2344 MET min per week no app, r = 0.19, p < 0.001) and total (6541 ± 4691 MET min per week app, 5122 ± 4381 MET min per week no app, r = 0.19, p = 0.007) physical activity than the no app group. However, when controlling for exercise identity, via partial correlation, physical activity differences between groups were rendered non-significant (r = 0.04, p = 0.50).

**CONCLUSIONS:**
Differences in weekly physical activity between participants who use at least one fitness app on their cell phone versus those with no apps were mediated by exercise identity.

This is evidence that cell phone use is associated with greater sedentary behavior and decreased cardiorespiratory fitness. Conversely, certain cell phone functions (e.g., listening to music, mHealth care) may promote healthy behaviors. The use of cell phone based software applications designed to monitor and/or promote exercise behavior (i.e., fitness apps) are a cell phone function which may promote physical activity. However, the relationship between fitness app use and physical activity is not well studied.

**PURPOSE:** To assess the relationship between physical activity and fitness app use and then to determine if this potential relationship was mediated by measures of exercise identity (i.e., the degree to which someone defines themselves as being an exerciser).

**METHODS:** A sample of 351 (21.0 ± 2.1 years old, n = 201 females) college students were surveyed for: weekly vigorous, moderate, walking and total physical activity and sedentary behavior via the validated International Physical Activity Questionnaire, exercise identity via the validated Exercise Identity Scale and were asked to report the number of fitness apps they had on their cell phones. Participants were then split into groups of those who use one or more (apps group, dummy coded 1, n = 207) and do not use any (no apps group, dummy coded 0, n = 144) fitness apps.

**RESULTS:**
Correlation analyses revealed that exercise identity was positively associated (r ≥ 0.18, p ≤ 0.02) with all measures of physical activity except walking (r = 0.06, p = 0.31). Exercise identity was inversely associated (r = −0.20, p < 0.001) with sedentary behavior. The app group reported a greater exercise identity (4.61 ± 1.6 app, 3.44 ± 1.8 no app, r = 0.32, p < 0.001) and participated in greater vigorous (2690 ± 2775 MET min per week app, 1651 ± 2344 MET min per week no app, r = 0.19, p < 0.001) and total (6541 ± 4691 MET min per week app, 5122 ± 4381 MET min per week no app, r = 0.19, p = 0.007) physical activity than the no app group. However, when controlling for exercise identity, via partial correlation, physical activity differences between groups were rendered non-significant (r = 0.04, p = 0.50).

**CONCLUSIONS:**
Differences in weekly physical activity between participants who use at least one fitness app on their cell phone versus those with no apps were mediated by exercise identity.

Pokémon Go! is a downloadable video game for use on an internet-connected cellular telephone (cell phone). The game encourages the player to traverse real-world locations (e.g., neighborhoods) and tracks the player, via GPS, as they move through these locales. The purpose of the game is to find computerized characters as the player moves through the real-world locations. Because the game requires players to move through real-world locales, it may promote physical activity.

**PURPOSE:** The purpose of this study was to assess self-reported walking and sedentary behavior in young adults before and after downloading Pokémon Go!.

**METHODS:** A sample of 238 (19.5 ± 1.7 years old, n = 119 females) college students who had downloaded Pokémon Go! on their cell phone for a minimum of two weeks were surveyed for weekly walking and sedentary behavior via the International Physical Activity Questionnaire. Participants reported their walking and sedentary behavior at three time points: the week immediately preceding their download of Pokémon Go!, the week participants downloaded Pokémon Go!, and the week after they downloaded Pokémon Go!.
Pokémon Go!, the first week after downloading the game and currently. Differences in self-reported physical activity and sedentary behavior across the three time points were compared via repeated-measures analyses of variance. **RESULTS**: There was a significant main effect of time (f = 3.84, p ≤ 0.001) for walking and sedentary behavior. Participants reported greater (t = 7.4, p ≤ 0.001) daily walking during the first week after downloading Pokémon Go! (206 ± 138 min) and currently (191 ± 202 min) versus the week before downloading (105 ± 101 min). There was no difference (t = 1.5, p = 0.15) during the first week after downloading and current walking behavior. Participants reported greater (t = 6.5, p ≤ 0.001) daily sedentary behavior during the week before downloading (329 ± 219 min) versus both the first week after downloading (242 ± 181 min) and currently (256 ± 152 min). There was no difference (t = 1.5, p = 0.15) between the first week after downloading and current sitting behavior. **CONCLUSIONS**: Use of the popular, physically-interactive cell phone game, Pokémon go!, had favorable effects upon self-reported physical activity (96% to 82% increase) and sedentary behavior (26% to 22% decrease). Such games hold promise as technology that may promote physical activity and discourage sedentary activity.


**METHODS**: The HERD Study is a prospective, randomized study examining the effects of a freshman year, healthy lifestyle intervention on the reduction of student’s risk factors for type 2 diabetes and cardiometabolic disease. Freshman students were recruited during the University’s Week of Welcome activities in the spring semester before students have moved to campus. Physical activity measures, cardiometabolic health parameters and other demographics were obtained at baseline. Social Support was assessed by the Social Support and Exercise Survey; a 13 item, Likert scale survey that queries about family and friends social support for exercise over the past 3 months. **RESULTS**: To date, 76 freshmen have enrolled into the HERD Study [age= 18.5±2.36 years; female=60.5% (n=46); 85.5% Caucasian (n=65); BMI= 26.5±6.85 kg/m²; VO2max=15.4±9.3 ml/kg/min]. Roughly 44% (n=33) reported engaging in regular exercise, however, of those, only 9.2% meet the recommendations of the aerobic guidelines for American adults and 26.3% meet the resistance training criteria. Those who participate in regular exercise where significantly more likely to report that friends help to: plan activities around their exercise, exercise with them, or ask them about how they (the friend) can adopt more exercise compared to their non-exercising counterparts (p=0.026, p=0.037 and p=0.015). Moreover, those who participate in regular exercise were more likely to report that their family makes plans for exercise on recreational outings compared to their non-exercising counterparts (p=0.042). **CONCLUSION**: Support from both friends and family appears to play a decisive role in the motivation and adherence to regular physical activity in late teenage years. Physical activity interventions should include strategies to promote peer social support in the college setting to enhance physical activity participation in college students.

Approximately 1 in 6 college aged adults in the United States engage in no leisure time physical activity. Still, a paucity of literature exists regarding what influences physical activity participation in this age group. **PURPOSE**: To determine the effects of social support on physical activity participation in college students enrolled in college health education classes. **METHODS**: The SRQ is a 36-item, self-report measure used to assess social support in four domains: emotional, instrumental, informational and total support. Participants were recruited from the University’s Week of Welcome activities in the spring semester. Selfreported physical activity and sedentary behavior was collected via a 13-item, Likert scale survey that queries about family and friends social support for exercise over the past 3 months. **RESULTS**: The SRQ scores were significantly higher for participants (3.25±0.63) than non-participants (3.07±0.78). First semester cumulative CD was significantly lower (p-value=0.01) for intramural sports participants (5.33±7.00) than non-participants (6.63±7.72). Finally, first year cumulative GPA (p-value=0.001) was also significantly lower for participants (6.9±7.13) than non-participants (7.7±8.20). **CONCLUSIONS**: Results suggest that freshmen students participating in intramural sports during their first year of college achieve higher cumulative first semester and first year GPAs, and have a lower first semester and first year cumulative CD than students who do not participate in intramural sports. Future studies should investigate intramural sports participation and academic variables beyond the first year, and also include retention as an outcome variable.


**METHODS**: The HERD Study is a prospective, randomized study examining the effects of a freshman year, healthy lifestyle intervention on the reduction of student’s risk factors for type 2 diabetes and cardiometabolic disease. Freshman students were recruited during the University’s Week of Welcome activities in the spring semester before students have moved to campus. Physical activity measures, cardiometabolic health parameters and other demographics were obtained at baseline. Social Support was assessed by the Social Support and Exercise Survey; a 13 item, Likert scale survey that queries about family and friends social support for exercise over the past 3 months. **RESULTS**: To date, 76 freshmen have enrolled into the HERD Study [age= 18.5±2.36 years; female=60.5% (n=46); 85.5% Caucasian (n=65); BMI= 26.5±6.85 kg/m²; VO2max=15.4±9.3 ml/kg/min]. Roughly 44% (n=33) reported engaging in regular exercise, however, of those, only 9.2% meet the recommendations of the aerobic guidelines for American adults and 26.3% meet the resistance training criteria. Those who participate in regular exercise where significantly more likely to report that friends help to: plan activities around their exercise, exercise with them, or ask them about how they (the friend) can adopt more exercise compared to their non-exercising counterparts (p=0.026, p=0.037 and p=0.015). Moreover, those who participate in regular exercise were more likely to report that their family makes plans for exercise on recreational outings compared to their non-exercising counterparts (p=0.042). **CONCLUSION**: Support from both friends and family appears to play a decisive role in the motivation and adherence to regular physical activity in late teenage years. Physical activity interventions should include strategies to promote peer social support in the college setting to enhance physical activity participation in college students.

An incongruous association between regular participation in physical activity (PA) and binge drinking (BD) among college students (CS) has been reported in the literature. **PURPOSE**: The purpose of this study was to qualitatively investigate the relationship between PA and BD among CS. **METHODS**: CS (18-24 years, non-varsity athletes) who were meeting the national physical activity recommendation (≥ 150 minutes/ week of moderate and/or vigorous PA) and reported consuming at least five or more alcoholic beverages in a single sitting within the previous 30 days were recruited to participate in the study. A trained facilitator asked open-ended questions based on the social ecological model during focus groups, separated by sex, to inquire about PA and BD experiences among CS. The sessions were audio-recorded and transcribed verbatim. Transcripts were analyzed by three researchers (first independently, then jointly) to determine emergent themes. **RESULTS**: Participants (n = 58, 19 ± 7 months, 76.1% Caucasian) described how PA and BD were related in their everyday lives as full-time students. Several intrapersonal, interpersonal, institutional and community factors were identified. The most frequently occurring theme among females (n = 25) was “calorie conscious.” “Damage control: healthy/unhealthy” was the most frequent theme/sub-theme among males (n = 33). **CONCLUSION**: The results indicate there are multiple social ecological levels that influence PA and BD behavior in CS. Although additional research is warranted, results of this study suggest that community level factors greatly influence several intrapersonal and interpersonal level factors described by participants. It is imperative that all social ecological levels are considered when designing interventions to promote PA and reduce BD among CS.
**Results:*** Among males, SE was weakly correlated with curl-ups \(r = -11, p < 0.05\) and push-ups \(r = -14, p < 0.01\), but SE was not significantly correlated with PACER, handgrip, or body fat percentage \(p > 0.05\). Among females, SI was significantly correlated with PACER \(r = -23, p < 0.001\), push-ups \(r = -33, p < 0.001\), handgrip \(r = -23, p < 0.001\), and body fat percentage \(r = -22, p < 0.001\), but SE was not significantly correlated with curl-ups \(p > 0.05\).

**Conclusion:** Overall, SE was weakly correlated to each component of HRF. Compared to males, females had slightly stronger correlations between SE and each component of HRF. The lack of moderate or strong relationships between SE and HRF may be due to the focus on academic outcomes in undergraduate courses. Thus, fitness class instructors should consider making additional efforts to promote SE among their students. Techniques could include positively reinforcing small improvements in fitness, discussing ways to overcome barriers, or helping students to experience success.

---

**Board #7**

May 31 3:15 PM - 5:15 PM

**Motivational and Self-Perceptions of College Students Who Exercise for Different Reasons**

James R. Whitehead, FACSM, Amanda Dufner, Jesse L. Rhodeas, Tanis J. Walsh, University of ND, Grand Forks, ND. Email: james.whitehead@email.und.edu

**No relationships reported**

College students exercise for a variety of reasons, but specific differences in their motivations and perceptions have not been extensively studied. PURPOSE: The main purpose was to see if students whose primary reason for exercise is to lose fat (FATCON), gain muscle (MUSC), or maintain health (HLTH) had differences in their exercise motivations, social physique anxiety, and body image self-perceptions. A secondary purpose was to explore if the participants’ supplement use reflected their exercise priorities. METHODS: Data were collected at a university Wellness Center, or from exercise classes. Participants (N = 216) completed a packet of four questionnaires: Multidimensional Body Self Relations Questionnaire (MBSRQ), Social Physique Anxiety Scale (SPAS), The Behavioral Regulation of Exercise Questionnaire (BREQ-3), and an ad hoc dietary Supplement Questionnaire (DSQ). RESULTS: MANOVA revealed a significant difference between groups \(F (14, 350) = 4.89, p < .001\). Post hoc tests showed significant differences between groups on six out of seven dependent variable scales. Specifically, MUSC was significantly higher in autonomous motivation than FATCON and HLTH \(p < .001\), but FATCON scores on SPAS, appearance evaluation, body area satisfaction, overweight preoccupation, and self-weight classification were all less positive than the scores of MUSC and HLTH \(p < .001\) to \(p < .005\). Supplement use was low in HLTH \(11\%\), but MUSC \(15\%\), but higher in MUSC \(49\%\). In addition, some of the supplements listed by MUSC were of questionable efficacy and safety. CONCLUSIONS: The majority of these college student exercisers were autonomously motivated, but those who exercised primarily for fat control had more negative body-related perceptions than those who exercised primarily for health, or for muscle gain reasons. Additionally, the data on supplement use indicates a need for consumer education, especially for those who report they are exercising primarily to gain muscle.

---

**Board #8**

May 31 3:15 PM - 5:15 PM

**Analysis of Physical Activity Knowledge, Motivators, and Self-Efficacy in an Undergraduate Wellness Course**

Monica M. Maidari1, Michelle Scribner-MacLean2, David J. Rice3, Fitchburg State University, Fitchburg, MA. 1University of Massachusetts Lowell, Lowell, MA. 2Florida Southern College, Lakeland, FL. (No relationships reported)

Research suggests that many undergraduates do not achieve the minimum recommended amounts of physical activity (PA). These findings are concerning as habits developed during college are likely to be continued into adulthood. PURPOSE: The purpose of this investigation was to identify changes in health-related fitness knowledge (HRFK), PA practices, self-efficacy and motivations for exercise that occurred while participants were enrolled in a conceptually-based, mandatory, health and fitness course. METHODS: One hundred and thirty-five students (66 females) enrolled in the course (mean ±SD; age 19.89 ± 2.3 years; BMI 24.5 ± 5.24 kg/m²) completed a pre-course survey on the first day of classes and a post-course survey during the last week of classes. The survey collected demographic data and information on HRFK, PA practices, motivations, and self-efficacy for exercise. RESULTS: Analysis demonstrated that HRFK increased significantly \(p<.001\) during enrollment in the course. Self-efficacy and BMI values were largely unchanged between pre- and post-course values. Results for PA practices noted increases in miles walked \(p<.05\) and flights of stairs climbed \(p<.05\) per day. Significantly more \(p<.002\) male students reported muscle development, whereas significantly more \(p<.046\) female students reported weight management as a motivators for exercise. Motivations shifted slightly post-course with a significant increase \(p<.014\) in the number of females exercising for muscle development at the end of the course compared to beginning. Responses to Likert scale \(1=\)Strongly Disagree, \(5=\)Strongly Agree\) of course outcomes revealed that most students “agreed” \(4\)” that as a result of the course they understood physical responses to exercise training \(M=4.3, SD=6.7\), improved understanding of their current fitness levels \(M=4.0, SD=.9\), and learned tools to design effective, individualized exercise plans \(M=4.2, SD=.64\). However, most students “neither agreed nor disagreed” \(3\)” that they exercised more at the end of the course compared to the beginning. CONCLUSION: Enrollment in a conceptually-based, health and fitness course can increase HRFK over the course of the semester, however this increase in knowledge is not associated with concurrent increases in activity levels or self-efficacy.

---

**Board #1**

May 31 3:15 PM - 5:15 PM

**A 5-Year Descriptive Epidemiology and Performance Study of Adolescent Recreational Marathon Runners**

Mary A. Kennedy1, Matthew W. Penney2, Dai Sugimoto3, Anna N. Brilli4, Christopher R. Cuna4, Pierre A. d’Hemecourt, FACSM4, DREAMFAR High School Marathon, Chestnut Hill, MA. 1Advanced Sports Therapy, Wellesley, MA. 2The Micheli Center for Sports Injury Prevention, Waltham, MA. 3Boston Children’s Hospital Department of Orthopaedic Surgery and Division of Sports Medicine, Boston, MA. 4Harvard Medical School, Boston, MA. Email: mary@dreamfarhsm.org (No relationships reported)

**PURPOSE:** To descriptively examine injuries, treatments, and performance of adolescent recreational runners who trained for a half or full marathon from 2011-12 to 2015-16. METHODS: Musculoskeletal injuries and medical treatments of high school recreational runners who committed to a 30-week half or full marathon training program (mean=3.5 practices/week) were recorded by physical therapists over a 5-year period. The recorded information included number of injured participants, number of injuries, injury sites, diagnosis, and number of treatment sessions. Number of participants who completed a half or a full marathon at the end of the 30-weeks of training was recorded annually for the last 5 years. Obtained information was descriptively analyzed. RESULTS: Throughout the 5 training seasons, a total of 448 adolescent runners (age: 16±0.9 years; 55% female N=247, 45% male N=201) participated in the 30-week training period. During the training periods, 165 adolescent runners (36.8%) reported 225 musculoskeletal injuries (50.2%). The most common injury site was the lower leg \(29.9\%\) followed by knee and ankle/foot as the second and third most commonly injured sites \(25\%\) each. Achilles/posterior/peroncal tendinitis was the most common injury diagnosis reported \(16.1\%\) followed by patellofemoral pain \(14.7\%\) and shin splints \(14.3\%\). Overall 87.1% of the injuries required 3 or fewer treatment sessions with a mean of 1.82 treatment sessions per injury. Of the 448 adolescent runners, a total of 441 adolescent runners completed either a half (N=62) or full marathon \(N=379\). The completion rate was 98.4% in this cohort following the 30-weeks of training. CONCLUSIONS: Despite the number of injured runners and reported injuries, most adolescent participants completed a half or full marathon following 30-weeks of training. Also, the injuries do not appear to be as severe as evidenced by the low number of treatment sessions required and high percentage of students able to complete the race. Further research detailing volume of training with more precise measures of training time lost to injury is needed to more thoroughly validate these results.

---

**Board #2**

May 31 3:15 PM - 5:15 PM

**Runner’s Perceptions and Expectations of Medical Coverage at Ultramarathons**

Jeff S. Lynn, Kim Keeley, Kristen Zaitz, Kelly Holzberger, Slippery Rock University, Slippery Rock, PA. (Sponsor: Patricia Pierce, FACSM) (No relationships reported)

As the popularity of ultramarathons grows, medical directors and staff could benefit from greater understanding of runners’ needs and expectations. PURPOSE: The purpose was to describe runners’ expectations and perceptions of medical coverage at 100-mile trail races. METHODS: A survey was distributed via email to 230 Abstracts were prepared by the authors and printed as submitted.
registrants of a 100-mile trail race in the Northeast United States. Questions included expectations of medical coverage at ultramarathons as well as perceptions of coverage at prior races. RESULTS: One hundred sixteen runners completed the survey (98 men, 18 women; age=42±8). Ultramarathon experience ranged from 2.50+ races with runners reporting 1-20 years’ experience (mean 4.6 years). Ninety-one percent (n=110) of runners reported a medical issue during prior ultramarathons. The most common were chafing (n=81; 79%), blisters (n=66; 65%), muscle cramps (n=64; 55%), blood under toenail (n=61; 59%), and GI distress (n=47; 41%). Of those who received medical care during a race, 45 of 46 were satisfied with the treatment they received. Runners thought that medical aid should be available every 10 miles (n=49; 45%) or 20 miles (n=33; 30%) and should include medical tape (n=89; 81%), sodium (n=88; 80%), Band-Aids (n=88; 80%), anti-choke products (n=86; 78%), emergency blankets (n=82; 75%), and ice packs (n=78; 71%). Runners reporting carrying few medical items with them including sodium (n=65; 57%), anti-choke lube (n=46; 35%) anti-inflammatories (n=39; 34%), and Band-Aids (n=28; 24%). While only 4% (n=4) of respondents believed that there are no conditions under which medical personnel should stop a runner from continuing, others thought that appropriate reasons include venomous bite (n=90; 84%), seizure (n=82; 73%), head injury (n=80; 71%), altered consciousness (n=70; 63%), irregular heart beat (n=60; 54%), chest pain (n=58; 52%), or blood in urine (n=56; 50%). CONCLUSIONS: Based on this small sample, a large percentage of ultramarathoners suffer from non-emergent conditions, but most do not seek medical care during the race. Those who sought treatment tended to be satisfied with the care received. Medical directors should provide supplies to care for skin care but have the expertise to recognize and treat more serious issues that may require the runner to stop.

734 Board #4
May 31 3:15 PM - 5:15 PM
Two-peaked Increase of Serum Myosin Heavy Chain-a After Ironman Demonstrates Heart Muscle Cell Death
Jörg Carlsson, Tom Danielsson, Patrick Bergman. Linnaeus University, Kalmar, Sweden.
Email: jorg.carlsson@lkalmar.se

There is an ongoing debate about the significance of cardiac troponin T (cTnT) elevation after strenuous exercise: heart muscle cell death versus physiological mechanism of release through an intact cell membrane. While cTnT is a small molecule (37 kDa), cardiac specific myosin heavy chain-alpha (MHC-a) is much larger (224 kDa) and an increase after exercise could hardly be explained by passage through an intact cardiac cell membrane. PURPOSE: To measure MHC-a, and other biomarkers (C-reactive protein (CRP); cTnT, creatine kinase (CK), myoglobin (MG), creatinine (Cr), and N-terminal prohormone of brain natriuretic peptide (NT-proBNP) before and after a full distance Ironman in order to answer the question of heart muscle cell death versus physiologic changes. METHODS: In 52 non-elite athletes (14 female, 38 male; age 41.1 ± 9.7, range 24-70 years; all completed the race) biomarkers were measured by standard laboratory methods 7 days before, directly after, and day 1, 4 and 6 after the race. MHC-a was measured with a commercially available ELISA with no cross reactivity with other myosins. RESULTS: The course of MHC-a concentration [µg/L] was 1.33 ± 0.53 (before), 2.57 ± 0.78 (directly after), 1.51 ± 0.53 (day 1), 2.74 ± 0.55 (day 4) and 1.83 ± 0.76 (day 6). Other biomarkers showed a one-peaked increase with maximal values either directly after the race or at day 1: cTnT 76 ± 80 ng/L (12-440; reference <15), NT-proBNP 776 ± 684 ng/L (92-4700; reference <300), CK 68 ± 55 µkat/L (5-280; reference <1.9), MG 2088 ± 2350 µg/L (130-7000; reference <72), and creatinine 100 ± 20 µmol/L (74-161; reference <100), CRP 49 ± 23 mg/L (15-119; reference <5). There was a significant correlation between MHC-a and NT-proBNP (R=0.48; p<0.001) but neither between MHC-a and cTnT (R=0.13; p=0.36) nor MHC-a and myoglobin (R=0.18; p=0.02). CONCLUSION: An Ironman leads to remarkable disturbances in biomarkers as e.g. cTnT was in the range of myocardial infarction in 100% of women and 97% of men. This is to our best knowledge the first investigation of MHC-a after strenuous exercise and its two-peaked increase most likely represents first release from the cytosolic pool and later from cell necrosis including the contractile apparatus. However, many questions remain, not at least why MHC-a baseline levels are as high as 1.33 ± 0.53 µg/L.

Medical infrared thermography (MIT), a non-radiating imaging technology, detects changes in skin temperature. Musculoskeletal injuries result in blood flow changes which may produce patterns of associated changes in skin temperature that can be visually detected by MIT. PURPOSE: To determine if clinical symptoms of distal lower extremity overuse injuries in runners are associated with visually detectible changes in MIT. METHODS: 29 competitive distance runners (age 18-25y, running 25-50 miles per week) enrolled and participated. Once weekly, runners reported to lab for MIT photos of bilateral lower limbs taken with an infrared camera. Prior to MIT, runners acclimatized to lab conditions for 15 minutes and the camera was calibrated to the room temperature and humidity. A modified Oslo Sports Trauma Research Centre (OSTRC) overuse injury questionnaire was used for athlete-reported musculoskeletal symptoms and problems. MIT photos and OSTRC scores were obtained on a weekly basis for 8 weeks. Runners’ photos were grouped into those with no reports of any lower extremity problems (Controls: OSTRC = 0, n=5); and those with reports of significant lower extremity problems (Injured: OSTRC =5, n=7). Photos from each group were placed into an online viewer and evaluated by 7 blinded clinicians. For the injured group, a photo from the week of the highest reported OSTRC score was paired with a baseline (OSTRC <25) photo. For the control group, two uninjured photos were paired. The reference photo for each pair was labeled. The order of photos (control vs. injured) was randomized and reviewers were not provided the number of included injured runners. Clinicians visually inspected 12 image pairs and decided whether or not the photo suggested a lower extremity problem existed. Diagnostic accuracy statistics were computed for each evaluator. RESULTS: The median (interquartile range) for the seven evaluators were sensitivity=0.43 (0.29), specificity=0.60 (0.2), positive likelihood ratio=1.43 (0.0), negative likelihood ratio=0.71 (0.08). CONCLUSIONS: Low diagnostic accuracy and considerable inter-rater variability suggests evaluator training of MIT interpretation is necessary to accurately confirm or disconfirm presence of injury based on MIT findings.
Board #6  
May 31 3:15 PM - 5:15 PM  
**Hematological Changes in Elite Collegiate Cross Country Runners Residing at Moderate Altitude: A Retrospective Analysis**  
Kalee L. Morris*, Jesse A. Goodrich†, Sourav Poddar‡, Luke Widstrom*, Miguel Rueda†, William Byrnes†. 1University of Colorado Boulder; Boulder, CO; 2University of Colorado Denver, Denver, CO.  
(No relationships reported)

**PURPOSE:** This study assessed selected seasonal hematological changes in elite male and female collegiate cross-country (XC) runners residing at a moderate altitude (1655 m). **METHODS:** Previously collected de-identified data from 29 members of the University of Colorado’s XC team (12 males, 17 females) were analyzed for this project. The data was part of the regularly scheduled monitoring of these athletes through the CU Sports Medicine program. This program includes blood samples being taken following a rest day, after an overnight fast, at five time points across the year, (August, October, January, April, and August) of the next season. hematological parameters measured included red blood cell count (RBC), hemoglobin concentration (Hb), hematocrit (Hct), mean corpuscular volume (MCV), red cell distribution width (RDW) and serum ferritin. A linear mixed model was used to assess changes over time, significant set at p < .05. For variables that violated the assumptions of the linear mixed model (ferritin), non-parametric analysis was used. **RESULTS:** Males (M) and females (F) had significantly different baseline values for Hct (%) (M: 46.5 ± 8 versus F: 43.0 ± 6) and Hb (gm/dL) (M: 16.3 ± 3 versus F: 14.6 ± 2), although they exhibited the same pattern of change across the season. Overall, Hct increased from baseline at the October time point (+5.4%) before returning to near baseline levels for the remainder of the season. Hb had a similar trend, being higher at the October time point (+2.2%, p = 0.083) before returning to near baseline levels. MCV (Aug-1: 90.4 ± 6, Aug-2: 92.4 ± 6) and RDW (Aug-1: 12.7 ± 1, Aug-2: 12.5 ± 1) were the only two variables whose two August time points were significantly different. Serum ferritin (ng/mL) was stable across all five time points for males (average of all time points: 56.5), whereas females demonstrated significantly lower values in January (49.2), (average of all time points excluding January: 56.9). **CONCLUSION:** These results suggest seasonal hematological changes occur in elite collegiate XC runners. These changes could be the result of adaptations associated with alterations in training, nutrition and/or altitude exposure. Future studies should directly assess the contribution of these parameters to the observed changes and determine the impact of these changes on performance.

Board #7  
May 31 3:15 PM - 5:15 PM  
**Fluid Replacement Knowledge and Sources of Hydration in High School Cross-Country Runners**  
Email: mrauh@mail.sdsu.edu  
(No relationships reported)

Cross-country is a popular interchercsical sport with a growing number of participants annually. As most training and competitions take place during summer and fall, the risk of dehydration may be increased. Unlike other fall high school sports, knowledge about hydration and fluid intake have not been reported in cross-country runners. **PURPOSE:** To assess fluid replacement knowledge and sources of hydration in high school cross-country runners. **METHODS:** Runners were recruited from high school cross-country teams in San Diego. Each runner completed a questionnaire that assessed fluid replacement knowledge and sources of hydration. **RESULTS:** Overall, 148 runners (89 girls, 68 boys) participated in the study. Less than a quarter (23%) of runners correctly identified that thirst is not a timely indicator of when to drink fluids. Most runners correctly indicated that monitoring urine color is an effective way to determine if hydrated (89.9%), dehydration decreases performance in endurance events (92.6%), dehydration increases risk of heat-related illness (95.9%), running in hot or humid conditions affects hydration (96.6%), runners should begin each training session or competitive event well-hydrated (98.6%), fluid replacement during running should prevent dehydration of greater than 2% of body weight (89.9%), and during recovery runners should rehydrate within a 2 hour period after running (93.9%). Girls (96.2%) were more likely to report that monitoring urine color is an effective way to determine hydration level than boys (83.8%) (p=0.02). Runners in the 9th grade (83.7%) were less likely than 10th (88.4%), 11th (100.0%), and 12th (96.9%) graders to report that monitoring urine color is an effective method to determine if dehydrated (p=0.02). **CONCLUSIONS:** High school cross-country runners indicated a high knowledge of fluid intake and sources of hydration. However, improving runners’ knowledge to hydrate regardless of thirst appears warranted. The data suggest that boys and younger runners may need increased education on how urine color indicates safe/unsafe hydration levels.

B-41  
**Thematic Poster - Macronutrient Metabolism in Athletes**  
Wednesday, May 31, 2017, 3:15 PM - 5:15 PM  
Room: 304

Chair: Craig Sale, FACSM. Nottingham Trent University, Nottingham, United Kingdom.  
(No relationships reported)

**Board #1**  
May 31 3:15 PM - 5:15 PM  
**Exercise Mode Combined with Essential Amino Acid and Carbohydrate Supplementation Differentially Regulate Skeletal Muscle microRNA**  
Lee M. Margolis, Holly L. McClung, Nancy E. Murphy, Stefan M. Pasiakos, FACSM. United States Army Research Institute of Environmental Medicine, Natick, MA. (Sponsor: Stefan M Pasiakos, FACSM)  
Email: lee.m.margolis.ctr@mail.mil  
(No relationships reported)

Skeletal muscle microRNAs (myomiR) have been implicated in modulating intracellular regulation of muscle protein synthesis by negative inhibition of the mTORC1 pathway. The acute effects of endurance exercise mode and recovery essential amino acid and carbohydrate (EAA+CHO) nutrition on myomiR expression are not well defined. **PURPOSE:** Determine the effects of endurance exercise mode, with or without EAA+CHO ingestion on myomiR expression. **METHODS:** Twenty five adults (mean ± SD; 22 ± 2 y, 82 ± 11 kg, VO2peak 4.0 ± 0.5 L/min) performed 90 min of metabolically-matched (2.2 ± 0.1 VO2peak L·min−1) load carriage (LC, performed on a treadmill wearing a vest equal to 30% of individual body mass; load carried 24 ± 3 kg) or cycle ergometry (CE) exercise, during which EAA+CHO (10 g EAA and 46 g CHO) or non-nutritive control (CON) drinks were consumed. Expressions of myomiR were determined using RT-qPCR in muscle samples obtained at rest (PRE), immediately post-exercise (POST) and after 3-h recovery (REC). **RESULTS:** Relative to PRE, POST and REC expressions of miR-1-3p, miR-206, miR-208a-5 and miR-499 were lower (P < 0.05) for LC compared to CE, regardless of dietary treatment. Independent of exercise mode, miR-1-3p and miR-208a-5 expression were lower (P < 0.05) after ingesting EAA+CHO compared to CON. Expression of miR-206 was highest for CE+CON than any other treatment (exercise-by-drink, P < 0.05). **CONCLUSIONS:** These data show that myomiR expression is differentially regulated by endurance exercise mode and EAA+CHO nutrition. Weight bearing exercise downregulates myomiR expression, whereas myomiR expression appears to be upregulated after non-weight bearing exercise. Consuming EAA+CHO attenuated the increase in myomiR expression with non-weight bearing exercise, yet the suppression of myomiR expression with feeding was more pronounced when EAA+CHO were consumed during weight bearing exercise. These findings suggest that combining weight bearing exercise with protein and carbohydrate supplementation may facilitate muscle anabolic adaptations to exercise by lowering mTORC1 inhibition.

Board #2  
May 31 3:15 PM - 5:15 PM  
**Fructose and Sucrose Ingestion Increase Exogenous Carbohydrate Oxidation Rates During Exercise in Trained Cyclists**  
Jorn Trommelen1, Cas J. Fuchs1, Milou Beelen1, Kaatje Lenaerts1, Asker E. Jeukendrup, FACSM2, Naomi C. Carmak1, Luc J.C. van Loon1.  
1Maastricht University, Maastricht, Netherlands. 2Loughborough University, Loughborough, United Kingdom.  
(Sponsor: Janice Lee Thompson, FACSM)  
Email: jorn.trommelen@maastrichtuniversity.nl  
(No relationships reported)

Peak exogenous carbohydrate oxidation rates typically reach ~1 g min−1 during exercise when ample glucose or glucose polymers are ingested. Fructose co-ingestion has been shown to further increase exogenous carbohydrate oxidation rates. **PURPOSE:** To determine the impact of fructose co-ingestion provided either as a monosaccharide or as part of the disaccharide sucrose on exogenous carbohydrate oxidation rates during prolonged exercise in trained cyclists. **METHODS:** Ten trained male cyclists (VO2peak: 65±2 mL·kg BM·min−1) cycled on 4 different occasions for 180 min at 50% Wmax and consumed a carbohydrate solution providing 1.8 g min−1 of glucose (GLU), 1.2 g min−1 of sucrose (GLU+SUC), or water (WAT). Breath samples were collected to determine the 14C/12C ratio in expired air and combined with indirect calorimetry (VO2 and VCO2) to calculate oxidation rates of total fat, total carbohydrate, and exogenous carbohydrates. Repeated measures ANOVA with treatment as within-subject factor was used to determine differences in exogenous carbohydrate oxidation rates between treatments.

Abstracts were prepared by the authors and printed as submitted.
RESULTS: Peak exogenous carbohydrate oxidation rates did not differ between GLU+FRU and GLU+SUC (1.40±0.06 vs 1.29±0.07 g·min⁻¹, respectively, P<0.05). But were 46±8% higher when compared to GLU (0.96±0.06 g·min⁻¹; P<0.05). In line, exogenous carbohydrate oxidation rates during the latter 120 min of exercise were 46±8% higher in GLU+FRU or GLU+SUC compared with GLU (1.19±0.12, 1.13±0.21, and 0.82±0.16 g·min⁻¹, respectively, P<0.05).

CONCLUSION: Fructose co-ingestion (0.6 g·min⁻¹) with glucose (1.2 g·min⁻¹) provided either as monosaccharide or as sucrose strongly increases exogenous carbohydrate oxidation rates during prolonged exercise in trained cyclists.

Funding: Knowledge Centre Sugar and Nutrition, Utrecht, the Netherlands and Sugar Nutrition UK, London, United Kingdom.

---

743 Board #5 May 31 3:15 PM - 5:15 PM
Glucose Regulation Following A Short And Long Bout Of High-Intensity Functional Training
Brian K. Keesbez, Bruce Buresh, Emily Beckhe, Cassie Williamson, Paul Bailey, Yuri Feito, FACSMM, Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSMM)

Glucose regulation is a fundamental process of metabolic function, and is acutely altered by physical activity. Importantly, exercise intensity and duration have been shown to affect glucose regulation differently. High-Intensity Functional Training (HIFT) is a form of exercise performed using combinations of various modalities and durations. Though HIFT is of a high-intensity nature, it is unknown if different durations of HIFT will influence glucose regulation differently.

PURPOSE: To determine the effect of a Short (<5 min) and Long (15 min) bout of HIFT on plasma glucose and insulin concentrations.

METHODS: Ten apparently healthy males (28.1±5.09 yrs) participated in this study. Two HIFT sessions (SHORT and LONG) were performed in a crossover fashion. The SHORT bout consisted of 30 power clean-and- jerk lifts (61 kg) for time, while the LONG bout was a 15 min circuit of 250 m row, 20 kettle bell swings (24 kg), and 15 dumbbell (16 kg) squat presses performed for 15 min. Blood plasma was collected at four different times points: PRE, POST, 1HR, and 3HR in order to examine glucose (GLU) and insulin (INS) responses.

RESULTS: A repeated measures ANOVA showed no trial dependent difference between the SHORT and LONG bouts of HIFT in GLU (p = 0.109) or INS (p = 0.504). A time effect was observed in both bouts only at the POST time point for both GLU: Short: 83.9 ± 16 mg/dL vs. 110.3 ± 18 mg/dL (p = 0.001), Long: 84.5 ± 11 mg/dL vs. 124.6 ± 19 mg/dL; INS: Short: 7.9 ± 4 mUI/L vs. 16.1 ± 7 mUI/L, Long: 9.1 ± 7.8 mUI/L vs. 13.7 ± 7.3 mUI/L (p < 0.05).

CONCLUSIONS: This study demonstrated that the SHORT and LONG bouts of HIFT elicited similar glucose and insulin responses. Duration of the HIFT bouts may not be a determining factor in glucose regulation in healthy individuals. Further research is necessary to better understand the relationship of varying durations of HIFT on glucose regulation.

---

744 Board #6 May 31 3:15 PM - 5:15 PM
Metabolic Effects of Acute Blood Flow Restricted Exercise: Glucose & Insulin
Larry A. Osborne1, Lucas Harrison1, Ge Chen1, Samuel Pitcairn1, Michael Kushnick1, Norio Hotta2. 1Ohio University, Athens, OH. 2Chubu University, Kasugai, Japan.

Blood flow restricted exercise (BFRE) has gained a lot of attention as of late due to its ability to increase muscle mass and strength during low intensity exercise. BFRE results in ischemia, which has been shown to cause a shift to a greater reliance on glucose for metabolism. Although the metabolic effect of traditional exercise has been well studied, there is a lack of research on the metabolic effects of BFRE.

PURPOSE: Investigate the glucose and insulin response to a single bout of blood flow restricted exercise 12, 36, and 48 hours after completion.

METHODS: 8 healthy men (22±2 yrs), of above average VO2 max (49±13.4 ml/kg/min), and average body fat percentage (17.4±2.3) performed two separate trials of treadmill walking (CON) & BFRE. BFRE was defined as 50-55% of their predicted VO2 max until 200 keal were expended. For the BFRE trial, pressure cuffs were applied to the most proximal portion of the thigh and inflated to 200 mmHg. Subjects walked in 10-minute increments, interspersed with 2 minutes of passive recovery where the pressure cuffs were deflated. Blood samples were taken at baseline, immediately after exercise, 12, 36 hours, and 48 hours post exercise bout. All values were reported in standard deviation.

RESULTS: No significant difference was found in the glycemic response post exercise between BFRE and CON (95.9±2.8, 99.9±14.1, 102.6±14.8, 104.6±8.2, and 96.8±8.4) vs (97.0±3.9, 93.8±1.6, 96.2±6.5, 99.9±14.1, 102.6±14.8, 104.6±8.2, and 96.8±8.4).

Conclusions: Blood flow restricted exercise (BFRE) has gained a lot of attention as of late due to its ability to increase muscle mass and strength during low intensity exercise. BFRE results in ischemia, which has been shown to cause a shift to a greater reliance on glucose for metabolism. Although the metabolic effect of traditional exercise has been well studied, there is a lack of research on the metabolic effects of BFRE.
POSSIBLE: This study examined physiological and performance effects of a 3-week high fat, low carbohydrate diet (HFLC) in trained runners.

METHODS: Middle-aged, recreationally competitive (VO₂max > 48 ml/kg/min) male runners (n = 8; 39.5 ± 9.9 y) completed 5 sets of 10 min runs separated by 2 min of rest in a controlled, hot environment (29 °C and 60 % relative humidity). The first 7 min of each stage were run at a sub-maximal pace with the last 3 min of each stage matching the runner’s goal pace for 5-km, 10-km, half-marathon, marathon, and sub-marathon race pace (1%). Indirect calorimetry variables were collected during each race distance pace. Runners rested for 20 min before a challenging outdoor 5-km time trial (STT). Runners followed their habitual high carbohydrate (HC) for the first phase of the study followed by 3 weeks of HFLC (>70% kcais from fat; < 50 g/day carbohydrates).

RESULTS: Pre- and post-exercise ketones increased by ~0.5 mmol for HFLC. Sum of 7-site skinfold thickness and body mass decreased (p < 0.01) by ~13 mm and 2.5 kg for HFLC respectively. Mean RER was lower (p < 0.01) by 0.08-0.10 at all paces for HFLC. Mean fat oxidation was predicted to be non-existent at 5-km pace and <0.3 g/min at all other paces for HC, while ranging from 0.32-0.81 g/min for HFLC. Absolute VO₂ was higher for HFLC or neared statistical significance at all paces slower than 5-km. Rectal temperature was higher in HFLC after the first 10 min bout, but did not differ at any other time point. Total sweat losses and heat rate for each pace did not differ between treatments. Five runners completed their STT faster after HFLC, 1 runner completed the same, and 4 runners completed their STT slower after HFLC.

CONCLUSIONS: Transitioning to a HFLC resulted in positive fat oxidation adaptations and may even improve lactate exercise, high intensity endurance performance for well-trained but recreational runners. Anecdotally, non-responders to HFLC may be identified by lack of cessation in training impairment that is almost always experienced in the first 2 weeks during transition to HFLC. In contrast to the runners with improved times, continued difficulties noted in training logs were only noted in runners with lack of STT improvement.

B-42  Thematic Poster - Muscle Activation during Sport and Exercise

Wednesday, May 31, 2017, 3:15 PM - 5:15 PM
Room: 101

Chair: Ajit Chaudhari, FACSM. The Ohio State University, Columbus, OH.

746

May 31 3:15 PM - 5:15 PM
Board #7

Body Composition, Substrate Utilization, Thermoregulation, And Performance In Male Runners After 3-week High Fat Diet

Alexander J. Heatherly. University of North Alabama, Florence, AL.

Email: aheatherly@una.edu

(No relationships reported)

PURPOSE: To examine the relationship between transverse plane hip passive ROM and hip muscle activation during a landing task. METHODS: Twenty female Division 1 soccer players (19.2 ± 0.9yrs, 167.2 ± 5.7 cm, 65.9 ± 6.6 kg) volunteered to participate. Passive hip internal (HIR) and external (HER) ROM of the left limb was measured with participants prone and the knee flexed to 90 degrees using a digital inclinometer by a single examiner (ICC = 0.87). The average of three HIR and HER ROM measures was used for analysis. Surface electromyography (sEMG) was used to assess activation of the gluteus medius (GMED) and gluteus maximus (GMAX) during 3 trials of a drop vertical jump (DVJ) task from a 31 cm high box. The average root mean square amplitude (RMS) of the sEMG signal of the GMED and GMAX 150ms following initial contact across three DVJ trials was normalized to the peak RMS amplitude across three maximal voluntary isometric contractions (%MVIC). Pearson’s Product Moment Correlations were calculated to determine the relationship between passive hip ROM and muscle activation during the DVJ (p = 0.05). RESULTS: Greater HIR ROM (39.9 ± 11.1 degrees) was correlated with less GMAX activation during the DVJ task (RMS-0.61 ± 0.40%MVIC, R = -0.53, P = 0.02). HIR ROM was not correlated with GMED activation during the DVJ task (RMS-0.24 ± 0.12%MVIC, R = -0.38, P = 0.10). HER ROM (30.6 ± 8.1 degrees) was not correlated to GMED (R=0.10, P = 0.69) or GMAX activation (R = 0.21, P=0.37) during the DVJ task. CONCLUSIONS: Greater HIR ROM potentially influences the length-tension relationship of the GMAX, decreasing its ability to effectively activate during dynamic activities and increasing the risk of knee injuries. Ongoing work is needed to examine whether the effects of HIR ROM on muscle activation contribute to landing biomechanics known to increase risk of knee injuries.

747

May 31 3:15 PM - 5:15 PM
Board #2

Shoe Cushioning Reduces Impact And Muscle Activation During Landings From Unexpected, But Not Self-initiated, Drops

Weijie Fu, Xi Wang, Yang Yang, Yu Liu. Shanghai University of Sport, Shanghai, China.

Email: fuweijie315@163.com

(No relationships reported)

The drop jump, regarded as “an active landing from a self-initiated drop” (self-initiated drop landing, SDL), is an effective training modality to develop explosive strength. Contrarily, “a landing from an unexpected drop” (unexpected drop landing, UDL), which is mostly unanticipated, has been proposed to generate potentially hazardous alterations to impact absorption. To date, few rigorous scientific studies have been conducted to understand the impact mechanics and muscle activation characteristics of these two landing tasks and the role of shoe properties.

PURPOSE: To investigate the shoe effects on impact biomechanics and muscular responses during drop landings.

METHODS: Twelve male collegiate basketball players performed bipedal landings from self-initiated and unexpected drops (SIDL and UDL) from a 60-cm height wearing highly-cushioned basketball shoes (Bball) and minimally cushioned control shoes (CC). Sagittal plane kinematics, ground reaction forces (GRFs), accelerations of the shoe heel-cup, and electromyography (EMG) of the tibialis anterior (TA), lateral gastrocnemius, rectus femoris (RF), vastus lateralis (VL), and biceps femoris (BF) were collected simultaneously.

RESULTS: In SIDL, no significant differences were observed in peak vertical GRF, peak height acceleration, or normalized EMG amplitude (root mean square, EMGroot) for all muscles during either the pre- or post-activation phase between the two shoe conditions. In UDL, however, both peak vertical GRF (4.1±0.7 vs. 4.7±0.8 BW, p < 0.05) and heel acceleration (29.7±7 vs. 36.8±9 g, p < 0.05) were lower in Bball compared to CC. Furthermore, the EMGTA of TA (17.6±6 vs. 24.8±5%, p < 0.05), RF (21.3±3 vs. 28.7±7%, p < 0.05), VL (28.5±5 vs. 35.4±7%, p < 0.05), and BF (9.4±4 vs. 14.5±5%, p < 0.05) muscles showed a decrease in Bball compared to CC within the 50 ms after contact. CONCLUSION: These observations suggest that shoe cushioning may make only a limited contribution to reducing landing impact forces provided that neuromuscular adjustments occur properly during landings from self-initiated drops. However, in the situation when relevant muscles are not activated on purpose, as in landings from unexpected drops, wearing a highly-cushioned shoe decreases peak impact and muscle post-activation.

Supported by NSFC grant (81302131).

Passive hip range of motion (ROM) is theorized to influence activation of the hip musculature during dynamic activity. A decrease in the activation of the hip musculature may lead to landing biomechanics that increase the risk of knee injuries.

Understanding the relationship between passive hip ROM and hip muscle activation during landing is needed to identify individuals at risk for knee injuries. PURPOSE: To examine the relationship between transverse plane hip passive ROM and hip muscle activation during a landing task. METHODS: Twenty female Division 1 soccer players (19.2±0.9yrs, 167.2±5.7 cm, 65.9±6.6 kg) volunteered to participate. Passive hip internal (HIR) and external (HER) ROM of the left limb was measured with participants prone and the knee flexed to 90 degrees using a digital inclinometer by a single examiner (ICC = 0.87). The average of three HIR and HER ROM measures was used for analysis. Surface electromyography (sEMG) was used to assess activation of the gluteus medius (GMED) and gluteus maximus (GMAX) during 3 trials of a drop vertical jump (DVJ) task from a 31 cm high box. The average root mean square amplitude (RMS) of the sEMG signal of the GMED and GMAX 150ms following initial contact across three DVJ trials was normalized to the peak RMS amplitude across three maximal voluntary isometric contractions (%MVIC). Pearson’s Product Moment Correlations were calculated to determine the relationship between passive hip ROM and muscle activation during the DVJ (p = 0.05). RESULTS: Greater HIR ROM (39.9±11.1 degrees) was correlated with less GMAX activation during the DVJ task (RMS-0.61±0.40%MVIC, R = -0.53, P = 0.02). HIR ROM was not correlated with GMED activation during the DVJ task (RMS-0.24±0.12%MVIC, R = -0.38, P = 0.10). HER ROM (30.6±8.1 degrees) was not correlated to GMED (R=0.10, P = 0.69) or GMAX activation (R = 0.21, P=0.37) during the DVJ task. CONCLUSIONS: Greater HIR ROM potentially influences the length-tension relationship of the GMAX, decreasing its ability to effectively activate during dynamic activities and increasing the risk of knee injuries. Ongoing work is needed to examine whether the effects of HIR ROM on muscle activation contribute to landing biomechanics known to increase risk of knee injuries.
Muscular activation and recruitment patterns of the hamstrings and quadriceps may play an important role in knee joint stabilization with unanticipated reactions during sport.

**Purpose:** To examine lower limb muscle activation during a lateral lunge jump reaction task.

**Methods:** Female soccer players participated in the study (n=10, age: 15:1±1yrs, height: 162.3±4.6cm, mass: 54.5±4.5kg). While wearing standardized cleats, each participant was instrumented with reflective markers for motion analysis. Surface EMG sensors were placed on the semimembranosus (MH), biceps femoris (LH), vastus lateralis (LQ), and vastus medialis (MQ). While standing in a ready position (feet shoulder width apart, knees slightly bent) on force platforms covered with artificial turf, a visual cue of an arrow pointing either left or right was projected on a screen in front of the participant, at which time they were to lunge jump laterally in the correct direction as quick and far as possible. Right directed lunge trials were analyzed. Muscle onset time was defined as greater than 5SD above the resting threshold prior to the visual cue. Peak root mean square EMG amplitudes of the left leg were calculated and normalized to maximum amplitude (%) during a cutting task. Reaction time (Rt) was defined as the difference between the visual cue popup and left toe off from the force platform. Paired t-tests (p<0.05) were used to determine differences in muscle onset time and amplitude during the task. Stepwise linear regression was utilized to determine significant predictor variables for Rt.

**Results:** Rt from visual cue to toe off was 0.99±0.10s. There was a significant difference (p<0.039) between LH (0.40±0.12s) and LQ (0.47±0.11s) onset times with no significant difference (p>0.2) between LH (0.42±0.09s) and MQ (0.48±0.10s) onset times. Differences were not found between peak EMG amplitude (LH: 67.6±24.9%, LQ: 80.8±8.2%, p=0.06), MH: 66.3±21.4%, MQ: 79.2±14.9%, p=0.18). Stepwise linear regression indicated that the single predictor variable of Rt was LQ onset time (R²=0.616, F(1,8)=12.81, p=0.007).

**Conclusion:** Earlier hamstrings activation may provide increased co-activation during an unanticipated reaction requiring a rapid lunge jump. However, quicker quadriceps activation is strongly correlated with improved reaction time performance.

**Resistance training (RT) is a form of physical activity that is designed to improve muscular fitness. Considering the need to adequately prescribe RT, a better understanding about the effects of mono and multi-joint exercises is required, mainly using electromyographic (EMG) findings.**

**Purpose:** To compare EMG activation of quadriceps in single and multi-joint exercises. Considering the need to adequately prescribe RT, a better understanding about the effects of mono and multi-joint exercises is required, mainly using electromyographic (EMG) findings.

**Methods:** Ten healthy male (25.3 ± 3.7) and with no previous experience with RT were recruited. This study was conducted as a cross-over design; i.e., the subjects were randomly assigned either to mono-joint (n = 5; seated knee extension) or multi-joint (n = 5; seated leg press) exercise. Surface electromyography was used to measure muscle activation of the vastus lateralis (VL), vastus medialis (VM) and rectus femoris (RF) using Root Mean Square (RMS) signal normalized by peak during dynamic contraction. A 12-RM test was used in order to promote some standardized load for both experimental situations. For statistical analysis a two-way ANOVA was performed (muscle and treatment effects).

**Results:** RF showed a lower (p<0.05) EMG activation than VL and VM in multi-joint exercise (26.8 ± 7.48% versus 33.43 ± 5.49% and 33.27 ± 4.96, respectively). In another way, RF showed a higher (p<0.05) EMG activation than VL and VM in mono-joint exercise (41.17 ± 5.08% versus 37.87 ± 4.94% and 37.12 ± 3.79%). Mono-joint exercise increased ~34% the EMG activation of RF than multi-joint exercise. There are no significant differences between the vasti (p>0.05).

**Conclusion:** A mono-joint and open kinetic chain exercise promoted higher RF-EMG activation and not altered vastus-EMG activation when compared with a multi-joint and closed kinetic chain exercise. These findings suggest that EMG pattern may be muscle-dependent even within the same muscle group as the quadriceps.
Adequacy of activation during rapid voluntary contractions is limited in young and old adults and can be shown by comparing the voluntary rate of force development (RFD) and electrically evoked RFD. Nonetheless, it is unknown whether the activation of rapid voluntary contractions differs between young men and women.

**PURPOSE:** The purpose of this study was to compare the maximal RFD of young men and women during electrically evoked isometric contractions and rapid voluntary contractions with the knee extensor muscles across a range of torques.

**METHODS:** Eight young adults (18-26 years; 4 men, 4 women) consented to sets of single and double pulse (10 ms interval) stimulations of the femoral nerve at maximal intensities followed by rapid voluntary isometric knee extensions at target torques matched to the electrically evoked torques. For the rapid voluntary isometric contractions, subjects were instructed to kick as fast as possible rather than as accurately as possible. Voluntary target torques ranged between 10-40% of maximal voluntary contraction (MVC) and were set to match the electrically evoked torques. Maximal RFD for each trial (voluntary and electrically evoked) was calculated as the peak values of the first derivative of the torque signal.

**RESULTS:** (i) 28% less VL activation at 83-100% of stance. No changes were detected in GM activation at 0-20% of stance, (ii) 31% more MH activation at 43-100% of stance, (iii) 14% less GX activation at 83-100% of stance. No changes were detected in GM activation at 0-20% of stance.**

**CONCLUSIONS:** Young men and women had marked reductions in the ability to voluntarily generate isometric knee extension torque rapidly compared with electrically evoked contractions that were independent of the central nervous system.

Supported by NIA R01 AG048262 to SKH

---

**Board #8**

**Proximal Joint Muscle Activation During Cutting in Chronic Ankle Instability Patients Following a Rehabilitation Intervention**

Cody J. Perry, S. Jun Son, Hyunsoo Kim, Brian Wiseman, Dustin Breuning, Matte K. Seeley, J. Ty Hopkins, FACSIM. Brigham Young University, Provo, UT. *West Chester University, West Chester, PA. (Sponsor: J. Ty Hopkins, FACSIM)

**Email:** codyjperry6@gmail.com

**No relationships reported**

Sensorimotor deficits due to ankle sprains often result in altered lower extremity muscle activation during cutting. Interventions focusing on the ankle and hip could enhance muscle activation and subsequent sensorimotor function in patients with chronic ankle instability (CAI).

**PURPOSE:** To examine the effect of a 6-week ankle and hip intervention program on vastus lateralis (VL), medial hamstrings (MH), glutus medius (GM), and glutus maximus (GX) activation during cutting and patients with CAI.

**METHODS:** 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 56±10% FAAM Sports, 3±1.1 MAII, 4±1.2 ankle sprains) completed a series of 10 ankle and hip strength and proprioceptive exercises (thera-band, wobble board, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3±1.1 MAII, 5±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (a=0.05) were used to detect a group x treatment interaction over time. If 95% CI did not cross the zero, significant differences existed.

**RESULTS:** Figure 1. The rehab intervention resulted in up to (i) 28% less VL activation at 0-20% of stance, (ii) 31% more MH activation at 43-100% of stance, (iii) 14% less GX activation at 83-100% of stance. No changes were detected in GM activation over time.

**CONCLUSIONS:** Relative to the control group, reduced proximal joint muscle activation in CAI patients in the rehab group may be due to altered knee and hip positions. A less flexed position of the knee and hip often leads to less knee and hip extensor moments, which potentially could result in reduced VL and GX muscle activation.

---

Abstracts were prepared by the authors and printed as submitted.

**Walking and running are widely used modes of exercise to improve fitness and promote weight loss. The energy expended during walking or running can be measured in a lab or estimated based on speed, grade, and body weight. However, these assessments are not easily completed by the general population, so a crude estimate of energy expenditure (EE) of 100 kcal/mile is commonly used. Although the equations for estimating EE at a given walking or running speed have been validated, the accuracy of the 100 kcal/mile value has not been evaluated.**

**PURPOSE:** The purpose of this study was to determine the accuracy of the 100 kcal/mile estimate across a wide range of walking and running speeds.

**METHODS:** A sample of 21 subjects (age 23.6±8.8 y) walked or ran one mile at a self-selected speed on a motorized treadmill while VO2 was measured. The EE was calculated from VO2 self-selected speed on a motorized treadmill while VO2 was measured. The EE was calculated from VO2 during running was significantly higher than during walking, neither was significantly different from the 100 kcal/mile estimate. This suggests that this value may be useful for estimating EE for weight or weight loss purposes in a general population.
Reduced body mass and/or relative fat mass is expected to improve endurance running performance, by lowering energy cost of running and allowing the runner to maintain higher mean race velocity using identical %VO2max. The majority of studies during the last 40 years have been centered mainly on the effect of adding external loads and on energy cost of walking and running. PURPOSE: The purpose of this study was to examine the effect 5% and 10% reduction of inactive body mass on metabolic responses and 3km running performance. METHODS: Eleven trained (8 male, 3 female) club level runners (mean ± sd body mass, height, %fat, peakVO2 and 3km running performance). The subjects completed a series of 4 maximal trials 4-6 days apart. During the first trial, the subjects completed an exhaustive incremental peakVO2 test on the treadmill. On the second visit they completed a 3 km race time trial on the treadmill running with normal body mass (BM). During the last two laboratory visits, the subjects completed two 3km race trials in random order on the treadmill while body mass (a rope through a system of pulleys lifted the runner with the calculated body weight throughout striding phases while not interfering with running technique) was reduced 5% (5%BM) or 10% (10%BM). Repeated Anova was used for the statistical analysis. RESULTS: Mean (±sd) 3km race performance time was lower (improved) during 5%BM (663.5 ± 76.05) and 10%BM (648.9 ± 74.9 s) trials (p<0.05) compared with BM (684.9 ± 74.8 s). The 5% and 10% reduction in body mass induced a mean 3.1% and 5.2% improvement in 3km race performance accordingly. Every kg reduction of inactive body mass improved 1.4% running endurance performance. Mean values of the Rate of perceived exertion, heart rate, VO2, ml/kg/min, (RO), Blood lactate and Volume of expired air were not different between time trials and peak VO2max test (p<0.05). CONCLUSIONS: The results of the present study showed that the reduction of 5% and 10% of inactive body mass may improve significantly 3%mpm performance time without noticeable effects on metabolic parameters and are supportive of the notion that one way to maximize further running performance is to reduce inactive body mass.

**CONCLUSIONS:** The results of this study showed that the reduction of 5% and 10% of inactive body mass may improve significantly 3%mpm performance time without noticeable effects on metabolic parameters and are supportive of the notion that one way to maximize further running performance is to reduce inactive body mass.
Running shoe features (low mass, cushioning, midsole bending stiffness) have been shown to individually reduce the energetic cost of running. Recently, energetic cost has been directly linked to time-trial performance.

**PURPOSE:** To quantify the energetic cost of running in three marathon racing shoes: a prototype and two shoes currently available to runners. **METHODS:** 18 sub-elite runners (sub-3:11min10km at altitude or equivalent; altitude VO2max: 72.1±3.4 ml O2/kg/min) ran six 5 min trials (3 shoes × 2 replicates) in: a prototype shoe (NP), and two established marathon shoes (NS6 and AB2) (all equilibrated to 250g/shoe (the mass of AB2, size 10) during three separate sessions - 14, 16 and 18 km/hr. The order of the shoe conditions within a session and the session speed order were pseudo-randomized, mirrored and counterbalanced. The NP shoe has a novel, lightweight and highly resilient midsole and a carbon fiber plate that stiffens the shoe in longitudinal bending. We measured submaximal VO2 and VCO2 in a crossover manner. OVR sessions were performed around an indoor 144 m oval ground, Motorized Treadmill (MOT) (16 ± 2%; ES 1.50 ± 0.15). Similarly, there was a trivial difference in the average %V̇O2 and only 6 of 14 runners could maintain the penultimate speed on the NMT. There were no significant differences between shoes (NS6 vs. AB2: P=0.34) and during the last trial of each session and RER indicated running energetics were at steady-state (+3.00ml./L and -0.91, respectively). We compared the 3 shoes over 3 speeds using a two-way ANOVA with repeated measures. **RESULTS:** A significant main effect for shoe (P<0.0001) indicated the NP shoes required 4.0±1.3% (mean±SD) less energy than the NS6 and AB2 shoes (NP vs. NS6: P<0.0001; NP vs. AB2: P<0.0001), which had similar metabolic costs (NP: 16.45±0.89; NS6: 17.14±0.92 and AB2: 17.14±0.97 W/kg averaged across 3 speeds. Although the shoe × speed interaction effect was significant (P<0.0005), post-hoc analyses suggest that relative percent differences between shoes were similar at the 3 running speeds (all P>0.56).

**CONCLUSIONS:** The new shoe reduces the cost of running by 4.0% as compared to two other established marathon racing shoes. This study was supported by Nike Inc. EF and GL are employees of Nike Inc., RK is a paid consultant to Nike Inc.
researchers were blinded to treatment. Maximum ear swelling occurred at 24 hours post injection. Results were expressed as the difference between the right and left ear thickness.

RESULTS: We found a significant time main effect (p=0.001) indicating a significant increase in anti-OVA IgG at one, two and four weeks relative to pre-immunization. However, there were no significant time x treatment (p=0.652) nor treatment main effects (p=0.764). There was a significant difference between ECC and SED groups in ear DTH at 24h post injection (p=0.028), indicating eccentric exercise increased the DTH response.

CONCLUSION: Acute eccentric exercise immediately before vaccination improved the DTH (i.e. cell-mediated immune), but not the antibody, response to vaccination in aged mice.

766 May 31 3:30 PM - 3:45 PM
Voluntary Wheel Running and Response to Vaccinia Virus Infection and Inoculation in Mice
Brandt D. Pence1, Melissa R. Ryerson2, Ariana G. Bravo-Cruz2, Jeffrey A. Woods, FACSM3, JoAnna L. Shisler3,1. University of Memphis, Memphis, TN. 1University of Illinois Urbana-Champaign, Urbana, IL.

Email: bd Pence@memphis.edu

(No relationships reported)

PURPOSE: Exercise has been shown to improve immune responses to viral infections and vaccines in several mouse models. However, previous pathogen studies have primarily used infections limited to the respiratory tract. Additionally, previous studies have utilized forced treadmill exercise paradigms, and voluntary wheel running (VWR) has been shown to have differential effects on the immune system in non-infection models. We examined whether VWR could improve morbidity and mortality to a 50% lethal dose of vaccinia virus (VACV), a systemic pathogen commonly used to examine immune responses. Additionally, we examined whether VWR could improve antibody response to a replication-deficient strain of VACV, mimicking a vaccination.

METHODS: Male C57Bl/6J mice underwent 8 weeks of VWR or remained sedentary, then were infected intranasally with 10^6 PFU VACV strain CVM. Mice were followed 14 days for mortality, and body weights and food intakes were recorded daily. In a similar manner, mice in the vaccination study run or were sedentary for 8 weeks, then were given 10^6 PFU of replication-deficient VACV strain MVA intraperitoneally. Blood was collected under anesthesia from the retro-orbital sinus prior to vaccination (VACV), and sera were collected and frozen prior to the beginning of the VWR intervention.

RESULTS: There was no difference between boys and girls in age (9.1±0.6 and 9.3±0.5 yr) or BMI percentile (94±1 and 97±1%) before the intervention. After the intervention group (significant main effect of sex, p < 0.05, table 1). There was no correlation between changes in body weight and inflammatory markers.

CONCLUSION: There was a decrease in inflammatory markers over 16 weeks in girls, but not in boys, that is not due to exercise training. These data indicate previous findings that exercise training, in the absence of weight loss, do not affect inflammatory markers may be sex (and perhaps age) specific.

Table 1. Inflammatory markers and changes in body weight in boys and girls before and after the intervention.

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EX</td>
<td>CON</td>
</tr>
<tr>
<td>Baseline MCP-1 ( pg/ul.)</td>
<td>256±17</td>
<td>258±26</td>
</tr>
<tr>
<td>Baseline IL-6 (pg/mL)</td>
<td>0.9±0.6</td>
<td>0.7±1.0</td>
</tr>
<tr>
<td>Baseline TNF-alpha (pg/ul.)</td>
<td>4.4±0.3</td>
<td>3.4±0.5</td>
</tr>
<tr>
<td>Percent change MCP-1 (%) #</td>
<td>121±5</td>
<td>75±8</td>
</tr>
<tr>
<td>Percent change IL-6 (%) #</td>
<td>52±23</td>
<td>55±35</td>
</tr>
<tr>
<td>Percent change TNF-alpha (%) #</td>
<td>0.5±8</td>
<td>8±7</td>
</tr>
<tr>
<td>Change in weight (kg) *</td>
<td>2.3±0.5</td>
<td>0.4±0.8</td>
</tr>
</tbody>
</table>

* Significant sex by group interaction
# Significant main effect of sex

Supported by NIH RO1DK071081

Recent evidence implicates chemokine (C-C motif) ligand 5 (CCL5, also known as RANTES) and its receptor CCR5 in mediating T cell infiltration into adipose and other tissues, which contributes to chronic low-grade inflammation in obesity and type 2 diabetes (T2D). Exercise may relieve obesity-related inflammation but the effects of interval training on T-cell migration and tissue infiltration in T2D are unknown.

PURPOSE: To examine the impact of interval walking training (IWT) versus continuous walking training (CWT) on circulating RANTES along with T cell adipose tissue CCR5 in patients with T2D.

METHODS: Participants with T2D were randomized to control (n=4), IWT (n=12) or CWT (n=12). Training groups were prescribed five 60-minute sessions per week of free-living training with intensity monitored with a calories and heart rate monitor. Fasting blood samples and subcutaneous abdominal adipose tissue biopsies were obtained before and 6 days after completion of the 16-week intervention period. Plasma RANTES was measured by ELISA. Peripheral blood mononuclear cells (PBMCs) were isolated for subsequent measurement of CD8+ T cell CCR5 mRNA expression using flow cytometry. mRNA expression of RANTES, CCR5 and CD8 were measured in subcutaneous adipose tissue biopsy samples by qPCR.

RESULTS: Training duration and mean intensity were well-matched between IWT and CWT. A significant group X time interaction (p<0.05) was detected for CD8+ T cell CCR5 surface protein expression, with post-hoc tests revealing a reduction of ~20% after IWT (p<0.05) with no changes seen in CWT or control. Plasma RANTES concentration and adipose tissue mRNA expression of RANTES, CCR5 and CD8 were not altered in IWT, CWT, or control groups following the intervention period (all p>0.05).

CONCLUSIONS: Sixteen weeks of IWT, previously shown to benefit physical fitness, insulin sensitivity, body composition, and glycemic control in patients with T2D, resulted in lower CD8+ T cell CCR5 protein expression. These findings suggest lower migratory potential for circulating T cells but future research is needed to determine if IWT influences infiltration of T cells into adipose and other tissues. JPL is funded by a CHIR New Investigator Award (M18-141890)

767 May 31 4:00 PM - 4:15 PM
Interval Walking Training Reduces T Cell CCR5 in Individuals with Type 2 Diabetes
Jonathan P. Little, FACSM1, Janiule Barr1, Soren Nielsen2, Louise Justesen2, Thomas Solomon3, Kristian Karstoft2.
1University of British Columbia Okanagan, Kelowna, BC, Canada. 2University of Copenhagen, Copenhagen, Denmark. 3University of Birmingham, Birmingham, United Kingdom.

Email: jonathan.little@ubc.ca

(No relationships reported)

768 May 31 4:45 PM - 5:00 PM
Voluntary Wheel Running and Response to Vaccinia Virus Infection and Inoculation in Mice
Brandt D. Pence1, Melissa R. Ryerson2, Ariana G. Bravo-Cruz2, Jeffrey A. Woods, FACSM3, JoAnna L. Shisler3,1. University of Memphis, Memphis, TN. 1University of Illinois Urbana-Champaign, Urbana, IL.

Email: bd Pence@memphis.edu

(No relationships reported)

PURPOSE: The aim of the present study was to examine the effect of exercise training on inflammatory markers in overweight and obese pre-pubertal boys and girls.

METHODS: Forty-six overweight and obese children (age range 9-11 yr old, mean Tanner stage 1.2) volunteered for the study and were randomized to no-exercise control (CON, 6 boys and 7 girls) and exercise training (EX, 14 boys and 19 girls) groups for 16 weeks. Serum monocyte chemoattractant protein-1 (MCP-1), interleukin 6 (IL-6) and tumor necrosis factor (TNF-alpha) were measured as markers of inflammation before and after the intervention.

RESULTS: There was no difference between boys and girls in age (9.1±0.6 and 9.3±0.5 yr) or BMI percentile (94±1 and 97±1%) before the intervention. After the intervention, a significant increase in fitness (time to exhaustion for incremental treadmill test, p < 0.05) was observed in the EX (81±13 sec) but not in CON (12±22 sec). There was no effect of exercise training on MCP-1, IL-6 or TNF-alpha; however,
Acute dynamic exercise enhances Natural Killer (NK) cell cytotoxicity against HLA-expressing tumor target cells. This enhanced killing capacity of NK cells occurs during recovery from exercise. A preferential repopulation of NK cells with an activated phenotype has been proposed as one mechanism to explain increased function. However, NK cells frequently co-express activating and inhibitory molecules, complicating interpretation of earlier results that have failed to fully characterize the mobilized cells. PURPOSE: To thoroughly investigate changes in NK cell phenotype due to acute dynamic exercise. METHODS: 12 physically active adults accustomed to cycling exercise cycled for 30 minutes at 115% of lactate threshold power. Blood collected pre-, post-, and 1h post-exercise was analyzed using 10 parameter flow cytometry to identify NK cell subsets present at each time point. NK cytotoxicity against the HLA-expressing U266 tumor cell line was assessed following a 4h incubation using a flow-based assay. Differences in NK cell cytotoxicity and NK cell subset proportions between the three time points were assessed using maximum likelihood linear mixed models. RESULTS: Similar to earlier reports, NK cell cytotoxicity per cell against U266 tumor cells was highest 1h post exercise (0.36 ± 0.08 1H Post vs 0.26 ± 0.05 Pre). The proportion of NK cells expressing the activating receptor NKG2C was increased 1h post exercise (5.1 ± 1.6 vs 4.3 ± 1.6; p < 0.05), as were cells co-expressing NKG2A (2.0 ± 0.5 vs 1.5 ± 0.5; p<0.05). The co-expression of CD158a or CD158b (inhibitory KIRs) by the NKG2C+ NK cells did not differ from pre-exercise at 1h post exercise (p>0.05). Finally, NK cells expressing the late differentiation marker CD57 were at their lowest proportion 1h post exercise (31.6 ± 6.7 vs 37.2 ± 6.7%; p<0.05). CONCLUSIONS: Enhanced NK cell cytotoxicity against HLA-expressing tumor target cells 1h following exercise corresponded to changes in NK cell phenotype towards expression of activating receptors (NKG2C), and away from inhibitory receptors (CD158a, CD158b) and markers of late differentiation. These data lend support to the growing idea that acute exercise may be used clinically to enrich the blood of cytotoxic NK cells for immunotherapy.

Monocytes express the CD14 receptor involved in LPS ligation to TLR4 and subsequent production of anti-inflammatory (IL-6 and IL-10) and pro-inflammatory (TNFα) cytokines. However, under pro-inflammatory conditions, there is an increased proportion of monocytes expressing the CD16 receptor, which amplifies TLR4-mediated TNFα production. PURPOSE: We therefore examined the hypothesis that monocytes would express elevated TLR4 would exhibit increased CD14 and CD16 expression. maximal exercise would be accompanied by reduced CD14 expression. Conversely, the mobilization of pro-inflammatory monocytes (CD14+/CD16+) expressing elevated TLR4 would exhibit increased CD14 and CD16 expression. Concomitantly, LPS-stimulated ex vivo production of IL-6 and IL-10 would be attenuated, while TNFα would be enhanced post exercise. METHODS: Human mononuclear cells (n = 25) were isolated prior to and following exercise to assess CD14, CD16, and TLR4 expression by flow cytometry. RESULTS: Exercise reduced the proportion of classical monocytes and increased pro-inflammatory monocytes. In addition, TLR4 expression decreased to a greater extent on classical compared to pro-inflammatory monocytes. However, while CD14 expression was reduced on all monocytes, CD14 expression tended to increase on pro-inflammatory monocytes. LPS-stimulated production of IL-6 and IL-10 was also significantly decreased, while TNFα significantly increased. CONCLUSIONS: Exercise shifts monocytes towards a pro-inflammatory phenotype, raising additional questions regarding the anti-inflammatory impact of chronic exercise and the mechanisms involved monocyte immune function.

Purpose: To evaluate the Kaiser Permanente Thriving Schools Initiative, a program designed to increase physical activity (PA) in Colorado public schools. METHODS: This cross-site evaluation examined 27 public school districts funded to incorporate PA into the school day, operationalized as classroom PA (CPA), shifts and after school PA (BAPA), and PA occurring in physical education classes or recess (PERPA). All data were collected during the 2014-2015 academic year using an online data management system. CPA were collected by asking randomly selected teachers in each school to report classroom PA during a one-week period, 2-3 times each semester. Programming for BAPA was reported by each district’s health coordinator and included day w offered, min d offered, and number of students participating. PERPA schedules were collected for each school and entered into an aggregate database containing all PA. Mean minutes of PA d was calculated using the sum of CPA, BAPA, and PERPA.
divided by the number of school days. Descriptive and inferential statistics were calculated. Results: Most districts (76%) provided ≥30 min d⁻¹ (42.9±27.6 min d⁻¹) of PA, though only 36% provided 60 min d⁻¹. There were no significant differences in the likelihood of achieving mandated PA minutes based on school characteristics. Most PA minutes were offered in PERPA (66.8%). In fact, schools that reported more minutes in these two types of PA were significantly more likely to achieve mandated PA minutes. Schools with greater percentages of free and reduced lunch eligible students reported significantly fewer minutes spent on PA in classrooms, PE, recess, and in total. Finally, coefficients for PE, recess, and total minutes indicate schools with greater percentages of minority students tend to report a greater number of minutes in said activities. Conclusion: These findings support increased efforts for PA promotion in public schools, though additional research is needed to identify best practices for implementing school-based PA promotion.

774 May 31 3:45 PM - 4:00 PM
Effectiveness Of A Preschool-Based Exercise Intervention On Physical Activity, Motor Performance, Body-Mass-Index And Blood Pressure: A Cluster-Randomized Controlled Trial
Claudia Hacke¹, Sascha Ketelhut², Ulrike Wendi³, Götz Müller⁴, Claudia Schlesner⁵, Kerstin Ketelhut⁶, ¹University Medical Center Hamburg-Eppendorf, Hamburg, Germany.
²Martin-Luther-University Halle-Wittenberg, Halle, Germany.
³University Heart Center Hamburg, Hamburg, Germany.
⁴Medical School Berlin, Berlin, Germany. (Sponsor: Reinhard G.
Ketelhut, FACSM)
Email: c.hacke@uke.de
(No relationships reported)

PURPOSE: Beneficial effects of physical activity interventions on health are well described for adults and adolescents. However, the impact in early childhood is understudied. The present study set out to investigate the effectiveness of an intervention on activity level, motor performance, BMI and central blood pressure in 3-5-year-old preschoolers, with emphasis on social background.

METHODS: A 6-months cluster-randomized controlled trial including a 45min biweekly supervised exercise program was conducted in 3 intervention and 2 control daycare centers in Hamburg, Germany. A total of 135 children (68% male; 28% FRPL eligible; p<0.001) completed the trial with baseline and follow-up data on BMI, activity level (time during leisure-time and in organised sports) and motor performance (z-scores of 4 test items assessing flexibility, coordination, power, speed). Peripheral and central BP were measured with a brachial cuff-based oscillometric device.

RESULTS: No significant differences in mean change were found but there was an improvement in PA (time during leisure-time and in organized sport) and BMI (z-score) in the intervention group compared to the control group, could be detected on weekly activity level (-24.7 min; 95%CI:-45.8, -3.6) and central BP was measured with a brachial cuff-based oscillometric device.

CONCLUSION: These findings support increased efforts for PA promotion in public schools, though additional research is needed to identify best practices for implementing school-based PA promotion.

776 May 31 4:15 PM - 4:30 PM
The Association Between Perceived Athletic Competence And Physical Activity: Implications For Low-income Schoolchildren
Sarah A. Amin, Kenneth Chui, Paula Duquesnay, Catherine M. Wright, Christina D. Economos, FACSM, Jennifer M. Sacheck, FACSM. Tufts University, Boston, MA. (Sponsor: Jennifer Sacheck, FACSM)
Email: s.amin@tufts.edu
(No relationships reported)

PURPOSE: Addressing athletic competence (AC) may shape children’s physical activity (PA) behaviors through participation in organized and unorganized PA, but these opportunities may be limited in low-income children. We aimed to assess the association between children’s perceived AC and daily moderate-to-vigorous PA (MVPA) and whether socioeconomic status (SES) modifies this relationship.

METHODS: Schoolchildren (n=1137; grades 3-4) were recruited from 24 schools in Massachusetts communities to participate in the Fueling Learning through Exercise study. Demographic data were collected by parent report. Free or reduced price lunch (FRPL) eligibility was used as an indicator of SES. Seven-day accelerometry data were collected to assess the use of facilities that promoted PA (ρ = 0.001, p > 0.05). However, a direct association between FRPL eligibility and PA change was found (ρ = -0.34, p < 0.01). CONCLUSION: Although the average DSST was very low in this group of children, more recess time was associated with more DSST. More research is needed to confirm these observations, and the importance of school interventions to discourage sedentary time during recess time. Funded by University of PR-FIPI Institutional Grant.

777 May 31 4:45 PM - 5:00 PM
Relationship Between School Physical Environment And Sedentary Time Among Children In Puerto Rico
Maria Enid Santiago-Rodriguez¹, Maria José Machado Castellanos², Farah A. Ramirez-Marrero, FACSM³, ¹University of Illinois at Chicago, Chicago, IL. ²University of Puerto Rico, Rio Piedras Campus, San Juan, PR.
Email: msantiago2@uic.edu
(No relationships reported)

Sedentary time increases the risk of obesity and other hypokinetic diseases. The school’s physical environment (SPE) can influence during school sedentary time (DSST) in children. The association between SPE and DSST has not been clearly established in this population. PURPOSE: To evaluate DSST and the potential influence of SPE in DSST among children in Puerto Rico. METHODS: Fifty-four girls and 48 boys (age=7.9 ± 0.7 yrs, range=7-9 yrs) were an accelerometer during 7 consecutive week-days over the right hip area. A filter was created to determine DSST for those children who wore the accelerometer during at least 3 weekdays. The SPE was evaluated taking into consideration the physical education class, recess time, and use of facilities that promoted PA. Time in physical education and recess was provided by the school’s administration. To determine the use of facilities, a score was generated based on self-reported activities during school, and the time spent in each activity. Correlation and regression analyses were conducted to test the relationship between: 1) physical education class (min/wk) and DSST (hr/wk); 2) recess time (min/wk) and DSST (hr/ wk); and 3), use of school facilities (score) and DSST (hr/wk). RESULTS: DSST was different between gender (girls: 4.3 ± 0.5 hr/wk; boys: 4.4 ± 0.3 hr/wk; p = 0.01) and type of school (private: 4.3 ± 0.4 hr/wk; public: 4.6 ± 0.2 hr/wk; p = 0.04). No relationship was observed between DSST and time in physical education (r = -0.15, p > 0.05), or use of facilities that promoted PA (p = 0.001, p > 0.05). However, a direct association between DSST and recess time was observed (p = 0.34, p < 0.01). CONCLUSION: Although the average DSST was very low in this group of children, more recess time was associated with more DSST. More research is needed to confirm these observations, and the importance of school interventions to discourage sedentary time during recess time. Funded by University of PR-FIPI Institutional Grant.

BACKGROUND: Short and long term exposure to prolonged sitting is associated with excess food intake and weight gain in children. Interrupting prolonged sitting with low-intensity activity does not alter subjective appetite sensations or food intake

778 May 31 4:45 PM - 5:00 PM
Efforts Of Interrupting Prolonged Sitting With Activity On Appetite Sensations In Elementary School-age Children
Tiwaloluwa A. Ajibewa, Molly P. O’Sullivan, Matthew R. Nagy, Shannon S. Block, Trevor R. Tooley, Rebecca E. Hasson, FACSM. University of Michigan, Ann Arbor, MI. (Sponsor: Rebecca Hasson, FACSM)
Email: tajib@umich.edu
(No relationships reported)
in children. However, it is unclear whether activity performed at a higher intensity will alter appetite sensations in children. **PURPOSE:** The purpose of this study is to examine the acute effects of interrupting prolonged sitting with intermittent activity performed at varying intensities on hunger, satiety, and prospective food consumption (PFC) in elementary school-age children. **METHODS:** Using a randomized crossover design, thirty-nine children (ages 7-11 years; 18 male, 21 female; 33% overweight/ obese and 59% non-white), completed four experimental conditions: 8 hours of sitting interrupted with 20, 2-minute low-intensity (L), moderate-intensity (M), or high-intensity (H) activity breaks or 20, 2-minute sedentary (S) screen time breaks. Exercise intensity for the L, M, and H conditions corresponded with 25%, 50%, and 75% of heart rate reserve, respectively. Hunger, satiety, and PFC, were assessed using the Visual Analog Scale at four time points (post-breakfast, pre-lunch, pre-lunch, and pre-dinner) throughout each experimental condition. **RESULTS:** Satiety sensations tended to be lower during the L and H conditions compared to the S condition (S: 5.3±0.3, L: 4.8±0.3, M: 5.2±0.39, H: 4.7±0.4, p=0.05). There were no significant differences across conditions for hunger (S: 4.6±0.3, L: 4.6±0.3, M: 4.6±0.3, H: 4.7±0.3, p=0.99) and PFC (S: 4.5±0.3, L: 4.4±0.3, M: 4.5±0.3, H: 4.7±0.3, p=0.63). There were no significant differences between post-breakfast vs. post-lunch scores (p=0.05), and pre-lunch vs. pre-dinner scores (p<0.05). **CONCLUSIONS:** These data suggest interrupting prolonged sitting with moderate-intensity activity may be an effective strategy to increase physical activity energy expenditure without triggering increases in hunger and PFC or reductions in satiety. Future studies should examine the long-term effects of interrupting prolonged sitting with activity on appetite sensations, food intake, and weight outcomes in elementary school-age children.

**PURPOSE:** Throughout the elementary school years school-time moderate-to-vigorous physical activity (MVPA) tends to decrease while sedentary time (SED) increases, contributing independent effects on health outcomes. There is insufficient research on how physical activity (PA) programming may impact SED in children. Our objective was to determine whether two innovative school-based PA programs impact school SED in children and if program reach differed by sex, race/ethnicity, and weight status. **METHODS:** Eighteen schools from lower-income Massachusetts school districts were enrolled in the Fueling Learning Through Exercise Study (FLEX) and randomized to 100 Mile Club (100MC; walking/running program), Just Move (JM; active classroom breaks), or a Control group. Third- and fourth-grade children (n=883) were recruited and measured at baseline (Fall 2015) and short-term follow-up (Spring 2016) for height/weight and 7-day accelerometry (ActigraphGT3x). Demographic information was obtained by parent questionnaire. PA program effects on SED were examined using mixed-effects models adjusting for child sex, race/ethnicity, free or reduced-price lunch (FRPL) eligibility, weight status, accelerometer wear time, average daily temperature, and controlling for school-level clustering. **RESULTS:** 793 children (8.7 ± 0.7 years, 44% male, 65% non-white, 53% FRPL, 41% overweight/obese) had valid accelerometer wear-time (3 days, 10 hrs/day) at both study visits. At baseline, few children achieved the recommended 30 minutes of school-time MVPA (9%, 18 ± 7.9 min) and children were sedentary for 59.7% (233 ± 43 min) of their school day. There was a significant effect of program on SED (p=0.041) with Control and JM increasing in SED (6.2 [95%CI: 2.7, 9.5], p=0.001 and 4.3 [95%CI: 0.9, 7.7] mins/day, p=0.012 respectively) while 100MC did not change (p=0.88). There were no differences in program effects by sex (p=0.58), race/ethnicity (p=0.08), or weight status (p=0.19). **CONCLUSIONS:** Short-term follow-up of program implementation during a two-year PA intervention demonstrates a potential effect of 100MC on mitigating an increase in SED that may occur over the elementary school years. Longer-term findings will demonstrate whether the effects of PA programming on SED are sustained.

**With the elimination of physical education and recess, the opportunities for children to be physically active in schools has declined. Therefore, afterschool programs have been identified as ideal settings where children (5–14 years) can accumulate a significant portion of their daily total, recommended level of moderate-to-vigorous physical activity (MVPA).** **PURPOSE.** The first purpose of this pilot study was to quantify the level of in-school MVPA in underserved elementary school settings. A second purpose of the study was to quantify the level of MVPA achieved through a structured afterschool program that integrates physical activity with a STEM (Science, Technology, Engineering, and Mathematics) learning component. **METHODS.** Participants were 13 children (female n=5, age: 9.36, SD=0.83) enrolled in an afterschool program offered at a YMCA located in an urban community. All participants wore accelerometers to track their MVPA during the school day (6 hours and 15 minutes) and while participating in the structured afterschool program (30 minutes) called Active Science. During the program, the participants completed thirty minutes of physical activity followed by a science lesson delivered through the Active Science Mobile App. Physical activity levels were monitored for five consecutive days (Monday-Friday) during the in-school and afterschool environments. **RESULTS.** Participants mean in school and afterschool MVPA were M=14.5±2.60, M=16.87±3.6 minutes, respectively. T-test showed a significant difference between these two settings t(12)=16.29, p<.05. The 6-hour school day contributed to approximately 24% of the recommended daily physical activity, while the 30-minute afterschool program contributed to 28% of the daily-recommended MVPA time. **CONCLUSION.** A guided and well-structured afterschool physical activity program can significantly impact MVPA levels in children. The results of this study are well aligned with national recommendations that endorse innovative strategies to incorporate movement into afterschool programs to improve physical activity levels in children.
Nerve Posterior Tibial Nerve Impingement Stress Reaction/Fracture of Calcaneeus Fat Pad Syndrome Planatar Fascitis Tests and Results Previous MRI’s of the foot and ankle as well as lumbar spine were negative. A reported electromyographic and nerve conduction study was negative for lumbar radiculopathy but without evaluation of calcaneeus nerves. Given the entire clinical picture, we proceeded with a lidocaine challenge with ultrasound guidance at the location of the bisection of posterior tibial to calcaneeus nerves. She received complete relief of pain within five minutes.

Working Diagnosis Posterior Tibial Nerve Impingement at Level of Bifurcation of Calcaneeus Nerves

Treatment & Outcomes Given the positive Lidocaine challenge, the decision was made to proceed with hydro-dissection at the level of posterior tibial nerve bifurcation of medial and lateral calcaneeus nerves. In plane short axis hydrodissection technique with 1% plain Lidocaine and Triamcinolone was performed. The patient had complete relief of pain at 5 minutes, 24 hours, 72 hours, and 90 days post procedure. The patient has returned to training without restriction with hopes of competing for a spot on the next Olympic Team.

784
May 31 3:35 PM - 3:55 PM
Foot Pain - Recreational Skier
Kelly L. Roberts Lane, FACSM. Fix It physical therapy, Mahometohi, MN.
Email: kelly@fixitpt.com
(No relationships reported)

HISTORY: 35 yo slipped down her back deck steps 1/25/16. She experienced severe pain and inability to stand on her R foot with immediate swelling and minimal bruising on day 1. She was evaluated at an Orthopedic Clinic, where X-ray showed a talar avulsion fx. She was given a cast boot and instructed to follow-up in 4 wk. She saw me at the physical therapy clinic 7 days post fx with complaints of severe pain and inability to weight bear on her R foot. The boot was not fitted correctly with the front piece missing and the air bladder not inflated. The boot fit was corrected and she left for Colorado. She returned 2 wk later with continued severe pain.

PHYSICAL EXAMINATION: Examination 3 wk post talar avulsion fracture revealed severe tenderness with palpation R foot, significant bruising and severe R lower leg, ankle, and foot swelling. Her R foot skin was cool to touch compared to the L and had a mottled appearance. She had painful and severe tightness with R calcaneeus and forefoot varus and valgus PROM and R dorsiflexion PROM. She had limited ability to wiggle her toes, but no complaints of numbness or tingling.

DIFFERENTIAL DIAGNOSIS: 1. Additional Fracture 2. Ligament Tear 3. Complex Regional Pain Syndrome

FINAL WORKING DIAGNOSIS: Complex Regional Pain Syndrome post avulsion/impaction fx of the talus with extensive marrow edema talar head and neck, calcaneeus contusion

785
May 31 3:55 PM - 4:15 PM
Tarsal Dysostosis in the Adolescent Athlete
Blahesh B. Joshi, Millcreek Community Hospital, Erie, PA.
(Sponsor: Patrick F Leary, DO FACSM, FACSM)
Email: blahesh.joshi.bb23@gmail.com
(No relationships reported)

Articular Dysostosis is a rare musculoskeletal condition due to an abnormal bridging of two bones by cartilage, bone, or fibrous tissue. This abnormality changes the intrinsic physiologic motion of those two bones and surrounding structures. The most common site involves the talus, calcaneus, and navicular bones- known as Tarsal Dysostosis or Tarsal Coalition (TC). The condition has been linked to a gene mutation that can affect both feet in fifty percent of cases. TC typically presents in the adolescent patient after beginning athletic activities.

A 12-year old male with no significant medical history presented to the Sports Medicine office complaining of worsening left non-traumatic foot pain for over one years time. The patient had been participating in high school football and sustained an inversion ankle injury. On physical exam tenderness to palpation at the proximal dorsal surface of his left foot was elicited. Osteopath exam of the foot and ankle was noted for Pes planus with fallen arch and the inability to induce medial arch, Hammer toes, and hallux valgus deformities of the foot. The patient was empirically started on a rehabilitation program consisting of foam rolling exercises of the lower quarter, increase flexibility, ankle and foot intrinsic exercises, ambulation with a non-inflating walking boot. With only minimal clinical improvement, magnetic resonance imaging (MRI) was ordered revealing bony contusions in the talus, calcaneus, and navicular bones. He was referred to Shriners Hospitals for Children and underwent a resection of the left calcaneeonavicular coalition. He has since has returned to pain-free athletics after completing rehabilitation and therapy.

Current literature indicates that Tarsal Dysostosis affects up to 1% of the population. It is a diagnosis found primarily in children and young adolescents during the ages of 8-16 when the ossification process of bones initiates. The disease is caused by mutations in the NOG gene. This gene is responsible for the noggin protein, which plays an important role in proper bone and joint development. The diagnosis of tarsal coalition begins with clinical suspicion and key physical exam findings of pain in an adolescent with decreases in foot range of motion, as well as pain into the hind-foot.

786
May 31 4:15 PM - 4:35 PM
Ciprofloxacin Induced Achilles Tendinopathy
Igor Prus1, Kenneth Bielak, FACSM2, Rebecca Morgan3.
1University of Tennessee Graduate School of Medicine, Knoxville, TN; 2University of Tennessee, Knoxville, TN.
(Sponsor: Kenneth Bielak, FACSM) (No relationships reported)

TEST AND RESULTS

Ciprofloxacin Induced Achilles Tendinopathy

PREVIOUS MRI’s of the foot

PREVIOUS MRI’s of the foot

PRESENT MRI = synovitis & edema around talar joint. Otherwise normal. F/u Labs: ESR = 26; CRP, CCP, ANA, dsDNA, Smith Ab, RNP Ab, SSA, SSB, SCL70, myeloperoxidase Ab, Anti-Centromere Ab, Lyme neg FINAL WORKING DIAGNOSIS: Early Lupus or drug induced lupus treatment and outcomes: was prescribed prednisone but preferred nonpharmacologic therapy. Continue PT, repeat labs. F/u in 2 wks: Symptoms improved. Work up ongoing. Has to have occasional foot and ankle pain without functional limitation. Final diagnosis pending

HISTORY: 26 year old college graduate student with past medical history of a kidney stone had painful urination and increased frequency over several days. He was seen by internist at student health center, prescribed Ciprofloxacin for 14 days for acute bacterial prostatitis. Two months later he developed right Achilles tendon pain which had started insidiously upon awakening one morning, with no inciting event except for taking Ciprofloxacin 6 weeks earlier. PHYSICAL EXAMINATION: Swelling of the of posterior ankle noted. Tenderness to palpation at the insertion site of a tight Achilles tendon was appreciated. DIFFERENTIAL DIAGNOSIS:1. Ciprofloxacin induced Achilles tendinopathy 2. Idiopathic Achilles tendinopathy 3. Posttraumatic Achilles tendinopathy TEST AND RESULTS: 1. Ankle ultrasotony: Thickening and swelling of Achilles tendon. 2. Ankle X-ray: no bony abnormalities. FINAL WORKING DIAGNOSIS: Ciprofloxacin Induced Achilles Tendinopathy TREATMENT AND OUTCOMES: 1. Walking boot 2. NSAIDs 3. Physical therapy. Patient has recovered after six month of treatment.

787
May 31 4:35 PM - 4:55 PM
Ankle Pain and Swelling - Tennis.
Gabriel Carpio-Bracho, Poonam Thaker, Anthony Rizzo, Brian Donohue. Presence Resurrection Medical Center, Chicago, IL. (No relationships reported)

HISTORY: 19 yo f D3 collegiate tennis player presented to the athletic training room for evaluation of b/l ankle pain on 9/12/2016. Pain began 2 months prior, while at home in Germany, starting in the left ankle, progressing to the right ankle a few weeks later with accompanying swelling, numbness & weakness. Diagnosed with trauma or acute injury. Initial evaluation in Germany consisted of serum blood analysis and joint aspiration without joint fluid analysis. She returned to school & began a course of PT with the athletic training staff, with improvement in the numbness and weakness, but continued to have intermittent ankle pain and swelling. She denied taking any medications or herbal supplements. History of “allergic” reactions to many medications, which vary from blisters on her body to GI upset. At the time of initial presentation ROS neg. PHYSICAL EXAMINATION: Ankle: mild non pitting edema b/l. No erythema, ecchymosis, or deformity. Full A/PROM. Pain with passive and active dorsiflexion, plantar flexion, inversion, and eversion b/l. TTP over anterior and inferior aspect of lateral malleoli b/l, Achilles’ b/l. Anterior drawer negative b/l. Altered gait due to pain. Normal arches. Toe walk elicited pain, heel walk was painless. Strength 5/5 b/l in ankle and foot. DTR 2+ at Achilles’ tendon b/l. Sensation intact b/l in all fields. DIFFERENTIAL DIAGNOSIS: 1. Systemic Lupus Erythematosus (SLE) 2. Drug Induced Lupus 3. Rheumatoid Arthritis 4. Sereagenic Spondyloarthritis 5. Lyme Disease 6. Synovitis/Tenosynovitis 7. Stress fracture / Stress reaction 8. Hypercholesterolemia Arthritis TEST AND RESULTS: Initial labs: Chol 202, TG 178, LDL 110, CBC (WBC = 9.5, Hb = 12.4, PT = 473), CMP wnl, ASO neg, Fe wnl, Uric acid = 3.1, CRP = 5, CCP, Lyme neg, MRI = synovitis & edema around talar joint. Otherwise normal. F/u Labs: ESR = 26; Anti-histone = 1.3 (weak positive); CRP, CCP, ANA, dsDNA, Smith Ab, RNP Ab, SSA, SSB, SCL70, myeloperoxidase Ab, Anti-Centromere Ab, Lyme neg FINAL WORKING DIAGNOSIS: Early Lupus or drug induced lupus treatment and outcomes: was prescribed prednisone but preferred nonpharmacologic therapy. Continue PT, repeat labs. F/u in 2 wks: Symptoms improved. Work up ongoing. Has to have occasional foot and ankle pain without functional limitation. Final diagnosis pending
A 31-year-old recreational mountain biker presented with a one-month history of 5/10 low back pain. During a weekend excursion, he rode off of a 15-foot cliff and landed flexed forward at the waist on his bike with his tailbone landing directly on the rear tire. He experienced immediate low back pain without radiation, no numbness, tingling, or overt weakness in the lower extremity. He does have an occasional radicular pain into the left leg. No recent infections, fever, or change in bowel or bladder habits.

PHYSICAL EXAMINATION: Inspection: stiff gait otherwise reciprocal and non-antalgic, able to walk on toes and heels. No swelling, erythema or superficial skin stigmata in the lower lumbar spine. Palpation: midline tenderness to palpation over the L2-L4 vertebrae. Mild paraspinal tenderness left greater than right. ROM: unable to forward flex at the waist; decreased ROM in extension, lateral side bending and rotation. Special tests: + 2 patellar and achilles reflexes; sensation intact throughout.

Negative straight leg raise. Unable to bring knees into chest. DIFFERENTIAL DIAGNOSIS: Tumor, ABC, muscle strain, infection

TEST AND RESULTS: X-ray of lumbar spine shows obliteration of the left L3 pedicle, + winking owl sign. MRI L: spine L3 vertebral body severe compression deformity on the left, essentially vertebral plana appearance, bulging/extravasation extension of enhancing tissue involving the left vertebral body, pedicle, and posterior elements extending into paraspinous tissues. Findings may represent Langerhans cell histiocytosis or other neoplasm. CT needle guided biopsy-confirmed LCH Skeletal survey- no other bony involvement FINAL WORKING DIAGNOSIS: Bone tumor of L3 pedicle. Possible LCH.

TREATMENT AND OUTCOMES: Symptomatic treatment including-TSLO brace and activity modifications - close monitoring and followup - no chemo or radiation therapy.

Abstracts were prepared by the authors and printed as submitted.
colonoscopy which showed inflammation of the terminal ileum consistent with Crohn’s.

1. Crohn’s Disease

Final Diagnosis

Platelet 296 (150-450)

WBC 7.02 (4.5-11)

STT and MRI findings consistent with spondylolysis.

2. Spondylolysis

3. Muscle strain

4. Disc Herniation

5. Spondyloarthropathy

 Degenerative disc disease

TEST AND RESULTS: XR L-spine, AP/Lat/Flexion/Extension views: Negative MRI L-spine.

1. Stress fracture with nondisplaced fracture of anterior pedicle on left and pars interarticularis on right of L4.

2. Left paracentral protrusion compressing left S1 nerve root at L5-S1.

CT scan L-spine: Bilateral posterior element fractures at L4 vertebral body level, involving right lamina and pars interarticularis and left pedicle. No evidence of spondylolisthesis.

FIRST WORKING DIAGNOSIS: Left L4 pedicle fracture. Right L4 pars fracture.


PHYSICAL EXAMINATION: Full flexion, extension, sidebending, and rotation at waist.

Bilateral lumbar paravertebrals are tight and TTP, worse on left. Left S1 region TTP. Spinous processes are non-tender. Full sensation in bilateral LE L2-S1 dermatomes 5/5 strength in bilateral LE L3-S1 myotomes 2+ patellar and achilles reflexes bilaterally. No clonus.

SLR equivocal left, negative right. Slump test positive left, negative right. Stork test with mild discomfort left, negative right.

DIFFERENTIAL DIAGNOSIS: 1. Lumbar radiculopathy

2. Lumbar paraspinal strain.

3. Spondyloolisthesis.

Degenerative disc disease

History: A 16 year-old male soccer player presenting to primary care sports medicine with 2 months of low back pain that was first noticed after a throw-in during a game. The patient has previously been evaluated by a pediatric orthopedic spine surgeon and was noted to have scoliosis and mild kyphosis but no other diagnosis. On further history he recalled intermittent low back pain prior to the injury, but it has become much more consistent since the injury. He has not had any numbness, tingling, weakness or incontinence. Upon further review of systems he has crampy, loose stools much more consistent since the injury. He has not had any numbness, tingling, weakness or incontinence. He has not had any numbness, tingling, weakness or incontinence.


Nonantalgic gait. Normal deep tendon reflexes.

4/5 strength in bilateral LE L3-S1 myotomes with 2 months of low back pain that was first noticed after a throw-in during a game. The patient has previously been evaluated by a pediatric orthopedic spine surgeon and was noted to have scoliosis and mild kyphosis but no other diagnosis. On further history he recalled intermittent low back pain prior to the injury, but it has become much more consistent since the injury. He has not had any numbness, tingling, weakness or incontinence. Upon further review of systems he has crampy, loose stools daily for over 2 months. Stool studies by his primary care provider have been negative much more consistent since the injury. He has not had any numbness, tingling, weakness or incontinence.


Nonantalgic gait. Normal deep tendon reflexes.

DIFFERENTIAL DIAGNOSIS: 1. Lumbar radiculopathy

2. Sacroiliac Joint Dysfunction

3. Sacral Stress Injury

TEST AND RESULTS: XR Lumbar Spine - negative

MRI of the Lumbar spine and pelvis - Non-displaced fracture of the left sacrum predominantly at the S1 vertebral level, with subtle extension to the S2 vertebral level

DEXA Hip/Pelvis Spine - Z score L1-4 = -1.4

Laboratory Testing - normal range for all labs including Vitamin D, Calcium, Testosterone Free and Total, BMP, PTH, Ferritin, CBC, L/H, FSH, TSH, and free T3 & T4

FINAL WORKING DIAGNOSES: 1) Left grade 4 sacral stress fracture

2) Low bone mineral density for an athlete

TREATMENT AND OUTCOMES: 1. Initial treatment — stop high impact activity and running, cross-train, and counselled regarding appropriate calcium intake

2. At 8 weeks, started return to run program under team’s ATC

3. At 4 months, returned to regular training, running up to 5 days per week

4. At 5 months, began to have discomfort in the left lower back. Repeat MRI showed resolution of previous fracture, but now showed marrow edema involving the right S1 vertebra. Repeat MRI showed resolution of previous fracture, but now showed marrow edema involving the right S1 vertebra. Repeat MRI showed resolution of previous fracture, but now showed marrow edema involving the right S1 vertebra.

5. Presently, working with formal PT and returned to reduced volume running.

TREATMENT AND OUTCOMES:

2) Low bone mineral density for an athlete

1) Left grade 4 sacral stress fracture

B-48 Clinical Case Slide - Shoulder IV

Wednesday, May 31, 2017, 3:15 PM - 5:15 PM

Room: 402

Chair: Dina C. Janse van Rensburg, FACSM. University of Pretoria, Pretoria, South Africa.

(No relationships reported)

Discussant: Wayne Franklin Sease, FACSM. Steadman Hawkins Clinic of the Carolinas, Greer, SC.

(No relationships reported)

Discussant: Andrea Arruda. Sao Paulo, Brazil.

(No relationships reported)

An Unusual Cause Of Arm Pain - Lacrosse

Bradly J. Bowen, Deborah L. Light, Alexander Gozman, Hamish A. Kerr, FACSM. Albany Medical Center, Albany, NY. (Sponsor: Hamish A. Kerr, FACSM)

Email: bowenb1@mail.amc.edu

(No relationships reported)

HISTORY: A 17-year-old female presented with 2 days of right arm pain. The day after lacrosse practice, she awoke with a dull ache, swelling and redness starting at the elbow then progressing to the shoulder, worse with movement and improved with elevation.

PHYSICAL EXAMINATION: From the lumbar spine, but with painful F/E. Negative SLR and Slump. 5/5 strength throughout LE b/l. Reflexes 2+ b/l TTP over L/SJ and sacrum. The left sided pain was reproduced with single leg hopping, worse on the left than the right. He had a non-antalgic gait.

DIFFERENTIAL DIAGNOSIS:

1. Lumbago with Radiculopathy

2. Sacroiliac Joint Dysfunction

3. Sacral Stress Injury

TEST AND RESULTS: XR Lumbar Spine - negative

MRI of the Lumbar spine and pelvis - Non-displaced fracture of the left sacrum predominantly at the S1 vertebral level, with subtle extension to the S2 vertebral level

DEXA Hip/Pelvis Spine - Z score L1-4 = -1.4

Laboratory Testing - normal range for all labs including Vitamin D, Calcium, Testosterone Free and Total, BMP, PTH, Ferritin, CBC, L/H, FSH, TSH, and free T3 & T4

FINAL WORKING DIAGNOSES: 1) Left grade 4 sacral stress fracture

2) Low bone mineral density for an athlete
She denied recent trauma, shortness of breath, cough, paresthesias or arm weakness. There was no recent immobilization or travel, no illness or history of similar symptoms. Past medical, surgical and birth history were unremarkable. She denied tobacco use or known allergies. She was started on levonorgestrel-ethinyl estradiol four months ago. Her Father had a remote post-surgical deep vein thrombosis.

**PHYSICAL EXAMINATION:**
Vitals: Temp 36.7, BP 112/64, HR 58, RR 16, 99% O2 on room air. Well-appearing female in no apparent distress. Normal heart sounds. Lungs were clear, abdomen was benign. Pulses were intact and bilaterally symmetric throughout. Good muscle tone and bulk. The right arm was swollen from the elbow to the shoulder with mild erythema and warmth. Moderate tenderness to palpation of the elbow and shoulder, worse one the medial brachium. Elbow and shoulder range of motion was full but painful, limiting provocative maneuvers. Adson’s test and costoclavicular compression tests were negative. Reflexes were 2+ throughout.

**DIFFERENTIAL DIAGNOSIS:**
1. Undisclosed trauma or non-accidental injury
2. Septic or reactive arthritis
3. Cellulitis or bursitis
4. Upper extremity DVT
5. Thoracic outlet syndrome or overuse injury

**TESTS AND RESULTS:**
- CBC, CMP, PT, INR unremarkable
- Hypercoagulable work up pending
- Chest x-ray: No cervical rib or acute pathology
- Venous Doppler: Extensive right subclavian and axillary vein DVT
- Venogram: subacute thrombosis of the axillary and subclavian veins likely due to stenosis at the level of the first rib and medial clavicle

**FINAL WORKING DIAGNOSES:**
Paget Von Schroetter Syndrome

**TREATMENT AND OUTCOME:**
1. Initial anticoagulation with Enoxaparin
2. Thrombectomy with heparin and IPF infusion
3. Repeat thrombectomy and balloon venoplasty for residual stenosis
4. Discharged on Apixaban
5. Right thoracic outlet decompression with anterior scalenectomy and balloon venoplasty
6. Hypercoagulable work up was negative
7. Three months oral anticoagulation with Apixaban
8. Held from contact sports for the duration of anticoagulation

**801 May 31 3:35 PM - 3:55 PM**

**Unusual Cause of Periscapular Pain**

**HISTORY:** 38 yo female recreational athlete presents with left posterior shoulder pain which has gradually worsened over the past 4 months. Denies any previous trauma, injury to the area. It 8/10 sharp quality pain localized to posterior scapula with radiation to the neck. Denies any numbness, tingling, weakness, instability or crepitus. Symptoms are worse with activity. She tried PT and has modified her activities. On 1/29/2016 she underwent an ultrasound guided injection into the subscapular bursa.

On 4/29/2016 she reports symptoms had resolved. On 7/29/2016 she reported her symptoms returned with a feeling of crunching under the shoulder blade. Underwent a second injection into the subscapular buritis, MRI was obtained and she restarted physical therapy home exercise program. Underwent a second injection into the subscapular bursitis, MRI was obtained and she restarted physical therapy home exercise program.

**PHYSICAL EXAMINATION:**
- GEN: Alert, oriented x 3
- EYES: emol
- RESP: normal respiratory effort
- SKIN: intact no signs of infection
- NEURO: sensation to light touch intact. CN 2-12 intact.
- MSK: Neck: full rom to flexion, extension, lateral rotation. Negative spurlings
- Shoulder: Mild periscapular tenderness, crepitus with active abduction. ROM 180 degrees of abduction, forward flexion. 5/5 strength with empty can testing, internal external rotation, normal obliques, Hawkins, neers testing. Myofascial soreness on posterior medial boarder of the scapula. Negative scapular liftoff with scapular stress, pain with scapular compression and active abduction.

**DIFFERENTIAL DIAGNOSIS:**
1. Subscapular Bursitis
2. Cervical Paraspinal Muscle Strain
3. Cervical Radiculopathy
4. Glenohumeral Joint Arthritis
5. Labral Tear
6. Neoplasm
7. Multidirectional Instability
8. Parascapular Strain
9. RTC Tendonitis

**TESTS AND RESULTS:**
- Musculoskeletal Ultrasound left periscapular region showing no subacapsular bursal fluid collection. MRI: medial border of right upper scapula, within intermuscular planes between trapezius, erector spinae, serratus anterior muscles there is a 2.9 x 1.3 x 1.1 cm mass. Lobulated cluster of grapes morphology with interspersed fast and central low T2 signal dots. No surrounding soft tissue edema. 3cm soft tissue mass consistent with a vascular lesion such as soft tissue hemangioma.

**FINAL WORKING DIAGNOSIS:**
- 3cm soft tissue hemangioma

**TREATMENT AND OUTCOMES:**
Consult Vascular Surgery
Continue activities as tolerated

**802 May 31 3:55 PM - 4:15 PM**

**A Shot at Expanding Shoulder Pain Differential Diagnosis**
Mark McEleneity, Andrew Peterson. University of Iowa, Iowa City, IA.

**History**
14 yo male swimmer who was seen on 2/24/16, for evaluation of left upper extremity numbness and weakness of 2 month duration. Symptoms had begun the day after receiving his second of three injections for HPV vaccination series in his left shoulder on December 29, 2015. The patient woke up the following day with tightness in his left shoulder. Intense, sharp pain and weakness of his arm developed inhibiting participate in swim practice the following evening. The patient had previously been seen by his pediatrician as well as an orthopedist, neurologist, and physical therapist. Parsonage-Turner syndrome was diagnosed clinically. The patient received a six-day course of oral methylprednisolone and underwent physical therapy for shoulder strengthening and range of motion. There was improvement of pain though weakness with shoulder flexion and abduction, decreased tactile sensation over the shoulder, and paresthesias of the fingertips had persisted.

**Exam**
- Decreased tactile sensation over the dorsal hands and fingers. Passive ROM full, active ROM was limited to 90 of forward flexion and abduction. Scapular winging with flexion and abduction. 5/5 strength with resisted internal and external rotation. 4+/5 strength with empty can and Speed’s test. Lift off test was positive.

**Differential Diagnosis**
- Cervical disk herniation, cervical neural foraminal stenosis, mass lesion compressing the brachial plexus, calcific tendinitis, acute subacromial bursitis, adhesive capsulitis, thoracic outlet syndrome.

**Tests/Results**
- NCS/EMG of the left upper extremity (2/24/16)
- Mild median neuropathy at the left wrist
- Left shoulder MRI without contrast (5/31/16)
- Normal

**Final Working Diagnosis**
Parsonage-Turner syndrome

**Treatments and Outcomes**
- Two rounds of IVIG at 2 g/kg (135 g) separated by 24 hours were given on 3/7/16 - 3/8/16. Shoulder strength improved significantly and pain resolved completely within one week of treatment. There was slightly diminished muscle bulk of the supraspinatus, deltoid, bicep, tricep, and latissimus dorsi as well as scapular winging with wall push-up and scapular dyskinesia at follow-up exam (3/28/16). Mild (4+/5) weakness with shoulder shrug/protraction/retraction, resisted internal rotation, and supraspinatus testing persisted to visit on 5/31/16.

**803 May 31 4:15 PM - 4:35 PM**

**Shoulder “Droop” In Multi-sport Athlete**
Amy Rabatin1, Daniel Lueders2, Cara Prideaux1. 1Mayo Clinic, Rochester, MN. 2University of Michigan, Ann Arbor, MI.

(Sponsor: Karen Newcomer, FACSM)
Email: rabatin.amy@mayo.edu

**HISTORY:** A 16 year old, right handed, multi-sport male athlete presented with right shoulder region asymmetry noted 3 months prior by teammates and athletic trainer. Scapular dyskinesis noted one month prior. No associated pain, paresthesias, sensation changes, or frank weakness. Active range of motion was impaired with overhead activities, but did not adversely affect sports performance. No history of shoulder, arm or neck trauma or injury. Past medical history unremarkable with no recent viral illnesses.

**PHYSICAL EXAM:** Peripheral pulses intact, normal capillary refill. Gross asymmetry and atrophy in right trapezius and latissimus dorsi muscle bulk with prominence of right scapula inferior angle. Right acromion 2- 3 cm inferior to left. Normal activation of serratus and stabilization of scapula with wall push with no frank scapular winging.

Abstracts were prepared by the authors and printed as submitted.
Right scapula dyskinesis with slowed elevation and rotation with shoulder abduction and forward flexion. Ten degrees of right glenohumeral internal rotation deficit. 2/5 right shoulder elevation and external rotation strength, otherwise normal. Reflexes and sensation normal. No tenderness to palpation. No pain with Neer’s, Hawkins, Scarf, O’Brien’s and dynamic labral shear testing. No shoulder apprehension.

DIFFERENTIAL DIAGNOSIS:
1. Brachial plexopathy
2. Focal myopathy or myositis
3. Neuromuscular disease
4. Mononeuropathy

TEST AND RESULTS:
Shoulder radiograph:
- Normal
MRI chest:
- Diminutive right trapezius relative to left. Mild increased T2 signal in right trapezius with subtle post contrast enhancement. No abnormality noted in latissimus dorsi.
EMG:
- Electrodiagnostic evidence of focal myopathy involving right trapezius, latissimus dorsi and sternocleidomastoid.

Laboratory:
- CK, CRP, and ESR normal
- Connective tissue disease testing negative
- Fascioscapulohumeral Dystrophy testing negative

Focal myopathy involving right trapezius and latissimus dorsi, possible FSHD variant

TREATMENT AND OUTCOMES:
1. Physical therapy - scapular stabilization and strengthening of compensatory musculature.
3. Educated in safety with weightlifting activities.
4. Participated in football camp and fall football.

804 May 31 4:35 PM - 4:55 PM Soccer Player with Neck Pain and Upper Extremity Parasthesias
Adam Susmarski1, Stephanie Giammittorio2.1 University of Pittsburgh Medical Center and US Navy, Pittsburgh, PA. 2University of Pittsburgh Medical Center, Pittsburgh, PA. (Sponsor: Dr. Bradley C. Nindl PhD, FACSFM) Email: susmarski@upmc.edu (No relationships reported)

HISTORY: An 18 year old right hand dominant female Division 1 soccer goalie with no medical history presented in February to clinic with neck pain and right upper extremity parasthesias radiating to her wrist. Initial symptoms began in October after diving for a ball when an opponent fell on to her right shoulder, neck, and head. She was diagnosed with a concussion and was held out of competition for 3 weeks during which she reports resolution of her symptoms. Her symptoms gradually returned and then remained present during activity only after she was cleared to return to play from her concussion.

PHYSICAL EXAMINATION: Full cervical and upper extremity range of motion. No tenderness or swelling in the cervical spine or upper extremities. Upper extremity strength was 5/5, reflexes were 2+/4, and sensation was intact to light touch and pinprick. Speed’s, Yergason’s, Empty Can, Hawkins’, O’Brien’s, Spurling’s, cervical facet provocation, Neer’s, and Tinel’s at the medial elbow were negative. Adson’s, Wright’s Hyperaduction, Allen’s, and Costoclavicular maneuvers reproduced her symptoms.

DIFFERENTIAL DIAGNOSIS:
Brachial plexopathy
Cervical Radiculopathy
Cervical Discogenic Pain Syndrome
Cervical Fracture
Clavicle Fracture
Mononeuropathy
Shoulder Impingement Syndrome
Spondylolisthesis
Thoracic Outlet Syndrome
Tumor

TEST AND RESULTS: Cervical X-ray (November 2)-No abnormalities
MRI cervical spine without contrast (November 13)-Punctate focus of increased susceptibility in the cervical cord at C1-C2. Recommend MRI with contrast to exclude hemorrhage or vascular malformation
MRI cervical spine with contrast (November 19)-Previously questioned susceptibility at C1-C2 is not seen and most likely represents artifact
EMG/NCS (February 15)-Normal study without evidence of radiculopathy, brachial plexopathy, or mononeuropathy

Right upper extremity ultrasound (February 18)-Vascular compression with reproduction of symptoms in provocative positioning

FINAL WORKING DIAGNOSIS: Vascular Thoracic Outlet Syndrome

TREATMENT AND OUTCOMES: Through a comprehensive rehabilitation program adjustment in her throwing mechanics she was able to prevent provocation of symptoms without hindering her performance and ultimately was able to continue her college soccer career without symptoms or limitations

805 May 31 4:55 PM - 5:15 PM Do Not Get Stung By What Is Not A Stinger In Boys Lacrosse Player
Matthew D. Sedgley, MedStar Sports Medicine, Ellicott City, MD. Email: msedgley@mac.com (No relationships reported)

14 year old male is at the sports medicine outpatient clinic with his mother. She mentions that her son gets “stingers” all the time. The stingers are felt to be appreciated in the bilateral upper arms. The duration is for many months (greater than 6.) Time makes them better and they are worse with motion around the neck or playing lacrosse.

PHYSICAL EXAMINATION: VITAL SIGNS: Pulse is 72 and regular, respirations 18 and regular, blood pressure 122/78. GENERAL: NWWD 14yom in no acute distress. EXTREMITIES: No peripheral edema or varicosities. NEURO: Inspection: no atrophy or brusing Palpation: no tenderness to palpation to the spinous process of the neck DTRs: Negative for Hyperreflexx bilaterally. Cervical range of motion: 1. Right side bending: Within normal limits, painful. 2. Left side bending: Within normal limits. 3. Forward flexion: 45 degrees with pain at the end of range. 4. Extension: Within normal limits. Special Test: Spurlings:shows Positive with pain down the bilateral arms and occasional tingling and numbness. MSK: Palpation of the upper neck and shoulders is non tender ROM: full range of motion of arms is noted Gait: normal with normal station Images: MRI C Spine: Cranioclival angle of 139.

THORACIC OUTLET 9. REDUCED CLIVAL ANGLE

FINAL DIAGNOSIS: Cervical Discogenic Pain Syndrome

B-59 Basic World Congress/Poster - Cognition, Intelligence, and Learning
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

822 Board #1 May 31 2:00 PM - 3:30 PM The Acute Effects Of A Physically Active Games Lesson On Cognition In Primary School Children
Andy J. Daly-Smith1, Margaret A. DeFeyter1, Jim McKenna1, Pamela L. Graham2, Melissa A. Fothergill3, Scott Lloyd1. 1Leeds Beckett University, Leeds, United Kingdom. 2Northumbria University, Newcastle, United Kingdom. 3Redcar & Cleveland Borough Council, Redcar, United Kingdom. Email: a.j.w.smith@leedsbeckett.ac.uk (No relationships reported)

Evidence regarding the impact of acute physically active bouts on cognition in schools is conflicting. Treatment fidelity of PA bouts is often unconfirmed, while many studies focus on few cognitive outcomes. PURPOSE: To investigate effects of a physically active games lesson (PAGL) on cognition in primary school children. METHODS: Six schools (N=123, F=73; 9.9±0.3yrs) were ranked and paired by socio-economic status, with one per pair randomly allocated, by coin toss, to a ~40 min PAGL (n=62) or sedentary class lesson (n=61). One week post-familiarisation, immediately before and 10mins after each lesson, pupils completed a computerised cognitive battery (COMPASS); simple, easy and hard reaction time (correct response reaction time, RT), Stroop (RT and % correct answers, %C), Digit Vigilance (RT & %C), Tower of London (ToL; thinking time TT, RT & %C), immediate word recall (%C), delayed...
Developmental research has demonstrated that Perceptual Speed is related to higher cognitive abilities and linked to increases in fitness and physical activity participation. Epidemiological research has also shown that there is an inverse relationship between cardiorespiratory fitness and all-cause mortality. PURPOSE: The purpose of the study was to examine the impact of 45 minutes of daily physical education on Perceptual Speed and on fitness performance among youth attending Legacy Charter School. METHODS: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education and Perceptual Speed among youth in grades 2-5 attending Legacy Charter, a Title I school in the southeastern US. Gain scores (final post-test assessment in May 2016 - pre-test assessment in September 2014) were calculated and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was stratified by gender and adjusted by age to control for baseline differences by school. A Type I control school who provided physical education once per week was identified and utilized as a comparison. RESULTS: Legacy Charter School students observed significant gain increases on: 2 of 4 (p<.05) Perceptual Speed sections, including the Total section, compared to 0 of 4 for the control (p<.05). When stratified by gender, Legacy Charter females observed significant gain score increases (Gain Score= 9.75; F=64.07; df=1; p<0.000) over time. Legacy Charter School males and females also demonstrated significant increases in gain scores on the PACER test (Males: Gain Score=14.14; F=8.17; df=1,162; p=0.005) over time. On the PACER fitness test, Legacy Charter male and female elementary school students who participated in Legacy Charter School students observed significant gain increases (Gain Score=2.58; F=25.065; df=1; p=.000), and number of curl ups performed (Gain Score=5.64; F=37.592; df=1; p=0.000) compared to controls. Legacy Charter School underserved males improved in aerobic capacity (Gain Score=1.94; F=4.316; df=1; p=.039), number of push-ups performed (Gain Score=2.60; F=35.542; df=1; p<.000), and number of curl-ups performed (Gain Score=11.27; F=4.290; df=1; p=.000) compared to controls. CONCLUSION: These findings suggest that daily physical education can influence the cognitive and fitness performance of underserved middle school youth. Funded by Campbell Young Leaders.

PURPOSE: The modified version of the Physical Activity Gradient Laps (PAGL) used in this study allowed for assessments of: (1) moderate-to-vigorous physical activity (MVPA) for adequate aerobic exercise, and (2) the multimodal intervention that included casual physical activity. PURPOSE: The purpose of the study was to measure the difference between the PAGL and the traditional 22 minutes of MVPA. RESULTS: The purpose of the study was to examine the difference between the PAGL and the traditional 22 minutes of MVPA. RESULTS: The purpose of the study was to examine the difference between the PAGL and the traditional 22 minutes of MVPA.
Influence subsequent cognitive performance. Specifically, physical activity involving strategy and planning may prime maturing adolescent brains toward enhanced organization. The duration of these cognitive effects are unknown; further investigation is needed.

Board #6 May 31 2:00 PM - 3:30 PM
Low Academically-achieved Students Did Not Get Worse Score from Being Physically-active
Jacky Ka-wai Chan, Stanley Sai-chuen Hui, FACSM. The Chinese University of Hong Kong, Hong Kong, Hong Kong. Email: jacky.sspe@link.cuhk.edu.hk

It is not surprised that parents and educators struggled for time resources allocated to low academically-achieved students. Cutting physical activity (PA) time is one of the common practices as PA has been generally thought to produce negative impact on academic performance. Such belief has not yet been verified. PURPOSE: To examine the associations between mathematics performance and level of PA engagement in Chinese adolescents.

METHODS: A total of 882 grade 9 Chinese students were randomly recruited in Hong Kong that covered all 18 districts and three school bandings (high, middle, and low). Participants’ mathematics performance was assessed at the beginning (T0) and the end (T1) of an academic year using validated and uniformed test papers. Their PA level was measured using self-reported questionnaire (PAQ-A). At both T0 and T1 time points, participants were classified as physically-active, moderate-active, and inactive according to the composite ratings in PAQ-A. They were further categorized into Go-Active, Go-Inactive, and Unchanged-PA groups based on the changes in their PA status throughout the academic year. Longitudinal changes in mathematics scores over the year were compared among the groups using two-way repeated measures ANCOVA, adjusted for family income and revision time.

RESULTS: Significant Time (T0 - T1) x PA-group interaction effect on mathematics (F=5.52, p<0.02) was observed. Significant improvement was found in Go-Active participants. When same analysis was split by school-banding, no adverse effect was shown in low-band students (F=2.35, p=0.14) but a significantly positive change in high- and middle-banding students. Shift of PA status from T0 to T1 was a significant predictor of mathematics score change (p=0.02). CONCLUSIONS: Higher school-bandung students gained better mathematics scores from being more active. More importantly, a reduction in PA time among low-achieved adolescents seemed unrelated to academic performance. This study demonstrates that students’ academic achievement (i.e. mathematics scores) may not be boosted considerably from cutting their PA time. However, such finding has yet to be examined in other learning areas such as languages and science subjects.

Board #7 May 31 2:00 PM - 3:30 PM
Combined Associations Between Sitting Time And Physical Activity With Cognition And Academic Achievement In Young-adults
Mireia Felez-Nobrega, Charles H. Hillman, Eva Cirera-Vilolas, Anna Puig-Ribera. University of Vic-Central University of Catalonia, Vic, Spain. Northwestern University, Boston, MA. Email: mireia.felez@uvic.cat

Working memory capacity (WMC) is a core cognitive process that involves holding and manipulating information to meet task goals. WMC, in conjunction with other cognitive processes, is essential for improving vocational performance, academic performance and manipulating information to meet task goals. WMC, in conjunction with other cognitive processes, is essential for improving vocational performance. Specifically, physical activity involving strategy and planning may prime maturing adolescent brains toward enhanced organization. The duration of these cognitive effects are unknown; further investigation is needed.

Board #8 May 31 2:00 PM - 3:30 PM
Effect of Physical Activity on Cognitive Control in College-Aged Students
David Phillips1, Bradley Gregory1, Jeffery L. Hart1, Quinn Dilworth1, Patrick Arvillle1, Ryan D. Burns2, SOUTHERN UTAH UNIVERSITY, CEDAR CITY, UT. UNIVERSITY OF UTAH, SALT LAKE CITY, UT. Email: davidphillips2@suu.edu

Purpose: To determine the effect of Physical Activity (PA) on three differing types of cognitive processes, within an under-researched segment of the population.

Methods: 45 College-Aged Students were recruited from a University in the Southwestern United States. These participants completed three computer-driven tests from a battery of measurements that assess various components of cognitive control (CC): One Card Learning Test (Attention) Two Back Card Test (Working Memory) Revised Groton Learning Maze Test (Inhibition/Executive Function). Testing took place after a bout of Sedentary Activity, and two weeks later, after a bout of individualized PA (based on VO2 max). Results: Due to the high intellect/ high fit nature of the participants there was no statistical significance with the One Card Learning or Two Card Back Tests (i.e. many reached the test ‘ceiling’ on the initial attempt). After controlling for sex, age, GPA, BMI and aerobic capacity, there was significant differences between sedentary and PA conditions in both moves (mean difference = 0.156, p < 0.001, Cohen’s d = 0.85) and durations (mean difference = 22179, p < 0.001, Cohen’s d = 0.74) within the Revised Groton Maze Learning Test. The differences between conditions represented a medium-to-large effect. There were no moderating influences on the condition differences.

Conclusions: This study adds to the existing literature that suggests PA may facilitate improvements in CC, dependent on the nature of the cognitive task.

Board #9 May 31 2:00 PM - 3:30 PM
Correlation Of BDNF And Irisin With Aerobic Fitness And Cognition In Graduate Students
David M. Boland1, Brett A. Dolezal2, Alan Garfinkel2, Christopher B. Cooper2. U.S. Army-Baylor University, San Antonio, TX. UCLA, Los Angeles, CA. Email: bolanddpt@gmail.com

Purpose: A positive relationship between exercise and cognition has been observed in the developing brains of school children and the degenerating brains of elderly adults. However, this relationship remains relatively unstudied in the fully functioning brains of young adults. Brain-derived Neurotrophic Factor (BDNF) is known to promote neurogenesis and long-term potentiation within the hippocampus and is believed to mediate the effect of exercise on brain structure and function. A recently discovered myokine, irisin, may upregulate expression of hippocampal BDNF in response to exercise. This study explored the impact of fitness on cognition in graduate students and considered BDNF and irisin as potential mediators of the relationship.

Methods: Forty-four apparently healthy graduate student participants (19 women) completed a comprehensive online cognitive assessment (Lumosity®) and an incremental maximal treadmill exercise test immediately followed by blood collection. Aerobic fitness was measured in terms of maximum oxygen uptake (VO2max) during the exercise test and expressed relative to body mass (mL/kg/min) for data analysis. Plasma concentrations of BDNF and irisin were determined by enzyme-linked immunosorbent assay (ELISA).

Results: Participants were 26.0 (23.0-28.3) years old, with 19.4 (12.1-24.7)% body fat and a VO2max of 44.8 (38.3-53.5) mL/kg/min; median (IQR). The median score on the cognitive assessment was 63.5 (55.8-74.0) %. The median plasma BDNF concentration was 1.00 (2.8-20.9) ng/mL and irisin was 19.79 (16.98-24.65) ng/mL. Significant correlations between aerobic fitness and performance on the cognitive assessment were not found. An inverse relationship was observed between aerobic fitness and BDNF (rho=-0.32, P=0.03), as well as irisin (rho=-0.27, P=0.11). Irisin was moderately and positively correlated with cognitive assessment score (rho=0.33, P=0.03).

Conclusions: Irisin may be a valuable peripherally detectable marker of cognitive ability. An inverse relationship between fitness and irisin is inconsistent with the original understanding of irisin’s role. The lack of correlation between aerobic fitness and cognitive performance may suggest the presence of a cognitive ceiling, above which the benefits of exercise on cognition significantly taper off.
Purpose: Growing evidence suggests that moderate intensity continuous training (MICE) appears to improve cognition function. Physical activity to improve cognitive function is thus strongly recommended, however evidence regarding the training intensity is still lacking. The purpose of this randomized study was therefore to assess the effects of a high intensity interval training (HIIT) compared to MICE, representing the same total training load, for improving cognitive functions in healthy adults.

Methods: Twenty-five participants exercised three times a week for 6 weeks after randomization to the HIIT or MICE training group. Target intensity was 60 % of maximal aerobic power (MAP) in the MICE group and 100% MAP in the HIIT group. A maximal graded test, a cognitive battery of paper tasks and a computerized Stroop task, were performed before and after the six weeks training program.

Results: After training, MAP increased significantly in both the HIIT and MICE groups (9% and 15 %, p<0.01). The cognitive results from this study showed that after 6 weeks of training HIIT was mainly associated to a greater improvement of overall reaction time in the executive components of the computerized Stroop task (900.43 ± 128.97 ms vs 890.89 ± 109.45 ms, p<0.01). Participants in the HIIT training also improved their task in the executive component of the Trail test after 6 weeks of training (42.35 ± 14.85 s vs 30.35 ± 4.13 s, p<0.01). Conclusion: Exercise intensity was clearly an important factor for improving executive functions in young adults. These findings may have important implications in designing effective training programs to help improve cognition in different populations.

Psychological research has strongly documented the memory-enhancing effects of emotional arousal. Current opinion implicates the central release of stress hormones, specifically norepinephrine, as the neurobiological basis for this enhancement. Experimental induction of arousal has been shown to enhance long-term memory in a time-dependent manner. While extensive research has provided evidence for the memory benefits of exercise training, the effects of an acute bout of exercise on long-term memory are not as well understood. Furthermore, acute exercise of a sufficient intensity and duration stimulates norepinephrine release. This presents an opportunity to investigate the role of acute exercise-induced arousal in the modulation of long-term memory.

PURPOSE: The purpose of this study was to determine the time-dependent relationship between acute exercise-induced arousal and long-term emotional memory.

METHODS: Forty healthy young adults (22±4 yrs) were randomly assigned to an intervention group (n=20) or a control group (n=20). Subjects in the intervention group completed a high-intensity session of cycling exercise which lasted for 30 minutes. The control group completed a 30-minute duration cycling session at 60% of MAP. The exercise protocol consisted of 10 minutes of warm-up followed by 20 minutes of constant speed cycling (40 km/h) and 5 minutes of cool-down.

RESULTS: After training, MAP increased significantly in both the intervention and control groups (9% and 15 %, p<0.01). The cognitive results from this study showed that after 6 weeks of training HIIT was mainly associated to a greater improvement of overall reaction time in the executive components of the computerized Stroop task (900.43 ± 128.97 ms vs 890.89 ± 109.45 ms, p<0.01). Participants in the HIIT training also improved their reaction time in the executive component of the Trail test after 6 weeks of training (42.35 ± 14.85 s vs 30.35 ± 4.13 s, p<0.01). Conclusion: Exercise intensity was clearly an important factor for improving executive functions in young adults. These findings may have important implications in designing effective training programs to help improve cognition in different populations.
Exercise may be a means to ameliorate the progression of cognitive decline in older adults, although the mechanisms underlying exercise-induced neuroprotection are not well understood.

**Purpose:**
- (i) To assess cerebral hemodynamics under exercise-induced stress on cognitive function;
- (ii) To determine the cerebral changes occurring during cognitive tasks; We hypothesized that these effects will be different with training.

**Methods:** Right-handed college-aged adults (28 sedentary and 24 athletic) performed 10 minutes of light and moderate (20% and 65% max power) constant-load cycling. Right middle cerebral artery (MCA) blood flow velocity (CBFv) was continuously monitored during exercise and cognitive test using Transcranial Doppler ultrasonography (TCD). Cognition was assessed using the Cogstate brief battery test: Detection (psychomotor function/processing speed), Identification task (visual attention), One-card learning (Visual learning & memory), One-back task (working memory) and Groton maze (for visuospatial memory) before and immediately after exercise.

**Results:** Exercise increased CBF during 20% but this was not significant for either group. Exercise at 65% decreased CBF with a significant decrease of ~9.6% (p < 0.05) for athletes. It also decreased for sedentary individuals but it was not significant. Cognitive performance improved significantly during the ONB with a significant increase in reaction time (RT). At 20 and 65% for sedentary and only at 65% for athletes. Speed on the Groton Maze test increased following exercise at 65%; however, this increase was associated with a significant increase in number of errors in the sedentary participants. Athletes demonstrated increased Groton maze speed however no significant change in errors (1.3%). Athletes also demonstrated an increase in RT for the ONB only following exercise at 65%.

**Conclusion:** Training status may demonstrate adaptations to cerebral blood flow and cognition.

---

**Purposes of the Study**: To determine the effects of a quasi-randomized, controlled aerobic and cognitive training intervention on cognitive function in cancer survivors (N = 28).

**Methods:** Pre and post physical and cognitive assessments were administered. A 36-session computer-based cognitive, aerobic, and flexibility training intervention was completed. Participants were assigned to one of the following groups: aerobic exercise only (AER), cognitive training only (COG), simultaneous aerobic exercise plus cognitive training (AER+COG), or a control flexibility only group (CON).

**Results:** No significant (p > 0.05) main effects between groups and variables were observed. Within groups measures revealed that the AER logical memory scales scores (+33%), delayed recall scaled scores (+27%), block design scaled scores (+19%), and letter-number sequencing scaled scores (+12%) significantly increased (p < 0.05, respectively) pre-to-post. The CON group significantly (p < 0.05) increased from pre-to-post in controlled oral word association gender, age, and education verbal fluidity subtests (Z-scores). All cognitive scores (AER+COG and COG groups) failed to significantly (p > 0.05) increase pre-to-post. CONCLUSIONS: Aerobic training alone had the greatest impact on cognitive function. Individually, these methods may be appropriate for addressing CRCI in this population, but combined training of this nature may be too demanding for cancer survivors suffering from CRCI.

---

**Purpose:** To examine the influence of a 12-week golf intervention on walking performance and cognitive function in older military veterans.

**Methods:** Gait speed and cognition were measured before and after a 12-week golf intervention (2 x weekly; 90 min per session). Two male participants (74 and 67 years old) completed 5 gait trials walking as fast as possible, 5 dual-task gait trials walking as fast as possible while performing a backwards counting task, and the Dimensional Change Card Sort Test, Flanker Inhibitory Control and Attention Test, List Sorting Working Memory Test, Picture Sequence Memory Test, and Pattern Comparison Processing Speed Test, which make up the Fluid Cognition composite score of the NIH Cognition Toolbox.

**Results:** Participants improved gait speed by 5.3% and 15.8% and fast DT gait speed by 29.2% and 26.1% Fluid Cognition composite scores improved by 11% and 1% and the percent change in DT accuracy were -2.9% and 0%. **Conclusion:** Following the 12-week golf intervention, both participants improved their fast gait speed, fast DT gait speed, and cognitive function. There was little to no decrease in counting accuracy during the fast DT gait trial. These results demonstrate that the participant’s improved gait speeds were not at the expense of maintaining cognitive performance. These preliminary findings suggest that the physical and cognitive demands of golf (navigating the course, walking hilly terrain, bending over, swinging, shifting the center-of-pressure, planning and strategizing) may improve physical and cognitive function in older military veterans. Future expansion of this study will inform the development of golf programs to improve everyday function and quality of life in older adults.
Previous studies report that increases in aerobic capacity produce improvements in cognition. However, the effects of power training on cognitive domains are not well understood. PURPOSE: To compare the effects of high-velocity circuit resistance (CRT), treadmill (TM) training and no exercise (CONT) on cognitive domains and power output in older adults. METHODS: Fifteen subjects (2M, 13F; 71 ± 2.5 yr) participated in 12-wks of CRT, TM or CONT. Executive function (EF)/attention, EF, episodic memory, working memory, processing speed and overall cognition were measured by the NIH Cognition Battery. The walking response and inhibition test (WRIT) also assessed EF. A global score (GS) was determined by the WRIT. Aerobic power (AP) was determined from a peak oxygen consumption test, and lower body power (MP) by a chair stand test (CRT) and a one-leg Newton balance test (TM). RESULTS: A between-groups analysis revealed significant decreases in MP (MD = ±296, SE = ±55, p < .04) for TM compared to CONT and a decrease approaching significance compared to CRT (MD = ±237, SE = ±81, p < .07). There was a significant main effect for AP (p < .05, n2p= .48) with a trend towards an increase for TM compared to CONT (MD = ±4.0, SE = ±1.0, p = .09) and CRT compared to CONT (MD = ±2.5, SE = ±1.0, p = .07). No significant interactions were present for cognitive measures. Within-group analyses revealed a significant increase in PC (MD = ±12.6, SE = ±4.9, p = .04), a decrease in MP (MD = ±205.3, SE = ±56.9, p = .01), and a trend towards an increase in LS (MD = ±9.8, SE = ±4.7, p = .08) and GS (MD = ±3.1, SE = ±1.6, p = .07) for TM. For CONT, there was a significant decrease in PC (MD = ±12.8, SE = ±4.9, p = .04) and AP (MD = ±2.4, SE = ±8.9, p = .02). Correlation analyses revealed a strong positive association between AP and FL (r = .99, p = .008) and MP and GS (r = .97, p = .03), and an inverse correlation between MP and AP (r = .99, p = .03) and MP and FL (r = .93, p = .02) for CRT. A strong positive correlation was observed for AP and FL (r = .96, p = .03) for TM, and an inverse correlation between MP and FL (r = .99, p = .04) for CONT. CONCLUSION: TM and CRT resulted in an increase in AP compared to CONT that corresponded to improvements in EF and WRIT performance, however, only TM exhibited significant decreases in MP.

RESULTS: There was a significant relationship between the SLUMS score and FFFT (p < .05). The Norris scores significantly higher than the SCI subjects in BMM(5), lower- and upper-body strength (33.1%, 17.4%), max strength (22.5%), upper- and lower-body flexibility (102.1%, 83.1%), cardiovascular endurance (16.2%) and dynamic balance (20.5%) (p < .05). The Norris also had better performance than the SCI group with regard to lower- and upper-body strength (23.9%, 13.7%) cardiovascular endurance (13.8%), upper- and lower-body flexibility (71.3%, 34.0%), and dynamic balance (20.5%) (p < .05). Furthermore, there were no significant differences between MCI and NOR group in cardiovascular endurance and muscle strength.

CONCLUSIONS: The level of cognitive impairment was correlated to the degree of body composition and functional fitness in the group of community-dwelling elderly adults examined in this work, influencing muscle strength, flexibility, cardiovascular endurance and dynamic balance. The MCI period is the peak phase during which it is still possible for most elderly people to return the normal condition of functional fitness in cardiovascular endurance and muscle strength. Therefore, the any director or interventions aimed at achieving this should be properly developed modified to reflect the elderly subject adult’s level of cognitive abilities.
Exercise training is gaining attention regarding its role in the prevention and treatment of Alzheimer’s disease (AD). PURPOSE: The purpose of our meta-analysis was to evaluate: the effect of exercise on cognitive function in individuals at risk for or diagnosed with AD; potential moderators of the cognitive effects of exercise; and whether the cognitive effects of exercise are dependent upon Frequency, Intensity, Time, and Type (FITT) of the exercise. METHODS: Databases were searched for trials that measured pre- and post-exercise cognitive function in adults at risk for or diagnosed with AD. Analyses followed random-effects assumptions. RESULTS: 19 studies with 23 interventions qualified with 1,256 subjects (71.1% women; 28.3% men) that were 77.0±7.5 yr and who completed 9±3.7 yr of school. A majority of the sample was at risk for AD due to mild cognitive impairment (64%), another 1% was at risk due to a parent diagnosed with AD, and 35% had AD. Exercise interventions were performed at vigorous intensity for older adults (3.7±0.6 metabolic equivalents) for 3.4±1.4 wk; 45±17.0 min session for 18.6±10.0 wk. A majority were aerobic exercise training (AET) interventions (65%) and 35% other types (i.e., concurrent [31%] or resistance exercise training [4%]). Only questionnaires were used to assess cognitive function with the Mini-Mental State Exam most commonly used (61%). Overall, there was a positive, moderate effect of exercise on cognitive function (SMD=0.20, 95% CI=0.11, 0.28; I²=59.6%). The within group analysis revealed exercise improved cognitive function (SMD=0.47, 95% CI=0.31, 0.63; I²=65.1%) whereas cognitive function declined in the control group (SMD=-0.18, 95% CI=-0.36, 0.00; I²=65.1%). Furthermore, AET had a strong, positive effect on cognitive function (SMD=0.66, 95% CI=0.30, 1.02), whereas the other exercise types did not (SMD=0.09, 95% CI=-0.12, 0.49). CONCLUSIONS: Our findings suggest that exercise may reverse the decline in cognitive function that occurs among older adults who are at risk for or have AD, with favorable exercise effects that are largely mediated by AET. Future randomized clinical trials that include objective measurements of cognitive function are needed to confirm our novel findings.

Exercise And Cognition Among Individuals At Risk For Or Diagnosed With Alzheimer’S Disease: A Meta-analysis

Gregory A. Panza1, Beth A. Taylor2, Blair T. Johnson2, Hayley V. MacDonald1, Amanda L. Zaleski1, Paul D. Thompson3, FACSM, FACSM4, Linda S. Pescatello1, FACSM, FACSM1.

1University of Connecticut / Hartford Hospital, Storrs / Hartford, CT. 2University of Connecticut, Storrs, CT. 3University of Alabama, Tuscaloosa, CT. 4Hartford Hospital, Hartford, CT. (Sponsor: Robert J. Petrella, FACSM) Email: Gregory.panza@uconn.edu

No relationships reported

Board #22

May 31 2:00 PM - 3:30 PM

B-60 Basic Science World Congress/Poster - Sports, Performance, and Injury
as soccer, that involve attention to multiple aspects of the environment and for which performance success depends on the active engagement of executive control processes.

**PURPOSE**: To compare the effects of acute treadmill exercise versus futsal (indoor soccer) on performance and electroencephalographic event-related potentials measured during an inhibitory control task.

**METHODS**: Twelve experienced soccer players (24.8±2.2 years) completed three, counterbalanced 20-minute sessions of: 1) seated rest; 2) moderate intensity treadmill exercise; and 3) a game of futsal. Once heart rate (HR) returned to within 10% of pre-activity levels, participants completed the Stroop Color-Word Conflict Task while reaction time (RT) and P300 event-related potentials were measured.

**RESULTS**: HR did not significantly differ during treadmill exercise (122.4±5.4 bpm) compared to futsal (126.7±6.7 bpm). Reaction time during Stroop performance was significantly faster following the futsal game (762.7±59 ms) compared to seated rest (835.2±28 ms), but was not significantly different than treadmill exercise (784.7±22 ms). However, the P300 amplitude at three midline recording sites was significantly greater following futsal (F:z=5.77±2.87, C:z=4.84±1.66, P:z=4.25±1.43 μv) compared to both the treadmill exercise (F:z=4.96±2.66, C:z=4.02±2.58, P:z=3.73±1.02 μv) and seated-rest conditions (F:z=4.19±1.58, C:z=3.12±1.69, P:z=3.09±1.42 μv).

**CONCLUSIONS**: These findings suggest that single bouts of indoor soccer among college-aged soccer players, compared to treadmill and seated-rest conditions, may engender the greatest effect on brain networks controlling attention allocation and classification speed during the performance of an inhibitory control task.

Future research is needed to determine if cognitively engaging forms of sport-related aerobic exercise may differentially impact executive control processes in less experienced and older adult participants.

847 Board #26
May 31 2:00 PM - 3:30 PM
The Effects of Repeated, Consecutive High-Intensity Exercise on Cognitive Performance in Well-Trained Team Sports Players
Sarah E. Brown1, Barry V. O’Neill1, Phillip G. Bell1, Ken van Someren1, Glyn Howatson, FACSM1, Crystal F. Haskell-Ramsay2. 1, GSK Human Performance Lab, Brentford, United Kingdom. 2Northumbria University, Newcastle-upon-Tyne, United Kingdom.

Email: sarah.e.brown@gsk.com

**No relationships reported**

Improvements in cognitive performance and mood are generally accepted following moderate intensity exercise; however, the impact of high-intensity exercise is less clear. Given that professional team sports are performed at high or maximal intensity, which can be further compounded during periods of intensified periods of competition, investigations into the effect of such exercise on cognition are needed. **PURPOSE**: To determine the effect of repeated high-intensity exercise on cognitive function, mood and perceptions of physical and mental energy, and fatigue. **METHODS**: In a counterbalanced crossover design, twenty-four well-trained, sub-elite rugby players (mean ± SD age, height, mass were 20.7±1.9 yrs, 181.7±5.5 cm, 88.2±9.0 kg, respectively) completed a series of repeated sprints (20 x 20 m, three times per day for two consecutive days) or a seated control. Prior to and following each set of sprints or equivalent control duration, a selection of cognitive tests including simple reaction time, four-choice reaction time (FCRT), Corsi blocks and Stroop task (ST) were completed in addition to visual analogue scales assessing mood, energy and fatigue. Repeated-measures ANOVAs were conducted with pairwise comparisons where necessary (α = 0.05). **RESULTS**: No changes were observed in any cognitive, mood, energy or fatigue measures after one single high-intensity session. However, compared to the control, ST accuracy was lower in the exercise condition (p < 0.05) which was largely due to a sharp decline at bout 3 on day 1 that continued throughout day 2. Additionally, FCRT was slower on day 2 (+2.2 %) whilst feelings of alertness (-12 %), contentedness (-5 %), and physical (-22 %) and mental (-24 %) energy were reduced and ratings of physical (+22 %) and mental (+40 %) fatigue increased (all day 2 vs. day 1, P < 0.05). No changes were observed in the control condition. **CONCLUSION**: Intensified periods of exercise have detrimental effects on cognitive performance, mood and perceptions of physical and mental energy, and fatigue. The deleterious effects on these parameters could be contributing to increased injury rates during fixture congestion alongside decrements in performance. Player rotation may help alleviate these effects whilst also prompting further research into cognitive recovery strategies.

848 Board #27
May 31 2:00 PM - 3:30 PM
Injury-Related Reductions in Skilled Visuomotor Learning Revealed by Single Trial Analysis and Response Time Variability
Courtney Dunn-Lewis1, Shawn D. Flanagan1, James A. Onate2, Jeff S. Volek1, Carl M. Maresh, FACSM2, William J. Kraemer, FACSM2. 1University of Pittsburgh, Pittsburgh, PA. 2Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, Ph.D., FACSM)

**No relationships reported**

Classical psychometric tests emphasize measures of central tendency as it relates to response times, contact times, and errors. More sophisticated techniques, however, may complement neurophysiological measures of neuroplasticity in response to behavioral interventions or changes in intrinsic state. **PURPOSE**: To determine whether learning on a skilled lower extremity visuomotor task was affected by prior ACL injury. **METHODS**: Eighteen healthy women between 18 and 32 yr participated. Nine women served as controls; nine others had unilateral ACL reconstruction between 6 months and 5 years from the start of the investigation. All participants completed 120 trials of a choice reaction test with a Stroop-like effect and randomly-ordered stimulus presentation order (3 sets of 40 repetitions with 30 sec rest between sets and 1 sec intertrial interval) (The Quick Board, LLC Memphis TN). Response time, contact time, and error count was recorded for each leg during each trial.

**RESULTS**: In total, controls performed 525 trials with the dominant leg and 555 trials with the non-dominant leg. ACLs performed 550 trials with the injured leg and 530 trials with the uninjured leg. Average time to set completion, response time, contact time, and error count did not differ by group or leg measurement (mean or median). ACLs displayed better initial response times but failed to improve to the same extent as controls (6.1% improvement, y = −1.55 + 1110.2, R2=0.74 for non-injured; 2.7% improvement, y = −0.97+ 1004.8, R2=0.62 for ACL). Greater improvements in response time were generally observed in the (initially worse performing) non-dominant leg. In the less frequently injured (3/9) dominant leg, virtually no improvement (1.4%) in response time was observed in ACLs overall, resulting in a 341.5% relative improvement in controls. The variability of single trial response time increased from the dominant to the non-dominant leg and from the healthy to injured leg.

**CONCLUSIONS**: Single trial analysis revealed injury-related deficits in skilled visuomotor learning years after ACL rupture and rehabilitation despite the apparent recovery of the musculoskeletal system. This suggests a central neurological association with musculoskeletal injury that may affect neuroplasticity in the affected and unaffected extremity.

849 Board #28
May 31 2:00 PM - 3:30 PM
Unique Leg-specific Executive And Motor BOLD Activity With Visually-guided Imagery Following ACL Injury
Shawn D. Flanagan, 152031, Courtney Dunn-Lewis1, James A. Onate2, Jeff S. Volek1, Carl M. Maresh, FACSM2, William J. Kraemer, FACSM2. 1University of Pittsburgh, Pittsburgh, PA. 2Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, Ph.D., FACSM)

**No relationships reported**

Given the change in sensorimotor system activation during limited movements of the injured leg after unilateral ACL rehabilitation, we asked whether the foonstrial network might be involved during visually-guided action-imagery. **PURPOSE**: To determine whether injured individuals displayed different activity during a proprioceptive cognitive-motor-oriented imagery task. **METHODS**: Healthy women (18-32 yr, n=19) provided written informed consent. Ten served as controls; nine others experienced unilateral ACL rupture, repair, and rehabilitation between 6 months and 5 years from the start of the study. All participants completed a proprietary attention-switching task for 4 trials of 10 repetitions. The test required subjects to react to congruent and incongruent signals prompting them to jump and land with the right or left leg. Subjects wore a camera to record first person perspectives of test performance. Brain images were acquired with a three tesla Siemens Trio MRI with TIM system. Subjects watched the cues and their first person perception while imagining themselves physically reacting/jumping in response to the cues. A three-dimensional magnetization-prepared rapid gradient-echo (MP-RAGE) sequence acquired whole-brain structure. Voxel size was set at 1.0mm³ for functional scans and 3.0mm² for functional scans. Significant clusters were included if meeting a six-voxel cluster threshold. A false discovery rate (FDR) threshold was set at q=0.05. Map clusters were then converted to voxels of interest, and small cluster suppression highlighted the most affected brain regions. **RESULTS**: Occupancy changes were focused to visual cues. BOLD signal increased in the prefrontal cortex, primary somatosensory cortex, and the primary, pre, and supplementary motor areas (p<0.01). Activity was lower in ACLs than controls, particularly when using the injured leg. However,
activity was increased in the right dorsolateral prefrontal cortex in both groups, with more pronounced increases in the injured group; the highest dPFC activity was observed when participants imagined jumping and landing with their injured leg.

CONCLUSIONS: Prefrontal regions of the brain displayed heightened activity after ACL individuals, whereas motor regions tend to display decreased activity compared to controls.

850 Board #29  May 31 2:00 PM - 3:30 PM Cardiovascular Dynamics During The Cold Pressor Test In Recently Concussed College Athletes Blair D. Johnson, James R. Sackett, Zachary J. Schlander, Barry Wilber, John J. Leddy, University at Buffalo, Buffalo, NY. Email: blairjohn@buffalo.edu

Concussion patients who are experiencing symptoms appear to have impaired cardiovascular responses during sympathoexcitatory tests such as handgrip exercise and head-up tilting. However, it is not known if impaired cardiovascular responses are present during a cold pressor test (CPT).

PURPOSE: We tested the hypothesis that recently concussed college athletes would have a blunted cardiovascular response during a CPT.

METHODS: Four college athletes (age: 19 ± 1 years, 2 women) who were within 7 days of concussion diagnosis and still reporting symptoms and four healthy controls (age: 27 ± 4 years, all men) underwent a CPT. During the CPT, the participant’s right hand was submerged in an ice slurry mixture for 120 seconds. Heart rate (EKG) and blood pressure (photoplethysmography) were continuously measured and averaged at baseline and every 30 seconds during the CPT.

RESULTS: Heart rate was increased at 30 seconds (20 ± 5 bpm, P = 0.001) and 60 seconds (26 ± 13 bpm, P = 0.001) in the healthy controls but remained unchanged throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the healthy controls with a peak increase of 27 ± 6 mmHg at 120 seconds (<P = 0.001). The peak increase in mean arterial pressure of 9 ± 6 mmHg in the concussed athletes was observed at 120 seconds, but did not reach statistical significance (P = 0.079).

Systolic blood pressure was elevated at 60 seconds and throughout the remainder of the CPT in healthy controls reaching a peak increase of 28 ± 6 mmHg at 120 seconds (P < 0.001). Systolic blood pressure in concussed athletes did not increase at any point of the CPT (P > 0.196 for all time points). Diastolic blood pressure in healthy controls was elevated throughout the CPT and reached a peak increase at 120 seconds (21 ± 4 mmHg, P < 0.001). In concussed athletes, diastolic blood pressure was elevated only at 75 seconds (7 ± 5 mmHg, P = 0.014) of the CPT.

CONCLUSIONS: These preliminary data show that recently concussed athletes have a blunted cardiovascular response to the CPT. These data support evidence indicating that concussed patients who are experiencing symptoms have impaired cardiovascular responses to sympathoexcitatory stimuli.

851 Board #30  May 31 2:00 PM - 3:30 PM Effects of Multiple Sports Related Concussions On Neurocognition and Cerebral Vascular Function Nicholas G. Evanno1, Kara L. Marlati2, Bryon A. Mueller2, Suzanne S. Hecht, FACSIM1, Jeffrey R. Wozniak,1 Kevin O. Lim1, Donald R. Dengel, FACSIM1. 1University of Minnesota, Minneapolis, MN. 2Pennington Biomedical Research Center, Baton Rouge, LA. (Sponsor: Donald R. Dengel, FACSIM)

Email: evan0012@umn.edu

(No relationships reported)

PURPOSE: To determine the differences in neurocognition (NC) and cerebral vascular function (CVF) between athletes with multiple sports related concussions (mTBI) and matched controls (C).

METHODS: Twelve athletes (22±0.5 y SEM) who reported multiple sports related concussions (≥3) and 12 matched [age, sex, body mass index (BMI), and athletic status] healthy control athletes (22±0.9 y) were recruited. Neurocognitive methods Each participant completed neurocognitive testing (NC) including WASI II, WAIS-IV, WAIS-R, Grooved Pegboard, DKEFS, Connors’ CPT test II, and paint samples t-test with a statistical significance shown at p < 0.05.

RESULTS: Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 10 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 20 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 30 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 40 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 50 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 60 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 70 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 80 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 90 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 100 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 110 seconds: 10 ± 5 bpm, P = 0.257). Mean arterial pressure was elevated throughout the CPT in the concussed athletes (peak increase at 120 seconds: 10 ± 5 bpm, P = 0.257).
Conclusions: In conclusion, since no previous literature evaluated the effects of GD on the CogSport test, the results suggest that GD may decrease cognitive performance with prior concussions. Individual items within the CogSport test were influenced by differing factors and more detailed examination of the scores and co-factors is warranted.

Results: The feeling scale (FS) provides a valid measure of positive or negative feelings (i.e., affect) during dynamic exercise; however, research on constant work rate (CWR) exercise has been confined to lower intensities. Exercise >critical power (CP) is characterized by a time-dependent utilization of the finite work capacity >CP (tmax) kinetics for ~½ of the sample exhibited a continuous decline (~0.01 × tmax) until exhaustion (tmax) whereas a O2 slow component was observed with the remaining participants (i.e., severe domain). Exercise in the extreme domain evoked 43% greater decline in affective responses (p < 0.01) and a 274.6 ± 78.1 s reduction in tmax (p < 0.01) and the gain in V̇O2/CO2 relative to tmax was 6.9% greater for those exercising in the extreme domain (p < 0.001).

CONCLUSION: Affective responses during severe exercise is sensitive to changes in metabolic responses occurring with a compromised affective Responses During High-intensity Exercise

Board #33
May 31 2:00 PM - 3:30 PM
Change In Serum Protein S100B Following a Collegiate American Football Game
Sydney A. Keuler, Abigail E. Harris, Scott W. Ringenberg, Matthew J. Rogatzki. University of Wisconsin - Platteville, Platteville, WI.
Email: sydneykeuler@gmail.com

PURPOSE: Protein S-100 Beta (S100B) is a calcium handling protein found in astrocytes. Following traumatic injury to the brain, S100B can be measured in blood serum as an indicator of brain injury. PURPOSE: To determine if significant differences of vitamin D concentrations and manual dexterity exist in winter athletes mid- and post-season in the circumpolar North. METHODS: Fifteen competitive cross country skiers residing at 64° N were recruited for this study. Blood samples were taken in early February (“mid-season”) and in late April (“post-season”). Subjects completed the Purdue Pegboard Test (PPT), an assessment of mental cognition and manual dexterity, at the time of the blood draws. Plasma vitamin D concentration was measured as 25-hydroxvitamin D [25(OH)D] using an ELISA. Significance was determined by permutation test with 95% confidence interval. RESULTS: Subjects exhibited significantly lower mean concentration of plasma 25(OH)D in post-season (μ=3.39 ng·mL⁻¹, SD=4.53) as compared to mid-season (μ=5.94, SD=3.37). PPT revealed significantly higher scores in three of four tests in post-season (μ=18.00, SD=1.31; μ=16.89, SD=1.12; μ=46.64, SD=3.40) versus mid-season (μ=17.04, SD=1.82; μ=15.98, SD=1.62; μ=41.69, SD=4.37) with no significant differences in the remaining test. CONCLUSION: Post-season mean plasma 25(OH)D concentration was significantly lower than mid-season. This could be explained by significantly reduced intake of vitamin D supplements post-season. PPT scores improved significantly in two out of four tests in the post-season suggesting that 25(OH)D may not necessarily be linked to cognitive function measured with PPT. However, mean 25(OH)D concentrations from both mid- and post-season fell below the Institute of Medicine’s definition of “deficient” suggesting that subjects’ improvement on PPT may have been attributable to another factor or factors such as reduced stress levels.

Board #36
May 31 2:00 PM - 3:30 PM
The Effects of Self-selected Music as a Diverting Activity Between Two Bouts of Fatiguing Isokinetic Leg Extensions
Email: Vanessa.Rojo@csusb.edu

Previous studies have shown music’s ability to act as an ergogenic aid. However, there is limited research investigating the effects of music as a diverting activity in fatiguing exercise protocols. PURPOSE: To investigate the effects of listening to music as a diverting recovery intervention on peak torque and percent torque decline.

METHODS: Thirty-nine recreationally trained men (n = 18; 22.3 ± 2.7 y; 177.6 ± 8.8 cm; 80.7 ± 10.0 kg) and women (n = 21; 22.2 ± 1.7 y; 162.2 ± 5.2 cm; 62.6 ± 9.9 kg) performed 4 experimental visits consisting of 2 bouts of 50 maximal isokinetic leg extensions at 180°·s⁻¹. Between each bout of maximal exercise, 2 minutes of recovery involving one of the 4 interventions (no music, white noise, self-selected slow tempo music, and self-selected fast tempo music) was completed. Torque values were collected during the pre-intervention and post-intervention maximal isokinetic strength tests. Percent torque decline was calculated for both the first and second set of 50 repetitions.

RESULTS: There were no significant (p > 0.05) 3-way interactions for peak torque or percent torque decline. There was a significant 2-way (time × sex) interaction (p < 0.05) for peak torque. The decrease in peak torque from the pre-intervention test to
We are 40% activity monitors (AM) have been reported in some randomized controlled trials and have contributed to an increase in levels of physical activity (PA) in some, but not all participants. The sociodemographic profiles of users may be associated with the length of time (number of months) they wear the device, and how they perceive it impacts their PA behavior.

**PURPOSE:** To assess whether sociodemographic characteristics of AM users are related to (1) duration of device use, and (2) perceived changes in PA behavior.

**METHODS:** Current (n=1135) and former (n=590) AM users from across the United States were recruited online and completed a web-based survey. Sociodemographics, health information, and AM use were queried. Moderate to vigorous PA (MVPA) score was calculated using the Godin Leisure Time PA Questionnaire. Respondents also reported how AM use influenced their PA. Descriptive statistics are reported as medians, means ± standard deviations, and frequencies. AM users were categorized based on the median use time: AM use for > 6 months or ≤ 6 months. Age, income, and MVPA score were categorized by quartiles. Chi-squared analyses were used to compare groups for all categorical variables.

**RESULTS:** Respondents were 18-81 years old (33.0 ± 12.2) with 73.1% women. A majority were current AM users (69.7%) and BMI was 26.7 ± 6.6. The number of months of AM use among current users was 10.1 ± 11.6, and 6.8 ± 6.4 among former users. Age (χ² (3)=38.8), income (χ² (3)=22.0), MVPA (χ² (3)=22.4) and relationship status (partnered vs single; χ² (1)=14.7) were all significantly different across the device-use categories (p=0.001). A majority of current (76%) and former (53.2%) users perceived that the AM contributed to increased PA. Across all respondents, purchasing an AM themselves, as opposed to receiving it as a gift, was associated with a perceived increase in PA after device use (p<0.05).

**CONCLUSION:** Duration of activity monitor use was associated with the sociodemographic characteristics of users, with a majority perceiving an increase in their physical activity as a result of use. This supports the need for further research to explore how sociodemographic data can be used to tailor interventions to specific populations using technology-based objective monitoring.

**Measure indicators among members who choose early termination may allow for the development of prevention strategies.**

**PURPOSE:** Identifying the characteristics of those who opt for early termination via a cohort study.

**METHODS:** Across 17 fitness clubs, members completed a self-report questionnaire at baseline and follow-up. The survey included the following indicators 1) baseline characteristics; 2) purpose of membership; 3) health status; and 4) psychological factors (perceived benefit of exercise, perceived barriers to exercise, and exercise self-efficacy). Participants were followed to determine whether they terminated their memberships. Odds ratios (OR) and 95% confidence interval (95%CI) for the incidence of early termination adjusted for age and gender were obtained using a logistic regression model.

**RESULTS:** There were 1,839 participants (average age 37.9 years, 520 males and 1319 females) were involved in this observational study. During the follow-up period (six months on average), 428 participants early terminated. For every five-year increase in age, the gender-adjusted OR (95% CI) was 0.91 (0.85-0.98) for early termination. Members that joined an fitness club to relieve stress had an adjusted OR of 1.33 (1.06-1.68) for early termination. Additionally, the participants who joined an fitness club to improve their health had an adjusted OR of 0.81 (0.65-1.01) for early termination. The participants who agreed with the statement “recognition of one’s ability to others,” regarding the benefits of exercise, had a higher adjusted OR for early termination 1.46 (1.11-1.91). Similarly, the participants who agreed with the statement “improve appearance” had a higher adjusted OR for early termination 1.33 (1.03-1.72).

**CONCLUSIONS:** The predictive indicators for early fitness club termination included young age, perceived exercise benefit for stress reduction, “recognition of one’s ability by others” and “improve appearance.” Lastly, perceived benefit of health improvement may prevent early termination.
Studies have suggested that the light emitted from electronic devices can impair sleep. However, it is unclear whether removing electronic devices from the sleeping environment in the evening and overnight provides an extended sleep opportunity.

**Purpose** To investigate the effects of removing electronic devices in the evening and overnight on measures of sleep and anxiety during a seven-night training camp.

**Methods** Twenty-six water-polo athletes (12 males, 14 females, aged 17.1 ± 1.3 y) attending a training camp were allocated to either a no-device group (no electronic devices could be used after dinner or overnight; ND) or a control group (unrestricted use of electronic devices could be used after dinner or overnight; AUD). In the ND group, athletes in bed (520 ± 41 min vs. 478 ± 41 min; p = 0.009) or the average response time (p = 0.909) or interference response time (p = 0.808) responses between the workstations. No significant differences in average type speed in words per minute (p = 0.673), the average error count (p = 0.764) or the adjusted speed in words per minute (p = 0.836) for the typing tests at each workstation. CONCLUSION: Cognitive performance, typing speed and accuracy are not affected by sitting or walking on a treadmill desk. Data suggests cognition and typing productivity are not compromised by using a treadmill desk. Results indicate active workstation users are able to choose various walking speeds (1.0 mph, 1.3 mph and 1.7 mph) to minimize the sedentary nature of an occupational setting without concern of impaired workplace performance.

**RESULTS:** There were no additional time burden for participants or changes in behavior and sleep as a result of using a treadmill desk. Results indicate active workstation users are able to choose various walking speeds (1.0 mph, 1.3 mph and 1.7 mph) to minimize the sedentary nature of an occupational setting without concern of impaired workplace performance.

**CONCLUSIONS:** Baseline, post-intervention PA questionnaire completion rates were high; laboratory doing their oral glucose tolerance test, and the follow-up PA questionnaire was completed by mail or online. PA questionnaire completion rates were high; 30/31 (96.7%) completed baseline; 100% (N = 17) completed post-intervention PA questionnaire and counselling session if (randomized to receive it), and 7/8 (87.5%) have completed the three-month follow up PA questionnaire.

**USE OF SIT-TO-STAND WORKSTATIONS: IMPACT ON PHYSICAL ACTIVITY**

Shiann Wickham, Catherine Patrick, Larissa Boyd, Melissa Powers. *University of Central Oklahoma, Edmond, OK.

No relationships reported.

Active workstations have become a common method of combating the prolonged sedentary setting of the workplace and potentially decrease the risk of chronic diseases and health conditions due to inactivity. However, there is no evidence to indicate an optimal treadmill speed to increase physical activity without compromising employee productivity. PURPOSE: The purpose of this study was to determine whether four workstations including sitting, walking on a treadmill at 1.0 mph, 1.3 mph and 1.7 mph affect typing speed, typing accuracy, and cognitive function in college students. Additionally, this study aimed to determine optimal speed for treadmill desk users.

EXERCISE PRESCRIPTION: A multifaceted topic with the singular goal of defining a protocol that maximizes health and adherence. The ACSM guidelines refer to previous research that suggests an intensity threshold to continually improve fitness and reduce disease risk. The threshold for well-trained individuals is 95-100% max heart rate (HR) whereas the threshold for less-trained individuals is only 70-80% max to achieve the same benefits. Exercising at these intensities can be uncomfortable and unpleasant leading to low compliance. However, past research has demonstrated that engaging distractions such as an instructor, music, or digital images can enhance enjoyment while diminishing rate of perceived exertion (RPE). It is therefore possible that an instructor-guided workout with digital images synchronized to music could be the ideal combination to reach higher intensities with a lower perception of effort.

PURPOSE: The purpose of this study was to determine whether four workstations including sitting, walking on a treadmill at 1.0 mph, 1.3 mph and 1.7 mph affect typing speed, typing accuracy, and cognitive function in college students. Additionally, this study aimed to determine optimal speed for treadmill desk users.

**RESULTS:** There were no additional time burden for participants or changes in behavior and sleep as a result of using a treadmill desk. Results indicate active workstation users are able to choose various walking speeds (1.0 mph, 1.3 mph and 1.7 mph) to minimize the sedentary nature of an occupational setting without concern of impaired workplace performance.

**CONCLUSIONS:** Baseline, post-intervention PA questionnaire completion rates were high; laboratory doing their oral glucose tolerance test, and the follow-up PA questionnaire was completed by mail or online. PA questionnaire completion rates were high; 30/31 (96.7%) completed baseline; 100% (N = 17) completed post-intervention PA questionnaire and counselling session if (randomized to receive it), and 7/8 (87.5%) have completed the three-month follow up PA questionnaire.

**USE OF SIT-TO-STAND WORKSTATIONS: IMPACT ON PHYSICAL ACTIVITY**

Shiann Wickham, Catherine Patrick, Larissa Boyd, Melissa Powers. *University of Central Oklahoma, Edmond, OK.

No relationships reported.

**PURPOSE:** Our aim was to compare an audio (AUD) music only environment with an immersive (IMM; music + digital images) environment during group fitness cycling classes in both well-trained and less-trained individuals. METHODS: To date, 6 elite participants (more than 10 hours PA/wk) and 6 novice (less than 2 hours PA/wk) completed 8 AUD and 8 IMM classes in 8 wks. Both class formats were approximately 40 minutes in duration with parallel strength and speed intervals led by an instructor. We collected HR (% time in 80-100% max zone) during each class and survey data (RPE, satisfaction, enjoyment) immediately after each class. RESULTS: For the elite participants, % time in the max zone and RPE were significantly greater during AUD (54 ± 8%; 18 ± 1) compared to IMM (46 ± 9%; 15 ± 2; p ≤ 0.05). In contrast, for the novice participants, RPE was significantly less during IMM (16 ± 2) compared to AUD (18 ± 1; p ≤ 0.05) while the % time in the max HR zone did not differ between the two conditions (AUD = 62 ± 11%; IMM = 64 ± 12%; all values mean ± sd). Satisfaction ratings were high for both groups and both conditions, but the novice participants rated IMM as more enjoyable than AUD. CONCLUSION: Both AUD and IMM group fitness cycling formats are an ideal way to meet the exercise guidelines with high satisfaction. IMM may promote adherence in novice participants compared to AUD as HR intensity did not differ, RPE was less and enjoyment was greater.
of this pilot study was to determine whether physical activity would change when using a sit-to-stand workstation in a workplace environment. METHOD: Volunteers from the faculty of the University of Central Oklahoma included apparently healthy male and female adults (N = 11, M = 39.09± 10.445 years). Participants were asked to use sit-to-stand workstations for a minimum of three hours per workday. The International Physical Activity Questionnaire (IPAQ) was used to measure self-reported daily physical activity. RESULTS: Dependent t-tests were used to analyze changes in self-reported physical activity over 5 months. Non-significant (p > 0.05), meaningful improvements were seen in METmin/wk for walking (d = 0.19), total physical activity (d = 0.14), moderate activity (d = 0.01), and vigorous activity (d = 0.02). Total minutes of sit time per week (d = 0.25) and average daily minutes sitting (d = 0.25) decreased (p < 0.05). CONCLUSION: Sit-to-stand workstations do provide an increase in daily physical activity levels. Although the results were non-significant, they do indicate a small decrease in time spent sitting along with small improvements in walking and total physical activity. Decreasing employee sit time can increase the amount of physical activity achieved throughout the day. Future research should evaluate the use of sit-to-stand workstations in a larger, more diverse group of employees.

### Table 1

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pre (M±SD)</th>
<th>Post (M±SD)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PA</td>
<td>3333.18 (908.30)</td>
<td>3764.32 (3491.25)</td>
<td>-63</td>
<td>55</td>
</tr>
<tr>
<td>MPA (met·min·wk)</td>
<td>1567.27 (1637.81)</td>
<td>1590.91 (1303.82)</td>
<td>-0.75</td>
<td>0.49</td>
</tr>
<tr>
<td>VPA (met·min·wk)</td>
<td>1341.82 (1479.50)</td>
<td>1370.91 (2379.25)</td>
<td>-0.7</td>
<td>0.49</td>
</tr>
<tr>
<td>Weekly ST (min·wk)</td>
<td>2119.10 (1147.42)</td>
<td>1838.18 (618.48)</td>
<td>-0.72</td>
<td>0.49</td>
</tr>
<tr>
<td>Daily ST (min·d)</td>
<td>302.73 (163.92)</td>
<td>262.60 (88.36)</td>
<td>-0.72</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Note. MET = metabolic equivalent; min. = minutes; wk. = week; d = day; PA = physical activity; MPA = moderate physical activity; VPA = vigorous physical activity; ST = sit time; SD = standard deviation; CI = confidence interval.

Interactive video game technology has been extensively utilized in rehabilitative settings. However, few studies have explored the potential benefits of interactive video games as a within-the-home exercise instrument for middle-aged adults who do not have a gym membership or who otherwise cannot regularly make it to their local fitness center. Features of interactive “exergaming” (modeling proper exercise biomechanics, increasing self-monitoring of behavior, encouraging participants to set health-related goals, and rewarding regular use) may help increase self-efficacy (SE), which in turn could promote physical activity and functional fitness (FF). PURPOSE: To compare FF and SE in relation to exercise tests and self-reported questionnaires in sedentary men and women before and after regularly participating in interactive video game play (n = 12, 56±4 yrs, 162.1±10.9 cm, 79.2±19.1 kg, 39.6±7.7% fat mass).

METHODS: All subjects were initially screened and underwent a battery of FF tests and SE questionnaires. Subsequent observations took place in a monitored laboratory setting where subjects engaged in self-selected, low- to moderate-intensity exergaming involving aerobic, resistance, flexibility, or neuromotor training for 20 min/3d/wk between August 2015 and June 2016. After 8 weeks, FF and SE were retested.

EXERCISE: Exercise using interactive video game technology significantly increased 30-second Sit-To-Stand repetitions (14.2 - 16.8, p < 0.05). Additionally, all participants reported with 100% confidence they would continue to exercise for at least 20 min/3d/wk for up to 8wks post-study if they owned an interactive video game system within their home.

CONCLUSIONS: Exergaming improved lower extremity functional strength and endurance as well as participants’ confidence in their ability to continue exercising beyond this study in previously sedentary middle-aged adults. Interactive video game systems should be considered a viable option for convenient, enjoyable, within-the-home exercise programs to assist individuals in meeting ACSM physical activity guidelines.

Impaired walking performance is a key determinant of morbidity among older adults. A distinctive characteristic of impaired walking performance among older adults is a greater metabolic cost compared to young adults. Specifically, healthy older adults have been shown to have a 15-20% greater metabolic cost of walking compared to young adults. However, a recent study suggests that older adults who routinely run for exercise have a lower metabolic cost of walking compared to older adults who walk for exercise. Yet, it remains unclear if other aerobic exercises such as bicycling elicits a greater metabolic cost compared to young adults. Specifically, healthy older adults continue to be a health burden, as inactivity is linked to several non-communicable diseases. Even modest increases in activity can improve health benefits, even without weight loss. However, little is known about the psychosocial outcomes of exercise in weight stable conditions.

PURPOSE: The purpose of this research is to evaluate the effects of time spent in aerobic activity on self-reported psychosocial outcomes in previously sedentary young adults when weight is maintained.

METHODS: 65 previously sedentary overweight/obese adults (54% male, 31.3 ± 7.3 years), were randomized into a high flux (35 kcal/kg/week) or low flux (17.5 kcal/kg/week) exercise group for a 6-month aerobic intervention. All sessions were on site and consisted of 3-5 sessions per week for approximately 1 hour (dependent on body weight). Additionally, weight maintenance (±3%) was required for the entire 6 months. Exercise trainers monitored heart rate (HR) every 5 minutes to ensure intensity.
between 70-75% of maximal HR and all sessions were timed and recorded. To evaluate wellbeing, participants completed assessments relating to mood (POMS) and health status (SF-36) at baseline and at intervention completion.

RESULTS: The average exercise time in the high (n=32) and low (n=33) flux group was 220 ± 54.6 minutes and 155.9 ± 28.6 minutes per week, respectively. Quintiles were created based off average time per week of aerobic exercise (iSD) (mean values for least time to most time: 137.3 ± 19.2, 175.8 ± 8.8, 249.4 ± 39.4 minutes). There was a linear trend (p < 0.05) across quintiles for SF-36 (Role Emotional) subscale for time spent in routine activities due to emotional wellbeing, after adjusting for age and sex. No other significance was seen across the 6-month psychosocial wellbeing assessments.

CONCLUSION: These results indicate that an increase in time spent exercising will allow for less time spent in routine tasks due to emotional wellbeing. No other significance was found within the POMS or SF-36 evaluations. While these results are consistent with previous findings, more research is necessary to determine if exercise duration contributes to spending less time on daily activities in weight stable adults.

Parents are key for promoting physical activity (PA) in children. Family Gym provides a free, 90 minute weekly opportunity for families with young children (ages 3-8) to be active together. Family Gym is located in a community center in a Boston, MA low-income, minority neighborhood.

PURPOSE: To examine the PA levels of parents and children during Family Gym sessions and to determine the effect of varying lengths of structured activity sessions for parents and children.

METHODS: Twelve children (4.8 ± 1.9 yrs) and their parents (27.2 ± 9.4 yrs) participated in group sessions which included free play followed by staff structured activities that were either short (65 min; n = 9, averaging 4.4 ± 1.4 minutes per session) or extended (E) (n = 9, averaging 18.9 ± 3.5 minutes per session) in duration. PA levels of each participant were measured using an Actigraph GT3X accelerometer worn at the waist. Percent of time spent in sedentary behaviors (%SED), and in light (%LPA), and moderate-to-vigorous (%MVPA) PA were estimated using the Troiano cut points for age and sex. No other significance was seen across the 6-month psychosocial wellbeing assessments.

RESULTS: Parents and children did not differ in %SED (p = 0.05). Compared to children, parents had significantly more %LPA during the S and E sessions (parents, 69.0 ± 10.5 and 76.9 ± 3.2; male, n = 17; female, n = 24) were randomly assigned to an intrinsic motivational support (IMS) or an extrinsic motivational support (EMS) group. Both groups participated in a 12-week exercise program that met once a week. Every 60 min exercise session included warm-up period, dual-task “square-step”, and cool-down period. Subjects in the EMS group were given a monetary reward (JPY=500-US$5) every week if they achieved each target values of average daily step counts during 7 days between sessions. Subjects in the IMS group received a program that was designed using a self-determination theory to enhance competence, self-determination, and relatedness. The motivations to exercise were assessed by a questionnaire (BREQ-2) and the amount of physical activity was measured by a three-axis accelerometer before and after the program. BREQ-2 evaluates five types of motivations to exercise (i.e., amotivation, external regulation, introjected regulation, identified regulation, and intrinsic regulation).

RESULTS: Moderate-to-vigorous physical activity (MVPA) was defined as 77.0 ± 28.4 min at baseline and 86.4 ± 37.0 min at post in the IMS group and 72.4 ± 33.3 min at baseline and 96.7 ± 39.0 min at post in the EMS group. No significant time x group interaction was found in the MVPA values. In the IMS group, there was a significant trend (P = 0.08) in the score for intrinsic regulation to exercise (15.0 ± 2.7 points at baseline, 16.0 ± 2.0 points at post). In total subjects, the amount of physical activity was not significantly correlated with any of the five types of intrinsic motivations for exercise.

CONCLUSIONS: These results suggest that the exercise program with intrinsic motivational support and extrinsic motivational support both enhanced physical activity level in study participants and that effectiveness did not differ between the two programs. This research was designed to examine 1-year follow-up test for these legacy effects.

Interactive video game technology has been utilized in rehabilitative settings. However, research is limited in its possible role as a within-the-home exercise instrument for those who do not have a gym membership, or who otherwise cannot regularly make it to their local fitness center. PURPOSE: To compare quality of life and emotional well being before and after eight weeks of exercise using interactive video game technology in sedentary community members. METHODS: 12 Sedentary, middle-aged men and women (56±4 years, 162.0±10.9 cm, 79.2±19.1 kg, 5% fat mass 39 ± 17.7%) exercised under monitored conditions using interactive video game technology at a low to moderate intensity level for 20 minutes a day, three days a week for eight weeks. Participants were allowed to choose which activities they participated in each visit. The SF-36 questionnaire for assessing general health was administered before and after the intervention. Participants took a Subjective Exercise Experience Survey (SEES) before and after the intervention. Participants took a Subjective Exercise Experience Survey (SEES) before and after the intervention. Participants took a Subjective Exercise Experience Survey (SEES) before and after the intervention.

RESULTS: Self-reported SF-36 physical functioning scores showed improvement significance (84.6 before to 90.4 after, p < 0.08) after eight weeks of exercise. Review of the SEES taken after an exercising session at the end of the study showed that after exercising subjects felt slightly tired, but not at all drained. They also reported feeling positive and not at all disinterested post exercise. CONCLUSION: Virtual gaming platforms may be utilized by sedentary community members in place of regular physical activity. Eight weeks of exercising might improve physical functioning and have a positive effect on sedentary individuals attitudes toward exercise and general health. Supported by Departmental Funds.
PURPOSE: To examine the indirect effects of moderate-to-vigorous physical activity (MVPA) on weight loss through changes in eating behaviors (dietary restraint and disinhibition) in response to a behavioral weight loss intervention (BWL).

METHODS: Subjects (n=221; 42.8±9.2 years; BMI=32.7±kg/m2±3.6) with complete data were included in this secondary mediation analysis. The 18-month BWLI included prescribed energy intake of 1200-1500kcal/d and MVPA to 300min/wk. Weight, Restraint (flexible (FR), rigid (RR)), Disinhibition (internal (ID), external (ED)) and MVPA were assessed at 6, 12, and 18 months. Restraint and Disinhibition were measured by questionnaire. Objective MVPA was defined as bouts >10 min in duration and ≥3.0 METs.

RESULTS: Weight decreased [6mo:-9.07±6.26kg; 18mo:-8.1±8.5kg] and MVPA increased [6mo: 673.9±1191.1 M.E.T.-min/18wk; 18mo: 428.6±1101.4 M.E.T.-min/ wk][p<0.001] RR [FR:2.8±5.1; 18mo:2.3±1.6]& FR [18mo:1.3±1.7; 18mo:1.7±3.1.73] increased and ID [FR:2.4±3.11; 18mo:1.7±3.4.23] and ED [FR:1.051±1.65; 18mo:0.82±1.59] decreased over time. Change in FR and ID, but not RR or ED, partially mediated the effect of MVPA on weight loss at 6 months. At 18 months, change in FR, RR, and ID, but not ED, partially mediated the effect of MVPA on weight loss.

CONCLUSIONS: The influence of MVPA on weight loss may be partially explained by improvements in eating behaviors. Interventions designed to focus on changing these specific eating behaviors in combination with MVPA may improve weight loss in adults with obesity.

Mediator Analyses: Effect of Eating Behavior Changes on the Association Between Change in PA and Weight Loss

<table>
<thead>
<tr>
<th>Mediator</th>
<th>Baseline to 6 months Indirect Effect (95% CI)</th>
<th>Baseline to 18 Months Indirect Effect (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Flexible Restraint</td>
<td>(-0.3857, -0.0338)*</td>
<td>(-0.7386, -0.0957)*</td>
</tr>
<tr>
<td>A Rigid Restraint</td>
<td>(-0.2110, 0.0457)</td>
<td>(-0.7464, -0.1408)*</td>
</tr>
<tr>
<td>A Internal Disinhibition</td>
<td>(-0.0356, -0.0442)*</td>
<td>(-1.1561, -0.2469)*</td>
</tr>
<tr>
<td>A External Disinhibition</td>
<td>(-1.6919, 0.0196)</td>
<td>(-0.2185, 0.2031)</td>
</tr>
</tbody>
</table>

*indicates significance

Supported by NH (HL08840)

BOARD #52
May 31 3:30 PM - 5:00 PM
Using Focus Groups To Culturally Tailor A Diabetes Intervention In A Pacific Northwest Tribal Reservation

William Sellars1, Ka’imi Sinclair1, Myra E. Parker2, Maya Magrati1, Alison Ball1, Korey Carden11, Washington State University, Seattle, WA. 2University of Washington, Seattle, WA. 3Colville Tribes, Nespelem, WA. (Sponsor: Wendy Repovich, FACSM)

Email: sonny.sellars@wsu.edu

BACKGROUND: Despite having many health programs available, native men on the Colville Indian Reservation do not regularly participate.

PURPOSE: This qualitative study was designed to gain an understanding of how to effectively recruit and retain American Indian men in a Diabetes Prevention Study.

METHODS: Before recruitment, IRB approval was received from Washington State University and the Colville Tribes. Forty participants (31 males, 9 females) volunteered for five focus groups held in Omak, Nespelem, Keller and Ichinom. Verbal permission was given by participants for audio taping the discussion. Each participant completed a survey prior to the focus group to gather additional data related to diet and exercise. No identifying information was collected on the survey or in the focus groups. Questions elicited opinions about nutrition, physical activity (PA) and culture related to participation in a healthy lifestyle program, including perceived obstacles to participation. Participants were also asked whether their emotional state, including stress, trauma, historical trauma and depression may influence their decisions to participate in the program and in making personal health decisions. Dinner was served at each focus group and all received two $25.00 Walmart gift cards.

RESULTS: Participants identified a lack of quality produce at local grocery stores as a primary reason for poor eating habits. The men reported that they did not like to shop or cook, but thought recipes and video demonstrations would be helpful. Everyone thought inter-community competition would be motivation to increase PA and decrease weight. They recommended using native cultural activities in the program i.e., traditional dancing, hunting, fishing and gathering roots and berries to increase relevance. Obstacles identified included their emotional state, weather and seasons, as well as a lack of facilities and time.

CONCLUSIONS: Changing our intervention based on these suggestions is the next step. A secondary benefit mentioned in the focus groups is using cultural activities to encourage men, which will also keep those activities alive for the youth in the tribe. Colville tribal men have an interest in their health and would like to participate in our program if we make it culturally-based and at a time that is convenient.

874 Board #53
May 31 3:30 PM - 5:00 PM
Factors that Associate With Better Exercise Compliance in Mobile App Based Program: The Virtual Trainer Project

Stanley Sai-chen Hui, FACSM1, Ron C.W. Kwok1, Eric W.C. Tam1.1 The Chinese University of Hong Kong, Shatin, Hong Kong. 2City University of Hong Kong, Kowloon Tong, Hong Kong. 3Hong Kong Polytechnic University, Hung Hom, Hong Kong.

Email: hui2162@cuhk.edu.hk

Exercise-related mobile apps and wearable movement detection devices have become popular tools for active lifestyle promotion. Behavioral modification theories such as goal setting, stimulus control, incentive scheme, and self-determination theory could be easily integrated into mobile apps program design so as to make these exercise motivational strategies more interesting and appealing. Limited studies have evaluated these strategies for promoting better exercise compliance. PURPOSE: To evaluate factors that contribute to a better exercise compliance in a mobile-app based exercise promotion program called the Virtual Trainer (VT) project. METHODS: A VT mobile app that integrated various lifestyle modification theories, such as goal setting (exercise prescription module), know-how (educational materials dissemination), stimulus control (constant exercise reminding messages and health tips), incentive (exercise credit-points accumulated for prize redemption), feedback system (online health & fitness assessment), and self-determination theories (personalized exercise training scheduling), was designed and prescribed to 126 Chinese adults (age=29.98 ±4.35 yrs.) for a 8-12 weeks exercise intervention program. Exercise compliance was computed from ratio of completed exercise session that recorded from the VT system against planned exercise session at the beginning. At end of intervention a questionnaire was completed by participants to report ratings that they perceived as useful for encouraging exercise participation. Responses were compared between the high compliance group (100% compliance) and low compliance group (<70% compliance).

RESULTS: High compliance group accounted for 67% of total whereas low compliance group 15%. Mean compliance rate for low compliance group was 44.9%. Regarding VT built-in psychological factors the high compliance group reported significantly higher rating in educational contents (p<.01), feedback system (p<.05), stimulus control (p<.05), whereas other factors were not different between groups.

CONCLUSION: Among various behavioral modification theories the stimulus control, know-how, and feedback system are more effective strategies in promoting exercise compliance when integrated with mobile technology.

875 Board #54
May 31 3:30 PM - 5:00 PM
Exergaming by Sedentary Middle-Aged Adults Did Not Alter Self-Reported Dietary Intake and Physical Activity

Mingmei Tian, Sean M. Kishel, Katherine T. O’Donnell, Daniel M. Rosney, Peter J. Horvath. State University of New York at Buffalo, BUFF ALO, NY. (Sponsor: Luc E. Gosselin, FACSM)

Email: mingmeit@buffalo.edu

Self-regulation and self-control is a critical consideration to ensure the cogency of the final result in long-term, exercise-related studies since they act as confounding variables that can impact the outcome. Although researchers inform subjects to maintain unwavering lifestyle habits during an experiment, sedentary older people who barely focused on healthy dietary intake and exercise tend to alter their eating and exercise habits due to health awareness evoked by the research experiment.

PURPOSE: To investigate the change in dietary nutrients and physical activity after sedentary middle-aged adults have participated in regular, consistent exergaming.

METHODS: 12 sedentary, middle-aged men and women (56±3.6 years, 162.0±10.9 cm, 79.2±19.1 kg, % fat mass 39.6±7.7 %) used interactive exercise exergaming under monitored conditions at a low to moderate intensity level with self-selected exercises for 20 minutes a day, 3 days a week for 8 weeks. A three-day diet record was used to assess dietary intake and the Yale Physical Activity Survey (YPAS) to estimate energy expenditure and to document the frequency and intensity of various activities before and after the study for each subject.

RESULTS: No significant differences were found between before and after the exercise intervention for total energy intake or any dietary nutrient. The only variable in the YPAS analysis to change was the standing score which significantly increased after exergaming (5.00-7.33, p<0.05). However, total energy expenditure per day (p=0.10) as well as the activity dimension index (p=0.12) did not change.

CONCLUSION: Dietary intake and overall physical activity did not change. This indicates a strong control for confounding variables, which can impact final results besides the exercise due to exergaming. The increase in standing score suggests that participation in exergaming can lead to more awareness for healthier lifestyle habits.
MyPlate Enhances Physical Activity Along With Nutritional Knowledge In College Students: A Pilot Study
ALI M. Al nawaisheh, Moath F. Bataineh, Akef M. Taifour. Hashemite University, Zarqa, Jordan. (Sponsor: Matt Green, FACSM)
Email: nawaisheh_a@yahoo.com
(No relationships reported)

Purpose: The objective of this study was to investigate whether MyPlate, used as a nutritional assessment and an educational platform, can improve nutritional knowledge, eating attitudes and physical activity levels compared to food records.

Methods: One hundred twenty university students (18-22 years old) with a normal Body Mass Index (BMI) were recruited and randomly yet equally assigned into one of three groups after signing an IRB approved informed. The groups were: MyPlate group (MG), food records group (FG), and control group (CG). All participants attended two nutritional seminars and completed a modified and validated general nutrition knowledge questionnaire (GNKQ). Eating attitude test (EAT-26) at the beginning and the end of the 4-week study period. A detailed exercise log was also obtained from each participant for the entire period of study.

Results: Participants in the MG group showed a significant improvements in their nutritional knowledge (p<0.05), eating attitude (p<0.05) and physical activity (p<0.05) compared with other groups. Vegetable consumption elevated from start to finish in the MG (p<0.05) along with a trend towards elevated wholegrain consumption. Males tended to show a more positive eating behavior compared with females in all groups. No significant differences were observed in eating attitude, and physical activity in FG compared with CG.

Conclusion: MyPlate appears to be an effective tool to improve physical activity, nutritional knowledge and promote positive eating behaviors and therefore wellness.

Adherence-related Psycho-perceptual Responses To High-intensity Interval Training In Physically Inactive Middle-aged Adults
Eric Tsz-Chun Poon, Anthony Pui-Wan Chung, Waris Wongsipit, Sinead Sheridan, Stephen Heung-Sang Wong, FACSM, The Chinese University of Hong Kong, Hong Kong, Hong Kong.
(No relationships reported)

High-intensity interval training (HIIT) has recently been advocated as a time efficient alternative to HIIT, but relatively little is known about the adherence related psycho-perceptual responses to this form of exercise in physically inactive individuals. PURPOSE: To compare the adherence-related psycho-perceptual responses after a single session of HIIT versus moderate-intensity continuous exercise (MICE) and vigorous-intensity continuous exercise (VICE) in physically inactive middle-aged adults. METHODS: Using a repeated measures randomized cross over design, twelve middle-aged apparently healthy physically inactive males (mean age: 46.8 ± 7.5 years; BMI: 23.4 ± 2.1 kg m⁻²; VO₂max: 39.5 ± 5.6 mL kg⁻¹ min⁻¹) undertook three main trials (7-days apart) consisting of: HIIT (10 x 1-min run at 100% VO₂max interspersed with 1-min active recovery at 50% VO₂max), MICE (40-min run at 65% VO₂max) and VICE (20-min run at 80% VO₂max). Participants’ adherence-related psycho-perceptual responses including: (i) Self-efficacy assessed via a 5-item task-specific questionnaire; (ii) Perceived enjoyment responses measured via the Physical Activity Enjoyment Scale (PACES) and (iii) exercise modality preference were assessed upon completion of the trials. [hl1] One-way repeated measures ANOVA was used to identify within-subject differences. Pairwise comparison was conducted with LSD corrections. RESULTS: There was a significant main effect between the trials. Participants displayed significantly lower exercise task self-efficacy scores towards HIIT (42.7 ± 25.3) and VICE (49.2 ± 23.9) than MICE (63.4 ± 18.3, both P < 0.01) based upon pairwise comparison. Additionally, only 17% of participants (2 out of 12) reported a preference to engage in HIIT as opposed to either MICE and VICE. No significant difference was found for perceived enjoyment responses between the trials. CONCLUSION: Our finding suggests that HIIT does not promote self-efficacy and may not be an adherence exercise strategy for health promotion in physically inactive middle-aged individuals. Future research examining the long-term adherence to HIIT in this population is warranted.

Comparison of Mindful and Slow Eating Strategies on Acute Energy Intake
Anna Peluso¹, Kelliann K. Davis, FACSM², Bethany Barone Gibbs³, Elizabeth M. Venditti⁴, John M. Jakicic, FACSM⁵.
¹Greensboro College, Greensboro, NC. ²University of Pittsburgh, Pittsburgh, PA.
(No relationships reported)

Purpose: Mindfulness and slow eating techniques are commonly recommended to aid in weight loss within behavioral weight management programs; yet, the role of these eating strategies on acute energy intake (EI) and satiety are not clear. The purpose of this study was to investigate the effects of mindful and slow eating strategies on acute EI and satiety.

Methods: 24 subjects (median BMI: 29.1 (24.3 – 36.7), median age: 24.0 (21.0 – 31.8)) were randomized into one of three eating conditions (EAT, SLOW, or MIND). For the EAT condition, subjects were instructed to eat as they normally would for both test meal sessions. For the SLOW condition, subjects were instructed to eat as they normally would for their first test meal session and to slow their eating for their second test meal session. For the MIND condition, subjects were instructed to eat as they normally would during their first test meal session and were given brief instructions on mindful eating for their second test meal session. For each condition, subjects were provided ad-libitum access to a test meal and EI was calculated based upon food consumed during this period. Subjects rated their level of satiety following each meal.

Results: There were no significant differences in EI between eating strategy conditions (EAT: 848 (704-1071) kcals, MIND: 673 (485-846) kcals, SLOW: 756 (611-1076) kcals) (p = 0.786). There was a trend toward a decrease in energy intake in the MIND condition (mean change in energy intake: -64.4 ± 178.4 kcals) compared with the HIIT condition (mean change in energy intake: 93.0 ± 178.4 kcals) (p = 0.057). There was a trend toward a decrease in EI achieved through a brief mindfulness practice (EAT: 848 (704-1071) kcals, MIND: 673 (485-846) kcals, SLOW: 756 (611-1076) kcals) compared with other groups. There were no significant differences in EI between conditions.

Conclusion: Neither mindful nor slow eating strategies significantly decreased acute EI or satiety, although a decrease in EI achieved through a brief mindfulness practice and prevention of increased intake through slow eating may be clinically meaningful for weight management. Future studies should aim to investigate the potential benefits of slow eating and mindfulness for weight management.

Social Impact Bonds - Applicability In Preventive Medicine
Roni S. Moran, Daniel S. Moran, FACSM, Gil Fire. Ariel University, Ariel, Israel. (Sponsor: Daniel S. Moran, FACSM)
(No relationships reported)

Social impact bonds (SIBs) are a relatively new financial model which suggests the entry of private investors into the public sector, in fields which are under the responsibility of government establishments. The private investor goal is to initiate a social program agreed upon together with the government. To note, SIBs can be a novel model that has the potential to make a dramatic change in the strategy of funding projects whose data has been delivered, 21 show a very positive outcome. The first SIB ever launched was to reduce recidivism. The project matured in 2016 in 15 countries mainly UK, USA, Australia, and Israel focusing on issues of: education, prisoners’ rehabilitation, unemployment, health and family care. Out of 22 projects whose data has been delivered, 21 show a very positive outcome. The first SIB ever launched was to reduce recidivism. The project matured in 2016 in 15 countries mainly UK, USA, Australia, and Israel focusing on issues of: education, prisoners’ rehabilitation, unemployment, health and family care. Out of 22 projects whose data has been delivered, 21 show a very positive outcome. The first SIB ever launched was to reduce recidivism. The project matured in 2016 in 15 countries mainly UK, USA, Australia, and Israel focusing on issues of: education, prisoners’ rehabilitation, unemployment, health and family care. Out of 22 projects whose data has been delivered, 21 show a very positive outcome.
Board #59
May 31 3:30 PM - 5:00 PM
Health Promotion Intervention On Rural Roads In Sweden - A Case Study Of Cycling Safety
Ruggero l. Ceci1, Christopher J. Pattner2, Swedish Transport Administration, Stockholm, Sweden. Swedish National Road and Transport Research Institute, Borlänge, Sweden. (Sponsor: Christopher Dunbar, FACSM)
Email: ruggero.ceci@trafikverket.se
(No relationships reported)

PURPOSE: In Sweden, as well as in many countries in Scandinavia and in northern Europe, there is a growing trend to allocate the daily exercise routines to cycling and walking in the form of work commuting. This has led to an increase of bikers with light race bikes and garment for race bike training along the roads and streets of major cities like Stockholm and Gothenburg and elsewhere. The health gained from this new trend is of course an important factor to consider and the Swedish authorities, cycling organizations and researchers are actively engaged in the development and evaluation of this health trend. One crucial factor in this development is the safety of the bikers on the public roads with mixed traffic. A cyclists is often overtaken by cars and other vehicles and does not have control over the distance between them and the other vehicles. However, if the cyclist had control over the distance between themselves and the motor vehicle/object, how much space would they give themselves? To investigate how road safety factors such as proximity to vehicles passing the bikers on a rural roads a study was conducted.

METHODS: The experiment was conducted in an indoor athletics arena at Lugnet in Falun where 48 participants were assigned to one of three groups. Group one with a balanced order of the object-proximity variable (n = 24); group two with the object-proximity variable ordered closest first and moving outward from the track (n = 12); and group three with object-proximity variable ordered furthest away first and moving inward towards the track (n = 12). The participants were donned with a bicycle helmet with a GoPro camera, a second camera was attached to the handlebars. Independent variables were object proximity to the bicycle lane (cm) measured from the center of the lane; dependent variables were lateral position in cm to moving objects, cycling speed and heart rate.

RESULTS: The preliminary results suggest that bicycle lane must be at least 140 cm broad to accommodate a ‘comfortable’ passing distance (for the cyclist). The equivalent passing speeds equates to a car speed of approximately 40 km/h. If the car speeds were higher, the bicycle lane will need to be broader.

CONCLUSIONS: This would suggest that the current minimum bicycle lane breadth (in Sweden) of 70 cm would appear to be woefully under-dimensional.

880

Board #61
May 31 3:30 PM - 5:00 PM
Effect Of Frequent Daily Walking Bouts On Sedentary Time And Self-perceived Fatigue In Free-living Adults
Nathan DeJong, Corey A. Rynders, Daniel H. Bessesse, Audrey Bergouignan. University of Colorado Denver, Aurora, CO.
Email: nathan.dejong@ucdenver.edu
(No relationships reported)

PURPOSE: Breaking up sedentary time with frequent short bouts of activity has been suggested as a novel strategy to reduce sedentary behaviors, but whether this strategy will be effective at reducing sedentary time in free-living conditions is unknown. In this pilot study, objective measures of physical activity and self-reported measures of fatigue and vigor were compared to over 3-days among the following free-living conditions (1) microburst activity (MICRO: 5-min of brisk walking every hour for 9 hours), (2) one 45-min bout of brisk walking (ONE), and (3) a sedentary control condition (SED).

METHODS: Eighteen sedentary overweight adults (12F/6M, mean±SD: age=32±6.1 yo, BMI=30.8±2.5 kg/m2) completed each condition (MICRO, ONE, SED) in a randomized crossover study. The percentage of time spent in sedentary, light-intensity (LPA) and moderate-to-vigorous intensity physical activity (MVPA) were measured by accelerometry (ActiGraph GT3X). At the end of each day, participants self-reported their level of fatigue and vigor using visual analog scales (VAS).

RESULTS: Both MICRO (7.5±3.3%, p<0.01) and ONE (9.5±3.3%, p<0.0001) increased the percentage of time spent in MVPA during waking hours compared to SED (5.2±2.4%). However, MVPA decreased between the first (10.1±2.5%) and the third day (8.2±2.2%, p=0.02) of ONE, while no changes occurred in MICRO. ONE (79.3 ± 5.9%, p<0.0001), but not MICRO (83.1±5.4%) reduced the percentage of time spent sedentary during waking compared to SED (84.4±5.7%). The fact that LPA was lower with MICRO (10.6±4.1%) than with ONE (12.9±5.4%, p<0.03) suggests a spontaneous displacement from LPA towards sedentary time. Participants reported feeling less “worn out” (34.3±25.9 vs. 42.8±26.1, p<0.04), “bushed” (33.8±25 vs. 41.6±24.1, p<0.05), and had a lower desire to close their eyes (37.3±27.5 vs. 44.1±26.6, p<0.05) and lie down (39.5±28.0 vs. 47.6±27.7, p<0.05) during MICRO compared to ONE conditions.

CONCLUSIONS: Performing a continuous bout of brisk walking per day seems to be more potent at increasing MVPA and reducing time spent sitting, however, the effects may not be long lasting. Small lifestyle changes such as those induced by microbouts of activity may be easier to implement in at-risk populations. Long term studies are needed to confirm this hypothesis.

881

Board #60
May 31 3:30 PM - 5:00 PM
Relationship Between Affective Responses And Adherence To High Intensity Interval Training In Obese African-American Women
Alvin L. Morton1, Kelley Strohacker1, Michael J. McKenzie, FACSM2, Melicia C. Whitt-Glover, FACSM3, David L. Mount4, Lyndsey M. Hornbuckle1. 1University of Tennessee, Knoxville, TN. 2Winston-Salem State University, Winston-Salem, NC. 3Gramercy Research Group, Winston-Salem, NC. 4Mind Body Institute Beyond, Winston-Salem, NC. (Sponsor: Melicia C. Whitt-Glover, FACSM)
Email: amoranto16@vols.utk.edu
(No relationships reported)

Introduction: A previous parent study showed significantly better adherence for high intensity interval training (HIIT; 31% dropout) compared to steady state (SS; 73% dropout) in a sample of inactive, obese African-American (AA) women (N=27; age: 30.5±6.9 yrs, 527±1416646 pts/day; BMI: 35.1±5.1 kg/m2). However, the relationship between affective responses and adherence is unclear.

Purpose: To conduct exploratory and descriptive analyses of affective responses over time between SS vs. HIIT conditions, and between study completers vs. non-completers.

Methods: Subjects were randomized into a 16-week treadmill exercise intervention, consisting of 4 weeks of conditioning, then 12 weeks of SS or HIIT training. The intervention consisted of three, 32-min bouts/week. SS bouts consisted of continuous exercise at 60-70% of maximal heart rate (HRmax). The time-matched HIIT bouts alternated 3-min lower-intensity intervals (60-70% HRmax) with 1-min high-intensity intervals (80-90% HRmax). Core affect was assessed using the Feeling Scale (FS), pre- and post-exercise, as well as after the 8th, 20th, and 32nd minute of exercise. Possible FS scores range from -5 (very bad) to 5 (very good). Mean in-task FS scores are reported for the average of three sessions of week 5 and the last week of participation. Descriptive and frequency analyses are presented over the entire week.

Results: SS completers reported FS values of 5.00±0.00 both at week 5 and week 16. HIIT completers reported mean in-task FS values of 2.88±1.19 at week 5 and 3.82±0.63 at week 16. At week 5, SS and HIIT non-completers reported FS values of and 4.08±0.86 and 2.91±1.77, respectively. During the final week of participation (8.7±3.3 wks), SS and HIIT non-completers reported FS values of 3.88±1.13 and 3.16±1.18, respectively. Of 221 SS and 586 HIIT bouts completed, 11 (5.0%) and 42 (7.2%) contained ±1 negative in-task FS score, respectively.

Conclusion: While HIIT subjects consistently reported lower FS values relative to SS subjects, mean values were positive and similar to those observed for SS exercise in prior studies. Further, despite lower FS values, HIIT subjects had less dropout. Thus, it seems that HIIT is feasible in this population. These pilot data suggest the need for further research on contributors to adherence to HIIT in low-active, obese AA women.

882

Board #62
May 31 3:30 PM - 5:00 PM
Effects Of Whole 30 Dietary Program On Body Composition And CrossFit Performance
Valden Luis Matos Capistrano Junior1, Renata Alves Carneauba2, Natália Marques3, Ana Beatriz Baptista2, Renata Desiree Besseira de Sena1, Angela Siqueira Furtado Martin1, Adriana Pereira Sampao1, Diego de Castro e Silva Lacerda1, Valéria Paschoal2, Andrea Naves2. 1VC Nutrition Clinic research, Fortaleza, Brazil. 2VP Research Institute, São Paulo, Brazil. Email: valdenjunior@hotmail.com
(No relationships reported)

PURPOSE: To evaluate the influence of Whole30 program on body composition and CrossFit performance in trained individuals.

METHODS: Sixty four subjects (age range: 21-54years) attended to nutrition education class to learn food items and recommended volumetric values comprising the Whole 30 program (allowed foods: meats, seafood/ fish, eggs, fruit, vegetables and monounsaturated fats; forbidden foods: sugar, sweeteners, alcohol, flour, oat, quinoa, corn, rice, starch, beans, soy, milk and dairy products) and followed a 15 days training protocol (4 days/ week). On day 1 and day 15 of the training protocol, performance was measured as the minimum time taken to perform CrossFit workout. The body composition was evaluated by portable ultrasound during the days 1 and 30 of the dietetic program. The collected measures were chest (C), triceps (TR), subscapular (SB), medial axillary (MA), suprailiac (SI), abdomen (AB) and medial thigh (MT), and the fat percentage was automatically calculated by the Body View Software. Samples were tested for normal distribution and groups were compared by either Student’s t-test or Wilcoxon Mann Whitney test. The type 1 error was set at p<0.05.
RESULTS: After 30 days of Whole 30 program, there was a significant reduction on the sum of 9 skinfolds (67.7±21.21 vs 55.89±16.32, p<0.0001), total fat (23.2±6.73 vs 19.66±6.37, p<0.0001) and trunk fat (47.07±16.14 vs 36.51±11.91, p<0.0001); and a significant gain of body fat-free mass (76.76±6.73 vs 80.34±6.37, p<0.0001). When subgroup analyses were performed by sex, it was found that the relative loss of body fat (sum of 9 skinfolds, total fat and trunk fat) was similar. Regarding performance, a time reduction to perform the CrossFit workout was observed (14’18” vs 12 ‘33” , p<0.0001) and post dietary intervention, respectively.

CONCLUSIONS: The Whole 30 dietary program promoted body fat reduction and fat-free mass gain in trained Crossfit individuals. Additionally, after 30 days of dietary program, there was observed improvement in performance by reducing the time taken to perform the CrossFit workout.

PREVIOUS STUDIES have reported that healthy middle-aged adults spend less time on physical activity during the weekend than during the weekday. However, there are few reports about this topic that include older Japanese adults.

PURPOSE: To examine variation in the amount of daily physical activity during an exercise intervention for older Japanese adults. Variations between the sexes were also examined in this study.

METHODS: Forty-one healthy adults (female: n = 24; male: n = 17; age: 73.2 ± 7.3 years) participated in an exercise intervention (UMIN000020678). The exercise program was conducted once a week for 3 months. Daily physical activity was measured using three-axis accelerometers (OMRON: HJA-750C). Physical activity data were categorized into two types: locomotive or household activity. For each day of the week, we compared locomotive and household activity between male and female participants using one-way ANOVA. Statistical significance was set at P < 0.05.

RESULTS: For all participants, physical activity amounts for each day of the week (Monday-Sunday) was 21.7±2.03 Mets/h/day. There were no significant (P > 0.05) differences among the days of the week. The average total amount of daily physical activity through all 7 days of the week was higher for female subjects (24.2 ± 4.5 Mets/h/day) than for male participants (20.0 ± 3.9 Mets/h/day). The average amount of locomotive activity was higher for male participants (5.42 ± 1.81 Mets/h/day) than for female participants (4.82 ± 2.0 Mets/h/day). However, the average amount of household activity was higher for female participants (19.3 ± 3.7 Mets/h/day) than for male participants (14.6 ± 3.5 Mets/h/day).

CONCLUSIONS: The results suggest that there is no significant variation in daily physical activity amounts in older Japanese adults during our exercise intervention. Furthermore, female participants in this intervention had higher total amounts of daily physical activity because of higher household physical activity amounts, even though male participants had higher locomotor activity.

RESULTS: Thirty healthy and recreationally active men [25 (SD 2.7)] y of age, 65 (10) kg, height 1.72 (0.06) m, BMI 22.2 (7.1) kg/m², systolic and diastolic blood pressures [114 (5) 69 (8) mm Hg], fasting glucose [4.5 (1.3) mmol/L] and physical activity level [214 (428) MET-min/w] pre-RT. No interaction was found for all measures (p = .350-0.944). There were no group differences except for Hb, MCHC, and RDW (p = .001-0.022). Differences were due to the means (SE) of Hb [C: 15.150 (0.194) > NC: 14.396 (0.267), p = .001], MCHC [C: 35.071 (0.217) > NC: 34.060 (0.231) g/dL], and RDW [C: 12.553 (0.163) < NC: 13.530 (0.328) %] being lower in one group than the other at baseline. C and NC showed similar profile across respective time points. Hct, MCV and MCH increased at UT 0 h (p = .001-0.033) but Hct lowered at UT 24 h (p = .006) while MCH remained elevated at UT 24 h (p = .042) compared to UT pre. RB and Hb lowered at UT 24 h compared to UT Pre (p = .002-0.029). MCV and MP increased (p = .001-0.037) while MCHC lowered (p = .022) at UT 0 h compared to UT Pre. CONCLUSION: Both groups demonstrated similar post-RT responses in hematocrit profile.

Supported by NIE AcRF R1 5/14 YYF

PURPOSES: Health authorities worldwide recommends 2-3 d/w of resistance training (RT) for health, preferably spread 48-72 h apart. However, it is common among fitness buffs, top athletes and weekend warriors to RT on consecutive days. Yet, effects of recovery period in between RT sessions on many physiological variables are unclear. Therefore, the purpose of this study is to determine the effects of 12 w of either 3 consecutive (C) or non-consecutive (NC) d/w of RT on body composition and strength.

METHODS: Thirty young, healthy and recreationally active men [25 (SD 2) y] were randomly assigned to either C or NC for 12 weeks. The FIT program was conducted once a week for 3 months. Daily physical activity was measured using three-axis accelerometers (OMRON: HJA-750C). Physical activity data were categorized into two types: locomotive or household activity. For each day of the week, we compared locomotive and household activity between male and female participants using one-way ANOVA. Statistical significance was set at P < 0.05.

RESULTS: For all participants, physical activity amounts for each day of the week (Monday-Sunday) was 21.7±2.03 Mets/h/day. There were no significant (P > 0.05) differences among the days of the week. The average total amount of daily physical activity through all 7 days of the week was higher for female subjects (24.2 ± 4.5 Mets/h/day) than for male participants (20.0 ± 3.9 Mets/h/day). The average amount of locomotive activity was higher for male participants (5.42 ± 1.81 Mets/h/day) than for female participants (4.82 ± 2.0 Mets/h/day). However, the average amount of household activity was higher for female participants (19.3 ± 3.7 Mets/h/day) than for male participants (14.6 ± 3.5 Mets/h/day).

CONCLUSIONS: The results suggest that there is no significant variation in daily physical activity amounts in older Japanese adults during our exercise intervention. Furthermore, female participants in this intervention had higher total amounts of daily physical activity because of higher household physical activity amounts, even though male participants had higher locomotor activity.

RESULTS: Thirty healthy and recreationally active men [25 (SD 2)] y, 65 (10) kg, height 1.72 (0.06) m, BMI 22.2 (7.1) kg/m², systolic and diastolic blood pressures [114 (5) 69 (8) mm Hg], fasting glucose [4.5 (1.3) mmol/L] and physical activity level [214 (428) MET-min/w] pre-RT. No interaction was found for all measures (p = .350-0.944). There were no group differences except for Hb, MCHC, and RDW (p = .001-0.022). Differences were due to the means (SE) of Hb [C: 15.150 (0.194) > NC: 14.396 (0.267), p = .001], MCHC [C: 35.071 (0.217) > NC: 34.060 (0.231) g/dL], and RDW [C: 12.553 (0.163) < NC: 13.530 (0.328) %] being lower in one group than the other at baseline. C and NC showed similar profile across respective time points. Hct, MCV and MCH increased at UT 0 h (p = .001-0.033) but Hct lowered at UT 24 h (p = .006) while MCH remained elevated at UT 24 h (p = .042) compared to UT pre. RB and Hb lowered at UT 24 h compared to UT Pre (p = .002-0.029). MCV and MP increased (p = .001-0.037) while MCHC lowered (p = .022) at UT 0 h compared to UT Pre. CONCLUSION: Both groups demonstrated similar post-RT responses in hematocrit profile.

Supported by NIE AcRF R1 5/14 YYF
mixed-model ANOVA (p < .05). RESULTS: No main effects were found. Significant improvements (group x time) were observed for the experimental group at fast walking speed for AT (r = .78, p < .001); 30.3% ES (r = .72). Velocity (r = -86.8, F (1, 36) = 4.61, p = .039, ES = -114); and step length (r = .864, F (1, 36) = 5.64, p = .023, ES = -136). Significant differences in SS speed included SS (r = .892, F (1, 36) = 4.37, p = .044, ES = .108) and SS drop support (r = .887, F (1, 36) = 4.59, p = .039, ES = -113); and double support time (r = .868, F (1, 36) = 4.63, p = .038, ES = -114). The remaining variables were non-significant. CONCLUSION: The mobile health promotion app can significantly improve AT, velocity, step length and body support time during the gait cycle at varying speeds to potentially reduce the risk of falls in older adults. Funded by The Retirement Research Foundation.

Nurses face multiple negative stressors and report the greatest stress of all health care workers. The stress can have a negative effect on the health of nurses (e.g., obesity, fatigue, decrease in quality of life and satisfaction with life, and burnout). Stress is common among nurses with negative impacts on a nurse’s health as well as the quality of care patients receive. It is important for nurses to implement self-care strategies techniques (e.g., physical activity) to lower feelings of stress. PURPOSE: To examine the relationship between physical activity levels and measures of health among nurses in eastern NC. METHODS: Nurses (n = 62, 94% females; 85% White; age = 42.2 ± 11.7) were recruited primarily from two adult ICUs in a teaching hospital in Greenville, NC. ‘San Diego State University; San Diego, CA. (Sponsor: Matthew Mahar, FACSM) Email: dashbi@ecu.edu (No relationships reported)

Major revisions in the ACSM’s screening guidelines will be included in the 10th edition of the ACSM’s Guidelines for Exercise Testing and Prescription (GETP). The primary goal of the revised guidelines is to streamline the screening procedures published in the 9th ed. of the GETP by (a) eliminating the assessment of risk factors and stratification of individuals into low and high risk categories, and (b) possibly reducing the number of individuals needing to obtain medical clearance. A pre-activity screening questionnaire (PASQ) that incorporated the revised guidelines was administered to employees who participated in the 2016 University of South Florida FIT program. PURPOSE: To evaluate the PASQ by obtaining feedback from FIT participants and the project professional who administered the PASQ. METHODS: After completing the PASQ, participants were sent an e-mail asking them to complete a survey to determine if the terms and questions in each of the following five sections of the PASQ were clear and understandable: (1) Instructions, (2) Current Physical Activity, (3) Medical Conditions, (4) Signs/Symptoms, and (5) Acknowledgement/Signature. RESULTS: Of the 20 participants, 15 (75%) completed the survey including 10 new and five returning FIT participants. All participants indicated “yes” when asked if the terms and questions were clear and understandable in all of the five sections except one participant. This individual indicated that the definitions of moderate and vigorous intensity (in Section 2) were not clear and understandable and commented that there was not much variance in the activity levels. Regarding level of difficulty to complete the PASQ, 10 indicated “very easy” and five indicated “easy”. The professional who administered the screening processes was quicker and more efficient than the PASQ used for the FIT program in previous years that incorporated the screening guidelines from the 9th ed. of the GETP. Three of the five returning FIT participants also indicated that the PASQ was easier and faster to complete than the previous PASQ. In addition, none of the FIT participants needed to obtain medical clearance compared to previous years in which 25-25% of the participants did. CONCLUSION: The PASQ was found to achieve the primary goal of the ACSM’s revised guidelines.

Exercise enjoyment is purported to predict future exercise engagement. While the physiological benefits associated with high-intensity interval exercise (HIIE) have been well documented, limited information exists regarding individuals’ enjoyment of this form of exercise in comparison to traditional continuous exercise modalities, particularly in physically inactive individuals. PURPOSE: To quantify rating of perceived enjoyment using the physical activity enjoyment scale (PACES) following HIIE, moderate-intensity continuous exercise, and vigorous-intensity continuous exercise in physically inactive young men. METHODS: Twelve physically inactive apparently healthy young men (mean age: 24.3±1.72 years; body mass index: 23.49±4.64 kg·m⁻²; VO₂max: 48.86±6.55 mL·kg⁻¹·min⁻¹) participated in the study. Using a randomized cross over design, participants undertook three running trials consisting of HIIE (10 x 1 min at 100% VO₂max interspersed with 10 x 1 min active recovery at 50% VO₂max), moderate-intensity continuous exercise (40 min at 65% VO₂max) and vigorous intensity continuous exercise (20 min at 80% VO₂max). After the completion of all trials, participants were asked to rate their perceived enjoyment using PACES. Statistical analysis was calculated using one-way ANOVA with repeated measures to examine within-subject effect. RESULTS: There was no significant difference in perceived enjoyment rating following HIIE (92.4±13.77), moderate-intensity continuous exercise (87.67±15.38), and vigorous intensity continuous exercise (90.58±16.38) (p=0.10). CONCLUSIONS: Acute exercise responses to HIIE and non-HIIE exercise were similar in physically inactive young adults. Future research is warranted to compare the chronic exercise responses to HIIT and continuous exercise in this population.

Obesity rates are higher among rural compared to urban children in the U.S. for reasons that are incompletely understood. Emerging data suggest a relationship between food insecurity (FI) and physical activity (PA) insufficiency among children in the U.S., both factors that have been associated with obesity. Rates of child FI are known to be higher among rural compared to urban households, but research is mixed regarding rural/urban differences in PA. As such, exploring the relationships between FI, PA insufficiency, and obesity may help us better understand the rural/urban differences in child obesity rates. PURPOSE: To examine the association between FI risk and family diet and PA behaviors associated with child obesity, among a sample of families residing in rural Oregon. METHODS: Families (n=144) were recruited through six elementary schools (K-5/6) in low-income, rural, Oregon communities. Families completed surveys including a FI risk screener and the Family Stage of Change Survey (FSCS), a measure of readiness to change family-level diet (n=6 items), sleep (n=1 item) and PA (n=5 items) behaviors shown to predict child obesity. Logistic regression was applied to examine associations between FSCS scores and FI risk. RESULTS: Among families at risk for FI (40.2%), a higher proportion were non-white (77.4% versus 22.2%; p=0.036) and had lower adult education levels (50.4% versus 11.8% with a high school degree or less; p=0.015) compared to families not at risk for FI. Of the 12 FSCS items, only one significant difference emerged between families at risk and not at risk for FI: families at risk for FI scored lower on an item reflecting their readiness to provide and support opportunities for structured PA (p=0.001).
Logistic regression analyses showed the odds for FI risk were 55% lower among families reporting higher readiness to provide and support structured PA opportunities (p=0.003).

CONCLUSIONS: FI risk is associated with rural families’ readiness to provide PA and support structured PA opportunities for their children. A better understanding of factors relating to readiness and ability to provide structured PA and its relationship to FI may inform future obesity prevention efforts for at-risk families.

Supported by a grant from the National Institute of Food and Agriculture, USDA, award # 2011-68001-30020.

892 Board #71 May 31 3:30 PM - 5:00 PM Impact of Visual Feedback on Exercise Intensity and Motivation
Kelsey Reynolds, Dale D. Brown, FACSM, Daniel Dodd, Kelly R. Laursen. Illinois State University, Normal, IL. (No relationships reported)

PURPOSE: Determine if visual feedback motivates college-aged students to maintain a higher exercise intensity during an indoor cycling class and to ascertain the favored type of visual feedback.

METHODS: Thirty participants took part in a within-subject design experiment. Participants were assigned a heart rate monitor and identification number to record and monitor exercise intensity during each class session. Participants completed three cycling classes that were randomly assigned as a no visual feedback (NF), individual feedback (IF), or group feedback condition (GF). A Spielberger Trait Anxiety survey was completed before the first session and the Spielberger State Anxiety survey was completed before every cycling session. For each condition, participants stated if they enjoyed the heart rate feedback received and using the heart rate monitors. At the end of the study, participants specified the visual biofeedback condition they preferred.

RESULTS: The group feedback condition spent a higher percentage of time above 80% of their age-predicted heart rate maximum. Participants spent 17.5% of their time in the 80-90% heart rate zone and 2.8% in the 90-100% zone. No feedback and individual feedback groups spent 13.2% and 15.1% in the 80-90% heart rate zone and 0.9% and 2.7% in the 90-100% zone. A one-way repeated measures ANOVA indicated a statistically significant difference between the groups spent the 60-70% and heart rate zone between the three conditions. The group feedback condition had the highest average heart rate (138.1 bpm), maximal heart rate (174.4 bpm), and heart rate predicted calorific expenditure (293.5 kcal). A positive correlation was found between the group feedback RPE and enjoyment of group feedback (r=0.55, p=0.01). The RPE of individual feedback was positively correlated with working harder due to wearing a heart rate monitor (r=0.54, p=0.01) and receiving individual feedback (r=0.57, p=0.01). Twenty-one (70%) participants preferred group feedback, 4 participants (13.3%) favored the individual feedback, 1 participant (3.3%) chose no feedback, and 4 participants (13.3%) had no preference.

CONCLUSIONS: Participants favored group feedback over individual feedback and no feedback. Visual feedback was associated with higher exercise intensity and greater enjoyment of the exercise session.

893 Board #72 May 31 3:30 PM - 5:00 PM Impact Of Sit-to-stand Workstation Use On Physical Fitness: A Pilot Study
Catherine Patrick, Shiani Wickham, Larissa Boyd, Melissa Powers. University of Central Oklahoma, Edmond, OK. Email: cpattrick3@uco.edu (No relationships reported)

Recent studies indicate sedentary lifestyles have a negative impact on physical fitness. Modifying sedentary daily activities could maintain and improve optimal health. The introduction of sit-to-stand workstations within the workplace provides sedentary employees an opportunity to alternate between sitting and standing positions.

PURPOSE: The purpose of this pilot study was to determine if using a sit-to-stand workstation would improve physical fitness.

METHODS: Eleven health male and female full-time faculty (age = 39.0±10.45 years) volunteered to use a sit-to-stand workstation for a minimum of three hours per workday for one year. Muscular fitness was assessed as hand-grip strength, partial curl-up test, and push-up test. Flexibility was measured using the sit-and-reach test, while estimated VO2max was determined through the Queens College Step Test. Balance was evaluated by a timed one-leg stance with eyes closed.

RESULTS: Six participants completed this one year pilot study. Three participants withdrew from the study due to inconvenience or difficulty using the workstation; one withdrew due to retirement. One additional participant was unable to complete post-testing. Independent samples t-tests indicate no difference at baseline in any fitness variable between those who completed the study and those who withdrew (p > .05). Due to the sample size, no significant differences were observed in physical fitness over the one year period (p > .05); however, potential meaningful changes were observed using Cohen’s d calculations for effect size. Hand-grip strength increased by 3.17 kg (d = 0.11, +4.82%), while the number of curl-ups performed increased by 3.5 (d = 0.17, +9.46%). Estimated VO2max increased by 1.12 kg·min⁻¹ (d = 0.31, +25.7%) and one leg stance with eyes closed increased by 2.62 seconds (d = 0.15, +15.2%). CONCLUSION: Improvements in strength, balance, and VO2max suggest sit-to-standing workstations may have a positive impact on employees’ physical fitness. Participants who withdrew due to difficulty of use indicate a need for examining desk selection, instruction of use, and motivational techniques. Further investigation of a larger population should focus on potential physical fitness benefits and functionality for the user of sit-to-standing workstations.

894 Board #73 May 31 3:30 PM - 5:00 PM Soccer Training Improves Metabolic and Cardiovascular Health in 50-70-yr olds with pre Type 2 Diabetes
Magni Mohr1, May-Britt Skoradal1, Jann Mortensen2, Pål Welie1, Peter Krustup1. 1University of the Faroe Islands, Tórshavn, Faroe Islands. 2The Faroese National Hospital, Tórshavn, Faroe Islands. 3The Faroese Hospital System, Tórshavn, Faroe Islands. 4University of Southern Denmark, Odense, Denmark. Email: magnim@setur.fo (No relationships reported)

Type 2 Diabetes Mellitus is a pathological condition, which partly is provoked by an inactive lifestyle. PURPOSE: To examine effects of soccer training vs. dietary advice on glucose control, metabolic and cardiovascular health status in patients with pre-T2DM. METHODS: Fifty 50-70 yr-old untrained participants (26 women and 24 men; age: 61±1 yrs; height: 171±1 cm; weight: 85.7±2.3 kg; VO2max: 22±1.08 ml·min⁻¹·kg⁻¹; mean arterial pressure (MAP): 103±2 mmHg) suffering from pre-T2DM were randomized into a soccer training (SOC; n=26) and control (CON; n=24) group. Both groups received standardized dietary advice during a 16-wk intervention period. Additionally, SOC completed two sessions/wk of soccer training. Training consisted of small-sided games being increased progressively from 30 to 60 min per session during the 16-wk intervention period. Pre and post-intervention, the participants completed a maximal oxygen uptake (VO2max) bike test, an oral glucose tolerance test (OGTT), a DXA-scan, as well as assessments for blood lipid profile, blood pressure and resting heart rate. RESULTS: Post-intervention plasma glucose at rest and at 120 min in the OGGT were lower (P<0.05) in SOC and CON, with a greater effect (P<0.05) in SOC compared to CON (+2.3±0.3 vs. -1.2±0.4 mmol·L⁻¹). After 16 wks VO2max was improved (P<0.05) by 4.3±0.5 ml·min⁻¹·kg⁻¹ in SOC, which was more than in CON (-0.6±0.5 ml·min⁻¹·kg⁻¹). In SOC, body fat content and plasma triglycerides were lowered by -3.4±0.6 kg and -0.31±0.06 mmol·L⁻¹, respectively, and with changes scores greater (P<0.05) compared to CON. Moreover, SOC improved (P<0.05) resting heart rate, lean body mass and waist circumference to a greater degree than CON. CONCLUSIONS: Soccer training in combination with dietary advice improves glucose control, as well as metabolic and cardiovascular health to a greater degree than dietary advice alone in 50-70 yr old patients with pre-T2DM. Supported by a grant from the Faroese Research Council.

895 Board #74 May 31 3:30 PM - 5:00 PM Do University Fitness Classes Meet Acsm’S Daily Activity Recommendations
Jeff Williams, Taylor Ottesen, Zachary Fuller, Mitch Kass, William Mitchell, Ellis Jensen, Steven F. Namanny. Utah Valley University, Orem, UT. Email: namanny@uvu.edu (No relationships reported)

Purpose: The obesity crisis facing the American population is well documented. The American College of Sports Medicine (ACSM) recommends individuals exercise for 30 minutes five days a week at moderate intensity. College and University activity courses may be one avenue for obtaining such activity.

Methods: Fifty 50-70 yr-old untrained participants (26 women and 24 men; age: 61±1 yrs; height: 171±1 cm, weight: 85.7±2.3 kg; VO2max: 22±1.08 ml·min⁻¹·kg⁻¹; mean arterial pressure (MAP): 103±2 mmHg) suffering from pre-T2DM were randomized into a soccer training (SOC; n=26) and control (CON; n=24) group. Both groups received standardized dietary advice during a 16-wk intervention period. Additionally, SOC completed two sessions/wk of soccer training. Training consisted of small-sided games being increased progressively from 30 to 60 min per session during the 16-wk intervention period. Pre and post-intervention, the participants completed a maximal oxygen uptake (VO2max) bike test, an oral glucose tolerance test (OGGT), a DXA-scan, as well as assessments for blood lipid profile, blood pressure and resting heart rate. RESULTS: Post-intervention plasma glucose at rest and at 120 min in the OGGT were lower (P<0.05) in SOC and CON, with a greater effect (P<0.05) in SOC compared to CON (+2.3±0.3 vs. -1.2±0.4 mmol·L⁻¹). After 16 wks VO2max was improved (P<0.05) by 4.3±0.5 ml·min⁻¹·kg⁻¹ in SOC, which was more than in CON (-0.6±0.5 ml·min⁻¹·kg⁻¹). In SOC, body fat content and plasma triglycerides were lowered by -3.4±0.6 kg and -0.31±0.06 mmol·L⁻¹, respectively, and with changes scores greater (P<0.05) compared to CON. Moreover, SOC improved (P<0.05) resting heart rate, lean body mass and waist circumference to a greater degree than CON. CONCLUSIONS: Soccer training in combination with dietary advice improves glucose control, as well as metabolic and cardiovascular health to a greater degree than dietary advice alone in 50-70 yr old patients with pre-T2DM. Supported by a grant from the Faroese Research Council.

Purpose: To determine if college activity courses meet this requirement, physical activity was monitored in 78 students during their class activity period. The students were men and women between the ages of 18-35. Actigraph accelerometer were used to estimate caloric expenditure as well as time spent in sedentary, light, and moderate intensity zones.

Results: 3 out of the 8 fitness courses measured provided students with 30 minutes or more of physical activity, meeting ACSM recommendations. Conclusion: While college activity courses are a good supplement to an individual’s physical activity regimen, many courses should not be considered sufficient to provide all of the daily exercise a student needs.
B-62  Free Communication/Poster - Aging in Skeletal Muscle and Bone

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

896  Board #75  May 31 3:30 PM - 5:00 PM
Chronic Systemic Inflammation, Physical Activity and Skeletal Muscle in Elderly

Fawzi Kadi, Andreas Nilsson, Britta Wåhlin-Larsson, Oscar Bergens. Örebro University, Örebro, Sweden.

(Purpose: It is hypothesized that chronic systemic inflammation is influenced by physical activity level and is involved in the age-related decline in muscle function. The impact of physical activity behaviours on the level of CRP and the inflammatory status in elderly is explored. Methods: Total amount of sedentary time, 30-minute periods of sedentary time and breaks in sedentary behaviour and time spent in moderate-to-vigorous physical activity (MVPA) were assessed using accelerometry in a cohort of 89 elderly women. Serum hsCRP and TNF-α were measured. The results show that the level of CRP was significantly associated with the level of CRP, independently of sedentary behaviour and waist circumference, but not TNF-α. Serum CRP levels were inversely associated to skeletal muscle mass. Elevated serum CRP levels were associated to reduced proliferative rate of human muscle cells and changes in the regulation of the size muscle cells. Conclusions: Inflammation status in elderly is influenced by the amount of time spent in MVPA and exerts detrimental effects on skeletal muscle mass.

897  Board #76  May 31 3:30 PM - 5:00 PM
Biomarkers of Senescence in Aging Skeletal Muscle

Dongmin Kwak1, Cory W. Baumann1, LaDora V. Thompson1. Boston University, Boston, MA. 1University of Minnesota, Minneapolis, MN.

(Purpose: Cells enter into a state of senescence in response to certain stressors, such as aging and age-related diseases. It is proposed that senescent cells drive pathogenesis (e.g., atherosclerosis). Hence, it is possible that senescent cells underlie sarcopenia. Biomarkers of senescence include p53, p21, p16, and senescence associated beta-galactosidase (SA-b-gal). These biomarkers have been extensively investigated using in vitro cell culture experimentation. The purpose of this study was to explore the role of senescence as a potential driver of age-associated sarcopenia. We hypothesized that biomarkers of senescence will be increased in aging skeletal muscle and it is highly associated with sarcopenia. Methods: To identify biomarkers of senescence in aging skeletal muscle, the extensor digitorum longus (EDL) and tibialis anterior (TA) muscles were excised from male C57BL/6 adult ( <12 months, N=11) and elderly (>28 months, N=11) mice. The EDL was then used to examine in vivo whole muscle physiology while the TA was used for histological and biochemistry analyses. Western blotting was performed to determine the expression of p53 and p16, and an ELISA was performed to detect IL-6 content. Senescent cells were determined by SA-b-gal staining. Results: Muscle wet weight and absolute force production were significantly reduced in the elderly group. Aging resulted in a significant increase in p21 and IL-6, but did not alter p53 or p16 expression. Because the identification of senescent cells by SA-b-gal staining was very low the statistical comparison between adult and elderly was not performed. Conclusions: Taken together, selective biomarkers of senescence are present in muscles from elderly mice. Because p21 and IL-6 both increased in the elderly muscle, it is possible that these proteins play a role in the development of age-associated sarcopenia.

ACSM May 30 – June 3, 2017
Denver, Colorado
Regression Equation To Predict Body Fat In Elderly Women Using Body Circumference Measures

Eliane Cunha GONCALVES, DRA. Faculdade Estácio de Vitória, VITORIA - ES, Brazil. Email: elianecgc@hotmail.com

Purpose: The purpose of this study was to develop and validate an equation to estimate body composition in elderly women above 60 years of age using body circumference measures. Methods: The sample consisted of 60 women individuals with an average age of 68.23 ± 5.84 years, body weight 64.71 ± 11.18 kg, and percent body fat 41.33 ± 6.95%. The validation group had the following descriptive metrics: 71.33 ± 8.94 years, weight body 62.49 ± 2.34 kg, 1.55 ± 0.53 m, and percent body fat 41.75 ± 0.49%. Body circumferences variables were used to develop equations to predict body fat. Using the stepwise selection criteria, the following equation was developed: % body fat = 0.343 (hips) + 0.287 (waist) - 0.0714 (hand). Several parameters validated the strength of the partial equation: R² = 0.079, P= 0.329, P< 0.05; and validation of the model based on the partial significance (F) of the subset of variables that showed the strongest effect.

Conclusion: It is possible to develop an accurate and specific equation to estimate body fat percent in elderly women using circumference measurements. In elderly women, the equation: R² = 0.343 (hips) + 0.287 (waist) - 0.0714 (hand) was developed.

IGF-1 Response In Mid-aged And Older Men During Continuous And Intermittent Cycling At Lactate Threshold

Kenji Narazaki1, Yukiya Tanoue2, Yuichi Hatamoto2, Yasuki Higaki1, Hiroaki Tanaka2, Fukuoka Institute of Technology, Fukuoka, Japan. 1Fukuoka University, Fukuoka, Japan.

PURPOSE: To compare changes in the circulating level of IGF-1 in mid-aged and older men during continuous and intermittent cycling at lactate threshold. METHODS: Six men, mid-aged and older (57.8 ±11.6 years), randomly performed two cycling tests at lactate threshold load (108.8±27.3 W) and a control test with rest on separate days. The cycling tests comprised a 20-min continuous cycling (CC) and an intermittent cycling (IC) consisting of 20 repetitions of 1-min bouts separated by 30-sec rests. The control test was administered with a schedule identical to CC. During each session, blood samples were drawn via peripheral cannulation at rest, at 25, 50, and 100% of cycling time, and 10 min after cycling. A blood collection of IGF-1 and those of lactate, cortisol, and catecholamines were measured at each time point. Two-way analyses of variance for repeated measures with post-hoc tests, if appropriate, were performed to mainly compare changes between CC and IC.

RESULTS: Significant interactions were found in all the indices (P<.05). Changes in IGF-1 concentration were comparable between CC (102.0±29.3 to 116.0±30.2 ng/ml, p<.05) and IC (104.2±33.6 to 112.0±38.6 ng/ml, p<.05). In contrast, although concentrations of lactate and norepinephrine increased in both CC and IC (p<.05), the effect was greater for CC (p<.05). Furthermore, dopamine concentration increased in CC (p<.05) while cortisol concentration decreased in IC (p<.05) but not in CC.

CONCLUSIONS: As previously shown in young men, intermittent cycling at lactate threshold evoked an IGF-1 response comparable to its continuous counterpart in men middle-aged and older, but the two cycling formats induced different stress responses. These results suggest that moderate intermittent exercise has the potential to stimulate the IGF-1 pathway without considerable stress in older individuals. Supported by JSPS 25242065.

Ageing Affects Cell Cycle Regulation In Human Skeletal Muscle Undergoing Atrophy And Regrowth

Ulik Frandsen1, Tatyana Prokhorova1, Line Jensen1, Lars G. Hvid1, Peter Scherling2, Per Aagaard1, Michael Kjaer2, Charlotte Suetta3. 1Faculty of Health, University of Southern Denmark, Odense, Denmark. 2Faculty of Health, University of Copenhagen, Bispebjerg Hospital, Copenhagen, Denmark. 3Rigshospitalet, University of Copenhagen, Copenhagen, Denmark.

PURPOSE: To investigate the effect of ageing on satellite cell cycle regulation in human skeletal muscle undergoing atrophy and regrowth induced by short-term immobility and subsequent reloading. METHODS: Myofiber atrophy was induced by application...
of a knee-brace for a period of 4 days in young (Y, ~20 yrs, n=9) and aged (O, ~70 yrs, n=9) individuals. Muscle regrowth after atrophy was induced by 6 days of re-ambulation supplemented by one session of supervised unilateral resistance training for the disused leg 3 days after brace removal. Muscle biopsies (VL) were collected pre- and at 1d, 2d, and 4d of immobility and after additional 6 days of re-mobilization (10d). Protein and mRNA expression levels of CDKN2A (p16), CDKN1A (p21), CDKN1B (p27), TP53 and PCNA were determined using real-time RT-PCR and Western blotting, respectively. The youngest and oldest participants exhibited a greater decrease in strength and power following immobilization compared to pre (p<0.05). p27 mRNA was downregulated in Y and O at 4d and 10d compared to pre (p<0.05). p16 protein increased in O at 1d (2.0-fold) and 2d (3.9-fold) compared to Y and decreased to pre levels in Y and O at 10d (p<0.05). PCNA protein was upregulated in Y (5.5-fold) but blunted in O (1.6-fold) at 10d compared to pre (p<0.05). CONCLUSIONS: p16 and TP53 early (2-4 days) were selectively upregulated during immobility in O compared with Y subjects, suggesting that cellular senescence and SC cycle arrest could be implicated in the defective regenerative response in O compared to Y. Further analysis of epigenetic modifications may provide further explanation for the present findings.

Recent studies have demonstrated that age-related changes in the relative differences in isokinetic strength and power may reflect fast twitch fiber alterations. It is possible skeletal muscle ultrasound (US) imaging may reflect these changes. PURPOSE: The purpose of this study was to examine the influence of muscle quality on the relative differences in strength and power in younger and older adults. METHODS: Twenty young (20.1±1.5 yrs) and 20 older (69.5±3.1 yrs) healthy, recreationally active men performed two plantar flexion maximal voluntary isometric actions (MVCs) and three maximal isokinetic actions. Gender, age, and muscle mass were matched. Isokinetic dynamometer- and ultrasonic (US) technology were used to analyze the muscle samples. RESULTS: The rate of mutation and deficiency(ultraviolet spectroscopy and gel-imaging) increased significantly from 0.52 rad/s−1 to 2.09 rad/s−1 (p<0.001) in Y, whereas it was not different between the groups and therefore the runners were not placing greater stress on the bone response. CONCLUSIONS: Exercise and calorie restriction reduce mtDNA deficiency, increase the level of OGG1 in skeletal muscle, increase mitochondrial biogenesis in red muscle, but not in white muscle, thus enhance the ability of aging skeletal muscle to resist the oxidative damage. (This report is supported by NSFC 31271275,Corresponding author:wenlj3@hotmail.com)

Calorie restriction and exercise can relieve the oxidative damage in skeletal muscle caused by the aging, but it is still unclear that whether these two factors improved the rate of deficiency and mutation of mtDNA in skeletal muscle by the increase of mitochondrial repair enzyme (OGG1).

Purpose: Study the effect from the calorie restriction and exercise to the mitochondrial repair enzyme OGG1, nuclear-encoded COX I and mitochondria-encoded COX IV, and to explore the direct and indirect effects of the rate of mitochondrial deficiency and mutation (RMD) in aging mouse.

Method: Grouping 32 mice in 24 months into 4 groups: control (C), calorie restriction (CR, 60% of diet control group), exercise (E), running in treadmill in the angle of 5°, the intensity of 64% VO2 max for 60 min, the rate of 15/min and the frequency of 5 days a week for 12 weeks) and calorie restriction and exercise (CR+E). Decollected the mouse model animal 24 h after the last intervention, and then collected the red muscle (gastrocnemius) and white muscle (rectus femoris) in hind legs.

Results: The rate of mutation and deficiency (ultraviolet spectroscopy and gel-imaging) was significantly lower in E (0.089±0.01, p<0.05; 0.097±0.006, p<0.01) and CR+E (0.081±0.004, p<0.01; white: 0.089±0.06, p<0.01) than in C. The level of β-OGG1 (Western-blotting) in CR+E (1.302±0.086) was significantly higher than that in CR (0.859±0.073, P<0.05). The level of β-OGG1 was higher in CR+E (1.302±0.086) than in C (0.816±0.062, P<0.01). In red muscle, the level of COX I(Western-blotting) was significant higher in E (1.02±0.043, P<0.01) and CR+E (0.94±0.091, P<0.01) than in C (0.790±0.052), the level of COX IV was significant higher in CR+E (0.848±0.152, P<0.01) than in C (0.578±0.051). In white muscle, the level of COX I was significantly lower in E (0.807±0.072) than in C (0.990±0.080, P<0.01), and the level of COX IV was significant lower in CR+E (0.740±0.104, P<0.01) than in C (0.903±0.081).

Conclusions: Exercise and calorie restriction increase mitochondrial biogenesis in red muscle, but not in white muscle, thus enhance the ability of aging skeletal muscle to resist the oxidative damage. (This report is supported by NSFC 31271275,Corresponding author:wenlj3@hotmail.com)

The literature is mixed as to the benefits of weight bearing activities such as running on osteogenic responses for non- (N-MEN) and postmenopausal (MEN) women. PURPOSE: Therefore, this study was designed to compare bone mineral density (BMD) in N-MEN and MEN women with a running (RUN) history and those who were not runners (N-RUN). METHODS: A repeated measures design was employed as 100 Women (30 N-RUN/N-MEN; 12 N-RUN/MEN; 42 RUN/N-MEN; 16 RUN/ MEN) were evaluated for differences and relationships between BMD, blood pressure (BP) and body composition. RESULTS: Although the MEN women were older (MEN 55.6 yrs. vs N-MEN 36.2 yrs.), the MEN women did not differ for body fat% (MEN 38.5%; N-MEN 34.3%, p < 0.05) but did differ for BMD (MEN 1.11 vs N-MEN 1.23). Weight and central adiposity as measured by waist circumference was related to BMD in both RUN (r = 0.43; p<0.01) and N-RUN (r = 0.28; p < 0.05). Age was the only factor that produced a difference (p<0.05) in BMD in the N-MEN and MEN. The RUN/MEN had a trend toward a higher BP than the other groups and this may have contributed to their BMD response not being higher than the N-RUN. CONCLUSIONS: Although further study is needed to validate the findings in this study, these data indicate that a history of running does not result in a higher BMD or lower BP in MEN women. This may have been partially because body composition was not different between the groups and therefore the runners were not placing greater stress on the bone response.

Purpose: It is known that Notch signaling regulates skeletal muscle repair and is suggested to be inhibited in aged muscle. However, little is known about the effects of Notch signaling on muscle injury following exercise in aged mice. The purpose of this project is to determine the impact of Notch signaling on aged skeletal muscle injury following downhill running (DHR). METHODS: C57B/J6 and C57B1/6 mice (20-25 mo old) served as controls or performed a bout of DHR (~11m/min,−15% grade) until exhaustion. A Notch inhibitor (GSI) or Notch force-activator (FA) reagent were injected into the left gastrocnemius and PBS (control) was injected into right gastrocnemius starting at 24h post exercise. Haematoxylin and Eosin staining was used to quantify muscle injury. RESULTS: In C57B/J6 mice, DHR induced injury in GSI (4D: P = <0.001; 5D: P = <0.001; and 6D: P = <0.001) and PBS-treated (4D: P = <0.001; 5D: P = <0.001; and 6D: P = <0.001).
Adiponectin is a fat tissue-derived adipokine, and it has beneficial effects on lipid metabolism, and plays a protective role in the development of metabolic syndrome. Adiponectin is inversely associated with insulin resistance, and low levels of adiponectin are correlated with visceral adipose tissue (VAT). Age-induced intramuscular fat accumulation is implicated in insulin resistance and type 2 diabetes. Therefore we hypothesized that intramuscular fat is also associated with adiponectin.

PURPOSE: The present study aimed to determine the relationship between adiponectin and estimated intramuscular fat index in middle-aged and elderly adults.

METHODS: Twenty-two physically active middle-aged and elderly adults (mean age 68.7±4.4 years, mean body mass index 22.2±2.2 kg/m²) participated in this study. We assessed echo intensity as the intramuscular fat content index by using ultrasonography. Echo intensity of the vastus lateralis at the mid-thigh was measured, which was calculated based on the mean of grey scale. Blood samples were collected for the measurement of adiponectin. Waist circumference was measured at the level of the navel as the VAT index.

RESULTS: Echo intensity was 70±26.2±2.2 u. and adiponectin was 12.4±8.8 µg/mL in the subjects. Adiponectin was inversely correlated with echo intensity (r = -0.43, p < 0.05), and waist circumference (r = -0.46, p < 0.05). After controlling for waist circumference, there remained a significant inverse association between adiponectin and echo intensity (r = -0.47, p < 0.05).

CONCLUSION: This suggests that adiponectin affects intramuscular fat content. Independent of VAT, this study was supported by KAKENHI grant #23630432 and the Descente and Ishimoto Memorial Foundation for the Promotion of Sports Science.

Adiponectin is inversely associated with estimated intramuscular fat index in middle-aged and elderly adults. May a Hicki, Nana Kanehira, Teruhiko Koike, Akira Saijo, Kiyoshi Shimaoka, Hitaka Sakakibara, Yoshirah Oohida, Hiroshi Akima. Nagaoka University, Nagaoka, Japan. Tokaiakuen University, Nagaoka, Japan. Waseda University, Tokorocava, Japan.

908 Board #87 May 31 3:30 PM - 5:00 PM

Adiponectin Is Inversely Associated With Estimated Intramuscular Fat Index In Middle-aged And Elderly Adults

Maya Hicki1, Nana Kanehira2, Teruhiko Koike1, Akira Saijo1, Kiyoshi Shimaoka2, Hitaka Sakakibara1, Yoshirah Oohida1, Hiroshi Akima1.1 Nagoya University, Nagaoka, Japan. 2Tokaiakuen University, Nagaoka, Japan. 3Waseda University, Tokorocava, Japan.

909 Board #88 May 31 3:30 PM - 5:00 PM

Age-related Changes in Contractile Function of Mouse Soleus And Ed Muscles

David W. Russ1, Eric X. Beck2, Eric Leach1, Kevin E. McElhannon2, Noah Weisleder2. 1Ohio University, Athens, OH. 2Ohio State University, Columbus, OH.

910 Board #89 May 31 3:30 PM - 5:00 PM

Dysregulated Extracellular Matrix Remodeling Of Aged Human Skeletal Muscle Following Damaging Exercise.

Jacob R. Sorensen, Alex Holland, Allen C. Parcell, FACSM, Robert D. Hyldahl. Brigham Young University, Provo, UT. Email: jross.sorensen@gmail.com

Aged skeletal muscle has a diminished capacity to regenerate following injury. Effective regeneration of skeletal muscle necessitates the widespread remodeling of its extracellular matrix (ECM). Tenascin C is an ECM protein that is markedly increased following skeletal muscle damage, and is critical for effective ECM remodeling and subsequent muscle regeneration. Purpose: To assess markers of muscle damage and extracellular matrix remodeling in skeletal muscle of old (65+ years) and young (18-30 years) adults. We hypothesized that tenasin C expression would be dysregulated in older adults following exercise-induced muscle damage. Methods: 10 young (22.7±2.25 years) and 8 old (70.7±7.5 years) participants completed 300 lengthening contractions (LC) on a biodeck dynamometer to induce muscle damage. Soreness and muscle function were measured and muscle biopsies taken pre-exercise and at 3, 24, and 72 hours post-exercise from the vastus lateralis muscle. Results: Both age groups performed a similar amount of work during LC (young: 44,718±13,730 vs old: 49,038±10,217 J; P = 0.47). Soreness increased in both groups, with no differences between age groups (P = 0.1). Additionally, both age groups demonstrated a marked decrease in functional measures following LC, which remained reduced out to 72 hours post-exercise (P < 0.05). As expected, young subjects showed significantly higher absolute values in each of the functional measures compared to old at the pre-exercise time point. However, young subjects showed a significantly higher percentage of torque (53.6±5.19 vs 34.5±7.5%) and power (57.4±23 vs 34.4±19%) loss following LC compared to old subjects. Expression of tenasin C was significantly elevated in both old and young groups 24h following LC (P < 0.001). Overall, there was a significant main effect of group, with the older group demonstrating greater tenasin C expression. However, there was no significant time/group interaction, indicating that tenasin C responds similarly between young and old muscle following LC.

CONCLUSION: Elevated expression of Tenasin C may contribute to the reduced capacity of aged muscle to adapt following muscle damage. These data also demonstrate increased functional sensitivity in young muscle compared to old following a damaging bout of lengthening contractions.

911 Board #90 May 31 3:30 PM - 5:00 PM

IMCL:EMCL and rVO2 Changes following Vitamin D Repletion and Aerobic Training In Aged Individuals

D. Travis Thomas, Maya Redzic, Mingjin Zhao, David M. Schnell, Hideat Abraha, Guoqiang Yu. University of Kentucky, Lexington, KY. Email: dth225@uky.edu


Extramyocellular (EMCL) and intramyocellular (IMCL) lipid is associated with muscle metabolic dysfunction in aging. We recently reported a positive linear relationship between vitamin D status and IMCL in aged individuals that was independent of body mass and physical activity. The combined effect of vitamin D and exercise on muscle lipid has not been investigated. PURPOSE: Compare the magnitude of changes in myocellular lipid stores and local muscle oxygen consumption rate following combined treatment of vitamin D repletion and aerobic training (DAT) compared with vitamin D repletion alone (D), aerobic training alone (AT), and control conditions (Ctl).

METHODS: Aged subjects (>60 YO) with vitamin D insufficiency (25(OH)D < 32 ng/mL) were randomized to a double blinded, 2X2, four group design. Vitamin D3 (10,000 U X 5 days/week) or placebo was provided for 12 weeks with 1 additional week (7 consecutive days) of aerobic training or no training. Gastrocnemius IMCL and EMCL were measured with magnetic resonance spectroscopy and fat segmentation. Hybrid near-infrared and diffuse correlative spectroscopy measured local tissue blood flow, oxygen saturation, and VO2, during and following (recovery) a gastrocnemius fatiguing protocol. All measurements were completed at week 0 and at end-study.

RESULTS: Ten males and 9 females completed all measures. Mean age and BMI were 67.2±6.0 YO and 25.9±4.4 kg/m², respectively. Mean 25(OH)D concentrations increased significantly in subjects receiving vitamin D3 (45±16) vs. placebo (10±3, P < 0.05). Although not significant by group, DAT (n=5) experienced a mean reduction in IMCL:EMCL ratio of 33%, compared to a 9% reduction in AT (n=4), 6% reduction in D (n=6) and a gain of 12% in Ctl (n=8). This corresponded to a 26% increase in rVO2, during full exercise recovery in DAT compared to an 11%, 24%, and 11% reduction in AT, D, and Ctl, respectively.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: These data suggest a trend that vitamin D, when combined with exercise, may potentiate the metabolic benefits of exercise by affecting muscle lipid depots and altering tissue-level VO2. These data also provide an indication of effective metabolic response to a dietary supplement and exercise intervention. Future work will examine muscle mitochondrial function as a potential target of action of vitamin D + exercise on muscle metabolism.

A growing body of research has highlighted the benefits of high-intensity exercise. However, concern exists that such high-intensity training, especially in resistance training, is potentially deleterious at advanced age. Recently, we have addressed this issue in part by demonstrating in a rat model of resistance-type training, that training with maximally activated stretch-shortening contractions (SSCs) has no detrimental effect on performance and increases muscle mass at advanced age provided the frequency of training is moderated (i.e. 80 SSCs 2 days per week rather than 3 days per week). A major question remained from this research - whether reducing or altering other parameters when training with high-intensity contractions would also demonstrate similar outcomes at old age. PURPOSE: To determine whether decreasing repetition number (i.e. 40 SSCs 3 days per week) and/or changing contraction mode (i.e. 4 isometric contractions (ISOs) 3 days per week and 8 ISOs 2 days per week) induces muscle mass and performance gains in young (3 months old) and old (30 months old) male Fischer Brown Norway hybrid rats. METHODS: Dorislloraxs (9-10 per group) were exposed to 1 month of training using a custom-built dynamometer. Dynamic performance was monitored, tibial anterior muscle mass was normalized to tibia length, and muscle quality determined by dividing performance by normalized muscle mass. ANOVA was used for statistical analysis; significance was set at p < 0.05. RESULTS: Independent of training protocol, peak force increased by ~20% for young rats while peak force was not significantly altered for old rats. In contrast with performance, muscle mass gains were dependent on the training protocol. For young rats, the normalized muscle mass increase of 18 ± 2% after 40 SSCs 3 days per week training was greater than the increases of 7 ± 2% and 11 ± 1% after 4 SSCs 3 days per week or 8 ISOs 2 days per week training, respectively (p < 0.05). For old rats, only 40 SSCs 3 days per week training induced a muscle mass gain, 12 ± 3% (p < 0.001), without a decrease in muscle quality relative to values for the other training protocols. CONCLUSIONS: These findings demonstrate the extreme adaptability of muscle to various training protocols at a young age and the selectivity at old age especially in regards to muscle mass gain.

The age-related decrease in human skeletal muscle mass; i.e. sarcopenia, has received much attention, but an age-related decrease in muscle quality; i.e. the ratio of adipose tissue to muscle tissue, has received noticeably less. A few studies have shown that muscle quality, as determined by ultrasonographic echo intensity, is negatively associated with functional capacity, but the best parameters by which to predict muscle quality have not yet been established for older individuals. PURPOSE: The purpose of this study was to assess the relationships between quadriceps femoris (QF) muscle thickness and demographic, functional and morphological characteristics of older men and women. METHODS: Sixty-four healthy men (n=27; age, 72.9 ± 5.0 years; height, 164.1 ± 6.2 cm; weight, 60.6 ± 6.8 kg) and women (n=37; age, 71.5 ± 5.3 years; height, 152.8 ± 4.8 cm; weight, 50.8 ± 6.8 kg) aged 62-88 years participated in this study. The echo intensity and muscle thickness of the QF at the mid-thigh were calculated using ultrasonography. Sit-up, supine-up, sit-to-stand, 5-m maximal walk and 6-min walk tests were performed. RESULTS: As expected, QF muscle thickness in men was significantly larger than women (men, 3.1 ± 0.6 mm; women, 2.7 ± 0.6 mm; P = 0.01); however, no significant differences were observed in QF echo intensity between sexes (men, 63.0 ± 8.7 a.u.; women, 69.9 ± 7.4 a.u.). QF echo intensity was significantly correlated with QF muscle thickness as a result of simple linear regression analysis (men, r = -0.734, P = 0.001; women, r = -0.565, P = 0.001). Stepwise multiple regression analysis with QF echo intensity as a dependent variable revealed QF muscle thickness, age and sit-to-stand test in men (R = 0.875, adjusted R^2 = 0.734), and QF muscle thickness and sit-to-stand test in women (R = 0.648, adjusted R^2 = 0.383), to be significant independent variables. CONCLUSIONS: These results suggest that functional ability and greater muscle size are essential factors in the maintenance of muscle quality; however, an age effect was present only in men.
The execution or inhibition of decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.

METHODS: We investigated two neural activities in motor execution and inhibition during hypoxic exposure. Cognitive processing including executive and inhibitory responses were assessed using a computerized Go/No-Go test. Executive and inhibitory responses were assessed using a computerized Go/No-Go test. Execution of isolated decision making is critical for survival in a severe environment. Although cognitive performance (behavioral executive response such as reaction times) appears to be impaired at a given level of high altitude, the effect of hypoxia on cognitive processing including executive and inhibitory responses remains unclear. PURPOSE: The aim of present study was to test our hypothesis that not only executive processing but also inhibitory processing may be impaired during acute hypoxic exposure.
Various inspiratory resistors are used to protect workers against toxic airborne substances and pathogens. However, inspiratory resistors in hypoxia may not have a detrimental effect on oxygen consumption and RPE at maximal work rates.

CONCLUSIONS: Low-to-moderate inspiratory resistance in normobaric hypoxia did not have a detrimental effect on oxygen consumption and RPE at maximal work rates. However, added inspiratory resistance significantly decreased maximal power output and increased perception of breathing discomfort and breathing efforts.

Pilot study of Inspiratory Resistance on Exercise Performance in Moderate Normobaric Hypoxia
Yongsuk Seo1, Jeremiah Vaughan2, Raymond Roberge3, Jung-Hyun Kim1, Ellen L. Glickman, FACSM2. 1Centers for Disease Control and Prevention, Pittsburgh, PA. 2Kent State University, Kent, OH. (No relationships reported)

Purpose: To determine the effects of adding different levels of inspiratory resistance to submaximal and maximal exercise performance in normobaric hypoxia after cycling performance. It appears from these data that the inspirators do not impair cognitive function during work at the selected levels of resistance in normobaric hypoxia. Further research may be performed on this device to elucidate other markers of cognitive function in more extreme environmental conditions.

920 Board #99
May 31 2:00 PM - 3:30 PM
The Effect of Inspiratory Resistance on Exercise Performance in Moderate Normobaric Hypoxia

921 Board #100
May 31 2:00 PM - 3:30 PM
Impact of Inspiratory Resistance on Cognitive Function in Normobaric Hypoxia After Exercise
Jeremiah Vaughan, Brittany Followay, Hayden Gerhart, Ellen Glickman, FACSM. Kent State University, Kent, OH. (Sponsor: Ellen L. Glickman, FACSM) Email: jvaughan9@kent.edu (No relationships reported)

922 Board #101
May 31 2:00 PM - 3:30 PM
The Effects of Added Inspiratory Resistance during Exercise in Hypoxia on Lactate and Hemoglobin
Brittany Followay, Jeremiah Vaughan, Hayden Gerhart, Ellen Glickman, FACSM. Kent State University, Kent, OH. (Sponsor: Ellen Glickman, FACSM) (No relationships reported)

923 Board #102
May 31 2:00 PM - 3:30 PM
The Effect of Acute Simulated Altitude on the Lactate Thresholds of Well-Trained Cyclists
Pitre C. Bourdon1, Sally A. Clark2, Robert J. Aughey3, Tom Stanef4, Sarah M. Woolford4, Walter Schmidt4, Christopher J. Gore, FACSM1. 1ASPIRE Academy, Doha, Qatar. 2Australian Institute of Sport, Canberra, Australia. 3Victoria University, Melbourne, Australia. 4South Australian Sports Institute, Adelaide, Australia. 1Bayreuth University, Bayreuth, Germany. (Sponsor: Christopher J. Gore, FACSM) (No relationships reported)
Board #103  May 31 2:00 PM - 3:30 PM
Resistance Exercise In Hypoxia Combined With Blood Flow Restriction
Olivier Girard1, Marin Purnelle2, Sarah J. Willis2, Grégoire P. Millet2. 1Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar. 2Lausanne University, Lausanne, Switzerland. (Sponsor: Robert F Chapman, FACSFM)
Email: oliv.girard@gmail.com

The use of blood flow restriction (BFR) or systemic normobaric hypoxia (NH) during resistance exercise to increase metabolic stress and the subsequent muscular development is increasingly popular. However, the extent to which local and systemic hypoxic conditions in combination influence resistance exercise and accompanying physiological responses remains undetermined.

Methods: 14 physical education students were tested for 1 repetition maximum (1-RM) in the barbell biceps curl (biceps) and dumbbell pull-over (triceps). On separate visits, they performed 6 separate randomized trials of 4 sets at 70% 1-RM to failure of each exercise (90-s and 10-min rest between sets and exercises, respectively) in normoxia (FiO2; 20.9%) or NH (FiO2; 12.9%) combined with 3 different levels of vasoconstriction (0%, 45% or 60% of maximal occlusion). Arterial oxygen saturation, heart rate, and perceptual responses were assessed following each set.

Results: Compared to set 1, the number of repetitions before muscular failure decreased in sets 2, 3, and 4 for both the biceps (-44±6%, -55±7% and -63±6%, respectively; all P<0.001) and triceps (-39±10%, -56±7% and -62±7%, respectively; all P<0.001), independently of the condition (p=0.965). Arterial oxygen saturation was lower with NH (P<0.001), but not BFR, while heart rate (P=0.341) did not differ between conditions. A significant main effect of time was observed for overall muscle activation and oxygenation (EMG) and near-infrared spectroscopy, respectively.

Conclusion: Local and systemic hypoxic stimuli, or a combination of both, during resistance exercise to failure did not alter performance, perception of strenuous exercise, or trends of muscle activation or oxygenation.

Board #104  May 31 2:00 PM - 3:30 PM
Effects of Hypobaric and Normobaric Hypoxia on Mitochondrial Related Gene Expression
Robert J. Shute1, Roksana B. Zak1, Brent C. Ruby, FACSFM, John C. Quindry, FACSFM, Dustin R. Slivka, FACSFM. 1University of Nebraska at Omaha, Omaha, NE. 2University of Montana, Missoula, MT. (Sponsor: Dustin Slivka, FACSFM)

Environmental stimuli such as temperature and hypoxia may influence cellular signaling in the skeletal muscle. Previously we have shown changes in gene expression related to mitochondrial development with acute exposure to normobaric hypoxia. However, exposure to hypobaric hypoxia may elicit different physiological responses. Purpose: To determine the response of skeletal muscle mitochondrial related gene expression after 4-h exposure to normobaric hypoxia (NH), hypobaric hypoxia (HH) and normobaric normoxia (NN) after exercise. Methods: Recreationally trained participants (n = 15; age: 24 ± 4 y; height: 178 ± 12 cm; weight: 72.47 ± 13.84 kg, body fat: 14 ± 7%; VO2max: 3.60 ± 0.83 L · min-1, Wmax = 274 ± 72 W) each completed three trials of 1-h cycling at 70% of Wmax. Following exercise, participants sat in an environmentally controlled chamber for a 4-h recovery period in NH (4,420 m), HH (4,420 m), or NN (975 m) environmental conditions. Blood oxygen saturation was measured using pulse oximetry at baseline, 30 min into exercise, immediately after exercise, and 30 min into each of the 3-days of recovery. Muscle biopsies were taken from the vastus lateralis pre-exercise and after a 4-h recovery period. Samples were analyzed using qRT-PCR to assess gene expression related to mitochondrial development. Results: Arterial oxygen saturation was lower in HH and NH trials compared to the NN trial (p < 0.001) and lower in the HH compared to NH (p < 0.001). PBG-1a, GABPA, ERRα, and NRF1 mRNA were not different between the three conditions or from pre-exercise (p = 0.804, 0.650, 0.956, 0.563, respectively). TFAM mRNA increased in NH from pre-exercise to post-exercise (p = 0.036) and was higher than NN (p = 0.011). Conclusion: These data indicate that gene expression related to mitochondrial development is only marginally affected (TFAM) by the type of hypoxic environment after a 4-h treatment despite differences in arterial oxygen saturation. Funding provided by the Department of Defense United States Army Medical Research and Materiel Command (DOD USAMRMC: W81XWH-15-2-0075).

Board #105  May 31 2:00 PM - 3:30 PM
Effects of Hypobaric and Normobaric Hypoxia on Myogenic and Proteolytic Gene Expression in Humans
Caleb Ross1, Robert Shute1, Roksana Zak1, Brent Ruby, FACSFM, John Quindry, FACSFM, Dustin Slivka, FACSFM. 1University of Nebraska at Omaha, Omaha, NE. 2University of Montana, Missoula, MT. (Sponsor: Dr. Dustin Slivka, FACSFM)

Muscle mass is reduced during extended exposure to a hypoxic environment. Current research suggests that the physiological response to normobaric and hypobaric hypoxia may be different. It is currently unknown if these previously described differences extend to the skeletal muscle and transcriptional response regulating muscle mass.

Purpose: To determine the effects of normobaric and hypobaric hypoxia on myogenenic and proteolytic gene expression. METHODS: Recreationally trained subjects (n = 15; age: 24 ± 4 y; VO2max = 3.60 ± 0.83 L · min-1) completed three trials of 60-min cycling at 70% of Wmax followed by 4-h of recovery at ambient condition (975 m), normobaric hypoxia (4,420 m), and hypobaric hypoxia (4,420 m). For each trial, a muscle biopsy was taken from the vastus lateralis before exercise and at the end of the 4-h recovery period for analysis of gene expression (RT-qPCR).

RESULTS: There were no differences in the myogenenic gene expression of MYOD (p = 0.713), MYF-5 (0.053), or MYOG (0.832) between trials. MT1F-6 was higher after exercise (p = 0.002) regardless of trial. MSTN decreased from pre- to post-exercise (p < 0.001) in all conditions and was lower in hypobaric hypoxia compared to control condition (p = 0.037). There were no differences in the proteolytic gene expression of atrogin-1 with exercise (p = 0.811) or between trials (p = 0.419). However, FOXO3 (p = 0.009) and MuRF-1 (p < 0.001) gene expression increased with exercise but were not different between conditions (p = 0.543, p = 0.327, respectively). CONCLUSION: These data indicate that hypoxic recovery from exercise, regardless of whether normobaric or hypobaric, does not affect the expression of genes related to myogenesis and proteolysis with the exception of a modest attenuation of myostatin in hypobaric hypoxia. Funding provided by the Department of Defense United States Army Medical Research and Materiel Command (DOD USAMRMC: W81XWH-15-2-0075).

Board #106  May 31 2:00 PM - 3:30 PM
Prior Heat or Hypoxic Acclimation Does Not Attenuate the Cytokine Response to Hypoxic Exercise
Ben J. Lee1, Rob S. James2, Charles D. Thakre2. 1University of Chichester, Chichester, United Kingdom. 2Coventry University, Coventry, United Kingdom. Email: b.lee@chi.ac.uk

BACKGROUND: Heat acclimation activates the cellular heat shock response (HSR), inhibiting NF-κB and reducing heat-stressed cytokine production and limiting stress-induced inflammation. Hypoxia-mediated intestinal ischemia also activates the NF-κB pathway and stimulates pro-inflammatory responses linked to acute mountain sickness and pulmonary and cerebral oedema. The upregulation of the HSR via heat acclimation may therefore reduce inflammatory responses following subsequent hypoxic exercise.

Purpose: To determine whether prior heat or hypoxic acclimation attenuates the cytokine response following hypoxic exercise. METHODS: Plasma TNF-α, IL-6, IL-10 and IL-1ra were determined at rest and following a 60-minute cycling normoxic stress test (NST) and hypoxic stress test (HST; FIO2 = 0.14, 50% VO2peak) in 21 men (age 22 ± 5 years; stature 1.76 ± 0.07 m; mass 71.8 ± 7.9 kg; VO2peak 51 ± 7 mL kg⁻¹ min⁻¹). Participants formed 3 groups and completed 10 x 60 minute acclimation sessions (50% VO2peak) in control (n = 7; 18°C, 35% RH), hypoxic (n = 7; FIO2 = 0.14, 18°C, 35% RH), or hot (n = 7; 40°C, 25% RH) conditions. A second HST (HST2) was completed 48 hours after the final acclimation session. Cytokine data were presented as mean change in ng mL⁻¹ with 95% confidence intervals and comparisons made.

Abstracts were prepared by the authors and printed as submitted.
using mixed ANOVA. RESULTS: Following the NST plasma IL-6 (+0.6, 95% CI 0.3 - 0.9 ng/mL), IL-10 (+1.1, 95% CI 2.8 - 5.0 ng/mL) and IL-1ra (-16.6, 95% CI -60.5 - 27.2 ng/mL) were observed. Maximal metabolic change (p < 0.05) TNF-α was unaltered throughout the study. IL-6 (+3.9, 95% CI 2.8 - 4.9 ng/mL), IL-10 (+26.2, 95% CI 15.0 - 37.3 ng/mL) and IL-1ra (-1506, 95% CI 746 - 2266 ng/mL) were elevated following HST1 (p < 0.01), with no main effect for acclimation group (p > 0.05). A similar trend was observed after acclimation (HST2), with IL-6 (+3.1, 95% CI 2.5 - 3.7 ng/mL), IL-10 (+3.7, 95% CI 2.6 - 4.8 ng/mL) and IL-1ra (+1237, 95% CI 721 - 1753 ng/mL) increased (p < 0.01), and no main effect for trial or acclimation group observed (p > 0.05). CONCLUSIONS: Neither prior heat nor hypoxic acclimatization attenuated the systemic cytokine response following acute exercise in hypoxia. Future work investigating the effectiveness of different acclimation modalities on improving inflammatory outcomes to hypoxic stress is recommended.

928 Board #107
May 31 2:00 PM - 3:30 PM
Validity of the Load Velocity for Power Resistance Training Adjustment at Real Moderate Altitude
Lara Rodriguez-Zamora1, José Antonio Morales-Artacho2, Amador García-Ramos2, Pérez-Castilla Alejandro2, Paulino Padial1, Belén Feriche1. 1Mid Sweden University, Östersund, Sweden. 2University of Granada, Faculty of Sport Sciences., Granada, Spain.
Email: lara.rodriguez.zamora@gmail.com
(No relationships reported)

The relationship between muscle power and hypoxia represents a new way to improve the potential benefits of altitude training, especially in sports involving explosive movements. Monitoring workload through velocity (mean propulsive velocity, MPV), seems appropriate since both the neuromuscular demands and the training effect itself largely depend on the velocity at which loads are lifted. PURPOSE: To study whether the MPV could be used to adjust the workload during an oriented resistance training program (RT) at moderate real altitude. METHODS: 23 collegiate-men volunteers (23±3 yr) followed 4 weeks RT oriented to optimize muscle power development in either normoxia (N) or intermittent hypoxia (IH, 2320 m living at sea level). The RT (2 sessions/wk, 8 in total) was the same for both groups and the training load (ΣLV) was equally distributed over 8 weeks. Velocity for Power Resistance (Velotron Elite) at a self-selected cadence and work rate corresponding to 1 RPE of 9 (very light) for 5 min and RPE of 13 (somewhat hard) for 10 min. Following a 2 min rest, participants performed an incremental test (25W + 25W/min) to maximal exertion. Watts, VO2, VE, RER, HR, SpO2, and RPE were recorded each min. Differences between trials were evaluated by paired t-tests. Chi-square was used to determine subjects’ ability to correctly identify the FIO2 after each phase of the protocol. RESULTS: Supplemental O2 at 1890m increased SpO2 during submaximal exercise at RPE 9 and 13 (3±3 and 4±2%, respectively; P<0.01); Watts, VO2, VE, RER, and HR were unaffected. Supplemental O2 at 1890m increased SpO2 (51±3%), power output (16±8 Watts), and VO2 (0.28±0.16 L/min) at maximal intensity (all P<0.02). Subjects were not able to correctly identify the FIO2 (P range: 0.25 to 1.00). Conclusion: Although supplemental O2 improves maximal exercise performance at 1890m, it had little effect on short-duration, moderate-intensity exercise, such as might be performed during a warm-up for a competitive event.

929 Board #108
May 31 2:00 PM - 3:30 PM
Effects Of Supplemental Oxygen On Submaximum And Maximal Cycling Performance At Altitude
Kathryn Bell, Andrew W. Subudhi, FACSM. University of Colorado Colorado Springs, Colorado Springs, CO. (Sponsor: Andrew Subudhi, FACSM)
Email: Kbell2@uccs.edu
(No relationships reported)

Purpose: Reduced partial pressure of oxygen (PO2) at altitude reduces maximal oxygen consumption (VO2). When O2 is supplemented, maximal exercise performance at altitude has been shown to improve. We questioned whether supplemental O2 (SPO2) would increase performance at greater-intensity exercise performed at 1890m. Methods: Twelve (7 male) 26.6±6.7 year-old healthy participants (height, 174.8±9.7 cm; weight, 71.4±8.4kg) performed one familiarization trial and two experimental trials (double blind, cross over) while breathing either room air or supplemental O2 to simulate sea level (FIO2=0.265). To evaluate submaximal exercise performance, participants cycled an electrically braked ergometer (Velotron Elite) at a self-selected cadence and work rate corresponding to 1 RPE of 9 (very light) for 5 min and RPE of 13 (somewhat hard) for 10 min. Followed a 2 min rest, participants performed an incremental test (25W + 25W/min) to maximal exertion. Watts, VO2, VE, RER, HR, SpO2, and RPE were recorded each

930 Board #109
May 31 2:00 PM - 3:30 PM
Cerebral and Skeletal Muscle Oxygen Response During Exercise With and Without an Altitude Simulation Mask
Alexander Johnson, Reid Nelson. Concordia University Wisconsin, Mequon, WI.
(No relationships reported)

Altitude as well as hypoxic chambers cause a greater exercise-induced decrease in both cerebral oxygen response (COR) and skeletal muscle oxygen response (SMOR) when compared to exercise in normoxic conditions. Altitude simulating masks (ASM) such as restrictive breathing devices have promoted their products as respiratory muscle trainers that also expose the body to hypoxic conditions.

目的：决定一个显著的影响COR在和SMOR由近红外光谱学（NIRS）存在的最大运动期间在无氧条件下与和没有ASM。METHODS: 13人健康个体（F3 = 3, M10, 24.2 ± 2.7 yr）完成三个不同自行车周期最大运动测试。Test 1 consisted of respiratory gas analysis to identify VO2, max ventilatory threshold 1 (VT1) and the respiratory compensation point (RCP). Tests 2 and 3 were with and without the ASM in a counterbalanced crossover design. Heart rate (HR), blood pressure (BP), pulse oximetry (S O2), and blood lactate (BL) were assessed for all tests. COR was calculated by taking the peak 5-second average of oxygenated hemoglobin (O2Hb) and subtracting it from the O2Hb at the end of exercise. SMOR was measured by calculating the difference in tissue saturation index (TSI) at the onset and end of exercise. Dependent t-tests were used to assess differences between ASM and non ASM. Significant was set at p < 0.05. RESULTS: There were no significant differences in COR (non ASM 6.01 ± 3.54 vs. ASM 3.75 ± 1.92 mL · min-1 · L-1; p=0.078) or SMOR (non ASM 17.97 ± 8.08 vs. ASM 19.61 ± 10.92%, p=0.462) during maximal exercise. There was, however, a reduced S O2 during exercise in the ASM condition (ASM 11.3 ± 3.7 vs. non ASM 11.0 ± 2.2%, p<0.001). A significantly higher exercise capacity (non ASM 284.2 ± 74.6 vs. ASM 271.6 ± 65.8 watts, p=0.007) and BL (non ASM 11.5 ± 3.7 vs. ASM 9.5 ± 2.3 mL · min-1; p=0.008) was observed in the non ASM exercise trial compared to ASM. CONCLUSIONS: These results suggest that the use of the ASM during exercise in normoxic conditions did not show a significant difference in COR or SMOR when compared to exercise without the ASM. Although this study did not analyze the respiratory muscle training effect of the ASM, there was no evidence of a cerebral or muscle hypoxic effect during the acute bout of exercise.

931 Board #110
May 31 2:00 PM - 3:30 PM
Influence of Exercise Modality on Hypoxia-Mediated Decrement in Endurance Exercise Performance
Jeremy K. Theisen, Nathan C. Grimm, Simon P. Fredericks, Raj Trikha, Alissa A. Ackerman, Christopher Bell. Colorado State University, Fort Collins, CO. (Sponsor: Raoul Reiser, FACSM)
Email: jtheisen@colostate.edu
(No relationships reported)

Low oxygen environments, such as high altitude, impair endurance exercise performance. The magnitude of performance decrements are highly variable and may in part be explained by the exercise modality and volume of active muscle mass. For example, it is unclear if an exercise modality engaging both the upper and lower body, such as rowing, would be more impaired than a predominantly lower body exercise, such as cycling. PURPOSE: To determine the influence of exercise modality on hypoxia-mediated decrements in endurance exercise performance.

METHODS: Endurance trained men and women (n=8; 4 female; age: 30±11 years; maximal oxygen uptake: 3.5±1.3 L·min⁻¹ with self-regulated and 4.8±1.8 L·min⁻¹ with non self-regulated) participated in a Latin Square experimental design. Four time trials were completed: two on a stationary cycle (4km) and two on a rowing (2km) ergometer, in normoxia (FI02=0.210) and simulated high-altitude (hypoxia; FI02=0.150). Potential differences were analyzed using two-way analysis of variance with repeated measures.

RESULTS: Hypoxia slowed time trial performance (P<0.001) in both exercise modalities (Cycling: 6.7±0.7 vs. 7.3±1.0; Rowing: 8.0±0.9 vs. 8.5±1.0 min). The proportional magnitude of hypoxia-mediated decrements were not different (P>0.45) between cycling (9.5±4.6%) and rowing (6.3±3.7%).
CONCLUSIONS: Endurance exercise performance is attenuated in hypoxia. Our preliminary data suggest the magnitude of decrements may not be appreciably different between exercise modalities engaging upper and lower body, such as rowing, compared with modalities relying predominantly on lower body, such as cycling.

932 Board #111 May 31 2:00 PM - 3:30 PM Effect of Acute Simulated Altitude Exposure on Excess Postexercise Oxygen Consumption
Email: james.navalta@unlv.edu

(Optical Journal of the American College of Sports Medicine
No relationships reported)

Oxygen consumption (VO\text{2}) that remains elevated above the baseline after exercise termination is known as excess post-exercise oxygen consumption (EPOC). Arrival at altitude decreases maximal oxygen uptake, however studies are mixed with respect to the effect of altitude on resting metabolic rate (RMR). To our knowledge, the EPOC response has not been studied with altitude as an independent variable. PURPOSE: To observe the EPOC to constant-load cycle exercise performed under acute simulated altitudes of 3353 m and 6401 m.

METHODS: Subjects (N = 7 female, 7 male) reported to the laboratory between 0600 and 0830 hours and RMR was obtained. Constant workload cycle exercise was then performed (10-min at 100 W) while breathing air from an altitude simulator under one of the following conditions: control (CON), 3353 m (MID), 6401 m (HI). Subjects returned to complete the remaining conditions in a counterbalanced order. Upon completion of the exercise bout, participants were reconnected to the metabolic system and rested until a running 5-min average of VO\text{2} values returned to or below baseline (EPOC duration). Magnitude was determined by summing the net oxygen consumption for each minute during the EPOC period. Data were analyzed using 2 x 3 repeated measures ANOVA.

RESULTS: Since no sex differences were detected, data were collapsed and analyzed using one-way repeated measures ANOVA. There was no difference between condition for RMR (CON=3.0±0.5, MID=3.9±0.3, HI=3.9±0.4 ml/kg/min), or cycle performance variables including average power (CON=98±4, MID=100±4, HI=95±9 W). EPOC duration was significant at each altitude increase (CON=15±2 vs MID=20±1.7 min, p=0.002) (MID vs HI=28±1.2 min, p=0.006). Likewise, EPOC magnitude was significant at each altitude (CON=73.5±9.9 vs MID=99.1±9.3 ml O2, p=0.002) (MID vs HI=28.1±2.6 min, p=0.006) (MID vs HI=139.7±14.3 ml O2, p=0.001).

CONCLUSIONS: Determining the EPOC response to altitude is important because it represents a source of elevated carbohydrate that must be accounted for given that carbohydrates are preferentially utilized with altitude exposure. This has an influence on recovery exercise as well as future bouts of work. Thus, individuals that exercise at altitude must be aware of the potential impact on carbohydrate stores.

933 Board #112 May 31 2:00 PM - 3:30 PM Efficacy of Normobaric Intermittent Hypoxic Training to Improve VO2peak During Acute Hypobaric Hypoxia Exposure
John H. Sellers, Taylor M. Monaghan, Jessica A. Schnaiter-Brasche, Michelle M. Miller, Mitchel A. Magrini, Bert H. Jacobson, FACSM. Oklahoma State University, Stillwater, OK.
(Sponsor: Bert H. Jacobson, PhD, FACSM)
Email: john.h.sellers14.mil@mail.mil

(Optical Journal of the American College of Sports Medicine
No relationships reported)

Environmental conditions pose additional threats to the health of soldiers during military operations. Missions conducted at high altitude increase the relative workload of the soldiers when compared to normobaric normoxia (NN) training, on peak aerobic performance (VO2peak). The purpose of this study was to examine the efficacy of normobaric intermittent hypoxic training (NIHT), when compared to normobaric normoxia (NN) training, on peak aerobic performance (VO2peak). PURPOSE: To observe the NIHT to constant-load cycle exercise performed under acute simulated altitudes of 3353 m and 6401 m.

METHODS: Subjects (N = 7 female, 7 male) reported to the laboratory between 0600 and 0830 hours and RMR was obtained. Constant workload cycle exercise was then performed (10-min at 100 W) while breathing air from an altitude simulator under one of the following conditions: control (CON), 3353 m (MID), 6401 m (HI). Subjects returned to complete the remaining conditions in a counterbalanced order. Upon completion of the exercise bout, participants were reconnected to the metabolic system and rested until a running 5-min average of VO\text{2} values returned to or below baseline (EPOC duration). Magnitude was determined by summing the net oxygen consumption for each minute during the EPOC period. Data were analyzed using 2 x 3 repeated measures ANOVA.

RESULTS: Since no sex differences were detected, data were collapsed and analyzed using one-way repeated measures ANOVA. There was no difference between condition for RMR (CON=3.0±0.5, MID=3.9±0.3, HI=3.9±0.4 ml/kg/min), or cycle performance variables including average power (CON=98±4, MID=100±4, HI=95±9 W). EPOC duration was significant at each altitude increase (CON=15±2 vs MID=20±1.7 min, p=0.002) (MID vs HI=28±1.2 min, p=0.006). Likewise, EPOC magnitude was significant at each altitude (CON=73.5±9.9 vs MID=99.1±9.3 ml O2, p=0.002) (MID vs HI=139.7±14.3 ml O2, p=0.001).

CONCLUSIONS: Determining the EPOC response to altitude is important because it represents a source of elevated carbohydrate that must be accounted for given that carbohydrates are preferentially utilized with altitude exposure. This has an influence on recovery exercise as well as future bouts of work. Thus, individuals that exercise at altitude must be aware of the potential impact on carbohydrate stores.

934 Board #113 May 31 2:00 PM - 3:30 PM Maximum Oxygen Consumption Returns to Sea Level Values after Two weeks of Altitude Acclimatization in a Large Multi-Year Study
John E. Davis, Alma College, Alma, MI.
Email: davidj@alamu.edu

(Optical Journal of the American College of Sports Medicine
No relationships reported)

While it is generally agreed that maximum oxygen consumption (VO2peak) declines upon acute ascent to altitude, there has been some disagreement about the effects of acclimatization on VO2peak. Some of the disagreement reflects a small sample size and lack of control of physical activity during the stay at altitude. To our knowledge, no studies with a large subject pool that controls for physical activity have looked at VO2max after acute exposure, acclimatization and upon return to sea level in the same study. PURPOSE: To observe the NIHT to constant-load cycle exercise performed under acute simulated altitudes of 3353 m and 6401 m.

METHODS: Subjects (N = 7 female, 7 male) reported to the laboratory between 0600 and 0830 hours and RMR was obtained. Constant workload cycle exercise was then performed (10-min at 100 W) while breathing air from an altitude simulator under one of the following conditions: control (CON), 3353 m (MID), 6401 m (HI). Subjects returned to complete the remaining conditions in a counterbalanced order. Upon completion of the exercise bout, participants were reconnected to the metabolic system and rested until a running 5-min average of VO\text{2} values returned to or below baseline (EPOC duration). Magnitude was determined by summing the net oxygen consumption for each minute during the EPOC period. Data were analyzed using 2 x 3 repeated measures ANOVA.

RESULTS: Since no sex differences were detected, data were collapsed and analyzed using one-way repeated measures ANOVA. There was no difference between condition for RMR (CON=3.0±0.5, MID=3.9±0.3, HI=3.9±0.4 ml/kg/min), or cycle performance variables including average power (CON=98±4, MID=100±4, HI=95±9 W). EPOC duration was significant at each altitude increase (CON=15±2 vs MID=20±1.7 min, p=0.002) (MID vs HI=28±1.2 min, p=0.006). Likewise, EPOC magnitude was significant at each altitude (CON=73.5±9.9 vs MID=99.1±9.3 ml O2, p=0.002) (MID vs HI=139.7±14.3 ml O2, p=0.001).

CONCLUSIONS: Determining the EPOC response to altitude is important because it represents a source of elevated carbohydrate that must be accounted for given that carbohydrates are preferentially utilized with altitude exposure. This has an influence on recovery exercise as well as future bouts of work. Thus, individuals that exercise at altitude must be aware of the potential impact on carbohydrate stores.

935 Board #114 May 31 2:00 PM - 3:30 PM Does Arterial Oxygen Hemoglobin Saturation Influence the Hemoglobin Mass-VO2Peak Relationship in Endurance Athletes at Moderate Altitude?
Jesse A. Goodrich, Benjamin J. Ryan, William C. Byrnes, FACSM. University of Colorado Boulder, Boulder, CO.
(Sponsor: William C. Byrnes, FACSM)

(Optical Journal of the American College of Sports Medicine
No relationships reported)

Total hemoglobin mass (Hb) is a well-established, key predictor of maximal oxygen uptake (VO2peak) across aerobic fitness levels. Arterial oxyhemoglobin saturation (S\text{aO2}) has the potential to modify this relationship, especially in populations that experience exercise-induced arterial desaturation. PURPOSE: To examine the effects of normobaric intermittent hypoxic training (NIHT), when compared to normobaric normoxia (NN) training, on peak aerobic capacity (VO2peak) in hypoxic hypoxia (HH). METHODS: Eleven male Reserve Officers’ Training Corps (ROTC) cadets (age 19.55±1.44 y, mass 75.80±8.82 kg, stature 177.45±6.67 cm) completed the 6 week training intervention in either the NIHT (EXP, n=6) or NN (CON, n=5) conditions. Pre- and post-assessment of VO2max was conducted in an HH setting equivalent to 3033 m. The EXP group also completed two graded exercise tests (GXT) on a cycle ergometer to determine VO2peak and S\text{aO2} at VO2peak; the workload began at 4 and 3 W kg\text{−1} for men and women respectively, rounded down to the nearest 20 W increment, and power increased 20 W every minute until volitional exhaustion. VO2 was measured using indirect calorimetry and VO2peak was calculated as the highest average 30 sec VO2. S\text{aO2} was measured at rest and during exercise using forehead pulse oximetry. S\text{aO2} at VO2peak was calculated as the average S\text{aO2} during the same 30 sec used to determine VO2peak. Duplicate measures of Hb were averaged in order to reduce measurement error. In order to control for the effect of body mass on VO2peak and Hb, both variables were normalized by body mass prior to analysis.

RESULTS: VO2peak was significantly higher for the second GXT (+0.06 ± 0.17 L O2 min\text{−1}, p = 0.05) and the difference in VO2peak, SaO2 at VO2peakwas calculated as the

Abstracts were prepared by the authors and printed as submitted.
Changes in inspired oxygen concentration will affect the peak oxygen uptake compared with normoxia. These underlying mechanisms are not fully understood, but peripheral and central mechanisms have been proposed. PURPOSE: Our study focuses on the effect of acute moderate hypoxia and hyperoxia on cardiopulmonary responses, brain and muscle oxygenation during exercise. METHODS: Seven healthy male subjects performed on incremental maximal exercise test under normoxia (Normo: 20.9% FIO2) and hyperoxia (Hyper: 38% FIO2 and 28.5% FIO2) conditions. We measured cardiopulmonary measurements (VE, VO2, HR and Q) and blood gas (PO2 and PCO2) on incremental exercise. Near-infrared spectroscopy (NIRS) was also used to monitor concentration changes of oxy- and deoxyhemoglobin (Δ[O2Hb] and [HHb]) in left frontal cortex region of the forehead and ipsilateral vastus lateralis muscle. Changes in total Hb and StO2 were calculated and used as index of change in regional blood volume. Repeated-measures ANOVA were performed across treatments. RESULTS: VO2peak decreased in Hypo (38.5±3.1 ml/kg/min, p<0.05) and no difference in Hyper (42.6±3.4 ml/kg/min) compared with Norm (42.2±3.9 ml/kg/min). But blood PO2 at rest and moderate exercise was low in Hypo (57.7±3.1 mmHg) and moderate in Hyper (91.6±2.9 mmHg, p<0.05) compared with Norm (79.3±12.6 and 84.3±4.7 mmHg). Muscle oxygenation dropped progressively during Hyper, and also changes in muscle oxygenation during Hyper were similar to Norm. Interestingly, Brain oxygenation (Δ[O2Hb]) was slightly dropped progressively during Hypo, and also changes in muscle oxygenation during Hypo were similar to Norm. Interestingly, Brain oxygenation (Δ[O2Hb]) was slightly increased and deoxygenation (Δ[HHb]) was increased during exercise under each three conditions, respectively. Furthermore, changes brain and muscle oxygenation was also greater in Hypo compared with Norm and Hypo (p<0.05). CONCLUSIONS: Acute hypoxia decrease oxygen uptake with decreased muscle oxygenation and slightly increased brain oxygenation. But it is unlikely that changes in brain and muscle oxygenation was related with oxygen uptake in hyperoxia, despite a similar difference absolute Po2 in inspired blood and oxygen from hypoxia and/or hyperoxia to normoxia.

Elite endurance athletes typically use “live high - train low” altitude training to enhance sea level performance. Perhaps the most commonly utilized and expected control experiment in altitude training research concerns iron stores and supplementation. Whether elite athletes and coaches independently follow evidence-based best-practice principles regarding iron status and training at altitude, outside of a controlled research setting, is unknown. PURPOSE: To examine logistical decisions elite U.S. distance runners make regarding altitude training and the hematological outcomes that result from those decisions. METHODS: Elite U.S. distance runners (n = 58) completed altitude training (living elevation = 2,000 - 2,600m) at their own cost and volition. Total hemoglobin (tHb) mass was measured using CO rebreathing upon arrival and departure from altitude. Questionnaires asked athletes to self-report pre-altitude serum ferritin values, if iron was taken (pill or liquid) at altitude, and workout specifics. RESULTS: Of the 40 athletes who knew their serum ferritin level at the start of the camp, those with ferritin < 50 ng·ml⁻¹ (n = 11) demonstrated a ΔtHb of 0.6 ± 2.0% (ns) and those with ferritin > 50 ng·ml⁻¹ (n = 29) significantly increased ΔtHb by 3.7 ± 3.0%. Of those with ferritin levels > 50 ng·ml⁻¹, athletes who lived at altitude for 23 days (n = 9) showed a ΔtHb mass of 1.3 ± 1.7% (ns) and those who lived at altitude for > 27 days (n = 20) significantly increased ΔtHb mass by 3.8 ± 2.6%. Of the total cohort, 49 athletes answered questions regarding iron supplementation. Those who supplemented iron in liquid form (n = 27) significantly increased ΔtHb mass by 4.2 ± 3.4%. Those who did not supplement iron (n = 3) or supplemented in pill form (n = 19) showed a ΔtHb mass of 1.5 ± 0.5% (ns) and 1.4 ± 2.7% (ns). Athletes who answered questions regarding training (n = 47) reported completing 8.5 ± 2.5 “higher intensity workouts,” and 3.6 ± 1.1 of those workouts were done at <1,500m. Only 4 of the 47 athletes completed all higher intensity sessions at ≤1,500m. CONCLUSION: A substantial number of elite U.S. distance runners do not follow what would be considered evidence-based best-practice principles regarding altitude training. Coaches, sport scientists, and clinicians would be prudent to strongly advocate for athletes to follow these principles.

Acute hypoxia reduces arterial oxygen content, thereby increasing cardiac work to maintain oxygen delivery. Hypoxia may be accompanied by impairments in cardiac function which may be subject to sex differences, although this remains inadequately described in the literature. PURPOSE: Explore the differences in the cardiac response to acute hypoxia. METHODS: Thirty healthy participants (15 men, 22.4±3 yrs, BMI 25.3±3.0 kg/m²; 15 women, 20.3±3 yrs, BMI 22.6±1.2 kg/m²) underwent echocardiographic measures with simultaneous 1-Lead electrocardiogram-gating following ~1.5 hour shamm (20.0% O2) and normobaric hypoxia (12.5% O2) exposure on two separate days, in a randomized order. Systolic function (M-mode, tissue Doppler imaging [TDI]) and diastolic function (TDI) were assessed in triplicate. Tissue systolic function was assessed using fractional shortening (FS), ejection fraction (EF) from 2D Teicholz M-mode (parasternal short-axis), and S-wave velocity from tissue Doppler Imaging (TDI, apical 4-chamber). Diastolic function was assessed

UK to Nepal, a journey time of approximately 36 hours. Participants then trekked from 2800 m to 5300 m over 14 days. Temporal (RR, SDNN, RMSSD) and spectral power measures (LFnu, HFnu and LF/HF ratio) of HRV were recorded, at rest with spontaneous breathing, in normal ambient conditions (FIO2 = 0.209), NH (FIO2 = 0.124, ~4011 m) and in hypobaric hypoxia (HH) at 4356 m and 5350 m, during ascent. RESULTS: Two-way ANOVA (group x condition) with repeated measures revealed neither significant interactions (P > 0.05), nor between-group (P > 0.05) nor within-group (P > 0.05) differences for temporal and power spectral HRV measures between baseline, pre-IH and post-IH. No significant interactions, between-group or within-group changes were noted between post-IH, 4300 m and 5300 m (P > 0.05) natural altitude. CONCLUSION: Pre-acclimatization using active and passive intermittent hypoxic exposure did not significantly alter heart rate variability responses during ascent to very high altitude.

Acute hypoxia reduces arterial oxygen content, thereby increasing cardiac work to maintain oxygen delivery. Hypoxia may be accompanied by impairments in cardiac function which may be subject to sex differences, although this remains inadequately described in the literature. PURPOSE: Explore the differences in the cardiac response to acute hypoxia. METHODS: Thirty healthy participants (15 men, 22.4±3 yrs, BMI 25.3±3.0 kg/m²; 15 women, 20.3±3 yrs, BMI 22.6±1.2 kg/m²) underwent echocardiographic measures with simultaneous 1-Lead electrocardiogram-gating following ~1.5 hour shamm (20.0% O2) and normobaric hypoxia (12.5% O2) exposure on two separate days, in a randomized order. Systolic function (M-mode, tissue Doppler imaging [TDI]) and diastolic function (TDI) were assessed in triplicate. Tissue systolic function was assessed using fractional shortening (FS), ejection fraction (EF) from 2D Teicholz M-mode (parasternal short-axis), and S-wave velocity from tissue Doppler Imaging (TDI, apical 4-chamber). Diastolic function was assessed
We previously demonstrated that 7 days of intermittent hypoxic training (IHT) improved performance in the maximal anaerobic running test (MART) (ACSM 2015). However, it is unclear whether additional overnight hypoxic exposure in combination with IHT can further enhance MART. PURPOSE: The purpose of the present study was to compare the physiological adaptations in well-trained 400m or 800m runners with IHT to determine whether it can further enhance MART.

METHODS: Twenty-two men (400m: n=11; 800m: n=11) and 21 women (400m: n=9; 800m: n=12) were randomly assigned to either IHE (n=9), IHT (n=9), IHE+IHT (n=6) or Control (n=8) groups. Men had higher EF vs women across conditions (p<0.05). No significant condition by sex interactions were noted. CONCLUSION: Hypoxia resulted in greater systolic function but impaired diastolic function compared to the sham condition. Although men tended to have greater cardiac systolic function vs women there were no sex differences in the cardiac diastolic or diastolic response to acute hypoxic exposure. Supported by a Foundation Research Grant from ACSM.

<table>
<thead>
<tr>
<th>Tissue Doppler velocities</th>
<th>Sham</th>
<th>Hypoxia</th>
<th>P value</th>
<th>CxS, condition x interaction; EF, ejection fraction; FS, fractional shortening</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF (%)</td>
<td>57.7 ± 5.1</td>
<td>63.5 ± 6.8</td>
<td>66.6 ± 6.6</td>
<td>0.01</td>
</tr>
<tr>
<td>FS (%)</td>
<td>36.5 ± 5.1</td>
<td>34.4 ± 5.6</td>
<td>36.1 ± 5.0</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Weaning ratios between early (E) and late (A) filling waves assessed from Doppler (E, A) and TDI (E', A') waves were greater in hypoxia vs sham (p<0.05). Markers of diastolic dysfunction (E/A, E'/A') were lower in hypoxia vs sham (p<0.05). No significant condition by sex interactions were noted. CONCLUSION: Hypoxia resulted in greater systolic function but impaired diastolic function compared to the sham condition. Although men tended to have greater cardiac systolic function vs women there were no sex differences in the cardiac diastolic or diastolic response to acute hypoxic exposure. Supported by a Foundation Research Grant from ACSM.
reduced relative to sea level (p=0.01) in both groups (down 100 ± 29 vs. 91 ± 28 W, p=0.55), while SaO2 (70 ± 6 vs. 70 ± 5%, p=0.96), VO2peak (31.3 ± 4.6 vs. 34.0 ± 7.2 milliliters per kg of body weight per minute, p=0.81), and HR (146 ± 21 vs 149 ± 24 b·min−1, p=0.78) were similar between groups at peak power, as was the increase in BP from rest to peak power (increased by 31 ± 17 vs. 25 ± 16 mmHg, p=0.71).  

CONCLUSION: Losartan (100 mg) taken daily for 21 days had no observable effect on exercise performance at 5000 m.

**Acute Hypoxia Exacerbates Central Fatigue but not the Fatigue-related Reduction in Motor Neuron Responsiveness**

*(No relationships reported)*

It has been shown recently that acute hypoxia (AH) exacerbates fatigue through both muscular and neural mechanisms. At a supraspinal level, the voluntary drive from the motor cortex during fatiguing efforts was impaired compared to normoxia (NM). However, it is currently unknown whether hypoxia acutely affects motor neuron properties and their contribution to fatigue. **PURPOSE:** To examine motor neuron responsiveness and voluntary activation (VA) during fatiguing contractions in AH and NM. **METHODS:** On separate days, 11 males (31 ± 8 years) completed a 16-minute fatigue protocol composed of submaximal (25% maximal torque; MVC) intermittent (10s contractions, 5s rest) isometric elbow flexions in NM (Fp=21%) and AH (Fp=11%) for each condition. **RESULTS:** Prior to fatigue, arterial saturation and cerebral tissue oxygenation index were significantly lower in AH compared to NM (98 ± 1 vs. 76 ± 3% and 65 ± 7 vs. 48 ± 12%, respectively; p<0.01). MVC torque was equivalent (76.2 ± 9.5 vs. 80.6 ± 13.0Nm, respectively; p=0.05) but VA was significantly lower in AH compared to NM (90.4 ± 5.0 vs. 93.5 ± 5.4%, respectively; p<0.05). At the end of the fatigue protocol, the reductions of MVC torque and VA (relative to control values) were greater in AH compared to NM (20.5 ± 8.2 vs. 11.6 ± 9.8% and 14.4 ± 12.3 vs. 4.0 ± 7.1%, respectively; p<0.05). Conversely, the reduction in motor neuron responsiveness (area of the cervicomedullary motor evoked potential normalized to the maximal compound muscle action potential) was not significantly greater during AH compared to NM (47.6 ± 30.8 vs. 31.2 ± 37.2%, p>0.05). **CONCLUSION:** While AH elicited a marked effect in the CNS, such impairment was only confined to the cortical compartment (a greater reduction in VA), without affecting the responsiveness of motor neurons to a fatiguing task.

Supported by NSERC, CIHR and BCKDF.
RESULTS: Race performance improved by 0.6 ± 1.5 % overall, with similar improvements in HI22 (0.9 ± 0.5%) and HI30 (0.9 ± 0.9%); however these were not significantly different to MOD22 (0.1 ± 2.3 %). Performance improvements were achieved by all 4 participants in HI22, 9 of 10 in HI30 and 4 of 7 in MOD22 (4.7 and 3 lifetime bests respectively). Hbmax was increased from baseline in all groups (MOD22 = 4.4 ± 4.6%; HI22 = 6.0 ± 2.1%; HI30 = 4.0 ± 3.1 %). Weekly TL during the first 2 weeks of LIHTH was significantly increased in all groups compared to preceding sea level training (range 33 ± 7 % to 72 ± 27 %). TSB at the start of LIHTH in MOD22 (132 ± 21) was significantly higher (p < 0.001) than HI22 (94 ± 11) but not HI30 (95 ± 11; p = 0.10). TL for the final week of LIHTH was reduced significantly less (p < 0.03) from weeks 1 and 2 in MOD22 (23 ± 13 %) than in HI22 (44 ± 5 %) or HI30 (41 ± 10 %).

CONCLUSIONS: Lifetime best sea level performances were achieved following various doses of LIHTH. Substantial increases in training load were observed within the first 2 weeks at altitude, and tapering concluding LIHTH appeared beneficial for optimal performance.

948 Board #127 May 31 2:00 PM - 3:30 PM
Factors Predicting Performance during a High Altitude Hike
Allison Brown1, Nicole Deel1, John E. Davis2, Eric Achatz2, Michael Miller2, Jeremy Reitinger2, Elaine Reno2, Luke Yaeger3, Ann Wlosiowski1, Andrew Subudhi2, FACSM5, Robert Roach, FACSM4, 1Alma College, Alma, MI; 2CU School of Medicine, Aurora, CO; 3Military Research Center CU School of Medicine, Aurora, CO. (Sponsor: Andrew Subudhi, FACSM)

Email: brownlac@alma.edu

(No relationships reported)

Civilian and military personnel often endure heavy exercise loads at high altitude. To improve performance at high altitude, it is important to understand what factors predict human performance in that setting. PURPOSE: To assess whether a physical fitness test at sea-level can be used to predict exercise performance at high altitude.

METHODS: Subjects were recruited from mid-Michigan (sea level) and were required to pass a medical screening and achieve a high score on the Army Physical Fitness Test (APFT) in order to participate. The APFT performance trial consisted of a pushup test (maximum number of pushups in 2 min), a sit-up test (maximum number of sit-ups in 2 min), and a timed two-mile run. Ninety-nine subjects completed APFT testing at sea-level before being transported to Breckenridge, Colorado (9,075 ft; 2766 m) to undergo APFT testing immediately upon arrival. On day two in Colorado, subjects were a 35-pound rucksack during a timed, 3.7-mile uphill hike from 10,627 feet (3239 m) to 12,595 feet (3840 m). Multivariable regression analysis was performed to predict which variable(s) (height, weight, pushup score on APFT, sit-up score on APFT, 2 mile run time at the performance trial and at altitude) were most important in determining hike time. RESULTS: One multi-variable linear regression model indicated a significant correlation (r^2 = 0.05) between subjects’ weight and two-mile run time at the APFT performance trial at sea level relative to hike time (r^2 = 0.33). These findings indicate that as body weight increases hike time was slower, and that a faster 2-mile run time resulted in a faster hike time. A second multi-variable linear regression analysis indicated a significant relationship between the 2-mile run time, sit-ups, and push-ups at high altitude, and subjects’ weight relative to hike time (r^2 = 0.52). CONCLUSIONS: Overall, the APFT high-altitude trial was a better predictor of hike performance given that the model accounted for 52% of the variance relative to hike performance. Furthermore, in both the sea level and high-altitude trials, subjects’ weight and two-mile run time had the greatest influence on hike performance.
PURPOSE: The aim of the study was to assess the effects of acute aerobic exercise with and without blood flow restriction on arterial compliance in pre-hypertensive males.

METHODS: Ten pre-hypertensive male subjects (age = 23±1.5 yrs) performed two randomized exercise sessions. Anthropometric measurements, questionnaires, and Bruce protocol were completed at screening. Baseline measurements were obtained each day following subjects reaching a normal hydration status. Subjects then ran at 65% VO2 for 60 min or 20 min at 40% VO2 with blood flow restriction (BFR). Arterial elasticity was measured at 0, 10, 20, and 40 minutes and pulse wave velocity (PWV) was measured at 5, 15, 25, and 35 minutes post-exercise.

RESULTS: There were no significant condition*time interactions or no main effects for condition and time for carotid to radial, carotid to femoral, femoral to distal PWV, small artery elastance (SAE) or large artery elasticity (LAE). Significant condition*time interaction (p<0.03) and time main effect (p<0.01) were found in systolic blood pressure (SBP). There were also significant condition*time interaction (p<0.03) and condition main effect (p<0.01, BFR higher) in diastolic blood pressure (p<0.03). Significant condition*time interaction (p<0.01) and condition (p<0.01, 40% VO2) and time main effects (p<0.01) were found in stroke volume (SV). Significant condition*time interaction (p<0.01) and time main effect (p<0.02) were found in cardiac output (CO). Significant condition*time interaction (p<0.01) and condition (p<0.01, 0 min lower) and time main effects (p<0.02) were found in systemic vascular resistance (SVR). A significant condition main effect for total vascular impedance (TVI) was detected (p<0.05, 60 min lower).

CONCLUSIONS: Since subjects were in supine position for post-testing, significantly lower SV values could be due to lower venous return and/or sweat-related blood volume loss and lower SV and TVI could be because of endothelium derived nitric oxide following the 60 min session. The findings also indicate that the 20 min with BFR session may not be intense and/or long enough to cause significant changes in variables tested.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.

Walking, coupled with bilateral blood flow restriction (BFR) in legs, augments the central cardiovascular adjustment to activity (e.g., greater blood pressure, and aortic wave reflection) as compared to walking without BFR. Whether the same occurs in response to unilateral, upper-body exercise performed with bilateral blood flow restriction (BFR) is unknown.
mmol/L (antegrade shear rate: 178±18 s$^{-1}$ vs. 260±22 s$^{-1}$ vs. 309±24 s$^{-1}$, baseline vs. 0-2 mmol/L vs. 2-4 mmol/L, respectively, p<0.01; retrograde shear rate: 425±34 s$^{-1}$ vs. 849±9 s$^{-1}$ vs. 828±15 s$^{-1}$, baseline vs. 0-2 mmol/L vs. 2-4 mmol/L, respectively, p<0.005). No significant difference was observed between the 2-4 and 4+ mmol/L intensities.

**CONCLUSIONS:** The data shows that exercise-induced blood flow patterns are exercise intensity-dependent. However, high intensity exercise (lactate 4+ mmol/L) appears to offer little changes in blood flow patterns in comparison with moderate exercise (lactate 2-4 mmol/L).

Traditional resistance exercise may decrease vagal tone up to 30 minutes, which may increase the risk of cardiovascular events. However, the effects of resistance exercise with blood flow restriction (BFR) on autonomic modulation are unclear. **PURPOSE:** To evaluate autonomic modulation after exercise with and without BFR in active men. **METHODS:** Sixteen resistance-trained men volunteered for the study. Autonomic modulation was assessed at rest, 15 (Rec1), and 25 (Rec2) minutes after three different conditions. The low-intensity bench press with BFR (LI-BFR) consisted of 4 sets of 30, 15, 15, and 15 repetitions at 30% 1-repetition maximum (1RM) with 30 seconds rest between sets. The high-intensity bench press (HI) consisted of 4 sets of 8 repetitions at 70% 1RM with 60 seconds rest between sets, and control (CON) consisted of supine rest. Autonomic modulation was expressed as natural logarithm (Ln) and included total power (LnTP), low-frequency power (LnLF), high-frequency power (LnHF), and sympathovagal balance (LnLF/LnHF ratio). A repeated measures ANOVA was used to evaluate conditions (LI-BFR, HI, and CON) across time (Rest, Rec1, and Rec2) on autonomic modulation. **RESULTS:** There was a significant condition by time interaction for LnTP (LI-BFR: Rest: 8.6±0.9%, Rec1: 7.9±1.0%, Rec2: 7.9±1.2%; HI: Rest: 8.6±2.1%, Rec1: 7.3±1.0%, CON: Rest: 8.7±0.8%, Rec1: 8.7±0.7%, Rec2: 8.5±0.8%, p<0.05), LnLF (HI: Rest: 7.3±1.1%, Rec1: 5.5±1.2%, Rec2: 6.6±1.5%, HI: Rest: 7.4±1.2%, HI: Rest: 9.1±4.4%, HI: Rest: 7.3±1.1%, Rec: 6.4±0.8%, Rec2: 6.6±1.2%, CON: Rest: 7.1±1.0%, Rec1: 7.1±1.8%, Rec2: 7.1±1.0%, p<0.05) such that they were reduced at Rec1 and Rec2 after LI-BFR and HI compared to Rest and CON. There was a significant (p=0.05) effect of time for LnLF/LnHF ratio (Rest: 1.01±0.1%, Rec1: 1.00±0.2%, Rec2: 1.01±0.1%) such that it was increased at Rec1 and Rec2 compared to Rest. **CONCLUSIONS:** These data suggest that LI-BFR and HI significantly alters autonomic modulation for at least 30 minutes, with no difference between LI-BFR and HI.

Funded by School of Health Sciences at Kent State University

**Board #133**

**Title:** Hemodynamic Response to Resistance Blood Flow Restriction Exercise at Different Degrees of Arterial Occlusion Pressure

**Authors:** Eduardo S. Freitas1, Rodrigo R. Aniceto2, Julio C. G. Silva2, Patrick S. S. Pfeiffer3, Joamira P. Araújo3, Maria S. Cirilo-Sousa3, Michael G. Bemben, FACSM.

**Affiliation:** 1University of Oklahoma, Norman, OK. 2Federal University of Paraíba, João Pessoa, Brazil. 3Federal University of Ceará, Juazeiro do Norte, Brazil.

**Sponsor:** Michael G. Bemben, FACSM

**Email:** eduardofreitas@ou.edu

Although resistance exercise involving the application of an external arterial occlusion pressure (AOP) have been widely discussed in the literature, the hemodynamic response to this type of exercise when performed at different degrees of AOP remains unclear. **PURPOSE:** To investigate the hemodynamic response to resistance exercise performed at different degrees of AOP. **METHODS:** Twelve healthy trained males (2.67 yrs, 73.46 ± 7.89 kg, 1.81 ± 0.07 m, and 22.50 ± 1.66 kg/m²) were randomly assigned to four exercise conditions: CON (no occlusion), AOP-50 (50% of AOP), AOP-75 (75% of AOP), and AOP-100 (100% of AOP) in a within subjects cross-over design. A standard 15 cm wide cuff was placed on the thigh, inflated to the target pressure, and four sets of 10 repetitions of unilateral knee extension at 20% of IRM were executed with 30 sets between sets. Subjects performed the same protocol for the CON condition but with AOP. There was an interval of 7 days between each trial. Total AOP was set as the amount of pressure needed to fully occlude the auscultatory pulse in the lower limbs. Systolic (SBP) and diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR), and cardiac product (DP) were assessed at rest, between the second and the third set (during), immediately post-exercise, and every 15 minutes until 60 minutes post-exercise. **RESULTS:** SBP and DP significantly (p<0.05) increased from rest, during and immediately post-exercise for the AOP conditions during exercise. MAP significantly (p<0.05) increased during exercise from rest for all experimental conditions and for AOP-50, and AOP-100 immediately post-exercise. HR was significantly (p<0.05) increased during exercise only for CON and for all conditions immediately post-exercise. All these parameters returned to baseline 15 minutes post, and remained unchanged up to 1 hr post-exercise. **CONCLUSION:** Similar hemodynamic responses were observed for the AOP conditions during, immediately post-exercise, and until 60 minutes post-exercise, regardless of the amount of pressure applied.

**Board #134**

**Title:** Importance of Venous Return for Muscle Metaboloreflex-mediated Stroke Volume and Cardiac Output Responses

**Authors:** Masashi Ichinose1, Tomoko Ichinose2, Takeshi Nishiyasu3.

**Affiliation:** 1Meiji University, Tokyo, Japan. 2Osaka International University, Osaka, Japan. 3University of Tsukuba, Tsukuba, Japan.

**Sponsor:** Michael G. Bemben, FACSM

**Email:** banchigallotti@ou.edu

It has been shown in animals that activation of the muscle metaboreflex during dynamic exercise increases cardiac output (CO) via rises in heart rate (HR) with sustained stroke volume (SV). In addition, to maintain CO at higher level, venous return also needs to increase, decrease in venous return abolishes the muscle metaboreflex-mediated increase in CO. However, importance of venous return for the muscle metaboreflex-mediated SV and CO responses has never been examined in humans. **PURPOSE:** We aimed to investigate the influences of decreases in venous return from exercising limbs on the muscle metaboreflex-mediated SV and CO responses in humans. **METHODS:** We studied 9 healthy male volunteers. After resting measurements, the subjects performed cycling exercise for 8-min at 30% and 60% of VO$\text{peak}$ (EX30 and EX60), respectively. Beginning 3 min after the start of the exercise, inner pressure of the occlusion cuffs placed on the both thighs were increased by 80, 100, 120, 140 and then 160 mmHg in stepwise fashion with 1-min step durations. The purpose of the progressive application of thigh cuff pressure was to reduce venous return from exercising limbs as well as to decrease arterial blood flow (i.e., oxygen supply) to exercising skeletal muscles to activate the...
B-65 Free Communication/Poster - Body Composition

Wednesday, May 31, 2017: 1:00 PM - 6:00 PM
Room: Hall F

959 Board #138
May 31 3:30 PM - 5:00 PM
Total and Segmental Body Composition Examination in Collegiate Football Players Using Multifrequency BIA and DXA

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

(NO relationships reported)

PURPOSE: To examine the influence of player position on the agreement between multifrequency bioelectrical impedance analysis (BIA) and dual x-ray absorptiometry (DXA) when assessing percent body fat (BF%) and total and segmental (arms, legs, trunk) fat mass (FM) and lean mass (LM) in male NCAA Division I collegiate football athletes.

METHODS: Forty-four male collegiate athletes (age=19±1 yrs; height=1.9±0.1 m; weight=106.4±18.9 kg; body mass index=30.1±4.2) participated in this study. Player positions included: offensive linemen (OL; n=7), tight ends (TE; n=4), wide receivers (WR; n=9), defensive linemen (DL; n=6), defensive backs (DB; n=8), linebackers (LB; n=6), and kicking backs (RB; n=4). Total and segmental body composition was measured using multi-frequency BIA and compared with values obtained using DXA. Paired t-tests using a Bonferroni-adjusted p-value of 0.007 examined differences between the two methods and Bland-Altman analyses evaluated agreement. ANOVA assessed effect of position on total and segmental differences between methods and Tukey’s HSD determined differences among each position.

RESULTS: Compared with DXA multifrequency BIA significantly underestimated BF% (3.0±3.3%), total FM (2.5±4.3kg), leg FM (2.8±2.0kg), and leg LM (3.6±2.3kg) (all p<0.001) and significantly overestimated total LM (6.9±4.5kg) (p=0.001). Limits of agreement (9.6±9.9% of the mean difference) were: ±7.39% (BF%), ±10.45% (total FM), ±3.83% (leg FM), ±2.28kg (leg LM), and ±8.89kg (total LM). No significant differences were found between the two devices for trunk FM (±3.03kg; p = 0.565) and trunk LM (±1.02kg; p=0.009) measures, with limits of agreement ±5.92kg for trunk FM and ±4.71kg for trunk LM. Player position had a significant effect on the mean difference of all measures, including BF%, total FM and LM, leg FM and LM, and trunk FM and LM (adjusted p<0.05). OL demonstrated the greatest effect on the mean difference of each variable.

CONCLUSIONS: Compared to DXA, multifrequency BIA does not appear to be a valid way to assess segmental measures of body composition in collegiate football players. BIA may thus be limited by non-traditional body types (e.g. football players) indicating between-player comparisons should be limited. Further research in other athletic populations is warranted.
Estimating body fat percent (BF%) is an important fitness assessment for determining health status, monitoring weight loss and improving athletic performance. Women have a unique consideration when assessing BF% due to possible fluid retention, weight gain, and hormonal fluctuations that are happening throughout the menstrual cycle, and it has been questioned as to whether or not menses could negatively impact the accuracy of BF% assessments. PURPOSE: To identify whether or not body composition results would be affected by a woman during menses and to investigate the effects of birth control on the accuracy of body composition results. METHODS: 40 women (26.1 ± 7.1 yrs) had their BF% estimated with dual energy x-ray absorptiometry (DXA), air displacement plethysmography (ADP), and three different hand-to-foot bioelectrical impedance analysers (BIA1, BIA2, and BIA3). Participants completed BF% testing during 2 different phases of their menstrual cycle. Visit 1 was on day 1 or 2 of menses and visit 2 was 7 to 14 days later. Visit 2 was estimated to be in the pre-ovulatory phase of the menstrual cycle. Prior to testing participants did not exercise for 12 hours, consume alcohol for 24 hours, or eat or drink for 4 hours with the exception of water. All testing was administered per manufacturer specifications. RESULTS: 24 women were not on birth control (non-BC) and 16 were on a form of hormonal birth control (H-BC). The BF% means ± SE for non-BC were: DXA = 30.6 ± 1.3 vs. 30.3 ± 1.4, p = 0.077, ADP = 28.8 ± 1.6 vs. 28.3 ± 1.6, p = 0.083, BIA1 = 26.7 ± 1.5 vs. 27.1 ± 1.5, p = 0.122, BIA2 = 26.1 ± 1.5 ± 26.3 ± 1.5, p = 0.498, BIA3 = 27.0 ± 1.4 vs. 26.8 ± 1.5, p = 0.523. The BF% means ± SE for visits between H-BC were: DXA = 30.1 ± 1.5 vs. 30.2 ± 1.5, p = 0.677, ADP = 29.3 ± 1.8 vs. 28.8 ± 1.8, p = 0.215, BIA1 = 26.2 ± 2.0 vs. 26.4 ± 1.9, p = 0.508, BIA2 = 26.3 ± 1.9 vs. 26.3 ± 1.7, p = 0.988, BIA3 = 26.9 ± 1.9 vs. 26.9 ± 1.6, p = 1.000. CONCLUSIONS: For the H-BC group there were no differences for BF% between visits for all methods indicating that results should not be affected by menstrual cycle phase. However, the non-BC group had mixed results with no differences with the 3 BIAs but p-values near 0.05 for DXA and ADP methods. These data suggest that non-BC women should be tested post menses with certain methods, especially when BF% is being tracked over time.

**A Comparison of Body Composition Methods Across Two Phases of the Menstrual Cycle.**

Cherilyn McLeaster, Courtney H. Hicks, Tiffany E. Smat, John McLester, FACSM. Kennesaw State University, Kennesaw, GA. (Sponsor: John R. McLester, FACSM) (No relationships reported)

With technological advances, there has been a resurgence in the use of ultrasound as a method to measure subcutaneous fat thickness. Despite the increased interest in this methodology, there is a lack of research comparing A-mode and B-mode ultrasound devices. PURPOSE: Compare subcutaneous fat thickness measured by a low resolution A-mode ultrasound and a high resolution B-mode ultrasound to the actual fat thickness in dissected cadavers. METHODS: Six cadavers (3 male, 3 female), 80.8 ± 8.9 y at the time of death, were measured. Subcutaneous fat thickness was measured at six sites (chest, abdomen, thigh, triceps, suprailiac, calf) with both ultrasound devices before the cadavers were dissected and site-specific thickness was measured. RESULTS: Correlations between both ultrasounds and the dissected measurement exceeded 0.90 at all sites with a few exceptions. At the abdomen, the relationship between the two devices was 0.76, and the B-mode and dissected measurement was also 0.76. The correlation between dissection and A-mode was 0.75 for the suprailiac site, but it was not possible to discern the separation of tissue at this site when using the B-mode device. There were no significant differences (p > 0.05) between the devices and at dissection measurement at any other sites. The mean difference in fat thickness between A-mode and B-mode was < 0.7 mm at all sites except the calf (1.2 mm). CONCLUSION: With the exception of the suprailiac site, which was difficult to measure, both A-mode and B-mode ultrasound are equally capable of providing measurements of subcutaneous fat thickness with an accuracy of < 1 mm at most sites.

**Board #140 May 31 3:30 PM - 5:00 PM**

A Comparison of Body Composition Methods Across Two Phases of the Menstrual Cycle.

Cherilyn McLeaster, Courtney H. Hicks, Tiffany E. Smat, John McLester, FACSM. Kennesaw State University, Kennesaw, GA. (Sponsor: John R. McLester, FACSM) (No relationships reported)

**Board #141 May 31 3:30 PM - 5:00 PM**

A-mode and B-mode Ultrasound Measurement of Subcutaneous Fat Thickness: A Cadaver Analysis

Validation Study

Dale R. Wagner, Brennan J. Thompson, D Andy Anderson. Utah State University, Logan, UT (Sponsor: Edward Heath, FACSM) Email: dale.wagner@usu.edu (No relationships reported)

Preliminary data and results were presented by other investigators. PURPOSE: This study was designed to verify the validity of BF% in predicting body fat percent (BF%) in some populations. However, the results have been inconsistent across populations. The study was designed to verify the validity of BF% in predicting BF% in a sample of obese adults, using dual-energy X-ray absorptiometry (DEXA) as the reference method. METHODS: 48 participants (54% female, mean age 41.0 ± 7.3 years old). DEXA was used as the “gold standard” to determine BF%. Pearson’s correlation coefficient was used to evaluate the association between BAI and BF%, as assessed by DEXA. A paired sample t-test was used to test differences in mean BF% obtained with BAI and DEXA methods. To evaluate the concordance between BF% as measured by DEXA and as estimated by BAI, we used Lin’s concordance correlation coefficient and Bland-Altman agreement analysis. RESULTS: The correlation between BF% obtained by DEXA and that estimated by BAI was r = 0.844, p < 0.001. Paired t-test showed a significant mean difference in BF% between methods (BAI = 33.3 ± 6.2% vs. DEXA 39.0 ± 6.1; p < 0.001). The bias of the BAI was -6.0 ± 3.6% (95% CI -12.0 to 1.0, p = 0.06) indicating that the method was significantly underestimated the BF% compared to the reference method. Lin’s concordance correlation coefficient was considered stronger (r = 0.923, 95% CI = 0.862 to 0.957).

CONCLUSIONS: In obese adults BAI presented low agreement with BF% measured by DEXA; therefore, BAI is not recommended for BF% prediction in this Latin American obesity sample studied. Supported by Universidad del Rosario (Code No. FIUR DN-BG001)

**Board #142 May 31 3:30 PM - 5:00 PM**

Effect of Water Consumption and Moderate Intensity Exercise on Body Composition Measures

Brian Tyo. Columbus State University, Columbus, GA. Email: briantlyo@gmail.com (No relationships reported)

Although the data are not clear, manufacturers of body composition devices often recommend that users avoid exercise prior to measurement. These measures can potentially be impacted by acute exercise and hydration levels. PURPOSE: To determine the effect of water consumption and moderate intensity exercise on body composition measurements using air displacement plethysmography (ADP) and three biochemical impedance devices (T, O5, and O3). METHODS: Twenty four participants (age = 22.3 ± 23.9y; height = 166.8 ± 9.9 cm; mass = 77.4 ± 17.8 kg) completed the study. Pre-exercise (PreE) body composition was measured following manufacturers’ guidelines. Participants then exercised on a treadmill at moderate intensity (~50% of HRR) for 30 minutes on two separate occasions. During one visit, participants were allowed water ad libitum following exercise (W) while no water was allowed during the other session (NW). Body composition was measured immediately post-exercise (PE0), 15 minutes post-exercise (PE15), 30 minutes post-exercise (PE30), 45 minutes post-exercise (PE45) and 60 minutes post-exercise (PE60). Repeated measures ANOVA (2 x 6) were used to determine if water consumption and moderate intensity exercise influenced body composition measures for each device. Where appropriate, pairwise comparisons with Bonferroni adjustment were performed to locate differences among the post-exercise time points. RESULTS: All devices showed a significant effect of time (P<0.01) and O5 was the only device to demonstrate a significant interaction of group and time (P<0.05). ADP showed no significant differences among the time points during either condition. PreE was significantly greater than all other time points (P<0.01) for T and O5 and was significantly greater than PE10, PE15, PE30, and PE45 for O3 (P<0.01). Conclusion: Moderate intensity exercise can impact body composition to varying degrees. Ingestion of water post exercise does not appear to impact most measurements of body composition. Investigators should consider limitations of the device(s) which could impact the interpretation of data.
Mapping body composition patterns of those hired as police officers has implications not only to the health of officers during their careers but also in their ability to perform in emergency situations.

**PURPOSE:** To evaluate body composition changes that occur in police recruits from 1990 to 2013 with gender comparisons. **METHODS:** During the first week of police recruit training in a large southeastern metropolitan area, physical fitness levels were evaluated in 2,468 recruits. This study’s variables of interest are: body mass (kg), lean mass (kg), and % body fat. ANOVA and Bonferroni post hoc procedures were used to evaluate data. **RESULTS:** The initial ANOVA shows significance for males in all the three variables at p≤0.05. Males tended to increase in body mass and lean mass from 1990 to 2000 (80.6+1.2kg to 87.3+1.1kg, p<0.05) (68.9±0.8kg to 73.4±0.8kg, p<0.05), respectively. These values remained relatively constant between 2000 and 2013. No discernable pattern was seen in female lean mass nor body mass. Males tended to increase in % body fat from 1994 to 2010 (13.6±5.0 to 16.7±7.2, p<0.05). Although significant, female % body fat means increased from 1990 to 2013 (22.9±1.0 to 26.2±1.2). **CONCLUSIONS:** Even though there was an increase in body mass, pre lean mass and % body fat over time in males, these increases were low. In addition, these increases were lower in females.

---

**RESULTS:** While body mass index (BMI), body fat percent (%BF), and waist circumference (WC) each can be used as a body composition index (BCI) to establish associations with cardiorespiratory fitness, it is desirable to use an overall BCI to establish the association. This study was intended to create an overall BCI from the above three BCIs and see how the overall BCI could predict 1.5-mile run performance among university students. **METHODS:** Three different BCIs (BMI, %BF, WC) and 1.5-mile run were measured for 123 university students (mean age: 20.7±1.6; 70 males and 53 females), and an overall BCI was created by converting the three BCIs into z scores and then adding them together. The overall BCI was used to predict students’ 1.5-mile run performance with linear regression. All data analyses were conducted separately for males and females.

**RESULTS:** For both males and females, the scatterplots showed that a 1.5-mile run performance increased when the overall BCI decreased, indicating a linear relationship between the two variables. The regression equation for predicting the 1.5-mile run performance from the overall BCI for males was: predicted 1.5-mile run performance (in seconds) = 704.64 + 33.32 overall BCI, with the 95% confidence interval for the prediction equation: (593.14, 816.16) for males and (607.40, 820.80) for females. Males tended to increase in % body fat from 1994 to 2010 (13.6±5.0 to 16.7±7.2, p<0.05). Although significant, female % body fat means increased from 1990 to 2013 (22.9±1.0 to 26.2±1.2). **CONCLUSIONS:** Even though there was an increase in body mass, pre lean mass and % body fat over time in males, these increases were low. In addition, these increases were lower in females.

**PURPOSE:** The purpose of this study was to examine the relationships between body composition measures derived from air displacement plethysmography (BodPod) and several methods of body composition prediction in a population of National Association of Intercollegiate Athletes (NAIA) athletes. **METHODS:** Twenty-three NAIA athletes visited the lab for a single visit. Percent body fat and lean mass were assessed in all subjects using the BodPod (BP), handheld bioelectrical impedance analysis (HBIA), standing bioelectrical impedance analysis (SBIA), and skinfolds using the 3-site Jackson and Pollock equation. Body mass index (BMI), upper arm circumference (AC), waist circumference (WC), and hip circumference (HC) were also assessed. Relationships between percent body fat as assessed by BP and all field non-lean mass assessments as well as relationships between BP lean mass and all field non-percent body fat assessments were examined using Spearman’s correlation coefficients.

**RESULTS:** Percent body fat (19.1±8.4%) as assessed by BP was significantly related to BMI (29±8 kg/m²; r = 0.51; p = 0.012), percent body fat calculated from skinfolds (14±7%; r = 0.855; p < 0.001), percent body fat from HBIA (17.9±6.2%; r = 0.855; p < 0.001), percent body fat from SBIA (14.1±3.7%; r = 0.748; p < 0.001), AC (33±4 cm; r = 0.563; p = 0.005), WC (90±10 cm; r = 0.720; p < 0.001), and HC (102±18 cm; r = 0.788; p < 0.001). Lean mass as assessed by BP (73.3±8.7 kg) was significantly related to BMI (29±8 kg/m²; r = 0.483; p < 0.02); lean mass calculated from skinfolds (76±10 kg; r = 0.817; p < 0.001), lean mass from HBIA (72.7±8.6 kg; r = 0.851; p < 0.001), lean mass from SBIA (76.5±11.7 kg; r = 0.802; p < 0.001), AC (33±4 cm; r = 0.596; p = 0.003), WC (90±10 cm; r = 0.496; p = 0.016), and HC (102±18 cm; r = 0.570; p < 0.005). **CONCLUSIONS:** Skinfolds, HBIA, and SBIA appear to be most related to both percent body fat and lean mass in this population of NAIA athletes. Thus, when testing these athletes in a field setting, these tests could be performed to provide useful body composition information. If it were not possible to perform these tests, BMI, UAC, WC, and HC could also be used although these tests did not correlate as strongly as did skinfolds, HBIA, and SBIA with BP assessments.
BACKGROUND: Similar to the general US population, the rate of cardiovascular disease, sedentary lifestyle, and obesity in military populations is growing. Andropause, a type of obesity where excess fat accumulates around the thoracic and abdominal cavities, is associated with an increased risk of cardiovascular and metabolic deficiencies. Military populations are confronted with high physiological demands therefore it is crucial for them to be in good physical condition and minimize excess body fat in the thoracic and abdominal areas.

METHODS: This research investigated the effects of a 7-week periodized training program on body composition of ROTC cadets. Subjects consisted of 23 Army and Air Force ROTC cadets (male=18, female=6). Age (yr) = 22.6±5.96, Height (cm)=172.8±68. Weight (kg)=72.98±12.91. The intervention group (IG) n=14 trained for 1 hour/day, 4 days/week, and the control group (CG) n=9 participated in traditional military training protocol for 1 hour/day, 3 days/week. RESULTS: Findings revealed that both groups demonstrated a significant decrease in overall body fat percentage (p<0.005) pre vs post training, but only the IG demonstrated a significant training effect, evidenced by decreases in the abdominal area (p<0.009) and mid-axillary (p=0.025). CONCLUSION: Although this research demonstrated that periodized resistance training reduces abdominal body fat among ROTC cadets, it is important that future studies address certain limitations (small sample size and length of training period) this study encountered. Due to the health risks associated with android obesity, including increased cardiovascular and metabolic disease risk factors, implementing a periodized training program may be beneficial in diverse military populations.

CONCLUSIONS:

PURPOSE: The accuracy of a three-dimensional (3D) body scanner in determining body composition was compared against other laboratory methods (i.e., hydrostatic weighing, bioelectrical impedance analysis (BIA)). METHODS: A total of 176 (males=females= 83/93) young adults [mean±SD: age= 22.2±2.9 years, body mass index (BMI) =24.5±3.8 kg/m²] were recruited. Subjects had muscle mass estimated from the 3D body scanner, skinfolds, circumference measurements and BIA. The Jackson and Pollock equation was used to estimate body fat percent (BF%) from the sum of three skinfolds (males: chest, abdomen and thigh; females: waist, hip, neck, and height). Body fat percent (BF%) from the 3D scanner (10.6±4.0%) was significantly less than BF% from hydrostatic weighing, bioelectrical impedance analysis (BIA) estimate (12.5±4.1% kg/m²). RESULTS: The validity of the IBC %fat estimate was based on a comparison to the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r²), 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 IBC estimate. Paired t-tests determined paired-wise differences between measurements with significance set at p<0.05. The mean %fat was significantly lower for the IBC [23.0 (9.3)%] estimate than the DXA [25.9 (11.5)%] estimate (p<0.001). The r² value was 0.669; SEE was 6.6% fat; and total error (TE) was 7.2 %fat. When separated by sex, the IBC %fat estimate was still significantly lower for both male [-1.6 (5.9) %fat, r² 0.456, SEE=5.8 %fat, TE=6.16 %fat] and female [-4.0 (6.9) %fat, r²=0.462, SEE=6.9 %fat, TE=7.9 %fat] participants. CONCLUSIONS: In this study the IBC did not provide a valid estimate of body composition and underestimated %fat compared to the DXA estimate. Based on this preliminary analysis, this method cannot be recommended for estimating BC in college aged students.

PURPOSE: Body composition (BC) is a frequently assessed component of health-related fitness. Recently, a portable joint diameter-based body composition assessment system, sold by Integrative Body Composition Assessment (IBC) has become commercially available for estimating BC. This method involves measuring both right and left wrist diameters using calipers, waist circumference, height and weight. These measurements are entered into the IBC software together with age and gender and the average amount of both cardiorespiratory and resistance training exercise the subject has done on average per week for the past six months. However, little is known how IBC BC estimates compare to the dual-energy X-ray absorptiometry (DXA) estimate of body composition in college aged students. The purpose of this study was to determine the accuracy of the IBC as a way to estimate BC.

METHODS: Participants percent body fat (%fat) was estimated using IBC and dual-energy X-ray absorptiometry (DXA), which served as the criterion estimate. Subjects were 162 (75 males, 87 females) physically active college students [age 21 (3) yrs. height 1.73 (0.1) m, body mass 76.09 (15.74) kg, and BMI 25.4 (4.1) kg/m²]. RESULTS: The validity of the IBC %fat estimate was based on a comparison to the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r²), 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 IBC estimate. Paired t-tests determined paired-wise differences between measurements with significance set at p<0.05. The mean %fat was significantly lower for the IBC [23.0 (9.3)%] estimate than the DXA [25.9 (11.5)%] estimate (p<0.001). The r² value was 0.669; SEE was 6.6% fat; and total error (TE) was 7.2 %fat. When separated by sex, the IBC %fat estimate was still significantly lower for both male [-1.6 (5.9) %fat, r² 0.456, SEE=5.8 %fat, TE=6.16 %fat] and female [-4.0 (6.9) %fat, r²=0.462, SEE=6.9 %fat, TE=7.9 %fat] participants. CONCLUSIONS: In this study the IBC did not provide a valid estimate of body composition and underestimated %fat compared to the DXA estimate. Based on this preliminary analysis, this method cannot be recommended for estimating BC in college aged students.
The accurate measurement of percent body fat (%BF) is very important in the determination of a wrestler’s minimum wrestling weight under the National Collegiate Athletic Association Wrestling Weight Management Program. Skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing remain as the only three approved methods. Dual energy x-ray absorptiometry (DXA) is considered a criterion method while type-A ultrasound (US) serves as a less expensive, field alternative; however, a dearth of literature has examined the influence of hydration status on DXA and US determined %BF. PURPOSE: To determine the effect of hydration status on fat mass, lean body mass, and %BF using SF, ADP, US, and DXA. METHODS: Sixteen college-aged men (20.8 ± 1.6 yrs) participated in this study. Subjects participated to the lab on two separate occasions in each in a euhydrated state (Usg < 1.020) or a hypohydrated state (Usg > 1.020) using a randomized crossover design. Usg was assessed prior to testing. In order to verify hydration status and %BF was determined using SF, ADP, DXA, and US methods. RESULTS: US and body mass (BM) measurements were significantly different between the euhydrated (Usg=1.014 ± 0.006; BM=79.1 ± 14.3kg) and hypohydrated (Usg=1.026 ± 0.004; BM=78.4 ± 14.2kg) assessments (Usg: p=0.001; BM: p=0.006). However, hydration status had no significant effect on %BF observed in the euhydrated or hypohydrated states (p=0.730) although significant differences were observed between the different assessment methods (SF=10.3±1.3%; ADP=13.0±1.9%; US=13.2±1.3%; DXA=19.5±1.8%; p<0.001). Pairwise comparisons identified significant differences between all methods (p=0.001-p=0.018) except for the comparison between ADP and US (p=1.000). %BF measured by DXA was significantly greater than all of the other methods (2.8-9.2%; p=0.004). CONCLUSION: Hydration status did not have an effect on %BF measurements when using SF, ADP, US, or DXA. The significant differences among these four methods remain a concern. The difference between two approved methods (SF and ADP) suggests that a wrestler may lose additional weight when using ADP, thus potentially allowing for certification at a lower weight class.

### Table 1. Correlation coefficients between skinfold thickness and body fat.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fat (%)</th>
<th>Skinfold Thickness</th>
<th>Body Surface Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKF10</td>
<td>0.840</td>
<td>0.862</td>
<td>0.913</td>
</tr>
<tr>
<td>SKF8</td>
<td>0.851</td>
<td>0.838</td>
<td>0.914</td>
</tr>
<tr>
<td>SKF * Belanke</td>
<td>0.881</td>
<td>0.826</td>
<td>0.919</td>
</tr>
<tr>
<td>SKF * Biering</td>
<td>0.895</td>
<td>0.837</td>
<td>0.925</td>
</tr>
<tr>
<td>SKF * DuBois</td>
<td>0.903</td>
<td>0.818</td>
<td>0.921</td>
</tr>
<tr>
<td>SKF * Skinfold</td>
<td>0.910</td>
<td>0.813</td>
<td>0.919</td>
</tr>
</tbody>
</table>

In 1921 Matiepka proposed a strategy for estimating adipose tissue mass by calculating the half of average of some skinfolds thickness and multiplying it by body surface area (BSA), but this strategy has not been evaluated with modern body composition methods.

**POTENTIAL:** To determine the utility of the product of skinfold thickness measured by anthropometry and BSA in relation with body fat (% and mass) in variety athletes.

**METHODS:** 10 skinfolds were measured in 97 variety athletes (50 males [age 21.5 ± 2.0 yrs, weight 72.0 ± 10.9 kg, height 175.7 ± 6.7 cm, BMI 23.3 ± 3.0 kg/m²], 47 females [20.8 ± 1.9 yrs, 60.1 ± 10.2 kg, 164.7 ± 7.3 cm, 22.1 ± 2.9 kg/m²]). Body fat mass and percentage was assessed by DXA whole body scanning. Body surface area was calculated with two anthropometric equations (DuBois, Biering), additionally Behnke’s body building factor was calculated. We performed the Pearson correlation test for body fat mass and body fat percentage with each skinfold thickness, the sum of 10 skinfolds (10SKF), the sum of 8 skinfolds (8SKF) and the product of multiplying 10SKF or 8SKF with either a) DuBois BSA, b) Biering BSA, c) Behnke’s factor. **RESULTS:** There was a higher correlation with body fat mass than with body fat percentage when the skinfolds were multiplied by BSA, this correlation was higher in males than females. In males, triceps skinfold thickness had a higher correlation with body fat percentage and axilla with body mass. **CONCLUSIONS:** The product of 10SKF (or 8SKF) multiplied by BSA had high correlation coefficients with body fat mass. We propose using the sum of skinfolds (both 10 and 8) and multiplying it by BSA as an adiposity indicator in variety athletes. There is still need to test if this strategy is useful for monitoring changes in body fat.
RESULTS: Very vigorous PA was positively correlated with levels of HDL (r=0.557, p<0.01) and negatively correlated with TC-HDL ratio (r=0.453, p<0.01). There was also a strong negative correlation occurred between max breathing capacity and sedentary time (r=-0.459, p<0.01).

CONCLUSIONS: The results indicate that increasing PA and decreasing sedentary behavior could affect the health status of college-aged Hispanic males. Future studies should be performed to determine the minimum amount of vigorous exercise and length of breaks in sedentary time to improve variables tested in this study.

977 Board #156 May 31 3:30 PM - 5:00 PM
Validity and Reliability of a Consumer Bioelectrical Impedance Analysis Scale
Dulce H. Gomez, Kelly M. Hood, Jennifer Kirk-Sorrow, Kendrick Uong, John Farmer, IV, Matthew Lee, James R. Bagley, Marialice Kern, FACSM. San Francisco State University, San Francisco, CA. (Sponsor: Marialice Kern, FACSM)
Email: dgomez25@mail.sfsu.edu
(No relationships reported)

PURPOSE: Bioelectrical impedance analysis (BIA) scales have gained popularity in monitoring fitness progress at home, yet their accuracy is unknown. We assessed the validity and reliability of body fat percentage (BF%) measurements from a consumer bioelectrical analysis (cBIA) scale compared to the “gold standard” of hydrostatic weighing (HW).

METHODS: Forty-three [male (n=22); female (n=21)] healthy volunteers [age: 27.9±5.6y; height: 170.0±8.6cm; mass: 69.0±13.7kg; body mass index (BMI) range: 16.8-33.1] arrived at the laboratory 3h fasted after 12h without exercise and underwent measures of residual lung volume (for HW calculations), hydration status, and BF% via cBIA scale (‘Lean’ and ‘Regular’ modes) and HW. We assessed cBIA scale validity using Bland-Altman Plots (identifying Mean Bias/Limits of Agreement) and reliability using intraclass correlation coefficients (ICC).

RESULTS: With HW as the validity criterion, mean BF% was 22.3±6.1% for all participants (range: 5.3-35.8%; male mean: 20.8±6.4%; female mean: 23.9±5.5%). Compared to HW, the cBIA scale in ‘Lean’ mode underestimated BF% by -5.3±9.1% for all participants (males: -7.9±6.9%; females: -2.6±8.0%; p<0.05). In ‘Regular’ mode, the cBIA scale agreed with HW for all participants (BF%: 0.8±9.3%; p=0.27) and females (BF%: 0.4±10.8%; p=0.73); however, there was a significant difference for males (BF%: 2.0±7.1%; p<0.05). The cBIA was reliable when comparing day-to-day (‘Lean’ mode: 0.5±1.0%, ICC=0.99; ‘Regular’ mode: 0.4±1.1%, ICC=0.99) and week-to-week (‘Lean’ mode: -0.4±1.4%, ICC=0.98; ‘Regular’ mode: -0.2±1.5%, ICC=0.97) BF% for all participants. CONCLUSIONS: Compared to HW, the cBIA underestimated BF% in ‘Lean’ mode, and this discrepancy was more pronounced in males. However, the cBIA scale agreed with HW when analyzing BF% in ‘Regular’ mode for all participants and females, signifying the “mode” chosen on consumer BIA devices greatly impacts validity. The cBIA was reliable when comparing day-to-day and week-to-week BF% measures for all participants, suggesting this can be a reliable at-home BF% analysis scale.

978 Board #157 May 31 3:30 PM - 5:00 PM
Interater Reliability For Dxa And Bia Analysis For Measuring Total And Regional Lean Mass
Taylor Boyett, Trisha A. VanDusseldorp, Garrett M. Hester, Yuri Feito, FACSM, Gerald T. Mangine. Kennesaw State University, Kennesaw, GA. (No relationships reported)

Dual-energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) are capable of assessing total and regional body composition using different technologies. DXA is considered more reliable than BIA to evaluate body composition, while BIA is a more cost-efficient and portable option. The agreement between these measures has not been determined in Rugby athletes. PURPOSE: To assess the interrater reliability between two devices that are capable of assessing total and regional lean mass in rugby athletes. METHODS: Body composition was measured in sixteen male rugby players (21.1 ± 1.6 years; 88.3 ± 14.2 kg; 1.78 ± 0.06 m) prior to the onset of their competitive season. Total body estimates of percent fat (%FAT), fat mass (FM), and lean mass (LM) were determined by DXA (Lunar iDXA) and BIA (InBody 770). Regional LM estimates were also determined for the arms and legs from both devices. To assess the agreement between DXA and BIA on these measures, intraclass correlation coefficients (ICC), 95% limits of agreement (95% LOA), and coefficients of variation (CV%) were calculated. RESULTS: The agreement between DXA and BIA for total body estimates of %FAT (ICC = 0.81, 95% LOA = 0.91 - 1.34%, CV% = 10.5%), FM (ICC = -0.48, LOA = -0.63 to -0.92 kg, CV% = 10.1%) and LM (ICC = 0.67, LOA = 0.02 - 1.04 kg, CV% = 3.3%) were all significant. Mean values for lean arm mass (ICC = -0.91, 95% LOA = 0.93 - 1.06%, CV% = 3.3%) and lean leg mass (ICC = -0.89, 95% LOA = -1.05 - 1.15%, CV% = 2.4%) agreement was consistent. CONCLUSION: These data suggest that the interrater reliability between DXA and BIA is high when estimating total and regional lean mass, but not for estimating fat mass or body fat percentage. Although limited by the cross-sectional nature of the study design, our findings suggest it may be possible to use these devices interchangeably for tracking total and regional lean mass.

979 Board #158 May 31 3:30 PM - 5:00 PM
Effects Of Undulating Periodization On Physical Fitness And Body Composition In Women Practitioners Of Hydrogymnastics
Daniela G.M. Bueno, Marcelo M. Nascimento, Wonder H. Passoni, Stéfani A.M. dos Reis, Renato A. de Souza, Elisângela Silva, Wagner Z. de Freitas, Dênis B. da Silva. FSULDEDIMINAS, Macauhînho, Brazil. (No relationships reported)

Recently, new ways of manipulating the different training variables have been discussed in the aquatic environment. However, little attention has been considered in use of periodization theory training. PURPOSE: To compare the effect of two types of [daily (DUP) versus weekly (WUP)] undulating periodization on body composition, functional strength and flexibility in women practitioners of hydrogymnastics.

METHODS: 24 women practitioners of hydrogymnastics (age: 56.8 ± 2.4 years) were allocated in DUP (n=12) and WUP (n=12) groups. Both training protocols were periodized integrating a hydrogymnastics program composed by 39 sessions, 3 times per week, alternating in low or high intensity [Borg Rating of Perceived Exertion (RPE)], or per daily DUP or per week WUP. Before and after the experimental protocol the individuals completed four items from the Senior Fitness Test (SFT) and body composition analysis. The SFT task were: Chair Stand test, which assessed lower body muscle strength and endurance; Arm Curl, which assessed arm muscle strength endurance, specifically of the biceps; Chair Sit-and-Reach test to a lower body flexibility; and the Back Scratch Test, which assessed upper body flexibility, specifically of the shoulders. Body composition was determined using the InBody (720) equipment. Data were analyzed using two-way ANOVA (group and time with a significance level of 5%). RESULTS: DUP and WUP treatment produced similar increase (p<0.05) of scores related to Arm Curl (~18%) and Chair Stand (~17%) tests; maintenance of Chair Sit-and-Reach scores. Differences between the groups (p<0.05; ~25%) were showed only in Back Scratch test with a higher score in DUP group. CONCLUSION: Both daily and weekly undulating periodization were able to increase or maintain the physical fitness status and reduce fat mass in women practitioners of hydrogymnastics. Also, it seems that upper body flexibility may be influenced more by DUP than WUP.

980 Board #159 May 31 3:30 PM - 5:00 PM
Relationship Of Fat-Free Mass And Fat Mass To Body Weight In College Male Athletes Players
Richard M. Schumacher. Truman State University, Kirksville, MO. Email: richieschu@live.com (No relationships reported)

Body mass differs widely across the sports spectrum. While some sports are dominated by large athletes, other sports participants benefit from a small size or weight class restrictions. Perhaps the most unquantified measurement of body composition has been %fat with less frequent emphasis on the major components of body composition, fat-free mass (FFM) and fat mass (FM). FFM is the functional component as it is closely associated with maximal voluntary strength, while FM plays an important role in energy balance. With the ever increasing emphasis on control and manipulation of the components in modern sports, perhaps there should be greater focus on the relationship between FFM and FM. PURPOSE: To determine the relationship of FFM and FM to height and body mass across the wide range of size typically observed in college athletes. METHODS: Two hundred and sixty-seven NCAA D-1 male athletes (age = 20.2 ± 1.2 y, height =180.6 ± 7.9 cm, body mass = 87.3 ± 16.9 kg) volunteered to serve as subjects. Body composition was assessed using dual-energy x-ray absorptiometry (DXA). This allowed compartmentalization and regional estimates of lean (bone, muscle, etc) and fat tissue from which FFM and FM are determined. RESULTS: The relationship between height and body mass are curvilinear and moderately correlated (r=0.61). FFM and FM were significantly related to height
(r = 0.69 and 0.35, respectively) and body mass (r = 0.92 and 0.91, respectively), with the relationships being more curvilinear in the latter. FM accounted for 60% of the variance in body mass, while FFM accounted for only 40%. The relationship between FFM and FM was significant (r = 0.62) and curvilinear, showing a greater accumulation of FM at higher body masses. **CONCLUSIONS:** FFM and FM increase linearly with height, but showed a curvilinear relationship with body mass suggesting that this population of male athletes may be approaching a theoretical limit of FM accumulation. In contrast, the accumulation of FFM follows a linear pattern with height but increases exponentially with body mass. The curvilinear relationship between body weight and height is not typical and appears to be related to a relative increase in body weight with fat accumulation beyond 180 cm height and 110 kg body weight. Depending on the sport, accumulation of FM may become a hindrance to performance.

**RESULTS:** Height was linearly correlated with body mass (r=0.58). FFM and FM were significantly related to height (r = 0.63 and 0.40, respectively) and body mass (r = 0.91 and 0.85, respectively), with the relationships being linear in all four cases. FFM accumulated at approximately 0.35 kg/cm height and 0.50 kg/kg body mass; accounting for 91% of the variance in body mass, while FM accounted for only 9%. The greatest accumulation of FFM was at a height of 169 cm (0.402 kg/cm height) and body mass of 105 kg (0.663 kg/kg). The relationship between FFM and FM was significant (r = -0.71) and curvilinear. Accumulation of FM per kg of FFM increased at FFM = ~ 55 kg. **CONCLUSIONS:** In female athletes, body mass appears to be the significant determinant of FFM accumulation. The accumulation of FM is determined by FFM, while the rate of accumulation of FM increases significantly at a threshold of 55 kg FFM.

**METHODS:** One hundred and thirty-two NCAA Division-II female athletes (age = 19.9 ± 1.2 years, height = 169 ± 7.9 cm, body mass = 67.8 ± 12.2 kg) volunteered to participate. Body composition was assessed using dual-energy x-ray absorptiometry (DEXA) to assess regional estimates of size typically observed in college female athletes. METHODS: One hundred and thirty-two NCAA Division-II female athletes (age = 19.9 ± 1.2 years, height = 169 ± 7.9 cm, body mass = 67.8 ± 12.2 kg) volunteered to participate. Body composition was assessed using dual-energy x-ray absorptiometry (DEXA) to assess regional estimates of size typically observed in college female athletes. METHODS: One hundred and thirty-two NCAA Division-II female athletes (age = 19.9 ± 1.2 years, height = 169 ± 7.9 cm, body mass = 67.8 ± 12.2 kg) volunteered to participate. Body composition was assessed using dual-energy x-ray absorptiometry (DEXA) to assess regional estimates of size typically observed in college female athletes. METHODS: One hundred and thirty-two NCAA Division-II female athletes (age = 19.9 ± 1.2 years, height = 169 ± 7.9 cm, body mass = 67.8 ± 12.2 kg) volunteered to participate. Body composition was assessed using dual-energy x-ray absorptiometry (DEXA) to assess regional estimates of size typically observed in college female athletes. METHODS: One hundred and thirty-two NCAA Division-II female athletes (age = 19.9 ± 1.2 years, height = 169 ± 7.9 cm, body mass = 67.8 ± 12.2 kg) volunteered to participate. Body composition was assessed using dual-energy x-ray absorptiometry (DEXA) to assess regional estimates of size typically observed in college female athletes.

**RESULTS:** Height was linearly correlated with body mass (r=0.58). FFM and FM were significantly related to height (r = 0.63 and 0.40, respectively) and body mass (r = 0.91 and 0.85, respectively), with the relationships being linear in all four cases. FFM accumulated at approximately 0.35 kg/cm height and 0.50 kg/kg body mass; accounting for 91% of the variance in body mass, while FM accounted for only 9%. The greatest accumulation of FFM was at a height of 169 cm (0.402 kg/cm height) and body mass of 105 kg (0.663 kg/kg). The relationship between FFM and FM was significant (r = -0.71) and curvilinear. Accumulation of FM per kg of FFM increased at FFM = ~ 55 kg. **CONCLUSIONS:** In female athletes, body mass appears to be the significant determinant of FFM accumulation. The accumulation of FM is determined by FFM, while the rate of accumulation of FM increases significantly at a threshold of 55 kg FFM.

**METHODS:** To develop reference values by age and sex for LM measures using with GE-Healthcare DXA systems. METHODS: A de-identified sample, considered exempt from IRB review, was obtained from Ball State University’s Clinical Exercise Physiology Laboratory and University of Wisconsin-Milwaukee’s Physical Activity & Health Research Laboratory. DXA scans of 2,076 women and 1,251 men were completed using a GE Lunar Prodigy or IDXA. Variables of interest included total LM and appendicular lean mass index (ALMI; leg lean mass + arm lean mass (kg) / height (m²)). Percentiles (%ile) were calculated and a factorial ANOVA was used to assess differences for each variable between age groups and sex, as well as the interaction between age and sex.

**RESULTS:** Men had higher mean total LM and ALMI than women (p<0.01), across all age groups. Total LM and ALMI decreased over the 5 decades in men and women (p<0.01). The 50th %ile for total LM of men and women aged 20-29 years decreased from 63.9 and 42.5 kg to 54.2 and 39.1 kg for ages 70-79 years, respectively. The rate of decline in total LM during a 5 decade period was approximately 3% and 2% for men and women per decade, respectively.

**CONCLUSIONS:** These age- and sex-specific LM reference values are the first developed specifically for use with GE-Healthcare DXA systems. These reference values provide for a more accurate interpretation of DXA-derived LM measurements providing an initial resource to aid in the early detection and assessment of LM deficits.
students and 10.79 kg for female students. A strong correlation was observed between the actual weight and the ideal body weight, r= .832 (p < .001) and r= .829 (p < .001) for male and female rock wall students, respectively. The t-test indicated there are significant differences between the actual body weight and the ideal body weight for both male (t(133)=9.1, p < .001) and female (t(97)=14.49, p<.001). CONCLUSIONS: This finding demonstrates that even exercise science major students were heavier than their ideal body weight and female students are heavier than male students. Future researchers should focus on the mechanisms of college student weight gain to initiate the college level interventions to prevent unhealthy weight gain.

CONCLUSIONS

The overall conclusion of this study was that there is a relationship between mechanical efficiency (ME) and body fat percentage (BF%) in rock climbers. The secondary aspect was to determine if there is a difference in ME between male and female rock climbers. Years of experience and frequency of climbing was analyzed to correct for variability.

METHODS: 10 experienced rock climbers (7 males, 3 females) mean age of 25.5 ± 5.8 years volunteered to participate in the study. Each participant climbed up a 30 ft. indoor vertical rock climbing wall at a self-selected pace. VO2 was analyzed at rest and during the climb using a portable COSMED device. BF% was measured using bioelectrical impedance (BIA) and years of climbing and climbing frequency was self-reported. Participants were separated in two groups based on whether they fell above or below the median BF%. Males and female participants were also analyzed by group. Correlation and independent t-tests were run using Microsoft Excel 2016.

RESULTS: A negative correlation (r = -0.37) was found between ME and body fat percentage. No significant difference in ME was seen between groups (p= 0.086). No significant difference in ME between males and females although the difference in percentage. No significant difference in ME was seen between groups (p= 0.086). No significant difference in ME between males and females although the difference in percentage. No significant difference in ME was seen between groups (p= 0.086).

CONCLUSIONS: Individuals with higher BF% tend to have lower ME but this difference is not significant. Previous studies have shown that training state has the greatest effects ME. Therefore, self-reported years of experience and frequency of climbing may not be an accurate estimator for training status.

Validity of Body Fat Percentage And Sex On In-Body Composition Testing Devices

Alexa Suida1, Peter J. Chomentowski, III1, Amanda J. Salacinski1, Craig Broder, FACSM2, N V. Charli D. Aguilar.

University of Nevada Las Vegas, Las Vegas, NV.

(Sponsor: James Navalta PhD., FACSM)

(No relationships reported)

PURPOSE: The purpose of this study was to determine if there is a relationship between mechanical efficiency (ME) and body fat percentage (BF%) in rock climbers. The secondary aspect was to determine if there is a difference in ME between male and female rock climbers. Years of experience and frequency of climbing was analyzed to correct for variability.

METHODS: 10 experienced rock climbers (7 males, 3 females) mean age of 25.5 ± 5.8 years volunteered to participate in the study. Each participant climbed up a 30 ft. indoor vertical rock climbing wall at a self-selected pace. VO2 was analyzed at rest and during the climb using a portable COSMED device. BF% was measured using bioelectrical impedance (BIA) and years of climbing and climbing frequency was self-reported. Participants were separated in two groups based on whether they fell above or below the median BF%. Males and female participants were also analyzed by group. Correlation and independent t-tests were run using Microsoft Excel 2016.

RESULTS: A negative correlation (r = -0.37) was found between ME and body fat percentage. No significant difference in ME was seen between groups (p= 0.086). No significant difference in ME between males and females although the difference in percentage. No significant difference in ME was seen between groups (p= 0.086). No significant difference in ME between males and females although the difference in percentage. No significant difference in ME was seen between groups (p= 0.086).

CONCLUSIONS: Individuals with higher BF% tend to have lower ME but this difference is not significant. Previous studies have shown that training state has the greatest effects ME. Therefore, self-reported years of experience and frequency of climbing may not be an accurate estimator for training status.

Changes in Body Composition among Female College Basketball Players Pre and Post-Preseason Training

Bailey Parson, Taylor Tramel, Chatori Major, Tianna Knuckles, Ja’Da Brayboy, Aubrianne Rote. UNC Asheville, Asheville, NC.

(No relationships reported)

PURPOSE: To examine changes in area-specific lean mass and body fat among female, division I college basketball players before and after preseason training.

METHODS: Body composition was measured before and after preseason training using a dual-energy x-ray absorptiometry (DXA) scan. Total and area-specific (arms, trunk, legs, android, and gynoid) lean mass and body fat were analyzed. Preseason training lasted 1 month and consisted of 8 hours per week of a combination of weight training, high-intensity interval sprint training, and skill workouts. Paired-sample t-tests were used to examine change pre- and post-intervention. Pearson correlations were conducted to examine potential associations among variables.

RESULTS: Female athletes (N=11) completed this study. Total body mass significantly increased (p = .001) after preseason training from 152.8 to 155.6 lbs. Total and area-specific fat did not significantly change after preseason training. Total lean mass significantly increased (p = .004) from 109.6 to 112.0 lbs. However, for area-specific lean mass, only lean mass in the trunk (p = .01) and in the android region (p = .013) significantly increased from 51.2 to 52.3 lbs. and from 6.8 to 6.9 lbs., respectively. Individual lean mass responses to training varied widely. Specifically, changes in total lean mass ranged from +102 to +7.9 lbs. Changes in total body mass also varied widely between individuals, ranging from a loss of 2.2 lbs. to a gain of 3.5 lbs. Change in total lean mass was not significantly correlated with baseline total lean mass, age, year in school, or position played. Change in total body fat was negatively correlated (r = -.32, p = .001) but not significantly correlated with age, year in school, or position played. One athlete experienced an ACL tear midway through the season. Although her data was not included in post-preseason analysis, her iDXA scan indicated a loss of 11.3 lbs. in lean mass, with the majority of this reduction seen in the legs (+.4 lbs.).

CONCLUSIONS: Because there were significant increases in total body mass and lean mass but no body fat, it is important to directly measure body composition to examine effects of training. In addition, these data demonstrate that athletes’ responses to training can vary widely thus highlighting the potential use of individualized training programs.

Relationships Between Body Composition And Sports Performance In Collegiate Baseball

Zachary W. Bell1, Dr. Michael Lane1, Mark T. Byrd2, Tyler Hurley1, Kaylee Isfort1, Eastern Kentucky University, Richmond, KY.

(No relationships reported)

PURPOSE: Baseball requires a multifaceted list of skills and athletic abilities in order to be successful. This varies even further depending on the player’s role within the team, such as pitchers and hitters. There is currently little data seen within the realm of baseball depicting the relationships between athlete body composition and their performance.

METHODS: Athletes from a NCAA division I collegiate baseball team were recruited for this study (n=28). The athletes were measured for height, weight, and body composition. Body composition was measured utilizing air displacement (Cosmed, USA). The players were broken into two categories, allocated by their role as a pitcher in the team or as a batter. Pitchers were noted for their earned run average (ERA) and batters for their batting average (BA). Statistics were accessed from season performance data.

RESULTS: The pitchers within this squad had a mean body weight of 186 ± 12.3 lbs., (Mean±STD) a mean BF% of 17.3 ± 4.6, and a mean ERA of 7.31 ± 4.9. The batters had a mean body weight of 194 ± 23.7 lbs., a mean BF% of 16.4 ±8.2, and a mean BA of .270 ± 0.1. Correlations between body fat percentages and BA were non-significant, and so were correlations between body fat percentages and ERA.

CONCLUSIONS: From these results, no significant difference appeared to show how body fat percentage along with total body weight would play a major role in determining the overall ability of the pitchers or the batters. This research shows that variety of body weight and body compositions can be successful when playing baseball since no clear trend was identified. Further research should be conducted with baseball with comparisons at the professional level.
Body composition can be used as an indicator of health in the general population and athletes alike. Men’s college basketball players are encouraged to make healthy (body composition, aerobic and anaerobic markers, etc.) changes between Post-season and Pre-season, often overseen with a strength and conditioning staff intervention. The ability to measure percent fat, and track those changes during an athlete’s career, including the off-season, is a vital measurement for strength and conditioning coaches.

**PURPOSE:** To compare changes in body density (BD), body fat percentage (BF%) and fat-free mass (FFM) obtained from skinfolds (SKF) using calipers and BodPod values in men’s basketball players from Post-season to Pre-season during an off-season college-level strength and conditioning intervention.

**METHODS:** Certified Strength and Conditioning (CSCS) staff supervised the off-season (April to October) training intervention. SKF were performed by a single, experienced technician on 7 Division II men’s basketball players (21.0 ± 0.6 yrs, 1.91 ± 0.11 m, 94.9 ± 17.2 kg) following ACSM Guidelines. BD via SKF was calculated using Jackson-Pollock seven-site formula. For SKF, the BD to BF% conversion utilized either BF% = (4.86 xBD) - 4.39 or BF% = (4.95 xBD) - 4.50 based on age, sex, and ethnicity. BodPod was performed in accordance with manufacturer’s directions. A dependent, t-test was used to determine differences in BD, BF%, and FFM obtained from SKF and BodPod.

**RESULTS:** Changes in BD did not differ between the two groups (SKF 0.002 ± 0.002 kg/L, BodPod 0.004 ± 0.007 kg/L). The change in BF% did not significantly differ between skinfold and BodPod (SKF 1.2 ± 1.2%, BodPod 2.4 ± 2.2%). Changes in FFM did not significantly differ between the two assessment methods (SKF 1.1 ± 0.9 kg, BodPod 1.4 ± 0.6 kg). Body weight did not change significantly in the off-season (April 94.9 ± 17.1 kg, Oct 94.2 ± 14.5 kg).

**CONCLUSION:** The changes in body composition were accounted for equally by SKF and BodPod. While SKF and BodPod values may vary in the actual measurement of BD, BF%, and FFM, the absolute change in BD, BF%, and FFM from Post-season to Pre-season was assessed equally by both modes of testing. Regardless of the body composition assessment tool, its variation can be presumed accurate as long as the same mode of testing was used at both time points.

### Differences in Total Body Fat and Body Fat Percentage Between Performance and Aesthetic Collegiate Athletes

Aesthetic sport athletes may believe that they can achieve a higher score if their body contours conform to an ideally perceived body image. These athletes may follow extreme diets that can lead to a low body fat percentage, fluctuations in weight, and eating disorders in order to achieve their desirable body image. Although, performance sports do not score points from judges, these athletes may be very lean in response to their training demands.

**PURPOSE:** To compare absolute and relative total fat, android fat, gynoid fat and body mass percentage as well as the android and gynoid regions.

**METHODS:** ANOVA was used to compare between sport differences in total body fat and body fat percentage as well as in the android and gynoid regions. The average age of the athletes was 20.30 ± 4.09 yrs. To compare absolute and relative total fat, android fat, gynoid fat, and body mass between skinfolds and BodPod (SKF 1.2 ± 1.2%, BodPod 2.4 ± 2.2%). Changes in body composition were accounted for equally by SKF and BodPod. While SKF and BodPod values may vary in the actual measurement of BD, BF%, and FFM, the absolute change in BD, BF%, and FFM from Post-season to Pre-season was assessed equally by both modes of testing. Regardless of the body composition assessment tool, its variation can be presumed accurate as long as the same mode of testing was used at both time points.

### Changes in Division I Collegiate Ice Hockey Player Anthropometrics and Fitness Over 36 Seasons

Over the past several decades, fitness training has become integral to collegiate ice hockey, with the objective being to improve on-ice performance. However, the change in anthropometric and fitness profiles of collegiate ice hockey players has not been addressed. In addition, it is unknown whether these characteristics differ in athletes who later play in the National Hockey League (NHL) compared to those who do not.

**PURPOSE:** The purpose of this study was to describe anthropometric (height, weight, %fat) and aerobic fitness (VO_{max}) characteristics of collegiate ice hockey players over 36 years, and to evaluate whether these characteristics differ from those athletes who later play professionally in the NHL.

**METHODS:** Physiological and anthropometric profiles were obtained through preseason fitness testing of all players from a NCAA Division I men’s ice hockey team from 1980 through 2015. Athletes (N=56) who later played at least one year in the NHL were also compared to non-NHL.
Coaches and management should constantly monitor long-term development of both current and prospective athletes in order to ensure proper fit into their system. Longitudinal analysis of player development and changing physical requirements of specific player positions can help to further evaluate player characteristics and allow for more effective comparison within their organization. PURPOSE: To identify whether the anthropometric characteristics of professional basketball positions have changed over the past 20 years (1997-2016). METHODS: Anthropometric assessments (height, weight, body fat, wingspan, and wingspan:height ratio) were taken by staff from various NBA settings (combines, individual team tryouts, etc.) over the course of 20 NBA seasons (1997-2016) and pooled together in order to evaluate changes in anthropometric characteristics of each of the following positions: point guard (PG), shooting guard (SG), small forward (SF), power forward (PF), and center (C). All players included in the analysis were either current NBA players or prospective NBA players selectively chosen by the NBA and its respective organizations. Multilevel modelling was used to explore trends in anthropometric variation over time using linear regression analysis. RESULTS: With the exception of PG (2.626 cm), average height decreased for all positions over the course of 20 years (SG: -1.072 cm; SF: -0.335 cm; PF: -0.625 cm; C: -1.646 cm). Weight decreased for PG (2.626 kg), average height decreased for all positions over the course of 20 years (PG: 2.306 kg; SG: 2.322 kg; SF: 2.581 kg; C: 2.991 cm) with the exception of C (-0.655 cm). Improved body composition was observed increased for all positions (PG: 2.306 cm; SG: 2.322 cm; SF: 2.581 cm; PF: 0.368 kg; C: 0.017 kg). Wingspan increased for all positions (PG: 2.306 cm; SG: 2.322 cm; SF: 2.581 cm; C: 2.991 cm) with the exception of C (-0.655 cm). Improved body composition was observed with body fat percentage decreasing for all positions (PG: -2.55%; SF: -1.45%; PF: -1.45%; C: -1.45%; SG: -2.48%; C: -0.72%). SG showed minimal change in wingspan:height ratio (0.02%), while all other positions reported a slight increase in this ratio (SG: 1.80%; SF: 1.40%; PF: 1.02%; C: 0.60%). CONCLUSION: Findings demonstrate the long-term evolution of professional basketball players has resulted in minimal changes in height and weight, while all positions appear to have become longer and leaner over the past 20 years.
For prostate cancer survivors (PCS) on androgen deprivation therapy (ADT), the loss of skeletal muscle and increase in adiposity, together called sarcopenic obesity, is a common adverse effect. Sarcopenia is also associated with decreases in strength and mobility. No studies to date have concomitantly improved sarcopenic obesity and physical function in PCS on ADT. This study attempts to improve on existing interventions by employing periodization to optimize physiological and performance adaptations. PURPOSE: This ongoing pilot trial investigates the effects of 12 weeks of periodized resistance training on sarcopenic obesity and physical function in PCS on ADT. METHODS: Eighteen PCS (6.5 ± 8.3 y) on current or previous ADT were recruited from the USC Norris Comprehensive Cancer Center and randomized to periodized resistance training (PRT; n=9) or an attention control stretching program (CS; n=9). Outcomes were assessed at baseline and after the 12-wk intervention. Body composition was measured through dual-x-ray absorptiometry, estimated 1 RM strength was tested on leg press and seated row, and mobility was assessed through timed up and go. Appendicular skeletal muscle index (ASM), a common index of sarcopenia, was calculated from body composition. PRT performed a supervised total-body resistance exercise and stretching 3 times a week. CS performed home-based stretching 3 times a week. Baseline group differences were tested with univariate ANOVA, while differences in all outcomes were tested with 2 (group) x 2 (time) ANOVA.

RESULTS: No significant differences in characteristics or outcomes were found between groups at baseline (P > 0.05). Post-intervention, significant increases were observed in PRT compared to CS for appendicular skeletal mass (0.8 ± 4.4 kg; P < 0.04), ASM (0.3 ± 1.0 kg/m²; P < 0.001), leg press (126.6 ± 31.7 kg; P < 0.004) and seated row (23.0 ± 3.5 kg; P < 0.001). No significant decrease in body fat (%) was observed in PRT compared to CS (1.3 ± 7.5 %; P = 0.067; d = 0.89). No differences were found in mobility. CONCLUSIONS: In PCS on ADT, a 12-wk periodized resistance training program improved skeletal muscle mass and strength. Future work is warranted to determine if adiposity can be attenuated and improvements sustained beyond the 12-wk intervention. Supported by an NSCAF doctoral grant.

Medicine & Science in Sports & Exercise®

B-66 Free Communication/Poster - Cancer

Wednesday, May 31, 2017 1:00 PM - 6:00 PM
Room: Hall F

996 Board #175 May 31 2:00 PM - 3:30 PM
Effect of Periodized Training on Sarcopenic Obesity and Physical Function in Prostate Cancer Survivors
Jacqueline L. Kiwata, Tanya B. Dorff, E. Todd Schroeder, FACS,M, Christina M. Dieli-Conwright. University of Southern California, Los Angeles, CA.
Email: kiwata@usc.edu

(No relationships reported)

For prostate cancer survivors (PCS) on androgen deprivation therapy (ADT), the loss of skeletal muscle and increase in adiposity, together called sarcopenic obesity, is a common adverse effect. Sarcopenia is also associated with decreases in strength and mobility. No studies to date have concomitantly improved sarcopenic obesity and physical function in PCS on ADT. This study attempts to improve on existing interventions by employing periodization to optimize physiological and performance adaptations. PURPOSE: This ongoing pilot trial investigates the effects of 12 weeks of periodized resistance training on sarcopenic obesity and physical function in PCS on ADT. METHODS: Eighteen PCS (6.5 ± 8.3 y) on current or previous ADT were recruited from the USC Norris Comprehensive Cancer Center and randomized to periodized resistance training (PRT; n=9) or an attention control stretching program (CS; n=9). Outcomes were assessed at baseline and after the 12-wk intervention. Body composition was measured through dual-x-ray absorptiometry, estimated 1 RM strength was tested on leg press and seated row, and mobility was assessed through timed up and go. Appendicular skeletal muscle index (ASM), a common index of sarcopenia, was calculated from body composition. PRT performed a supervised total-body resistance exercise and stretching 3 times a week. CS performed home-based stretching 3 times a week. Baseline group differences were tested with univariate ANOVA, while differences in all outcomes were tested with 2 (group) x 2 (time) ANOVA.

RESULTS: No significant differences in characteristics or outcomes were found between groups at baseline (P > 0.05). Post-intervention, significant increases were observed in PRT compared to CS for appendicular skeletal mass (0.8 ± 4.4 kg; P < 0.04), ASM (0.3 ± 1.0 kg/m²; P < 0.001), leg press (126.6 ± 31.7 kg; P < 0.004) and seated row (23.0 ± 3.5 kg; P < 0.001). No significant decrease in body fat (%) was observed in PRT compared to CS (1.3 ± 7.5 %; P = 0.067; d = 0.89). No differences were found in mobility. CONCLUSIONS: In PCS on ADT, a 12-wk periodized resistance training program improved skeletal muscle mass and strength. Future work is warranted to determine if adiposity can be attenuated and improvements sustained beyond the 12-wk intervention. Supported by an NSCAF doctoral grant.
accelerometer (daily steps: EG 2,247.1 vs. UCG -1,204.3 steps/day, p < .027), moderate to vigorous physical activity: VO2peak 67 ± 8.1 years, who were receiving hormone therapy and/or radiation therapy. Each participant was randomly assigned to usual care (UC) or usual care plus exercise (UCE). ERL grip strength and ADV cancer was defined based on NCCN guidelines. Mean steps/day, minutes of resistance training/day and serum protein levels of IL-6, IL-1b, IFNγ, IL-10, IL-8, and TNFR1 were measured at baseline and post-intervention.

**RESULTS**: Attrition was minimal, with no significant difference between ERL and ADV patients (5 total withdrawals). No adverse events (AEs) were attributed to exercise and there were no significant differences between ERL and ADV patients in number of AEs. Results also showed no significant difference in the number of steps walked or minutes of resistance exercise between ERL and ADV patients in the exercise arm. (Steps Walked: ERL = 6,858 ± 899; ADV = 8,939 ± 1359; p < .005); Minutes of Resistance Training per Session ERL = 13 ± 4 (3 days/week); ADV = 19 ± 13 (3 days/week); p < .005). Changes in levels of IL-1b, IFNγ, IL-10, IL-8, and TNFR1 were similar among ERL and ADV (all p > .05), however changes in IL-6 did significantly differ between groups (p < .005).

**CONCLUSIONS**: Findings suggest exercise is feasible and safe, and may have positive effects on chronic inflammation in ADV prostate cancer patients. R25 CA1026218, DOD PC061518.

While there is extensive evidence connecting exercise to a reduction in psychological fatigue, the effect of exercise on objectively measured muscular fatigue has yet to be studied in cancer patients. Evaluating how exercise modulates physiological and psychological fatigue dimensions either similarly, or independently, could aid in our understanding of how exercise reduces cancer-related fatigue. **PURPOSE**: To evaluate the effect of exercise on self-reported psychological fatigue measures and objectively measured muscular fatigue in cancer survivors. **METHODS**: A total of 21 cancer survivors (62 ± 14 years of age) were asked to complete both physiological and psychological measures of fatigue prior to, at midpoint, and following a 24-week exercise intervention. Participants completed the revised Piper Fatigue Scale (PFS), a subjective and psychological measure of fatigue. The PFS produces a total score (PFST) and four subscale scores: behavioral/severity (PFSB), affective (PFSA), sensory (PFSS), and cognitive/mood (PFSC). For the measurement of objective, physical fatigue, a handgrip fatigue index (HI) was determined for each participant by repetitively squeezing a handgrip dynamometer 15 times with maximal force for each repetition. Participants also completed 15 maximal force knee extensions at a joint angular velocity of 60°/s and a quadriceps fatigue index (QFI) was computed. Following testing, participants completed 24 weeks of supervised exercise training. **RESULTS**: Significant main effects were found for PFST and all four subscales (p < .05). Results indicate significant decreases in PFST (-3.3%; p = .001), PFSC (-3.2%; p = .015), PFSA (-3.3%; p < .001), PFSB (-3.2%; p = .001), and PFSS (-2.5%; p = .004) following 12 weeks of the exercise intervention. Testing following 24 weeks of the intervention resulted in significant decreases in PFST (-30%; p < .001), PFSA (-33%; p < .001), PFSS (-31%; p < .001), PFSB (-32%; p < .001), and PFSC (-31%; p < .016). **CONCLUSION**: Improvements in psychological fatigue did not mirror the changes in physiological fatigue, indicating that exercise may be a more powerful modulator of emotional fatigue as opposed to muscular fatigue. Clinicians may find utilizing subjective evaluations of cancer-related fatigue more assistive and informative when prescribing exercise interventions in the cancer population.

**Validity of The Six-Minute Walk Test For Predicting VO2peak in Cancer Survivors**
Alexandra Schumacher, Daniel Shackelford, Deandra Elcock, Jessica Brown, Reid Hayward. **University of Northern Colorado, Greeley, CO.** 3SUNY Cortland, Cortland, NY. Email: tlvolson@stcloudstate.edu

Exercise improves cardiovascular function in cancer survivors (CS) suffering from treatment-related toxicities, such as decreased peak oxygen consumption (VO2peak). Establishing valid assessment protocols that determine VO2peak are essential for developing individualized exercise prescriptions for cancer rehabilitation programs. The University of Northern Colorado Cancer Rehabilitation Institute (UNCCRI) has developed a valid cancer-specific VO2peak treadmill protocol to address this need. The six-minute walk test (6MWT) is an exercise assessment used in many populations with chronic disease to predict VO2peak, but it is not clear whether this test accurately assesses VO2peak in CS. The 6MWT is simple, inexpensive, and representative of daily living activities.
Cancer is one of the major public health problems in Puerto Rico, especially breast cancer. There is evidence that suggests that engaging in physical activity (PA) during and after cancer treatment improved fatigue, body composition, cardiorespiratory fitness, quality of life, and quality of life. Thus, it is important to assess PA level in breast cancer survivors.

**PURPOSE:** To assess: 1) the level of PA in a group of breast cancer survivors; and 2) the relationship between survivorship time and PA level.**METHODS:** 21 breast cancer survivors participated. PA was assessed: 1) using the International Physical Activity Questionnaire (IPAQ-L); and 2) pedometer that the participants wore for a week (OMRON-HJ320).

**RESULTS:** The participants average age was 54 years, height 62±2.5 inches, weight 148±11.8 pounds, estimated basal metabolic rate 1607±1132.9 calories. The average survival time was 4.24±3.9 years, distributed as follows: 0-11 months, n=4; 1-2 years, n=5; 3-5 years, n=4; and >5 years, n=8. The average scores of the IPAQ-L were: Work 393.9±927.4 METS-mins/week, Transportation 1005.7±1008.1 METS-mins/week, Home Chores 2369.7±3111.2 METS-mins/week, Recreational activities 752.6±1184.4 METS-mins/week, Sitting time Work 201.4±176.8 minutes, Sitting time Week End 157.1±151.6 minutes. The daily average steps was 4870.8±2612.5. A Spearman Correlation analysis did not show significant relationship between survivorship time and physical activity. The participants did not meet the recommendation of 10,000 steps/day. The results from the IPAQ-L showed that the participants engaged in moderate physical activity in some of the domains of the questionnaire such as transportation, home chores and recreational activities.

**CONCLUSIONS:** The participants were moderate physically active in some of the domains of the questionnaire such as transportation, home chores and recreational activities.

**Feasibility Of Supervised Aerobic Interval Exercise Training Following Treatment For Breast Cancer**


(A No relationships reported)

Aerobic interval training (AIT) can be more effective in improving cardiorespiratory fitness, and muscle oxidative capacity than moderate continuous training (MCT) in a variety of healthy and clinical populations. Due to physical deconditioning associated with breast cancer treatment, AIT is of interest in this population. However, the feasibility and safety of AIT among breast cancer patients is unknown.

**PURPOSE:** To assess the feasibility and occurrence of major adverse events (MAE) with AIT among breast cancer patients immediately post completion of adjuvant chemotherapy and radiation. **METHODS:** Women with early stage breast cancer were enrolled in the Nutrition and Exercise During Adjuvant Treatment trial within the chemotherapy of high VO2peak.

**MCT aerobic exercise was prescribed 3x/week during chemotherapy and radiation (20-30 min at 50-75% Heart Rate Reserve (HRR)). Upon treatment completion, eligible participants were prescribed AIT (4 sets of 4 min at 75-85% VO2peak/HRR and 4 min at 40-65% VO2peak/HRR) at least 1x/week, with the choice of either MCT or AIT for remaining sessions. AIT eligibility included an absence of angina, dyspnea, uncontrolled hypertension, asthma or current prescription for heart medications. The ACSM’s metabolic equation for treadmill walking was used to prescribe interval speed grade, while HRR was used for intervals performed on a cycle ergometer or elliptical trainer.

**RESULTS:** 57 women (age 51±11) entered the post-treatment phase of the study, of which 44 (75%) were eligible for AIT. 16 (32%) participants performed at least one AIT session, 46% of the total AIT performed was described as having a potential preference for AIT vs. MCT. Those performing AIT attended significantly more sessions overall relative to those who were not performing AIT (16±1 vs 13±3, p=0.01). Adherence to AIT intensity was achieved in 68% of all sessions, with no difference between those performed on the treadmill, bike/elliptical, or relative to MCT sessions. The most common barrier to AIT intensity adherence was the prescription being too difficult (81±15 for MCT, 75±20% for AIT).

**CONCLUSIONS:** AIT after treatment completion for breast cancer appears to be feasible, potentially preferable to MCT, and may result in greater attendance than MCT alone.

**Effect of Combined Aerobic and Resistance Exercise on Remnant Cholesterol in Breast Cancer Survivors**

**Kyuwan Lee**, Nathalie Sami, Christina M. Dieli-Conwright, University of British Columbia, Los Angeles, CA.

Email: kyuwanle@usc.edu

(A No relationships reported)

Aerobic and resistance exercise has been recommended to reduce cholesterol levels and risk of CVD in breast cancer survivors (BCS). However, the combined aerobic and resistance exercise intervention has not been examined in this population. The purpose of this study was to determine if a 16-week combined aerobic and resistance exercise intervention improves remnant cholesterol levels in BCS.

**METHODS:** Thirty sedentary BCS diagnosed with Stage I-III breast cancer who completed cancer-related treatment within 6 months prior to enrollment were randomized to the Control (CON; n=15) or the Exercise (EX; n=15) group. The EX group underwent supervised aerobic and resistance exercise sessions 3 times a week for 16 weeks at a moderate-vigorous intensity. The CON group was asked to maintain their current level of activity. Remnant cholesterol was calculated as total cholesterol-HDL-LDL. Paired t-test and two-way repeated measures ANOVA were used to examine the effects of exercise training on remnant cholesterol.

**RESULTS:** Prior to the intervention, the EX and CON did not differ by age (52.7±9.7 yr), body mass index (35.9±6.4 kg/m²), waist circumference (99.8±4.2 cm), total cholesterol (196.4±37.5 mg/dL), LDL-C (101.9±31.2 mg/dL), HDL-C (42.7±5.7 mg/dL), and remnant cholesterol (51.7±28.8 mg/dL). Following the 16-week intervention, mean remnant cholesterol levels were significantly reduced (45.2±13.8 to 9.9±5.2 mg/dL; 78% mean decrease) in the EX group compared to CON group (P=0.02). Total x time interaction. There were no significant changes in remnant cholesterol levels in the CON group (P=0.05).

**CONCLUSIONS:** A 16-week supervised aerobic and resistance exercise intervention is an effective approach to reduce remnant cholesterol in BCS. Participation in combined exercise during cancer survivorship should be considered to reduce the risk for CVD mortality in BCS.

**Breast Cancer- And Metabolic-related Predictors Of Vo2peak Amongst Active Post-menopausal Women**


Email: amy.kirkham@ubc.ca

(A No relationships reported)

Peak oxygen consumption (VO2peak) is reported to be lower amongst breast cancer patients both during and after adjuvant treatment relative to healthy sedentary controls. It is not known whether this is attributable to direct effects of treatment or indirect effects on whole body metabolism and exercise behaviour. **PURPOSE:** To identify metabolic and breast cancer-related predictors of relative VO2peak amongst active post-menopausal women. **METHODS:** 10 subjects were selectively recruited to each of three groups: 1) breast cancer patients 3 weeks post chemotherapy (BC1); 2) breast cancer patients 1-3 years post chemotherapy and radiation (BC2); 3) healthy controls (CON). All women were 45-60 years, self-reported as post-menopausal and performing 60 min/week of moderate intensity aerobic exercise. Gas analysis measurements were made during rest, a maximal incremental treadmill test, and steady state exercise.
Eccentric, concentric and traditional resistance exercises that incorporate both eccentric and concentric phases are often used to improve musculoskeletal fitness. Although there is evidence that indicates concentric contractions are metabolically more costly than eccentric contractions, the extent to which this translates to whole body metabolism during an entire resistance workout is less clear. PURPOSE: To determine the extent to which metabolic variables such as VO2 (ml/kg/min), RER, and HR as well as blood glucose and lactate vary between resistance workouts comprised of only eccentric, concentric or traditional bouts. METHODS: N=12 men and women completed a traditional (TRAD), concentric (CONC), and eccentric (ECC) full-body resistance workout at 65% of a pre-determined 1 repetition max with each condition matched for work. The traditional condition required 3 sets of 10 repetitions on each exercise (6 total). 3 sets of 20 repetitions were required for the eccentric and concentric conditions. During each condition, the subject was fitted to a metabolic cart and the aforementioned metabolic variables were recorded through indirect calorimetry and heart rate monitor. Blood glucose and blood lactate were taken using the ACCU-CHEK glucose monitor and lactate during standing state exercise (β=1.7, p<0.01), and five-minute heart rate recovery (β=0.3, p=0.03) were also significant predictors. Results of concurrent chemotheraphy or trastuzumab treatments, resting heart rate, resting VO2, substrate utilization (RER) at rest and for moderate intensity exercise, time since last menstruation, and occurrence of chemotherapy-induced menopause were not significant predictors. CONCLUSION: Among post-menopausal women, receipt of chemotheraphy for breast cancer, in particular non-antracycline-containing chemotherapy protocols relative to CON was predictive of a lower VO2peak (β=8.8, p<0.01). The amount of moderate intensity exercise self-reported in the past month (hours/week) (β=1.5, p<0.03), and surrogates of cardiovascular function, including O2 pulse (ml/beat) during steady state exercise (β=1.7, p<0.01), and five-minute heart rate recovery (β=0.3, p=0.03) were also significant predictors. The duration of the exercise program was 47±13 years. All patients underwent AHSCT. The exercise program started before this procedure and continued until discharge day (mean 15 days). The program included breathing, range of motion, and resistive exercises focusing large muscle groups and brisk walking duration 5-10 minutes in corridor. The Borg Rating of Perceived Exertion was used to estimate the intensity of the program to light to moderate intensity exercise prescription was based on a rating of “somewhat hard” (10-13). The fatigue was evaluated with Fatigue Impact Scale. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLCQ-C30) was used to assess qol. RESULTS: The mean score of Fatigue Impact Scale was 32±32 points before the procedure and 23±17 points at discharge day, but there was not statistical significantly difference. Global health status, functional scale and symptom scale scores which the sub-tests of the EORTC QLQ-C30 were 47±31, 65±18, 31±18 points before procedure and 23±17 points at discharge day, but there was not statistical significantly differences between two time points in qol. scores. CONCLUSIONS: As a result of our study exercise program was effective in reducing fatigue levels and raising qol in AHSCT patients, however the results were not statistically significant. It was thought because of the clinical status of the patients is not recover completely at the discharge day and two week is not enough to show the effects of the exercise program, we could not demonstrate effectiveness of the exercise program statistically.
Previous studies demonstrated that carbohydrate feeding 30-45 min before exercise results in transient hypoglycemia shortly after onset of exercise in some but not all subjects. However, it remains unclear whether the transient hypoglycemia after pre-exercise carbohydrate intake is more likely to occur under fed or fasted conditions.

**PURPOSE:** The purpose of this study was to directly compare the effects of fasting vs. feeding on plasma glucose kinetics following pre-exercise carbohydrate ingestion and to elucidate the contributing factors of the transient hypoglycemia in each condition.

**METHODS:** Sixteen subjects performed 60-min cycle ergometer exercises at 75%VO2max in overnight fasted and fed (3 h after breakfast) states in random order. In both conditions, they consumed 500 ml of a beverage containing 150 g of glucose 30 min before the start of exercise. Plasma glucose and serum insulin levels are determined before and during the exercise. **RESULTS:** In the fasted state, plasma glucose levels dropped transiently below 4.0 mmol/l in 5 subjects, who showed substantially higher serum insulin levels at the onset of exercise, while plasma glucose levels remained above this level in the other subjects. On the other hands, 7 subjects developed transient hypoglycemia in the fed state and their VO2max (3285 ± 286.6 L/min) was significantly higher than that in the other subjects who did not demonstrate hypoglycemia in the fed state, respectively.

**CONCLUSIONS:** Acute hypoxia impairs exogenous CHO oxidation, but adaptations with altitude acclimatization alleviate that impairment, and contribute to a reduction in exogenous CHO oxidation. Supported by U.S. Army Medical Research and Material Command; authors’ views not official U.S. Army or DoD policy.

---

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**May 31 2:00 PM - 3:30 PM**

**Effects of Varying Physical Activity Level on Glucose Tolerance Testing**

Gabrielle A. Volk, Michael A. Deal, Adam J. Messler, Jenna M. Karrow, Alex P. Good, Kevin D. Ballard, Kyle L. Timmerman.

Miami University, Oxford, OH. (Sponsor: Helaine Alessio, FACSM)

Email: volkg@miamioh.edu

(No relationships reported)

The oral glucose tolerance test (OGTT) is a commonly used method for the diagnosis of insulin resistance. Currently the only level of control prior to an OGTT is an 8-10 hour fast. Physical activity is known to influence glucose uptake kinetics. Thus, our purpose was to determine if varying the level of physical activity, the day prior to an OGTT, influenced the blood glucose and insulin responses to an OGTT. We hypothesized that higher levels of physical activity the day prior to an OGTT would result in attenuated blood glucose and insulin responses to an OGTT.

**METHODS:** Ten healthy adults (6 m, 4 f; age = 21 ± 5.03; BMI = 24.15 ± 1.91) participated in three OGTT trials the morning after performing 50%, 100%, or 150% of their habitual physical activity in randomized order. Habitual physical activity as average steps/day (12,318±1310 steps/day) was determined using 7-day pedometry. Pedometers were worn for 24 hrs prior to each OGTT trial and used to confirm steps/day for the 50%, 100%, and 150% conditions. Trials were separated by at least one week and subjects were asked to follow a similar diet the day prior to each OGTT trial.

For each OGTT trial, plasma glucose and insulin were measured after an overnight fast and at 30 min intervals for two hours following ingestion of the glucose beverage (1-gram glucose kg−1 body mass). Area under the curve (AUC) for glucose and insulin for each OGTT was calculated using the trapezoidal method. Between trial differences for these variables were analyzed using a general linear model with repeated measures.

Significance was set to p < 0.05. **RESULTS:** Subjects successfully achieved the desired percentage of habitual steps prior to each trial: 52.1±1%, 98.1±2%, and 146.3±5%.

**Fasting plasma glucose (50%: 95±2 mg·dl⁻¹; 100%: 91±2 mg·dl⁻¹; 150%: 91±2 mg·dl⁻¹), glucose-AUC (50%: 12,932±769 mg·min·dl⁻¹; 100%: 13,231±1008 mg·min·dl⁻¹; 150%: 13,016±471 mg·min·dl⁻¹), and insulin-AUC (50%: 5,562±1810 µIU·min·ml⁻¹; 100%: 5,811±1839 µIU·min·ml⁻¹; 150%: 4735±1776 µIU·min·ml⁻¹) did not differ between trials. **CONCLUSIONS:** Our data suggests that varying the physical activity level (from 50 to 150% of habitual activity) the day prior to an oral glucose tolerance test did not influence the blood glucose or insulin responses to this commonly utilized test.

---

**May 31 2:00 PM - 3:30 PM**

**Prior Acute Resistance Exercise Enhances Postprandial Fat Oxidation in Response to a High-Fructose Meal**

Christopher Melby, Andrea Wysong, Jeffrey Bourquin, Jessie Wilburn.

Colorado State University, Fort Collins, CO. (No relationships reported)

A fructose-rich, mixed-macronutrient meal rapidly increases carbohydrate oxidation and decreases fat oxidation during the post-prandial period. An acute strenuous bout of weight-lifting exercise has been shown to elevate fat oxidation for many hours following cessation of exercise. **Purpose:** To determine whether or not a single resistance exercise bout performed approximately 15 hours before consumption of a high-fructose, mixed-meal could attenuate the meal-induced shift from fat oxidation to CHO oxidation. Following Seven apparently healthy men who were recreational weightlifters (Mean ± SEM; age = 37 ± 9 years, BMI = 24.3 ± 1.6 kg/m²) completed three separate two-day conditions in a random order: (1) EX-COMP: a full-body superset weightlifting workout (12 different exercises x 4 sets x 10 reps) with the provision of additional kilocalories to compensate for the energy expended during exercise on day 1, followed by the consumption of a high-fructose, mixed-macronutrient test meal (kcal = 600 ± 8 kcal, 0.75 g carbohydrate/kg body weight) the next morning (day 2) and the determination VO2, VCO2, and respiratory exchange ratio (RER) for determination of fat and carbohydrate oxidation during a six-hour post-prandial period; (2) EX-NoCOMP: same as EX-Condition but without energy.
intake compensation for the exercise on day 1; and (3) CON: no exercise control. **Results:** Post-prandial RER was significantly lower in the EX-NOCOMP (0.78±0.01) condition compared to CON (0.809±0.01) (p=0.001). Fat oxidation was significantly higher in EX-NOCOMP (0.094±0.009 g/min) compared to CON (0.084±0.009 g/min) (p=0.01). CHO oxidation was significantly lower in the EX-NOCOMP (0.09±0.001 g/min) compared to CON (0.108±0.011 g/min) (p=0.037). For the EX-COMP condition, postprandial RER (0.878±0.09), fat oxidation (0.095±0.008 g/min) and CHO oxidation (0.091±0.011 g/min) were almost identical to EX-NOCOMP, but these values compared to CON did not quite reach statistical significance. **Conclusion:** A single acute bout of high intensity resistance exercise completed 15 hours prior to a high-fructose, mixed-macronutrient meal results in greater post-prandial fat oxidation than does lack of exercise followed by the same meal.

**1016** Board #195 May 31 2:00 PM - 3:30 PM **Differential in Aerobic Capacity Among Collegiate Distance Runners Consuming a Low Carbohydrate Diet**

Marissa N. Baranauskas1, Brian Miller2, Jordan T. Olson2,4, Michele Boltz2,4, Laura Richardson2, Matthew Jaravich2, Ronald Otterstetter, FACSM1. 1Indiana University, Bloomington, IN. 2The University of Akron, Akron, OH. 

Email: marbaran@indiana.edu 

(No relationships reported)

Although current sports nutrition recommendations advocate for a high carbohydrate (CHO) intake among endurance athletes, recent research has suggested that training with low CHO availability may augment adaptations to aerobic training. When adopted during the competitive season, when training intensity and the demand for glycogen replenishment is high, low CHO diets may be detrimental to training adaptations by preventing adequate recovery between concurrent high-intensity endurance sessions. **PURPOSE:** To observe the dietary habits of collegiate distance runners and to investigate the effects of habitual CHO intake on aerobic performance (PostVO2max) during a competitive season. **METHODS:** During an 8-week trial period, 12 collegiate track athletes (males, n=8; females, n=4) recorded their self-selected dietary intake via 24-hr recall. Analysis of CHO intake was conducted by a registered dietitian using NutriCalc software. Pre (PreVO2max) and post season aerobic capacity assessments were performed. A one-way ANCOVA with two covariates controlling for PreVO2max and CHO intake compared the variance in PreVO2max and PostVO2max by sex. **RESULTS:** The average CHO intake was 4.11 ± 1.03 g/kg with only one female athlete meeting dietary recommendations, consuming > 6 g/kg. Male distance runners had a lower CHO intake than females (3.64±0.77g/kg; 5.03±0.91g/kg). After adjusting for PreVO2max and CHO, the male improvement in PostVO2max was 12.62 ml/kg/min (95% CI 2.12-23.12, p = 0.02) greater than the effect observed in females. There were no differences in weight and body composition changes by sex throughout the season (p=0.48; p=0.86). CHO accounted for 18% of the variance in PostVO2max. **CONCLUSIONS:** Collegiate distance runners were able to make improvements in their aerobic capacity during a competitive season while consuming a low CHO diet, with a predominant effect in male athletes. Therefore, it may not be detrimental for endurance athletes to consume low CHO diets while undergoing training at high intensities from an aerobic adaptation standpoint.

**1017** Board #196 May 31 2:00 PM - 3:30 PM **The Physiological Effects of 12-Weeks of Ketogenic Dieting While Cross-Training**

Paul A. Roberson1, Wesley C. Kephart2, Coree Pledge2, Petey W. Mumford3, Kevin W. Huggins3, Jeffrey S. Martin1, Kaelin C. Young2, Ryan P. Lowery2, Jacob M. Wilson2, Michael D. Roberts3. 1Auburn University, Auburn, AL. 2Applied Sports Performance Institute, Tampa, FL. 3Florida International University, Miami, FL. 

(No relationships reported)

**PURPOSE:** Recent literature has suggested improved strength and anaerobic performance outcomes with ketogenic dieting. Herein, we sought to determine the metabolic and performance effects of 12 weeks of ketogenic dieting while cross-training in cross-trained individuals. **METHODS:** Volunteers were divided into a control group (CTL; n=9) and a ketogenic group (KD; n=9). Pre and post-testing involved body composition assessment via dual x-ray absorptiometry (DEXA), vastus lateralis (VL) thickness using ultrasound, resting energy expenditure (REE), plethysmography to determine serum health biomarkers, an aerobic capacity evaluation, one repetition maximum (1RM) testing, and 400 m sprint time assessments. All subjects were instructed to follow a cross-training routine for 12 weeks. The KD group was given dietary guidelines to follow for 12 weeks, while the CTL group continued their normal diet. Blood ketone bodies were measured weekly to ensure nutritional ketosis was reached by the KD but not CTL. **RESULTS:** KD blood ketone levels were significantly higher than the CTL at each week following intervention (p<0.05) except week 9 (p=0.99). DEXA fat mass declined in the KD (-3.47 ± 1.06 kg) compared to CTL (-0.06 ± 0.45 kg) (p<0.01). DEXA lean mass and visceral fat mass changes were not different between groups (p=0.99 and p=0.23, respectively). At rest, respiratory quotient delta scores were not different between CTL (-0.012 ± 0.027) and KD (-0.067 ± 0.020) (p=0.19). REE was not altered between groups (p=0.24). No between-group differences in delta scores were observed for fasting glucose (p=0.31), HDL-C (p=0.49) or triglycerides (p=0.19), although LDL-C trended with increases in the KD (+33.8 ± 14.3 mg/dL) but not CTL group (+20.2 ± 8.0 mg/dL) (p=0.052). Neither VL nor total mid-thigh thickness delta scores were different between groups (p=0.46 and p=0.14, respectively). There were no between-group differences in delta scores for 1RM Squat (p=0.15), 1RM overhead press (p=0.37), 400 m sprint times (p=0.90) or VO2 max (p=0.57). **CONCLUSIONS:** Ketogenic dieting improves body composition without negatively impacting muscle mass and/or aerobic, anaerobic or strength performance in recreational cross-trained subjects.
Spinning (SP) is a very popular indoor stationary cycling advertised as an efficient exercise to foster cardiovascular fitness and weight loss. However, its absolute and relative cardiovascular intensity has been poorly described. PURPOSE: To compare physiological responses to a 20-min high intensity, Tabata-style shallow water exercise workout (TS-SWE) between healthy males (M; n=9, 24±1 y) and females (F, n=9, 26±6 y). METHODS: Participants first performed an incremental SWE test to exhaustion while metabolic (indirect calorimetry), heart rate (HR, telemetry) and blood lactate (Bla) responses were monitored. On a second visit, metabolic, HR, rating of perceived exertion (RPE, Borg scale 6-20), and Bla were measured while participants performed TS-SWE. TS-SWE consisted of 4, 4-min bouts with each bout alternating between 20s “all-out” exercise followed by 10s rest. Each bout was separated by 1 min rest (total of 32 “all-out” 20s efforts). For both visits, participants were immersed to auxiliary level at a water temp. of 83.3°F. RESULTS: M had a greater peak VO2 (10.9±1.3 vs 8.1±1.7 ml/kg/min; p<0.05) than F. %VO2peak for M and F was 72.9±4.7 and 72.4±6.5, respectively, while %HRpeak was 83.9±4.9 (M) and 86.3±2.2 (F). RPE for the overall workout was ~18-19 (very, very hard) for both M and F. %VO2peak for M and F was similar for each bout and increased from ~70% (Bout 1), 74% (Bout 2), to 77% (Bout 3) with the greatest metabolic load achieved during Bout 4 (~85%; p<0.05, main effect bout). %HRpeak was also similar between M and F for each bout: ~82% (Bout 1), 85% (Bout 2), 88% (Bout 3) and ~94% for Bout 4 (P<0.05, main effect bout). Bla (mM) was similar between M and F for bout 1 (6.3±1.8 vs. 5.7±1.5, respectively (p>0.05)), however, males accumulated a greater Bla in bouts 2 (9.0±2.0 vs. 6.0±1.0), 3 (9.3±2.3 vs 5.9±1.0) and 4 (11.1±2.2 vs. 9.2±1.7) (P<0.05). CONCLUSION: TS-SWE elicited cardiometabolic and psychophysical responses for both males and females that are classified as vigorous to near-maximal to maximal intensity according to the American College of Sports Medicine. Furthermore, the presence of a cardiometabolic “end-spurt”, as reflected in a substantially greater %VO2peak, %HRpeak, and blood lactate response during bout 4, suggests that a pacing strategy may have been employed despite a priori instructions to exercise “all-out” throughout the workout.

Despite the widely recognized benefits of weight loss, minimal research has examined the longitudinal effects of exercise training on cardiovascular disease (CVD) risk factors after weight loss. PURPOSE: To evaluate the long-term influence of exercise training on CVD risk factors after weight loss in previously overweight women. METHODS: A randomized weight loss trial was conducted in 64 premenopausal women (BMI 28.3±1.2 kg/m²; age 33.7±1.6 yrs). Participants were assigned to either aerobic training (AT: continuous treadmill exercise at 67-80% of maximum heart rate), resistance training (RT: 10 total body exercises at 65-80% of 1-RM), or control (C: no exercise). All groups consumed a standardized diet until achieving...
Exercise groups trained 3x/wk during the weight loss period and were encouraged to exercise 2x/wk for one yr following the initial weight loss. Body weight, % body fat, abdominal fat, resting blood pressure (BP), insulin sensitivity, total cholesterol (TC), high-density lipidoprotein (HDL) cholesterol, and triglycerides (TG) were measured. Two-way repeated measures ANOVA was used to analyze dependent variables at baseline, post-intervention, 1 yr post intervention, and 3 yrs post intervention. Post hoc paired sample t-tests were used to examine changes from baseline to 3 yrs post intervention. Significance was accepted at p≤0.05. RESULTS: Mean weight loss for all subjects was 11.92 kg. Significant group x time interactions were found for weight loss, % body fat, systolic BP, TG, HDL, and TC:HDL ratio, with no significant interactions for any other variable. Three yrs after weight loss, we found that age (r=-0.50, p=0.01), body weight (r=0.42, p=0.01), systolic BP (r=0.31, p=0.05), and HDL (r=0.29, p=0.05) had significant correlations with changes in body weight. No significant relationships were found between changes in body weight and any of the other independent variables. CONCLUSIONS: The findings of this study indicate that exercise training is an effective method for weight loss and that age, body weight, systolic BP, and HDL are important factors in determining the success of weight loss interventions.

Increasing evidence indicates adherence to exercise throughout life is concurrent with improved health. World masters games (WMG) have more participants than any other international sporting competition and is under investigated, particularly with regard to indices of cardiovascular disease (CVD) risk.

Purpose: To determine whether a progressive, high-intensity endurance exercise program will increase CPO in healthy, previously sedentary middle-aged adults. It is less clear whether such gains are realized among sedentary non-exercisers. Further longitudinal research examining the effects of exercise on the maintenance of improved CVD risk factors is warranted.

Methods: This was a cross-sectional, observational study which utilized a web-based questionnaire to survey cardiovascular risk factors of WMG participants. The survey consisted of three sections: basic demographics, medical history and physiological parameters which included body mass index (BMI), waist circumference (WC), resting blood pressure (BP) and lipids (total cholesterol (TC), high-density lipoprotein (HDL) and low-density lipoprotein (LDL)).

Results: A total of 1,435 participants (567 female & 868 male), aged 27-91 years participated in the study. Key findings included significant differences between genders where females were significantly lower in BMI (5.3%, p<0.001), WC (10.6%, p<0.01), resting SBP (5.8%, p<0.01), resting DBP (8.4%, p<0.01), significantly higher in HDLs (15.2%, p<0.001) and significantly lower in both the TC:HDL ratio (12.6%, p<0.001) and LDL:HDL ratio (19.0%, p<0.001). Significant differences (p<0.001) were also identified when comparing WMG lipid results to the Australian general population (AGP). WGMs demonstrated healthier TC (4.47±1.11 mmol/L), HDLs (1.75±0.79 mmol/L), and LDLs (2.92±0.96 mmol/L) when compared to AGPs (TC: 5.07 mmol/L, HDL: 1.34 mmol/L, LDL: 3.13 mmol/L). Conclusions: WMG participants demonstrated improved values in a number of CVD risk factors when compared to the general population with female WMG participants presenting healthier CVD risk factors when compared to males. Hence, within the parameters of this study, masters athletes exhibit evidence of superior health when compared to the general population within Australia.

The majority of evidence points to the stroke volume (SV) of the heart being the major limiting factor for maximal oxygen uptake (VO2max) in healthy humans. High-intensity aerobic interval training has previously been found to improve VO2max more than low and moderate intensity aerobic training when matched for total work. Haemodynamics are affected by venous return and positioning of the working muscles in relation to the heart. PURPOSE: It is the aim of the present study to investigate the effects of interval training with the legs placed above the heart. METHODS: A total of 28 young, healthy, untrained males were randomly assigned cycle training of 4x4 min intervals at 90 - 95% of HRmax with their legs higher than the level of the heart (STG) or on a conventional upright cycle (UTG) for 24 sessions over 6 weeks. VO2max, maximal SV (SVmax), submaximal heart rate (HR100W), and maximal power output (PMO) were examined before and after the training period. RESULTS: No significant difference was apparent between the groups in VO2max improvement for from pre- to posttest when tested in either postural condition. Both groups increased absolute VO2max (L/min) significantly, by 15.3% in UTG and 16.5% in STG (P < 0.01) in upright cycling, and 9.4% (UTG) and 15.9% (STG) in supine cycling (P < 0.01). These adaptations were accompanied by increased SV of 8.9% and 10.6% for UTG and STG, respectively (P < 0.05), and reduced submaximal HR (P < 0.01). CONCLUSIONS: High-intensity aerobic interval training performed in a 4x4 min fashion in either the upright or supine position does not lead to different adaptations in VO2max. However, high-intensity interval training four times per week is an effective means to improve VO2max in young, untrained males. Also, since the improvement in SV did not differ between groups this is further testament to the heart being an important modulating factor for VO2max improvements.
**Purpose**: To determine the relationships between maximal oxygen uptake (VO2max), 1,500 meter run (1500-R), and the 20-m shuttle run test (MS-R) according to aerobic fitness level in Korean young men.

**Methods**: Ninety-nine young men (19.5 ± 0.9 yrs; 175.6 ± 5.6 cm; 67.8 ± 8.8 kg; 16 ± 4.9 %fat) participated in three randomly ordered testings. In one occasion, they ran on a treadmill with an incremental work load to determine their VO2max. In other occasions, they ran on a track for 1500-R time trial and performed MS-R, twice for each test. They were categorized according to ACSM guidelines based on the VO2max (in ml kg^-1 min^-1), into four fitness groups; average (A; 41.5-44.9, n=18), good (G; 45.0-49.9, n=21), very good (VG; 50.0-54.9, n=30), and excellent (E; 54.9-59.0). The better score of two trials of 1500-R and MS-R was taken for the analyses.

**Results**: The average VO2max was 42.8 ± 1.6, 47.2 ± 1.5, 51.9 ± 1.3, and 59.4 ± 3.1 ml kg^-1 min^-1 in A, G, VG, and E, respectively. The best record of 1500-R was 429.4 ± 44, 416.6 ± 66, 387 ± 45, and 380 ± 31 sec and that of MS-R was 65.16, 71.18, 76.21, and 82 ± 19 repetitions in A, G, VG, and E, respectively. When the record were compared by groups, it was only different between A and E in both 1500-R (ANOVA, p < 0.005) and MS-R (ANOVA, p = 0.05). The Pearson Correlation Coefficients were only significant between 1500-R and MS-R in all groups (0.676 in A, 0.779 in G, 0.671 in VG, and 0.461 in E; p < 0.01) while no significance was noticed between VO2max and two field tests.

**Conclusion**: Records of both 1500-R and MS-R appear to increase progressively by fitness level, but the outcome of field endurance tests only differentiate the maximal aerobic capacity between the average and the excellent aerobic capacity groups. Two field tests were highly correlated with each other, but not with VO2max in all fitness levels.

Recent studies have concluded that the incidence of Metabolic Syndrome may be greater in male firefighters than in the US male population. However, research exploring this relationship is still lacking in male first responders (firefighters and police officers). Previous research has suggested that the prevalence of coronary artery disease (CAD) in police officers may be higher than in the general population.

**Purpose**: To determine the association of metabolic syndrome and cardiovascular fitness in male first responders.

**Methods**: As part of an annual physical exam, 405 male first responders (average age 36 ± 9 yr) underwent evaluation of risk factors associated with metabolic syndrome as defined by NCEP III. These include the presence of three or more of the following: Waist Circumference > 40", HDL Cholesterol < 40 mg/dl, Triglycerides > 150 mg/dl, Blood Glucose > 110 mg/dl and Resting Blood Pressure > 130/85 mm Hg. Cardiovascular fitness was determined by estimating VO2max from time on treadmill during a Bruce protocol. Results: The subjects were ranked and divided into quartiles based on VO2max. All data were analyzed using a Chi Square test (p < 0.05). Prevalence of metabolic syndrome increased across quartiles as cardiovascular fitness declined. Conclusion: These data suggest that as cardiovascular fitness improves, the likelihood of male first responders having metabolic syndrome decreases.

Nowadays, sports scientists have explored various methods to predict and to assess physiological performance to pursue better athletic outcomes. The use of Heart Rate Variability (HRV) to evaluate the Autonomous Nervous System (ANS) seems to be a reliable indicator to measure athletes’ physical adaptation to conditioning programs. The understanding of the behavior of the ANS plays a major role in identifying interaction between the parasympathetic and sympathetic activities during physiological stress and exercise adaptation. However, it is unknown whether or not HRV can assess the response of the ANS to different fatigue protocols. In this study, the non-linear Poincaré method was used to measure the self-similarity of consecutive R-R intervals to quantify the HRV at fatigue exposure.

**Purpose**: To examine the effects of four exercise-based fatigue protocols on the HRV variability in college-level athletes.

**Methods**: Ten healthy college-level handball athletes volunteered in this study (mean ± SD age: 21.10 ± 1.72 y/o, body mass: 47.80 ± 6.42 kg, body height: 173 ± 4.76 cm, and VO2max; 47.80 ± 6.42 mL/kg/min). Participants completed a consent form approved by an Institutional Research Board. A cross-over design was followed to expose athletes to four fatigue protocols based on isotonic and sustained maximal isometric contractions, maximal anaerobic and incremental aerobic protocols in a cycle ergometer. The SD1 Poincaré index was assessed immediately before fatigue (BF), after fatigue (AF), and during a 5-min recovery period (R). Differences were evaluated by a one-way ANOVA.
RESULTS: The isotonic and isometric fatigue protocols showed similar results, significant differences were found between the SD1 values of BF and AF (p < 0.01). Also, the differences between SD1 values of BF and AF were significant for the isotonic and isometric fatigue protocols (p < 0.05). Anaerobic and aerobic fatigue protocols depicted a significant difference between the SD1 mean values of BF and AF, and BF and R (p < 0.05).

CONCLUSIONS: Findings demonstrated that the effects of fatigue on the HRV could be assessed by the non-linear Pointcaré SF feature. Additionally, it seems that the behavior of HFV depends on the fatigue protocol used. Therefore, the non-linear HRV analysis could be a promising method to assess different types of-fatigues present in sports.

Sprint interval training protocols have been shown to significantly improve aerobic capacity and select markers of health in both healthy individuals and in diseased patients, and in some cases, have been shown to be superior to traditional aerobic training. PURPOSE: The purpose of the current study was to investigate the metabolic and cardiovascular effect of 3 sprint interval training protocols using an elliptical cross trainer. METHODS: Twelve healthy (Male = 6, Female = 6; Weight = 70.52 ± 13.47 kg; Height = 1.71 ± 0.11 m) college-aged participants (ages 19-28 years) volunteered. After giving written consent, each participant performed an individualized maximal aerobic capacity test on a cycle ergometer for the determination of VO2 max (40.53 ± 5.94 ml/kg/min). Each participant then performed 3 different high-intensity interval protocols in a randomized fashion: ten 30/30 sec, 30/60 sec or 30/90 sec work-to-rest ratio bouts for a total of 10, 15 or 20 min. Oxygen consumption and heart rate were continuously collected and monitored during each training protocol. A one way repeated measures ANOVA (SPSS v.22; p < 0.05) with post-hoc Bonferroni adjustment was used to examine differences between protocols. RESULTS: VO2 (mean of 15-sec averages) (30.1 ± 4.6, 29.5 ± 4.0, 28.2 ± 2.6 ml/kg/min), RER (1.0 ± 0.06, 0.95 ± 0.09, 0.98 ± 0.05) and average peak heart rate (177 ± 13, 176 ± 11, 171 ± 16) illustrated no statistical significance across the 30/30 sec, 30/60 sec and 30/90 sec protocols, respectively (p > 0.05). Total caloric expenditure was, however, significantly higher in the 30/60 (240.44 ± 34.30 kcal) and 30/90 (277.22 ± 57.78 kcal) protocols as compared to the 30/30 (182.64 ± 25.35 kcal) protocol (p = 13.97, p < 0.01). CONCLUSION: Under such work-to-rest ratios, varying rest duration between 30 and 90 seconds had limited impact on metabolic responses during repeated 30-sec high-intensity exercise bouts. These data suggest that a 30/60 sec or 30/90 sec approach may be advocated as a preferred strategy for producing higher caloric expenditure in a college-aged population. Future studies examining the minimum duration and frequency of HIIT bouts are warranted if HIIT is to be used as an alternative to current physical activity recommendations.

Purpose: The aim of this study was to compare the acute musculoskeletal and cardiovascular responses to a series of Hatha yoga postures performed at room temperature and in a hot environment by novice (N) and experienced (E) yoga subjects. Twelve healthy (Male = 6, Female = 6; Weight = 70.52 ± 13.47 kg; Height = 1.71 ± 0.11 m) college-aged participants (ages 19-28 years) volunteered. After giving written consent, each participant performed an individualized maximal aerobic capacity test on a cycle ergometer for the determination of VO2 max (40.53 ± 5.94 ml/kg/min). Each participant then performed 3 different high-intensity interval protocols in a randomized fashion: ten 30/30 sec, 30/60 sec or 30/90 sec work-to-rest ratio bouts for a total of 10, 15 or 20 min. Oxygen consumption and heart rate were continuously collected and monitored during each training protocol. A one way repeated measures ANOVA (SPSS v.22; p < 0.05) with post-hoc Bonferroni adjustment was used to examine differences between protocols. RESULTS: VO2 (mean of 15-sec averages) (30.1 ± 4.6, 29.5 ± 4.0, 28.2 ± 2.6 ml/kg/min), RER (1.0 ± 0.06, 0.95 ± 0.09, 0.98 ± 0.05) and average peak heart rate (177 ± 13, 176 ± 11, 171 ± 16) illustrated no statistical significance across the 30/30 sec, 30/60 sec and 30/90 sec protocols, respectively (p > 0.05). Total caloric expenditure was, however, significantly higher in the 30/60 (240.44 ± 34.30 kcal) and 30/90 (277.22 ± 57.78 kcal) protocols as compared to the 30/30 (182.64 ± 25.35 kcal) protocol (p = 13.97, p < 0.01). CONCLUSION: Under such work-to-rest ratios, varying rest duration between 30 and 90 seconds had limited impact on metabolic responses during repeated 30-sec high-intensity exercise bouts. These data suggest that a 30/60 sec or 30/90 sec approach may be advocated as a preferred strategy for producing higher caloric expenditure in a college-aged population. Future studies examining the minimum duration and frequency of HIIT bouts are warranted if HIIT is to be used as an alternative to current physical activity recommendations.

Purpose: The benefits of resistance training (RT) on cardiac function are well acknowledged but usually no effects of moderate load of RT on resting cardiac vagal modulation have been found in healthy subjects. Therefore, the aim of this study was to investigate the effects of moderate load of RT period and consequent tapering period on nocturnal heart rate variability (HRV).

Methods: Young, recreationally trained, healthy men (n = 15, age 24 ± 2 years, height 176 ± 6 cm, body mass 81 ± 15 kg, body fat 18 ± 5 %) performed a two-week intensive RT period (ITP) with five hypertrophic whole-body exercise sessions per week and a two-week tapering period (TAP) with two exercise sessions per week. Lower-body strength tests were performed before and after ITP and after TAP. Nocturnal RR-intervals were measured during three consecutive nights before and at the end of both training periods. A mean of all three nights were used in the analysis.

Results: Subjects were retrospectively divided to responders (Resp) and non-responders (Nonresp) according to the responses in strength tests in ITP. 1RM leg press (90°) in Resp improved 16.9% (p < 0.01) after ITP when compared to baseline (296 ± 59 kg) with no further change after TAP. 1RM in Nonresp did not change after ITP (-5.3 %, ns) or TAP when compared to the baseline (361 ± 90 kg). The root mean square of successive differences (RMSSD) in Resp decreased 14.1% (p < 0.05) after ITP when compared to baseline (52 ± 21 ms) with no further change after TAP. RMSSD in Nonresp did not change significantly either after ITP or TAP when compared to baseline (43 ± 7 ms).

Conclusion: An intensive two-week RT period improved performance and decreased nocturnal HRV in Resp but not in Nonresp. As previously reported in intensive endurance training, also the present increased RT load could be detected in resting HRV. It is presumable that a very high RT load is needed to achieve changes in HRV, as earlier studies with moderate load have not found changes in HRV. In contrast to the usual findings in endurance training, improved strength performance was not related to improved cardiac vagal modulation in the present study. It may be speculated that changes in the neuromuscular system may explain the improved performance despite the disturbed autonomic modulation, i.e. increased stress, detected as decreased resting HRV.

Purpose: The purpose of this study was to examine cardiovascular disease risk factors among university employees, and to compare these results with standardized norms based on age and gender from the National Health and Nutrition Examination Survey (NHANES) data and the American College of Sports Medicine (ACSM) recommendations. METHODS: Health and wellness assessments were performed on N = 47 public university employees aged 26 to 65 years. The assessments included body compositional analysis, blood lipid and glucose panels, dietary recalls, and blood pressure and then compared with the results of current NHANES data and ACSM recommendations using a multiple independent t-tests (p < 0.05) and descriptive analysis. RESULTS: Descriptive results indicated that the sample’s means were above recommended values for male age, body fat percentage, low density lipoprotein cholesterol, and a diet too high in sodium and too low in calcium, fiber, and vitamin D. Results indicated that the sample also had significantly higher diastolic blood pressure (p = .0008) and High Density Lipoprotein (p = .0005) and significantly lower blood glucose (p = .0001) than the national average. CONCLUSION: These results...
indicate that the university employees were at significant risk for some cardiovascular disease risk factors and dietary choices, which indicates that they would benefit from health promotion programs that target those specific risk factors.

**B-69 Free Communication/Poster - Cellular/ Molecular**

Every two weeks, progressing up to six bouts per day in the final two weeks. Plasma began with three bouts per day and an additional bout/day was added to the regimen in healthy men following four and eight weeks of HIIT.

Circulating CD31+ T cells (TANG cells) in both groups, with a significant time x age interaction found for total TANG cells (p=0.049), with older age group displaying reduced circulating cell response to the exercise bout (95.62±7.71% vs. 79.09±7.25%, younger vs. older individuals respectively). CD4+ TANG cells were also significantly affected by acute exercise, resulting in a time x age interaction (p=0.0014, 107.09±10.56% vs. 79.88±10.04% increase). Despite CD8+ TANG cells significantly increasing in response to exercise (time, p=0.002, 71.44±7.30% pooled increase), no such effect of age was apparent (age x time, p=0.384). CONCLUSIONS: Exercise significantly increases the number of circulating TANG cells, however age attenuates the increase in total TANG and CD4+ TANG cells, but not CD8+ TANG subtypes. Acute increases in circulating TANG cells may contribute to the improvements in vascular function observed with exercise, yet strategies to augment the TANG cell increase to exercise in older individuals may be required to promote vascular benefits of exercise.

Blood clots are the major cause of adverse cardiovascular events, such as heart attack and stroke, and fibrinolysis, the capacity to dissolve blood clots, is recognized as an independent predictor of cardiovascular morbidity and mortality. Aerobic exercise training is theorized to enhance fibrinolytic potential, but studies have yielded inconclusive results. High intensity interval training (HIIT) is a novel exercise training strategy that has been shown to improve several components of health in various populations, but the effect of a HIIT regimen on fibrinolytic potential is unknown. Purpose: The purpose of this study was to examine potential fibrinolytic adaptations in healthy men following four and eight weeks of HIIT. Methods: Healthy, sedentary men participated in a HIIT program three days/week for eight weeks. Training bouts were modeled after the traditional Wingate test, consisting of repeated, 30-second bouts of maximal intensity cycling separated by 4.5 minute rest intervals. Training began with three bouts per day and an additional bout/day was added to the regimen every two weeks, progressing up to six bouts per day in the final two weeks. Plasma concentrations of total tissue plasminogen activator (tPA) and plasminogen activator inhibitor-1 (PAI-1) were assessed at baseline, after four weeks (4w), and after eight weeks (8w). Statistical comparisons across the three time points were done using repeated measures ANOVA. Significance was set to p<0.05. Results: 21 men (age: 25±5 yrs, BMI: 26.7±6.2 kg/m²) completed the study. No significant changes were observed for tPA during training (baseline: 9.8±3.1, 4w: 9.7±2.9, 8w: 8.9±2.7 ng/ml, p>0.05). Likewise, PAI-1 did not change with training (baseline: 17.7±6.8, 4w: 18.8±16.1, 8w: 18.0±16.6 ng/ml, p>0.05). Conclusion: Though it has been suggested that HIIT may be superior to traditional, aerobic training for the purpose of enhancing one’s cardiovascular health, results of the present study do not indicate HIIT influences fibrinolytic potential in healthy young men. Future research should explore the benefits of HIIT in populations that may be characterized by diminished fibrinolytic potential.

**1034 Board #213 May 31 3:30 PM - 5:00 PM**

**High-Intensity Interval Training Does Not Promote Fibrinolytic Adaptations in Healthy Men**

Paul R. Nagelkirk, James Sackett, Dan Farrell. Ball State University, Muncie, IN.

Email: pmnagelkirk@bsu.edu

(No relationships reported)

To determine the influence of age on the exercise-induced Angiogenic response of human umbilical vein endothelial cells (HUVECs) to serum of young individuals with no risk factors for cardiovascular disease (CVD), who differ only by habitual aerobic exercise level. In addition, ci-miRNAs were compared as potential candidates responsible for differences in HUVEC responses. METHODS: Serum was isolated from fasted, peripheral blood of endurance trained (n=10) and inactive (n=10) men and women aged 20-39. Exercise habits and VO2max were determined, and groups were matched by age, BMI, and blood chemistry. Serum was applied to HUVECs in a radius well migration assay, fluorometric proliferation assay, and tube angiogenesis assay at concentrations of 10%, 20%, and 7.5%, respectively. Ci-miRNA was isolated from serum and reverse transcribed. Using real-time quantitative PCR (qPCR), a subset of three samples per group were first compared for an array of 84 CVD-related miRNAs. Targets showing at least a 4-fold difference, as well as a priori chosen miRNAs, were validated using qPCR and compared for all subjects. RESULTS: HUVECs exposed to serum from trained subjects migrated 8% more in the first 4 hours (p=0.05) and 13% more after 8 hours (p=0.058) compared to those exposed to serum from inactive subjects. Following 12 and 24 hours, migration was 20% (p=0.055) and 21% (p=0.08) greater respectively, with serum of trained subjects. Following 36 hours, serum of trained individuals resulted in greater proliferation of HUVECs compared to serum of inactive individuals (P=0.04). There were no differences in tube length or complexity between the groups. PCR array data indicated nine ci-miRNAs with ≥4-fold difference. One ci-miRNA was more highly expressed in the trained sample, while eight were higher in the inactive sample. Of the ci-miRNAs chosen for validation, none exhibited different expression between groups. CONCLUSION: Serum of endurance trained individuals induces faster migration and greater proliferation compared to serum of inactive men and women, even in a young, healthy population.

Circulating CD31+ T cells (TANG cells) possess significant pro-angiogenic capabilities, contribute to maintenance of endothelial function, and are reduced in those with vascular-related diseases. Therefore, maintaining high levels of these cells may be important for vascular health benefits. Acute bouts of exercise stimulate an increase in circulating T cells, including TANG cells. Ageing is associated with a chronic reduction in TANG cells. PURPOSE: To determine the influence of age on the exercise-induced increases in circulating TANG cells. METHODS: Eight young (18-25yrs) and eight older (60-75yrs) men underwent a 30-minute cycling bout at 75% of their pre-determined maximum oxygen uptake (VO2max). Peripheral blood samples were taken pre-, immediately post-, and 1 hour post-exercise. Blood samples were used to quantify circulating TANG cells by flow cytometry. TANG cells were defined as peripheral blood mononuclear cells expressing CD3 and CD31. In addition, these cells were further characterised using antibodies against CD4 and CD8. Mixed model repeated measures analyses of variance (ANOVA) were performed to examine the effect of age, time and interactions of such (age x time) on changes in circulating TANG cells. RESULTS: Acute exercise stimulated an increase in circulating TANG cells in both groups, with a significant increase in response to exercise (age x time interaction, p<0.001). Further, the magnitude of this response was significantly greater in younger than older individuals (p<0.001). No significant age differences were observed at the 1 hour post-exercise time point.

**1036 Board #215 May 31 3:30 PM - 5:00 PM**

**Serum Angiogenic Capacity and Circulating MicroRNAs in Trained and Inactive Young, Healthy Individuals**

Ryan M. Sapp1, Rian Q. Landers-Ramos1, Espen E. Stangenberg2, Steven M. Jay3, James M. Hugberg, FACSFM1, University of Maryland, College Park, MD. 2University of Maryland School of Medicine, Baltimore, MD. 3East Carolina University, Greenville, NC.

Email: rsapp@umd.edu

(No relationships reported)

ANGIOGENESIS is induced by endurance exercise training and improves cardiovascular function. Exercise training also influences blood-borne factors, such as circulating microRNAs (ci-miRNAs), which can affect endothelial cell functions. PURPOSE: To determine differences in the angiogenic response of human umbilical vein endothelial cells (HUVECs) to serum of young individuals with no risk factors for cardiovascular disease (CVD), who differ only by habitual aerobic exercise level. In addition, ci-miRNAs were compared as potential candidates responsible for differences in HUVEC responses. METHODS: Serum was isolated from fasted, peripheral blood of endurance trained (n=10) and inactive (n=10) men and women aged 20-39. Exercise habits and VO2max were determined, and groups were matched by age, BMI, and blood chemistry. Serum was applied to HUVECs in a radius well migration assay, fluorometric proliferation assay, and tube angiogenesis assay at concentrations of 10%, 20%, and 7.5%, respectively. Ci-miRNA was isolated from serum and reverse transcribed. Using real-time quantitative PCR (qPCR), a subset of three samples per group were first compared for an array of 84 CVD-related miRNAs. Targets showing at least a 4-fold difference, as well as a priori chosen miRNAs, were validated using qPCR and compared for all subjects. RESULTS: HUVECs exposed to serum from trained subjects migrated 8% more in the first 4 hours (p=0.05) and 13% more after 8 hours (p=0.058) compared to those exposed to serum from inactive subjects. Following 12 and 24 hours, migration was 20% (p=0.055) and 21% (p=0.08) greater respectively, with serum of trained subjects. Following 36 hours, serum of trained individuals resulted in greater proliferation of HUVECs compared to serum of inactive individuals (P=0.04). There were no differences in tube length or complexity between the groups. PCR array data indicated nine ci-miRNAs with ≥4-fold difference. One ci-miRNA was more highly expressed in the trained sample, while eight were higher in the inactive sample. Of the ci-miRNAs chosen for validation, none exhibited different expression between groups. CONCLUSION: Serum of endurance trained individuals induces faster migration and greater proliferation compared to serum of inactive men and women, even in a young, healthy population.

Exercise and calorie restriction have function to relieve the increase of oxidative damage in the myocardium. Mitochondria are the main cellular location to produce the reactive oxygen species (ROS). It is still unknown whether exercise or calorie restriction reduce the production of reactive oxygen in myocardial mitochondria. Purpose: The purpose of this study is to explore the positive effects from exercise and calorie restriction on the membrane potential of myocardial mitochondria, the ROS level in mitochondria, the relief of myocardial oxidative damage and the improvement of the myocardial function. Method: Twenty-one months-old male SD rats were divided into four groups: control group (CA), calorie aged with calorie restriction group (CA, 60% calorie of CA group), aged exercise group (EA, running on treadmill with the speed of 15m/
min, 3% at 64% VO2 max for 60 min/day; 5 days a week for 12 weeks) and exercise combined calorie restriction group (CREA). In addition, 20 of 9 months-old SD male rats were used as the young control group (YCG). Result: The pulse pressure/blood pressure in left ventricle) was significantly higher in CREA than in CRA (9.39±1.0, P<0.05) and EA (9.30±1.2, P<0.05). The membrane potential (fluorescence image) was significantly higher in CREA than in CRA (P<0.01) and EA (P<0.05). The level of ROS (fluorescence image) was significant lower in CREA (292±2.6) than in CRA (30.5±4.7, P<0.05), EA (32.94±3.2, P<0.05) and CA (33.63±5.6, P<0.01). The level of MDK(αt) in CA (5.79±1.9) was extremely significantly higher than that in YC (2.37±0.3, P<0.01), CRA (2.37±0.3, P<0.01), CRE (3.06±0.7, P<0.01) and CREA (2.94±0.7, P<0.01). Conclusion: Exercise training and calorie restriction increased the membrane potential of aged myocardium, they reduced the production of ROS and the level of oxidative damage in the mitochondrias, and improved the myocardial contractile function. This report is supported by NSFC 31272175, Corresponding author: wenli34@hotmail.com


No relationships reported

Technological advances now permit the simultaneous detection of previously unattainable numbers of small molecule metabolic products (the metabolome) in blood. Metabolomics facilitates analysis of dynamic, interacting physiologic systems and unravelling the role of physical activity during the process of growth in disease prevention across the lifespan. PURPOSE: To evaluate the effect of an acute intense bout of exercise on plasma metabolomics in a group of healthy adolescents, and explore sex-related patterns. Methods: 29 normal weight healthy adolescents (14-17 y/o, 16 girls performed 10, 2-min bouts of cycle ergometer exercise interspersed with 1-min rest at a constant work equivalent to ~75% of their peak VO2. Blood was collected at baseline and immediately after the exercise. Untargeted profiling of primary metabolism was performed using automatic liner exchange / cold injection GC-TOF mass spectrometry at the UC Davis WCM Center. An acute exercise effect was assessed using paired t test (FDR <0.05). Two- way repeated measure ANOVA followed by paired t test was carried out to evaluate sex differences. Pathway analysis was performed using MetaboAnalyst 3 (FDR<0.05). Results: Exercise caused a significant shift in plasma metabolites associated with major bioenergetics, and acute, anaerobic and amino acid metabolism. 48 annotated metabolites (36172) were classified into 11 metabolism pathways (e.g., citrate cycle, alanine, aspartate and glutamate metabolism, valine, leucine and isoleucine biosynthesis, glycine, serine and threonine metabolism, arginine and proline metabolism and aminoacyl-tRNA biosynthesis). 11 metabolites had different response to exercise in boys compared to girls, 4 of them were enriched (FDR<0.01) in the arginine and proline metabolism pathway, which plays a role in maintenance of vascular tone and hemodynamics, and acts in muscle metabolism. CONCLUSION: The rapidly emerging field of metabolomics enables us to identify interacting networks of cellular metabolites activated by exercise. Our exploratory data revealed that exercise induced a shift in the metabolic profile indicating global cellular metabolic/energetic stress and guides dimorphism not previously observed. Supported by NIH Grant P01HD-048721 and PERC System Biology Fund

1039 Board #218 May 31 3:30 PM - 5:00 PM Microparticles Are Linked to Post-Prandial Hyperglycemia and Cardiovascular Disease Risk in Adults with Prediabetes Natalie ZM Eicher, Nicole M. Gilbertson, Christine Rudy, Eugene J. Barrett, Arthur Weismann, FACS, Uta Enderbreg, Steven K. Malin. University of Virginia, Charlottesville, VA. (Sponsor: Dr. Arthur Weismann, FACS)

Email: nze8b2@virginia.edu

No relationships reported

PURPOSE: Microparticles (MPs) have been implicated in type 2 diabetes and cardiovascular disease (CVD). However, no study has assessed MPs from fresh samples with advanced imaging flow cytometry in order to understand the relation with MP characteristics, physiology, and disease. Therefore, the hypothesis that MPs would correlate with hyperglycemia and CVD risk in adults with prediabetes. METHODS: In this cross-sectional study, 12 subjects (Age: 61.25±7.03y, BMI: 34.2±5.5kg/m2) were screened with 1-min rest at a constant work equivalent to ~75% of their peak V̇ O2peak, followed by paired t test was carried out to evaluate sex differences. Pathway analysis was performed using MetaboAnalyst 3 (FDR≤0.05).

Matrix metalloproteinase (MMP)-2, an enzyme that is integral in regulating vascular structure and vascular homeostasis, is constitutively expressed in endothelial cells (EC). MMP-2 has been associated with arterial stiffness and hypertension in African Americans (AA). While exercise improves biomarkers of vascular dysfunction in AA with pre-hypertension and hypertension, the mechanism(s) related to exercise-induced improvements in EC health and MMP-2 activity is unknown. PURPOSE: To determine the extent of EC dysfunction of MMP-2 activity, and its responsiveness to a physiological exercise mimetic, laminar shear stress (LSS), in human umbilical vein endothelial cells (HUVEC) isolated from Caucasian (CA) and AA donors. METHODS: The present work evaluated expression and activity of MMP-2 and related peptides in 4 AA and 4 CA HUVEC with gender split under basal conditions with LSS (20 dynes/cm²). RESULTS: In AA HUVEC, we report that basal MMP-2 gene expression was significantly higher (2.13-fold increase, r=0.53, P<0.01) while relative MMP-2 activity was significantly lower (CA: 0.7758 ± 0.1944; AA: 0.1324 ± 0.1135, t=3.92, P=0.03), RPP (r=-0.66, P=0.02) and late phase glucose intolerance (r=0.64, P=0.02). CD105 MPs were inversely related to total AI (r=0.61, P=0.04). CONCLUSION: MPs are significantly linked to post-prandial hyperglycemia and markers of increased CVD risk in adults with prediabetes.

1040 Board #219 May 31 3:30 PM - 5:00 PM In Vitro Exercise, Laminar Shear Stress, Attenuates Basal MMP-2 Dysfunction In Cultured African American Endothelial Cells Marc D. Cook, Adelola Adeyemo, Martha Aldokhayyil, Michael Brown, FACSAM. University of Illinois at Chicago, Chicago, IL. (Sponsor: Michael Brown, FACSAM)

Email: marccook@uic.edu

No relationships reported

Peripheral artery disease is an atherosclerotic disease that causes limb ischemia and has few effective treatments. Stem cell therapy is a promising treatment option, but concomitant diabetes may limit its effectiveness. PURPOSE: To evaluate the therapeutic potential of skeletal muscle stem cells to augment postischemic neovascularization following the induction of limb ischemia in wild type (WT) and type 2 diabetic (T2DM) mice. METHODS: Pericytes were isolated via fluorescence activated cell sorting for CD45-CD34-CD146+ cells, and pericyte phenotype was confirmed via surface marker expression, gene expression, and in vitro differentiation potential. WT C57BL/6 (n=10) and db/db T2DM (n=8) mice underwent unilateral femoral artery ligation to induce ischemia. 24 hours post-surgery, and postoperative days 3, 7, 14, 21, and 28 using laser Doppler perfusion imaging. Differences in gene expression were determined using t-tests; differences in blood flow were determined using linear mixed models. RESULTS: CD45/CD34/CD146+ pericytes were positive for mesenchymal stem cell markers CD90 (74%), and CD105 (65%) and weakly positive for the pericyte marker PDGFRβ (42%) and CD146 (36%). Pericytes had significantly more CD45+ CD31+ Sca1+ / CD41- cells, and pericyte phenotype was confirmed via surface marker expression, gene expression, and in vitro differentiation potential. WT C57BL/6 (n=10) and db/db T2DM (n=8) mice underwent unilateral femoral artery ligation to induce ischemia. 24 hours post-surgery, and postoperative days 3, 7, 14, 21, and 28 using laser Doppler perfusion imaging. Differences in gene expression were determined using t-tests; differences in blood flow were determined using linear mixed models. RESULTS: CD45/CD34/CD146+ pericytes were positive for mesenchymal stem cell markers CD90 (74%), and CD105 (65%) and weakly positive for the pericyte marker PDGFRβ (42%) and the endothelial cell marker CD144 (36%). Pericytes differentiated into skeletal myocytes, adipocytes, osteocytes, and endothelial cells. Pericytes had significantly (p<0.05) upregulated Sca1 (4.0-fold) gene expression, downregulated CD31 (0.2-fold) gene expression, and no difference in MyoD (1.0-fold), Pax3 (1.3-fold), or Pax7 (1.0-fold) expression. Blood flow recovery in WT mice was significantly higher after pericyte transplantation than after vehicle control (p=0.03; 81.1±6% vs.

Abstracts were prepared by the authors and printed as submitted.
B-70  Free Communication/Poster - Cold/Dive/Space Physiology

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

1042 Board #221  May 31 3:30 PM - 5:00 PM
Differences in Energy Expenditure Between Genders in Ultra-Endurance Nordic Skiing
Michelle M. Johannsen, Kenneth Shin, Robert H. Coker, FACSM. University of Alaska - Fairbanks, Fairbanks, AK. Email: mmjohannsen@alaska.edu

PURPOSE: Given the new reclassification options for women serving in the, the purpose of this study was to evaluate sex differences in energy expenditure and body composition data collected during the Alaska Mountain Wilderness Ski Classic.

METHODS: Fifteen race participants (8 males and 7 females, aged 31-54) were recruited for the study. Participants completed pre- and post-race body composition scans via dual energy x-ray absorptionmetry (DEXA). Participants wore ActiGraph activity monitors around their wrists for the entire duration of their participation in the race. Pack weights were measured prior to the race. RESULTS: There was no difference in time to completion between men and women (25.2±21.1 hours and 119.3±18.0 hours, respectively, p = 0.6). Pack weights relative to body mass were significantly lower in men (20.7±2.0%) compared to women (25.9±5.4%). Pre- and post-per cent fat mass was significantly lower in men (14.8±4.0 and 12.8±3.5) compared to women (19.8±2.7 and 18.0±2.5), respectively. Calculated total energy expenditure for the duration of the race was higher in men (42,679 and 30,861 kcal, men and women, respectively, p = 0.002). Energy expended in order to complete the race was proportionate to total weight (body and pack) regardless of gender (R² = 0.84).

CONCLUSION: Despite the challenge of carrying a heavier pack weight relative to their body mass, the women were able to complete the race in the same amount of time as the men. Previous studies suggest that at extreme distances women may possess a metabolic advantage over men. Further research is warranted to better understand the unique physiological advantages women in the military may offer under similar conditions.

1043 Board #222  May 31 3:30 PM - 5:00 PM
A Thermochromic Leuco Dye Coated Glove for the Prevention of Frostbite in Cold Environments
Craig Verdin, Nilin Rao, Nicholas Williams, Joseph Albright, Michelle Hurless, Michael Dziewit, Ellen Glickman, FACSM. Kent State University, Kent, OH. (Sponsor: Ellen Glickman, PhD FACSM, FACSM)

Background: We have developed a prototype of a thermochromic leuco dye coated latex glove designed for the early prevention of frostbite in cold environments. The thermochromic leuco dye was calibrated to detect contact temperature and change color accordingly at temperatures of 8°C and below.

Purpose: The purpose of this study was to evaluate the reliability and efficacy of the glove as a potential tool for the early detection of frostbite and adverse outcomes secondary to cold environments.

Methods: Two trials were conducted in a constant environmental temperature set at 24°C and 6°C using an environmental chamber. Using a water bath, water was cooled to temperatures between 5°C and 15°C in 1°C increments. The thermochromic dye coated latex glove and was placed into the same temperature thermochromic dye coated latex glove five times at each temperature set point, in each trial. Visual findings were recorded and all data was analyzed using paired samples t-tests. Results: Color change was noted in 20/100 individual trials at all internal contact temperatures of 8°C and below. Mean internal contact temperature measurements were 35.8 ± 1.4°C in Trial 1 (24°C ambient) and 27.7 ± 1.4°C in Trial 2 (6°C ambient). It was concluded that there was no significant difference (p = 0.208) between threshold mean internal water temperature between the two trials at the targeted color change of red. Conclusion: The glove demonstrated a consistent color change at a threshold temperature of 8°C and below with all of the 100 individual trials at 2 different external environmental temperature set points, therefore, proving that ambient temperature has minimal influence on the necessary contact temperature required to elicit a color change. The results of this proof of concept supports the use of a thermochromic dye coated latex glove as a visual, real time diagnostic tool for the prevention of cutaneous frostbite. Future work may therefore focus on developing this material for the military or outdoorsman for the early detection of cold injury in the field.

1044 Board #223  May 31 3:30 PM - 5:00 PM
Evaluation of Three Rewarming Techniques Following Cold Water Immersion in Military Personnel.

(The relationships reported)

The Marine Corps Mountain Warfare Training Center (MCMWTC) conducts a Cold Weather Medicine course to educate students about first aid and treatment for cold injuries and illnesses. Students participate in a “hypothermia lab,” consisting of immersion in cold water followed by rewarming. Currently, no body temperature values have been analyzed to support a rewarming technique that is most physiologically or perceptually effective.

PURPOSE: To determine the impact of three rewarming techniques following cold water immersion, and to identify the most beneficial technique for rewarming warfighters in the field.

METHODS: Thirty-eight military personnel participated in the MCMWTC hypothermia lab (mean ± SD age: 26 ± 5 yrs; height: 1.8 ± 0.09 m; weight: 83.2 ± 10.9 kg). Students fully immersed their bodies in cold water (0.3°C C) and remained at neck-high level for 10 min. Post-immersion, students changed into a dry set of clothing and rewarmed for 60 min by either donning a sleeping bag (n = 13), donning a sleeping bag while drinking 1 liter of warm liquids (SBWL, n = 13), or completing a set exercise program (n = 12). Core (Tcore), and mean skin temperature (TS), thermal sensation (TS), % very cold to +4 very hot), and shivering sensation (SS, 0 no shivering to 3 vigorous shivering) were recorded. RESULTS: No physiological or perceptual differences were seen between the three techniques. CONCLUSION: The three rewarming techniques were not physiologically or perceptually different after the 60-min rewarming period. Within the limitations of this study (participants, environment, and equipment), any of these three techniques would appear to be suitable for rewarming in the field.

1045 Board #224  May 31 3:30 PM - 5:00 PM
Performance of Intravenous Insertion is Impaired Following Cold Water Immersion in Military Medical Providers

The purpose of this study was to determine the influence of cold water immersion and rewarming on IV insertion performance among military medical providers. Thirty-eight military personnel participated in the MCMWTC hypothermia lab (mean ± SD age: 26 ± 5 yrs; height: 1.8 ± 0.09 m; weight: 83.2 ± 10.9 kg). Students fully immersed their bodies in cold water (0.3°C C) and remained at neck-high level for 10 min. Post-immersion, students changed into a dry set of clothing and rewarmed for 60 min by either donning a sleeping bag (n = 13), donning a sleeping bag while drinking 1 liter of warm liquids (SBWL, n = 13), or completing a set exercise program (n = 12). Core (Tcore), and mean skin temperature (TS), thermal sensation (TS), % very cold to +4 very hot), and shivering sensation (SS, 0 no shivering to 3 vigorous shivering) were recorded. RESULTS: No physiological or perceptual differences were seen between the three techniques. CONCLUSION: The three rewarming techniques were not physiologically or perceptually different after the 60-min rewarming period. Within the limitations of this study (participants, environment, and equipment), any of these three techniques would appear to be suitable for rewarming in the field.

Accidental cold water immersion or unprepared exposure to extreme cold temperatures can negatively impact warfighter performance and mission outcomes by hindering hands and feet use due to numbness. Skin or extremity temperature has been identified as a relevant variable that predicts impairment in manual dexterity and tactile sensitivity; yet no data have been presented showing performance of medically-specific tasks, such as intravenous (IV) insertion following a cold water immersion.

PURPOSE: To determine the influence of cold water immersion and rewarming on IV insertion performance among military medical providers.

METHODS: Thirty-eight military personnel (mean ± SD age: 26 ± 5 yrs; height: 1.8 ± 0.09 m; weight: 83.2 ± 10.9 kg), trained in the technique of IV insertion, participated in a Cold Weather Medicine course. Following the training exercise, students completed six stations: baseline in a classroom (5 min, 23°C), pre-immersion (pre) outdoors (5 min, -4.6°C) immersion in cold water (10 min, 0.2°C), post-immersion (post) (5 min, wet clothing, -4.6°C), transition (5 min, change into dry clothing), and rewarming (60 min, using various techniques). An IV insertion task was performed upon arrival at baseline, pre- and post-immersion, and after rewarming. The IV insertion task required students to insert an IV using a manikin arm. Students were assessed for time to insert IV and success of administering fluid.

RESULTS: Assessment revealed a significant increase in IV insertion time (p<0.001) and a decrease in IV insertion success rate following cold water immersion. IV insertion times (seconds) for each station were: baseline
Recreational swimming in cold, open-water without a wetsuit continues to grow in popularity, attracting individuals with a wide variety of athletic backgrounds. Different than a polar bear plunge, cold-water swimming involves consistent swimming throughout the winter months. PURPOSE: To determine if cold-water swimmers have substantial differences in body mass index (BMI) vs. North American and International masters pool swimmers and International masters athletes from different sports. It appears that cold-water swimming abilities cannot be attributed to unique body composition; other factors such as acclimatization, heat production while swimming, and limiting time in cold water may be keys to preventing hypothermia.

METHODS: BMI was measured in a group of 103 open-water swimmers (mean age: 54 years; 76 men, 27 women), who swam consistently throughout the winter months in the San Francisco Bay, without wetsuits (median water temperature: 11°C [52°F]). Swimmers’ values were compared to data from North American Masters pool swimmers (mean age: 57 years), International masters pool swimmers (mean age: 54 years), and International athletes from different sports (age range: 42-57 years).

RESULTS: The average BMI values for cold-water swimmers in our study (25.9 kg/m²) were not significantly different that the average BMI of North American Masters pool swimmers (25.1 kg/m²; p=0.16). On average, San Francisco cold-water swimmers had slightly higher BMI (kg/m²; p=0.05) than ultramarathon runners (23.0), track and field athletes (24.1), soccer players (24.5), and volleyball players (24.9), and lower (p=0.05) BMI (kg/m²) than softball players (27.3).

CONCLUSIONS: The BMI of cold-water swimmers is similar to North American and International Masters pool swimmers; and in general, is slightly higher than masters athletes from different sports. It appears that cold-water swimming abilities cannot be attributed to unique body composition; other factors such as acclimatization, heat production while swimming, and limiting time in cold water may be keys to preventing hypothermia.

The degree to which temperature affects endurance performance and exercise metabolism in trained athletes is not fully known. PURPOSE: In the present study, we investigated the impact of cold and neutral environmental temperatures on subcutaneous abdominal adipose tissue (SACAAT) lipolysis and whole-body substrate oxidation during submaximal steady-state cycling in trained cyclists. Additionally, we assessed subsequent time trial (TT) performance. METHODS: Ten trained male cyclists (age = 22.80±2.76 yr; height = 178.58±6.55 cm; mass = 74.62±10.95 kg; body fat = 18.35±3.37%; peak oxygen consumption (VO2peak) = 66.60±4.67 ml kg⁻¹ min⁻¹; power output in Watts (W) at lactate threshold (LT) = 234.00±35.00 W) participated in a randomized, crossover designed study that consisted of baseline testing to determine LT and VO2peak, two familiarization trials, and two experimental trials. The experimental trials consisted of 25 min of cycling at 70% LT, followed immediately by 25 min at 90% LT in either cold (3.06±1.78°C; 41.63±5.60%RH) or theroneutral (19.43±0.98°C; 38.97±2.23%RH) conditions. Following a 15-min break, subjects then completed a 20kmtheroneutral room. SCAAT interstitial glycerol concentrations were measured in situ throughout the trial via the microdialysis technique. Two-way (group x time) repeated measures analysis of variance tests and student t-tests (where appropriate) were used to identify differences between measured variables with significance set at p ≤ 0.05. RESULTS: A significant time effect was observed for HR (p < 0.001), core temperature (p < 0.001), interstitial glycerol (p < 0.001), blood lactate (p = 0.028), carbohydrate oxidation (p < 0.0001), fat oxidation (p < 0.0001), and VO2 (p < 0.0001). No significant differences were observed between conditions for any measured variable including TT performance (cold, 189.92±24.6 V. neutral, 187.5±27.4 W, p=0.858). CONCLUSION: SCAAT lipolysis increases during steady state exercise. However, metabolism and performance are not impacted by ambient conditions. This study was funded by the National Strength and Conditioning Association and Florida State University.

Higher body mass contributes to protection from hypothermia and one might assume that swimmers who swim consistently in cold water have more adipose tissue than average individuals. PURPOSE: To determine if cold-water swimmers have substantial differences in body mass index (BMI) which might have a protective effect against heat loss during swims in cold water without wetsuits. METHODS: BMI was measured in a group of 103 open-water swimmers (mean age: 54 years; 76 men, 27 women), who swam consistently throughout the winter months in the San Francisco Bay, without wetsuits (median water temperature: 11°C [52°F]). Swimmers’ values were compared to U.S., California, and San Francisco populations, respectively.

CONCLUSIONS: The BMI of cold-water swimmers is lower or similar to the BMI of U.S., California, and San Francisco general populations. Protection from hypothermia in cold-water swimmers is likely related to other factors such as acclimatization, heat production while swimming, and limiting time in cold water. CONCLUSIONS: The BMI of cold-water swimmers is lower or similar to the BMI of U.S., California, and San Francisco general populations. Protection from hypothermia in cold-water swimmers is likely related to other factors such as acclimatization, heat production while swimming, and limiting time in cold water.
temperature (p = 0.05). Adiponectin was higher post-exercise than pre-exercise (p = 0.008). No differences in FNDC5 mRNA were observed between the hot, cold, and RT trials or between pre-, post-, and 3 h post-exercise time points (p > 0.05). CONCLUSION: These data indicate that the temperature in which exercise takes place does not influence FNDC5 skeletal muscle transcription or circulating irisin in a human model. Funding provided by the University of Nebraska at Omaha Graduate Research and Creative Activity Grant and the National Institute for General Medical Science (NIGMS, 5R20GM103427).

Future space missions beyond low earth orbit will require deconditioned astronauts to perform occupationally relevant tasks while confined within a spacesuit of significant mass. The prediction of task performance times under these conditions will be critical for crew safety, autonomous operations, and mission success. PURPOSE: Determine if the addition of task specific upper body strength testing to current National Aeronautics and Space Administration’s (NASA) standard lower body testing would enhance the prediction of time-to-completion in a test battery designed to simulate astronaut related occupational tasks. METHODS: Eight, healthy participants of astronaut age (34.9 ± 3.7 years) completed six occupationally relevant tasks while wearing a 48-kg weighted suit designed to emulate the weight distribution of the NDX-2 planetary spacesuit. The six tasks performed were: hatch opening, hand drilling, construction wrenching, half-mile walk, collecting weighted samples, and dragging an unresponsive crewmember to safety. The time-to-complete each task was recorded and summed to obtain a total time for the test battery. In addition to the standard knee extensor-flexor strength and endurance tests employed at the NASA Johnson Space Center for crew health testing, task specific isometric strength was collected prior to each task for hatch opening, hand drilling, and wrenching. Linear regression was used to predict the dependent variable of total time-to-completion with two independent variable models 1): NASA upper leg standard measures alone and 2): NASA upper leg standard measures + task specific isometric testing for wrenching and hand drilling. RESULTS: Total time-to-completion of the test battery ranged from 20.2±4.5 minutes. NASA upper leg standard measures alone accounted for 61.5% of the variability in time-to-completion (p = 0.15). The addition of hand drilling and wrenching testing to NASA upper leg standard measures accounted for 99.6% of the variability in time-to-completion (p = 0.047). CONCLUSION: Adding occupational specific strength tests (hand drilling and wrenching) to NASA’s standard lower extremity tests successfully predicted time-to-completion of a performance test battery within a weighted suit in 1G. Supported by ND NASA ESPCGR

Fibronectin type III domain-containing 5 (FNDC5) is a skeletal muscle membrane-bound precursor to the myokine irisin. Irisin is involved in stimulating adipose tissue to become more metabolically active in order to produce heat. It is unknown how exercising in different temperature environments affects the response of FNDC5 gene expression and blood irisin concentration. PURPOSE: To determine the effects of exercise in a hot (33 °C), cold (7 °C), and room temperature (RT, 20 °C) environment on the skeletal muscle gene expression of FNDC5 and the blood concentrations of irisin. METHODS: Twelve recreationally trained males completed three separate, 1 h cycling bouts at 60% of W\textsubscript{max} in a hot, cold, and RT environment followed by three hours of recovery at room temperature. Blood samples were taken from the antecubital vein and muscle biopsies were taken from the vastus lateralis pre-, post-, and 3 h post-exercise. RESULTS: Plasma concentrations of irisin did not change from pre- (9.2 ± 2.68 pg · mL\(^{-1}\)) to post-exercise (9.6 ± 0.2 pg · mL\(^{-1}\), p = 0.068) or decreased from post-exercise to 3 h post-exercise (8.9 ± 0.5 pg · mL\(^{-1}\), p = 0.047), regardless of temperature. However, when plasma volume shifts were considered, no differences were found in irisin at pre-, post-, or 3 h post-exercise (p = 0.086). There were no differences between trials for irisin plasma concentrations
Peripheral Chemosensitivity is Not Blunted during Head Out Water Immersion


Objective: We tested the hypothesis that peripheral chemosensitivity (PCS) is blunted during head out water immersion (HOWI).

Methods: We assessed PCS to hypoxia (PCSO2) and hypercapnia (PCSCO2) in 6 participants (age: 23 ± 3 y, BMI: 27 ± 2 kg/m², 3 women) during two randomized trials: a time-control dry trial (DRY) and a thermoneutral (35 ± 0°C) HOWI trial. PCSa and PCSco were assessed at baseline, and at 10, 30, 60, and 120 min of HOWI or DRY. For the PCSO2 test, participants inhaled 2–3% CO2 for 3 min, followed by 5 min of room air breathing. Similarly, for the PCSCO2 test, participants inhaled 2–3% CO2 for 3 min, followed by 5 min of room air breathing, 4 separate times. We determined the mean of the three highest consecutive V̇E values, the lowest %SatO2, and the peak PETCO2 within 2 min following each hypoxic or hypercapnic administration. The PCSa and PCSco data are reported as the slope of the linear regression line of V̇E vs. %SatO2, respectively.

Results: V̇E was not different between HOWI and DRY (condition main effect: p = 0.12). PETCO2 was higher during HOWI vs. DRY at 10 (45.9 ± 2.5 vs. 44.0 ± 2.4 mmHg, p = 0.001), 60 (46.0 ± 2.6 vs. 43.7 ± 1.8 mmHg, p = 0.005), and 120 min (45.9 ± 2.5 vs. 44.0 ± 2.4 mmHg, p = 0.001). PCSa was not different between HOWI and DRY (baseline: 0.41 ± 0.34 vs. 0.46 ± 0.39, 10 min: 0.40 ± 0.46 vs. 0.71 ± 0.57; 60 min: 0.33 ± 0.17 vs. 0.57 ± 0.59, and 120 min: 0.57 ± 0.29 vs. 0.73 ± 0.70 L/min/100mHg; respectively). A significant main effect (p = 0.20) was different between HOWI and DRY (baseline: 0.07 ± 0.04 ± 0.06 ± 0.03; 10 min: 0.06 ± 0.10; 60 min: 0.08 ± 0.04 vs. 0.06 ± 0.03; and 120 min: 0.08 ± 0.02 vs. 0.07 ± 0.02 L/min/mmHg, respectively; condition main effect: p = 0.63).

Conclusion: These data indicate that PCSa, and PCSco are not blunted during thermoneutral HOWI. However, the peak PETCO2 remained in safe limits and/or unchanged as a result of increased heat production due to head immersion.

Regional Heat Exchange During a Dry Suit Glove Failure in Cold Water Immersive Diving

Dana M. DiPasquale, Eric R. Bandstra, John P. Floriani. Navy Experimental Diving Unit, Panama City, FL.

Email: dana.dipasquale.ctr@navy.mil

Abstracts were prepared by the authors and printed as submitted.
first. Three acceptable trials were collected in each condition. Suspension chair trials needed to be within 0.5 sec (on average) of the matched rigid chair trials. A tri-axial accelerometer was mounted to the rear of the wheelchair seatpan with signals sampled at 2 kHz. Peak resultant accelerations were analyzed from surface 1, root mean square (RMS) resultant accelerations were analyzed from surfaces 2-4. RESULTS: Peak accelerations when the rear wheel traversed the door threshold and expansion seems of section 1 were significantly reduced from 47-79% in the suspended chair (p=0.0011). Peak accelerations at the front wheel were also reduced with rear suspension, but not to the same extent (p not consistently <0.050). RMS accelerations were significantly reduced by 50% over surfaces 2 & 3 (p=0.013 and p=0.050, respectively), and 56% over surface 4 (p=0.002) with rear suspension. CONCLUSION: Aftermarket rear suspension significantly reduces vibration and impact transmission of rough surface conditions to the users of manual tilt-in-space wheelchairs. The reduced accelerations most likely improve both comfort and health outcomes of users (e.g., low-back pain, neck pain, muscle ache and fatigue).

1058 Board #237 May 31 3:30 PM - 5:00 PM Long-duration Spaceflight And Latent Viral Reactivation After Plasma Antimicrobial Protein Concentrations.
Guillaume Spielmann1, Mitzi Laughlin2, Hawley Kunz3, Brian Crucian4, Satish K. Mehta5, Duan L. Pierson6, Richard J. Simpson7, FACSM8. 1Louisiana State University, Baton Rouge, LA. 2University of Houston, Houston, TX. 3NASA-JSC, Houston, TX. Email: gspielmann@lsu.edu (No relationships reported)

Long duration spaceflights have been associated with profound dysregulation of the immune system and latent viral reactivations, which could jeopardize crew safety and mission success. The dearth of information on the impact of long duration spaceflight on innate immunity raises concerns on crewmembers' ability to fight infections during a mission. Purpose: To determine the effects of spaceflight on plasma antimicrobial proteins (AMPs) and reactivation of latent herpesviruses. Methods: Plasma, saliva and urine samples were obtained from 23 crewmembers who spent 6 months on the International Space Station (ISS). Samples were collected before flight, during (Earlyflight, Lateflight), immediately upon return to Earth (R+0) and 30 days following return (Recovery). Plasma Albumin, LL-37, HNP 1-3 and lysozyme concentrations were determined by ELISA. Saliva Epstein-Barr virus (EBV), varicella zoster virus (VZV) and urine cytomegalovirus (CMV) DNA levels were quantified by Real-Time PCR. Maximum likelihood linear mixed models (LMM) were used to determine main effects of time, and viral shedding status on the concentration of each AMP. Results: The levels of viral EBV DNA were significantly higher during flight than at baseline, and VZV DNA concentrations increased during and after flight when compared to pre-flight level. CMV DNA level did not change during flight, but significant increased upon return on earth and during recovery, compared to baseline and in-flight viral concentrations. The magnitude of CMV reactivation after return was associated with reductions in plasma LL-37 concentrations, while EBV and VZV reactivations during the early stages of the missions preceded HNP 1-3 and Lysozyme increases during Lateflight. Following return on Earth and during recovery, HNP 1-3 and Lysozyme concentrations were associated with EBV and VZV viral DNA levels, reducing the magnitude of viral reactivation. Conclusion: Inactive immunity appeared to be partially restored after 6-months in space and the release of plasma HNP 1-3 and Lysozyme enabled the reduction of EBV and VZV reactivation rate and magnitude. However, the landing-associated decline in plasma LL-37 is likely to enhance the rate of CMV reactivation in Astronauts following spaceflight, potentially compromising crewmember health after landing.

1059 Board #238 May 31 3:30 PM - 5:00 PM Facilitation of Paraspinal Muscles with Kinesio® Tape During Exercise Countermeasures
Kara A. Stone1, Katie Lyman2, Bryan Christensen2, Joshua Brodersen2, Kyle Hackney3. 1North Dakota State University, Fargo, ND. Email: kara.stone@ndsu.edu (No relationships reported)

Declines in skeletal muscle function and physiological deconditioning during spaceflight have been well documented, giving way to exercise countermeasures such as the Advanced Resistive Exercise Device (ARED). Because of the high loads placed on the spine, a pullup to using ARED is the possibility of paraspinal muscle overload leading to injury. Enhancing the force production capability of the paraspinal muscles during exercise may help mitigate concern and maintain exercise form. PURPOSE: To examine Kinesio® Tape as an intervention to facilitate the paraspinal muscles during back squat.

METHODS: Thirty-two healthy subjects (age = 34.4 ± 7.9 yrs) completed a maximal voluntary isometric contraction (MVC) for back squat (control). Subjects completed two sets of eight repetitions at 70% of their MVC. To examine the effect Kinesio® Tape during exercise while controlling for fatigue, subjects were randomized to two conditions: tape applied during the first set (N=16) or second set (N=16). Prior to each set, an additional MVC was obtained to explore peak force and rate of force development (RFD) with tape. Joint markers were placed on subjects to analyze hip and knee angles. For MVC, a repeated measures ANOVA was completed with Bonferroni adjustment to examine differences between conditions. Paired r-tests were completed to examine differences in RFD and joint kinematics between the two conditions.

RESULTS: Significant decreases in MVC were observed with and without the application of tape when compared with the control (tape = 92.84 ± 98.88 kg, no tape = 92.68 ± 38.44 kg, control = 96.43 ± 39.97 kg, p = 0.01 and p = 0.02, respectively). However, no significant differences were observed between conditions in RFD (p>0.280). During the last repetition (most fatiguing), joint kinematics of the hip (tape = 83.02 ± 11.98°, no tape= 84.90 ± 11.81°, p=0.140) and knee (tape = 90.90 ± 10.16°, no tape = 91.35 ± 9.24°, p=0.678) were not significantly different at the lowest point of the squat.

CONCLUSION: The application of Kinesio® Tape to the paraspinal muscles during back squat does not enhance peak force, rate of force production, or after exercise form. However, future studies in deconditioned participants may warrant further investigation especially for application in long-duration spaceflight.

Support ND Space Grant Consortium

1060 Board #239 May 31 3:30 PM - 5:00 PM Submaximal Exercise Responses Before and During Long Duration Space Flight
Alan D. Moore1, FACSM1, Meghan E. Downs2, Alan H. Feiveson3, Shannon L. Jordan4, Stuart M.C. Lee3. 1Louisiana State University, Baton Rouge, LA. 2University of Houston, Houston, TX. 3NASA-JSC, Houston, TX. 4NASA Johnson Space Center, Houston, TX. KBRowley, Houston, TX. Email: alan.moore@lamar.edu (No relationships reported)

PURPOSE: To document the cardiopulmonary responses to submaximal exercise during long-duration International Space Station (ISS) missions. METHODS: Astronauts (n=14) assigned to ISS missions (range: 91-192 d) performed cycle exercise testing ~90 d before launch, ~15 d after launch and every ~30 d thereafter. Peak oxygen consumption (VO2peak) data were previously reported (Moore, et al., 2014). Heart rate (HR, ECG), and oxygen consumption (VO2, Portable Pulmonary Function System, DAC, Denmark) were measured at rest and during 5-min work rates prescribed to elicit 25, 50, and 75% of preflight VO2peak. Cardiac output (Q, FReen 22/ SF6 technique) was measured at rest and the 25 and 50% stages. Stroke volume (SV) and arterial-venous oxygen difference (a-oD) were calculated. Inflight outcomes were compared to preflight values using mixed-model linear regression with preflight body weight as a covariate. To account for multiplicity, significance thresholds for P values were adjusted (Holmberg procedure). No trend time during flight was evident, thus inflight data are reported as a single outcome. RESULTS: During spaceflight, neither resting VO2peak (Pre: 0.41 ± 0.12, In: 0.33 ± 0.07 L/min; Mean ± SD) nor HR (Pre: 71 ± 10, In: 69 ± 11 bpm) differed from preflight, but resting Q (Pre: 5.6 ± 0.9 L/min; Mean ± SD) did not differ from preflight during any other exercise stage. Inflight HR did not differ from preflight during the 25% stage (Pre: 113 ± 15, In: 122 ± 16 bpm) and the 50% stage (Pre: 147 ± 16, In: 158 ± 16 bpm). In contrast to rest, exercise Q and SV did not differ from preto inflight, although a-oD was reduced during both the 25% stage (Pre: 9.8 ± 0.8, In: 7.7 ± 0.5 ml O2/100 ml) and the 50% stage (Pre: 12.8 ± 0.9, In: 10.2 ± 0.8 ml O2/100 ml). CONCLUSION: Lower VO2peak during the 25% stage on ISS may result from reduced metabolic cost of pedaling. Maintained exercise Q and SV during flight suggest central cardiovascular factors did not limit submaximal exercise at these levels.

1061 Board #240 May 31 3:30 PM - 5:00 PM Metabolic and Cardiovascular Indicators of Intensity and Performance during Astronaut Related Test Battery
Christopher J. Kotarsky1, Andrew Taylor2, Kyle J. Hackney2, North Dakota State University, Fargo, ND. Email: christopher.kotarsky@ndsu.edu (No relationships reported)

The deconditioning of astronauts from weightlessness exposure in space may limit their ability to complete a variety of occupational relevant tasks efficiently upon landing, especially when confined within a space suit of additional mass. The tradeoff between task specificity and intensity will be important to predict the potential completion times of these tasks. PURPOSE: Compare task specific metabolism
and determine if a simple cardiovascular indicator (i.e., resting heart rate, HR) can be used to predict total time-to-completion during an astronaut related test array. METHODS: Eight, healthy participants were a 49.5-kg weight suit and completed six occupationalally relevant tasks. Tasks included hatch opening (HO), hand drilling (HD), construction wrenching (CW), a half-mile walk (HM), sample collection (SC), and dragging a crewmember to safety (DC). Total completion time for the array was calculated by summing each subjects’ completion time. The metabolic demands of each task were reported using a metabolic cart. One-way ANOVAs were used to identify differences in VO2, VCO2, RER, VE, and RR between HO, HD, CW, and HM, as well as differences in post HR between all tasks. Tukey Post-hoc tests were used to distinguish specific task differences. Linear regression was used, with an enter method, to predict total time-to-completion from resting HR values. RESULTS: The peak VO2 of HD was significantly lower than both CW (p = 0.002) and HM (p = 0.001). The peak VCO2 of HD was significantly lower than both HO (p = 0.025), CW (p = 0.029), and HM (p = 0.004). Mean RER for HO was significantly higher than both CW (p = 0.006) and HM (p = 0.002). No significant differences were observed for VE (p = 0.082) and RR (p = 0.941), and post HR (p = 0.087). Resting HR was a significant predictor (p = 0.027) of total time-to-completion. CONCLUSIONS: Occupational tasks in a weighted suit showed a variety of metabolic characteristics and alterations in fuel sources. The resting HR of subjects significantly predicted the total time-to-completion of an astronaut relevant test array performed within a weighted suit in IG. Resting HR can be easily monitored in novel environments and may be useful tool for determining an astronauts’ physical activity readiness for space relevant tasks.

Supported by ND NASA ESPCoR.

1063 Board #242 May 31 3:30 PM - 5:00 PM

Baroreceptor Unloading Attenuates the Increase in Blood Pressure Elicited by Prolonged Face Cooling

Zachary J. Schlader1, Uwe Drescher1, Lutz Thieschäfer2, Edwin Mulder2, Uwe Hoffmann1. 1German Sport University Cologne, Cologne, Germany. 2German Aerospace Center, Cologne, Germany. Email: j.schlader@dshs-koeln.de

(No relationships reported)

PURPOSE: To test the hypothesis that the regulation of heart rate (HR) and mean blood pressure (mBP) in response to moderate work rate (WR) changes differs before and after 60 days of bed rest. METHODS: Twenty-two male subjects ([mean ± SD]: 29 ± 6 years, 181 ± 6 cm, 77 ± 7 kg) were tested using a moderate WR protocol with pseudo-random binary sequences (PRBS) between 30W and 80W on an upright cycle ergometer before and after 60 days of 6° head down tilt (HDT) bedrest. Eleven of the twenty-two subjects participated in a near-daily reactive jump training intervention during bed rest, using a horizontal sled jump system (TRAIN). The other 11 subjects served as a control group (CTRL). The test was performed 9 days before the HDT period (BDC-9) and 2 days after (R+2) reamplification. HR and mBP were measured beat-to-beat during the cycle ergometer test and kinetics responses were calculated via time-series analysis. Higher maxima of the cross correlation function between WR and the respective parameter (CCF_(max)) indicate faster kinetics responses. ANOVA with the factors ‘group’ and ‘point in time’ combined with LSD post hoc tests were applied to calculate differences in kinetics between sessions as well as absolute values of HR and mBP during the PRBS. RESULTS: Significant effects were identified for point in time for the parameters CCF_(max) (BDC-9: 0.328 ± 0.093, R+2: 0.273 ± 0.062; P = 0.020) and CCF_(mBP) (BDC-9: -0.237 ± 0.069, R+2: 0.338 ± 0.134; P = 0.009), but not for point in time x group. Absolute values of HR during the PRBS (point in time: P = 0.001, point in time x group: P = 0.002, group: n.s.) were significantly higher at R+2 compared with BDC-9 (101 ± 12 min vs. 115 ± 12 min, P = 0.001), but only in the CTRL group. For the absolute mBP values a significant effect for ‘point in time’ (100 ± 12 mmHg, P = 0.029) but not for point in time x group or group was found. CONCLUSION: 60 days of bed rest affected the kinetics response to moderate WR changes during upright cycling, but differently for HR and mBP kinetics. As indicated by the higher absolute HR values during the PRBS, sympathetic nervous system activity might have increased after bed rest. This could have slowed HR kinetics and, as a result of the baroreceptor reflex, accelerated mBP kinetics.

1062 Board #241 May 31 3:30 PM - 5:00 PM

Heart Rate and Blood Pressure Regulation before and after 60 Days of Bed Rest

Jessica Koschate1, Uwe Drescher1, Lutz Thieschäfer1, Edwin Mulder2, Uwe Hoffmann1. 1German Sport University Cologne, Cologne, Germany. 2German Aerospace Center, Cologne, Germany. Email: j.koschate@dshs-koeln.de

(No relationships reported)

Purpose: To test the hypothesis that baroreceptor unloading does not interfere with time-to-completion. Supported by ND NASA ESPCoR.

1064 Board #243 May 31 3:30 PM - 5:00 PM

Short Bouts Of Resistance Training Reduces Lipid Metabolism Disparities In T2d Offspring In 6 Weeks

Ryan D. Russell1, Gregory G. Davis2, Arnold G. Nelson, FACSM3, Robert R. Kraemer, FACSM4, Indu Ketherpal5, Michelle A. Keske6, Ryan P. McMillan7, Christian K. Roberts8, Matthew W. Huvel9. 1University of Texas Rio Grande Valley, Brownsville, TX. 2Louisiana State University, Lafayette, LA. 3Southern Methodist University, Dallas, TX. 4Southeastern Louisiana University, Hammond, LA. 5Pennington Biomedical Research Institution, Baton Rouge, LA. 6Menzies Institute for Medical Research, Hobart, Australia. 7Virginia Tech, Blacksburg, VA. 8Occidental College, Los Angeles, CA. (Sponsor: Robert Kraemer, FACSM)

Email: ryanurrussell84@gmail.com

(No relationships reported)

Having a family history of diabetes (FH+) increases type 2 diabetes (T2D) risk, and is associated with metabolic flexibility, and mitochondrial dysfunction. However, the mechanisms underlying these differences remain elusive. Exercise has a protective effect on metabolic health and mitochondrial function, and we have shown resistance training (RT) can improve fasting glucose in FH+ and those with no family history of T2D (FH-) similarly. However, little is known about the impact of RT on lipid metabolism in the FH+ population.

Purpose: To evaluate markers of lipid metabolism in FH+ and FH- before and after 6 weeks of RT.

Methods: 10 healthy FH+ and 13 healthy FH- age and gender matched men and women participated in 6 weeks of RT (9±2 min/session, 5 days/week, including full-body, plyometric and core exercises on alternate days. Fasting plasma samples were collected prior to, and after 6 weeks of RT for triglycerides (TG), non-esterified fatty acids (NEFA) and acylcarnitine (AC) determination, followed by an oral glucose challenge (OGC, 50g glucose).

Results: No baseline differences in strength, fasting glucose, OGC area under the curve (AUC), body weight, or circulating TG and insulin were noted between groups. Though, FH+ displayed lower circulating NEFA (276 ± 37 vs 412 ± 44 mmol for FH+, p<0.04) and had lower median chain (C8-1, C10-1, C14-2, C14-2; p=0.04) and higher long-chain AC (C16-2, C18-2, C18-1 (µM, p<0.05) compared to FH- prior to RT. NEFA and fasting glucose declined (32.1 and 6.8% respectively) overall with RT (p<0.05), with no difference in changes between groups (p=0.33 and 0.55 respectively). During RT, NEFA and fasting glucose declined (32.1 and 6.8% respectively) overall with RT (p<0.05), with no difference in changes between groups (p=0.33 and 0.55 respectively).}

Conclusions: Baroreceptor unloading, induced by LBNP, attenuates increases in blood pressure elicited by prolonged face cooling. Supported by a U54 impact award.

B-71 Free Communication/Poster - Ergonomic Aids II

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F
Conclusions: Healthy young FH+ display a faster AC profile different than FH−, suggesting alterations in fat metabolism that may contribute to increased T2D risk. These disparities in AC profiles were diminished after RT, suggesting that 6 weeks of short RT bouts normalizes lipid metabolism in FH+. RT may protect against impaired lipid metabolism in FH+, thereby protecting against T2D.

Purpose: The aim of this study was to investigate the effects of caffeine supplementation on sprint cycling performance and how those effects are influenced by torque factor and sprint duration. METHODS: 13 recreationally active men (age: 20 ± 2 years; height: 1.78 ± 0.06 m; body mass: 75.3 ± 7.6 kg) completed nine trials on an electromagnetically-braked cycle ergometer. In Trial 1, participants completed a series of 6 s trials (separated by 5 min passive recovery periods) at progressively increasing torque factors (0.4 - 1.25 N∙m∙kg\(^{-1}\)) to determine the torque factor (for each individual) which elicited the highest peak power output (\(T_{\text{OPTIMAL}}\)). The remaining trials followed a counterbalanced randomised design in which torque factor (0.8 N∙m∙kg\(^{-1}\)) and sprint duration (10 s duration) were manipulated such that all possible combinations of conditions were experienced by each participant. One hour before trials 2 - 9, participants ingested a gelatine capsule containing 5 mg∙kg\(^{-1}\) of either caffeine or placebo (maltodextrin).

RESULTS: There was a significant effect of torque factor on peak power output (PPO) (\(F_{1,12} = 188.3; p < 0.001\)), with higher values at \(T_{\text{OPTIMAL}}\) (mean difference: 168 W; 95% likely range: 142 - 195 W) There was also a significant effect of sprint duration on PPO (\(F_{1,12} = 11.4; p = 0.006\)), with values being higher in 10 s trials (mean difference: 52 W; 95% likely range: 18 - 86 W). However, there was no effect of supplementation on PPO (\(F_{1,12} = 4.5; p = 0.056\)). Nevertheless, there was a significant torque factor \(\times\) sprint duration \(\times\) supplement interaction (\(F_{1,12} = 5.5; p = 0.036\)), with post hoc tests revealing that caffeine produced a significantly greater PPO (mean difference: 76 ± 75 W; 95% likely range: 19 - 133 W) only when the sprint duration was 10 s and the torque factor was \(T_{\text{OPTIMAL}}\). CONCLUSIONS: The results of this study confirm previous reports of significant effects of torque factor and sprint duration on PPO. Moreover, when torque factor and sprint duration are optimised to allow participants to express their highest PPO there is a clear effect of caffeine on sprinting performance.

Purpose: The purpose of this study was to examine the effects of caffeine on an upper body resistance training strength workout using the barbell bench press. METHODS: Fifteen men (M ± SD; age: 23.1 ± 1.9 years; body mass: 89.1 ± 13.9 kg; height: 175 ± 6.1 cm), volunteered for three laboratory visits. During visit one, 1RM values were determined. For visit two, subjects consumed either 800 mg caffeine, or a placebo. Subjects then completed three sets of the barbell bench press to failure at 80% 1RM. Visit three was the same as visit two; however, participants consumed the opposite treatment as visit two.

RESULTS: Participants completed significantly more average repetitions per set for the barbell bench press in the caffeine condition (M ± SD = 4.80 ± 2.66 repetitions) compared to the placebo condition (M ± SD = 4.42 ± 2.56 repetitions).

Conclusions: These results suggest that caffeine has a positive ergogenic effect on upper body strength workout performance.

Purpose: The purpose of this study was to determine if caffeine in the form of coffee or Advocare’s Spark would increase performance in anaerobic exercise and isometric strength. METHODS: Subjects (N = 16) completed three testing sessions on non-concurrent days. Each trial consisted of a standard warm up followed by a 600 yard shuttle run, a maximal grip strength test, and an isometric front plank to exhaustion. The first trial was a control trial where caffeine was absent and served as a baseline. A cross over design was used, and subjects completed two additional trials: one with coffee and the other with Advocare’s Spark. The amount of caffeine given to each participant was 4 mg/kg body weight.

RESULTS: A MANOVA was run to determine if significant differences existed in isometric strength or anaerobic exercise with the use of Advocare’s Spark or coffee. The use of coffee or Advocare’s Spark showed no significant (p > 0.05) effect on 600 yard shuttle time when compared to the control trial (F = 1.256). (M=123.65 ± 5 ± 42.43 s; M=121.73 ± 3.84 ± 92.9 s; M=123.64 ± 37.39 ± 49.9 respectively)The use of coffee or Advocare’s Spark showed no significant (p > 0.05) effect on plank time to exhaustion when compared to the control trial (F = 2.347). (128.89 ± 60.30 ± 5; M=120.44 ± 53.54 s; M=111.10 ± 48.97 ± 5)The use of coffee or Advocare’s Spark showed no significant effect on grip strength when compared to the control trial (F = 1.289). (M=45.44 kg ± 12.90 ± 5; M=45.44 kg ± 14.02 ± 5; M=43.81 kg ± 14.02 ± 5, respectively).

CONCLUSIONS: The use of caffeine did not significantly increase performance in either anaerobic exercise or isometric strength. While many studies have shown that caffeine will have a positive effect on exercise performance, the present study may not have provided a great enough dose of caffeine to elicit a positive response. Caffeine consumption greater than 4mg/kg may be necessary to elicit improvements in anaerobic performance & isometric strength.

Purpose: The purpose of this study was to determine the effects of coffee or Advocare’s Spark on anaerobic performance and isometric strength. METHODS: Ten runners completed two experimental trials performed in acute conditions. Treatments were placebo or caffeine anhydrous power, separated by a washout time in both coffee and the placebo condition. A cross over design was used, and subjects completed two additional trials: one with coffee and the other with Advocare’s Spark. The amount of caffeine given to each participant was 4 mg/kg body weight.

RESULTS: Sweating rate (mL/min) was not different among placebo (16.1 ± 4.4 mL/min) and caffeine (12.9 ± 6.8 mL/min) groups (p=0.399). Moreover, time running (min) also does not show statistical difference, 46.8 ± 5.2 in placebo and 47.0 ± 6.3 in caffeine group (p=0.939).

CONCLUSIONS: Caffeine mouth rinse does not affect sweating rate and performance in runners.
Prior studies suggest that the -163 C>A polymorphism of the Cytochrome P450 (CYP1A2) gene influences the ergogenic effect of caffeine. Although this polymorphism has been known to influence the inducibility of hepatic CYP1A2 and the rate of caffeine metabolism, levels of caffeine and/or metabolites were not reported. Thus, a mechanistic link between the polymorphism and the ergogenic effect of caffeine is lacking. **Purpose:** The purpose of the present study was to determine if the CYP1A2 polymorphism (A>A homozygotes and C allele carriers) affected caffeine metabolism and subsequent performance. **Methods:** Twenty subjects participated in two 3-km cycling time trials with placebo (all-purpose flour) and caffeine (6mg/ kg body weight anhydrous caffeine) supplementation. ‘Slow metabolizers’ were characterized as possessing a ‘C’ allele (grouped AC heterozygotes, and CC homozygotes), and ‘fast metabolizers’ fast for the A allele. **Results:** C allele carriers had significantly higher serum caffeine after one hour (C allele carriers: 14.2 ± 1.8 ppm, AA homozygotes: 11.7 ± 1.7 ppm). While there was a main effect for caffeine ingestion on time trial performance, there was no caffeine x genotype interaction (C allele carriers: Placebo = 297 ± 20 sec, Caffeine = 292 ± 20 sec; AA homozygotes: Placebo = 318 ± 35 sec; Caffeine = 318 ± 22 sec). **Conclusions:** Results from this study suggest that C allele carriers have higher serum caffeine after one hour than AA homozygotes, consistent with the assertion that C allele carriers exhibit slower caffeine metabolism. These findings do not support a genetic influence on the ergogenic effect of caffeine in a 3km cycling trial.

**Differences in performance tests for strength or power could be attributed to the amount of lean body mass (LBM). So it may be important to report results of such tests not only relative to weight, but also relative to LBM. Depending on their proposed ergogenic mechanisms, discerning between absolute and relative strength may be even more important in dietary supplement research. **Purpose:** Previously, our lab examined effects of caffeine withdrawal and acute caffeine ingestion, while this current study investigated effects of caffeine withdrawal and acute caffeine ingestion, as well as the rate of caffeine metabolism, levels of caffeine and/or metabolites were not reported. Thus, a mechanistic link between the polymorphism and the ergogenic effect of caffeine is lacking. **Purpose:** The purpose of the present study was to determine if the CYP1A2 polymorphism (A>A homozygotes and C allele carriers) affected caffeine metabolism and subsequent performance. **Methods:** Twenty subjects participated in two 3-km cycling time trials with placebo (all-purpose flour) and caffeine (6mg/ kg body weight anhydrous caffeine) supplementation. ‘Slow metabolizers’ were characterized as possessing a ‘C’ allele (grouped AC heterozygotes, and CC homozygotes), and ‘fast metabolizers’ fast for the A allele. **Results:** C allele carriers had significantly higher serum caffeine after one hour (C allele carriers: 14.2 ± 1.8 ppm, AA homozygotes: 11.7 ± 1.7 ppm). While there was a main effect for caffeine ingestion on time trial performance, there was no caffeine x genotype interaction (C allele carriers: Placebo = 297 ± 20 sec, Caffeine = 292 ± 20 sec; AA homozygotes: Placebo = 318 ± 35 sec; Caffeine = 318 ± 22 sec). **Conclusions:** Results from this study suggest that C allele carriers have higher serum caffeine after one hour than AA homozygotes, consistent with the assertion that C allele carriers exhibit slower caffeine metabolism. These findings do not support a genetic influence on the ergogenic effect of caffeine in a 3km cycling trial.

Energy drinks have been consumed often in the field of sports to enhance power performance. However, the effects of energy drinks are inconsistent in previous studies. **Purpose:** To assess the effects of energy drinks on power performance using meta-analysis. **Methods:** Published English language studies were located from computerized searches of following databases: Academic Search Complete, Education Source, ERIC, MEDLINE, PsycINFO, SPORTDiscus, and Google Scholar. Studies meeting inclusion criteria were: 1) included caffeine containing energy drinks, 2) reported a quantitative measure of power, 3) reported on supplement intervention, 4) published in peer reviewed journals and/or forms of thesis and dissertation from January 2000 to May 2016. Keywords included ‘energy drink or red bull or caffeine drink’ and ‘power or performance’. Two investigators independently collected data from the search engines and coded data for verification. The studies were coded for methodological, participant and study characteristics. The Comprehensive Meta-Analysis version 2 software was used to compute effect sizes (ES) and 95% confidence interval (CI) using a random effects model. ESs were computed based on a comparison of change scores between pre- and post- intervention. Subgroup analyses were conducted to identify moderators (gender, subject type, and dosage of caffeine). **Results:** A total of 30 ESs were derived from the 10 selected studies for meta-analysis. The overall mean ES was small, but significant (Cohen’s d (ES) = 0.163, 95% CI = 0.04, 0.29). Subgroup analyses showed that ESs were not affected by any moderator variables. **Conclusion:** Results of the present analysis indicated that the consumption of energy drink slightly improves the power performance. Other moderating variables should be considered so that the effects of energy drink intake can be explored further.
Caffeine (CAFF) is the most consumed psychoactive substance in the world. About 74% of athletes during international competitions use CAFF to improve performance. However, its effect on muscle endurance (ME) is still controversial. Placebo (PLA) effect may also increase performance and interact with CAFF. However, its effect on muscle endurance (ME) is still controversial. Placebo (PLA) effect may also increase performance and interact with CAFF.

METHODS: 16 young men, age 21.4±2.9 yrs, body fat 17.2±4.0%, underwent six exercise sessions: one for familiarization, one as control and four experimental (BPD). At the first session, they were submitted to anthropometric measurements, CAFF consumption questionnaire and one repetition maximum test (1RM) in the parallel squat. At the second session they performed the ME test - 3 sets until exhaustion with 3 min interval between sets with 60%1RM. The last four sessions were: Session C/C: Subject told CAFF and given CAFF; Session C/P: Subject told CAFF but given PLA; Session P/C: Subject told PLA but given CAFF; Session P/P: Subject told PLA and given PLA. Subject was asked to stand in the middle of the test equipment and perform CAFF if they perceived a difference in muscle strength or muscular endurance. RESULTS: Caffeine was 93.9 ± 88.2 mg/day, 1RM was 134.7 ± 24.1 kg. CAFF did not increase the number of repetitions or total work (p<0.05) - table 1, nor a Bonferroni post-hoc - 5% level of significance.

RESULTS: To study the effects of CAFF and expectation of CAFF, participants were asked to perform one set of each movement at 80% of their 1-RM as many times as they could. Participants were given a minimum of 72 hours between each trial session. Significant differences were determined by using repeated measures ANOVA. There was no significant difference found between the last trial and placebo (Placebo 14.6±2.5, Caffeine 17.1±5.7, Pre-Workout 17.6±5.6 Reps) and chest press (Placebo 9.5±3.0, Caffeine 11.2±3.6, Pre-Workout 10.2±3.2 Reps) trials, however Caffeine and Pre-workout showed a significant (p<0.05) increase(43% for caffeine & 35% for pre-workout) in the number of repetitions performed in the leg press (Placebo 11.6±6.8, Caffeine 20.5±7.1, Pre-Workout 17.6±6.7 Reps) and row (27% for caffeine & 28% for pre-workout) (Placebo 14.5±5.2, Caffeine 19.7±5.6, Pre-Workout 20.0±7.0 Reps) trials. There was not a significant difference found between caffeine and pre-workout trials. CONCLUSION: This data suggests that both caffeine and pre-workout may have a positive effect on exercise performance in multiple muscle group movements, but was less effective in increasing muscular endurance in leg pull downs and chest press.

This study examined effects of caffeine (CAF) on power output (PO) selection and associated physiological responses during cycling at moderate and high intensities prescribed by RPE (10-1 scale). Participants (n=9) (VO2peak: 55.4 ± 6.32 mL · kg⁻¹ · min⁻¹) cycled for 20 min at RPE, and 20 min at RPE, separated by 10 min recovery following caffeine (CAF) (6 mg · kg⁻¹) and placebo (PLA) ingestion. PO, HR, serum lactate [L], VO2, V̇E, and RER were recorded every 5 min. Session RPE (S-RPE) was recorded following 10 min recovery. Repeated-measures ANOVA’s 2 (trial) x 4 (time) analysis was used to determine if caffeine and pre-workout significantly affected changes in associated physiological responses particularly at a higher intensity (RPE).

Studies on the benefits of caffeine to anaerobic exercise have varied designs and equivocal results. Previous work in our lab has demonstrated positive effects of caffeine using laboratory-based tests. PURPOSE: To study the effects of CAFF and expectation of CAFF on muscle strength and endurance, and reaction time. METHODS: Physically active, habitual caffeine consumers (n=50; 40 female, 10 male; age: 22.3±3; mass: 63.9±10.0 kg; average caffeine: 258±128mg) participated in a placebo-controlled intervention. All subjects abstained from caffeine for 72 hours prior to withdrawal testing (T1), supplemented with 5mg/kg of caffeine for 3 days and on the final testing day (T2) consumed 6mg/kg of caffeine or placebo (insoluble fiber) one hour before testing. Power was assessed using peak vertical jump height, while muscular strength and endurance were assessed using a handgrip dynamometer. Subjects performed three handgrip trials to determine their maximal voluntary contraction (MVC). They then performed an isometric hold and volitional failure at 40% of their respective MVC. Reaction time was measured using a commercial application for a tablet computer. Data are presented as means ± standard deviation and were analyzed with SPSS 22.0 using either independent or paired t-tests with an alpha of 0.05. RESULTS: Following four days of caffeine withdrawal, peak vertical jump height decreased from 17.49±3.70m to 17.00±3.56m (p<0.001). There was a trend for an increase in power output (calculated from vertical jump) in caffeine:

Previous research has suggested that both caffeine and pre-workout supplementation prior to resistance training may be able to lead to increases in muscular endurance and repetition number. Popular pre-workout supplements can be fairly costly whereas caffeine is an inexpensive supplement found in many natural plant sources. PURPOSE: This aim of this study was to compare the effectiveness of caffeine and pre-workout supplementation on resistance exercise performance. METHODS: Eighteen healthy young adults (12 males and 6 females, 22.4±1.7 years) were recruited to participate in four separate exercise sessions in which they performed the same workout which consisted of 4 exercises: legs press, chest press, row, and pull downs. On day 1 all participants performed a 1-repetition max (1-RM) test for that movement. On days 2-4 each subject was randomly given a placebo, caffeine (260mg) or pre-workout (N.O.-Xplode, BSN, Boca Raton, FL, United States). During each of these sessions participants were asked to perform one set of each movement at 80% of their 1-RM as many times as they could. Participants were given a minimum of 72 hours between each trial session. Significant differences were determined by using repeated measures ANOVA. RESULTS: There was no significant difference found between the last trial and placebo (Placebo 14.6±2.5, Caffeine 17.1±5.7, Pre-Workout 17.6±5.6 Reps) and chest press (Placebo 9.5±3.0, Caffeine 11.2±3.6, Pre-Workout 10.2±3.2 Reps) trials, however Caffeine and Pre-workout showed a significant (p<0.05) increase(43% for caffeine & 35% for pre-workout) in the number of repetitions performed in the leg press (Placebo 11.6±6.8, Caffeine 20.5±7.1, Pre-Workout 17.6±6.7 Reps) and row (27% for caffeine & 28% for pre-workout) (Placebo 14.5±5.2, Caffeine 19.7±5.6, Pre-Workout 20.0±7.0 Reps) trials. There was not a significant difference found between caffeine and pre-workout trials. CONCLUSION: This data suggests that both caffeine and pre-workout may have a positive effect on exercise performance in multiple muscle group movements, but was less effective in increasing muscular endurance in leg pull downs and chest press.

This study examined effects of caffeine (CAF) on power output (PO) selection and associated physiological responses during cycling at moderate and high intensities prescribed by RPE (10-1 scale). Participants (n=9) (VO2peak: 55.4 ± 6.32 mL · kg⁻¹ · min⁻¹) cycled for 20 min at RPE, and 20 min at RPE, separated by 10 min recovery following caffeine (CAF) (6 mg · kg⁻¹) and placebo (PLA) ingestion. PO, HR, serum lactate [L], VO2, V̇E, and RER were recorded every 5 min. Session RPE (S-RPE) was recorded following 10 min recovery. Repeated-measures ANOVA’s 2 (trial) x 4 (time) analysis was used to determine if caffeine and pre-workout significantly affected changes in associated physiological responses particularly at a higher intensity (RPE).
**Board #256**  
May 31 3:30 PM - 5:00 PM  
**Effects Of Individualized NaHCO3 Ingestion On Peak Alkalosis**  
Lars R. McNaughton, FACSM, Andy Sparks, Sanjoy Deb, Lewis Gough. Edge Hill University, Ormskirk, United Kingdom. 
Email: lars.mcnnaughton@edgehill.ac.uk  

(NO relationships reported)

**PURPOSE.** Recently it has been suggested, that an individualised sodium bicarbonate (NaHCO3) ingestion strategy might be the most appropriate method to elicit a state of peak alkalosis. Such a strategy can then be used to “march up” time to peak alkalosis with the performance required. However, such ingestion strategies have displayed large inter-individual variation (range 10-180 min). Hence, if such a strategy is to be practically applied, the blood analyte response needs to be reproducible. This study aimed therefore, to evaluate the reproducibility of blood pH, HCO3, and Na+ following acute NaHCO3 ingestion on more than one occasion. **METHODS.** Fifteen team sports players completed six randomised trials entailing ingestion of 0.2 g.kg-1 BM NaHCO3, twice (SB2C2aA and B), 0.3 g.kg-1 BM NaHCO3, twice (SB3C3aA and B), or two control trials (CON1A and B) on separate days. Blood analysis included pH, HCO3, and Na+ prior to and at regular time points following NaHCO3 ingestion over a three hour period. **RESULTS.** Compared to pH, a greater relationship for HCO3, in both time to peak (SB2C2 = 0.772, P = 0.003, SB3C3 = 0.942, P < 0.001; pH SB2C2 = 0.618, P = 0.044 SB3C3 = 0.712, P = 0.016) and absolute change (HCO3: SB2C2 = 0.890, P < 0.001, SB3C3 = 0.755, P = 0.008; pH SB2C2 = 0.422, P < 0.001, SB3C3 = 0.624, P = 0.041) was observed. **CONCLUSIONS.** The results indicate that both time to peak and absolute change in HCO3 are more reliable when compared to time to peak pH. Future work should utilise an individualised NaHCO3 ingestion strategy based on HCO3 responses and evaluate the effects on exercise performance.

**Board #258**  
May 31 3:30 PM - 5:00 PM  
**The Influence of Alkalosis on Muscle Force and Power in the Triceps Surae and Brachii**  
Jason Siegler, FACSM, Paul Marshall, Kurt Muldie. Western Sydney University, Sydney, Australia. 
Email: j.siegler@westernsydney.edu.au  

(NO relationships reported)

The effect of metabolic alkalosis on fibre-specific maximal force production and rates of force development (RFD) has been previously investigated in animal models, with evidence suggesting an improved capacity to rapidly develop force in fast- compared to slow-twitch muscle. To date, the fibre-type dependent findings related to pH and rapid force generation have not been replicated in the exercising human. **PURPOSE:** To model in vivo the fatigue profile of voluntary and involuntary maximal force and rate of force development in the triceps’ surae and brachii after sodium bicarbonate (NaHCO3) ingestion. **METHODS:** In a double-blind, 3-way repeated measures design participants (n=10) ingested either 0.3 g kg−1 NaHCO3 (ALK) or equivalent calcium carbonate (PLA) prior to 2-min of continuous (1Hz) supramaximal stimulation (300ms at 40Hz) of the triceps’ surae or brachii, with maximal voluntary efforts (MVT) coupled with direct muscle stimulation also measured at baseline, 1-min and 2-min. **RESULTS:** Metabolic alkalosis was achieved in both ALK trials but was not different between muscle groups. Regardless of condition, involuntary torque declined nearly 60% in the triceps brachii (p < 0.001) and 20% in the triceps surae (p < 0.001). In all trials there was a significant decline in normalised involuntary RFD (p < 0.005) with RFD declined nearly 28% but was not different between conditions (p < 0.01), and although declining nearly 21% in voluntary RFD (p < 0.05) there was no difference between PLA and ALK in either muscle group (p = 0.93). **CONCLUSION:** NaHCO3 exhibited no effect on the fatigue observed between representative fibre-type muscle groups on maximal voluntary and involuntary torque or rates of torque development during and after 2-min of tetanic stimulation.
**B-72** Exercise is Medicine®/Poster - EIM - Health Professionals and Vital Signs

Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall II

1081 Board #260 May 31 2:00 PM - 3:30 PM Evaluation Of Exercise is Medicine From The Perspective Of Fitness Professionals

Taniya S. Nagpal, Liza Stathokostas, Harry Prapavessis, Michelle F. Mottola, FACSM. University of Western Ontario, London, ON, Canada.

Email: tnagpal@uwo.ca

(No relationships reported)

**PURPOSE:** Exercise is Medicine (EIM) promotes physicians prescribing exercise and referring patients to fitness professionals (FP). Early focus in research has been on improving the knowledge of physicians on how to prescribe exercise and encouraging physicians to refer patients to FPs, however the receiving end of the referral procedure has not been examined. This mixed method pilot study aimed to identify level of awareness for FPs regarding EIM initiatives and whether a brief educational session enhanced that level of awareness. The second aim was to engage FPs in dialogue to indicate barriers to and enablers of the exercise prescription and referral procedure.

**METHODS:** Twelve certified personal trainers employed at a university campus recreation facility with an active EIM on campus group, were recruited to participate in an EIM information session and filled out a pre-information session questionnaire on EIM goals, mission, and contents of the exercise prescription pad. A 15 minute EIM information session was provided and then the same questionnaire was completed again. Immediately after the information session personal trainers participated in a focus group to indicate if problems exist and discuss solutions regarding the EIM goal of engaging FPs and physicians to implement exercise prescription and referrals in the health care system.

**RESULTS:** Average score on the pre-information questionnaire (7 questions) was 30% which significantly improved to 82% (p<0.05) after the information session. Thematic analysis of the focus group identified four suggestions: increase communication opportunities between physicians and FPs, increase promotion of EIM to both physicians and FPs, add progression and follow-up details to the EIM prescription pad and increase educational opportunities about EIM for all staff employed at a recreational facility.

**CONCLUSION:** EIM should consider increasing opportunities to educate FPs about the EIM initiative so they are better prepared to receive patients referred to exercise and can engage with physicians to promote EIM. Furthermore, by incorporating the suggestions of FPs to enhance the exercise prescription and referral procedure, the effectiveness of EIM for increasing physical activity levels in all populations can improve.

1082 Board #261 May 31 2:00 PM - 3:30 PM Physical Activity Levels and Counseling Practices of Physicians & Patients in a Chilean Sports Medicine Clinic

Sandra Mahecha Matsudo, Guillermo Droppelmann, Fernando Gonzalez. Clinica MEDS Sports Medicine, Santiago, Chile.

Email: Sandra.mahecha@meds.cl

(No relationships reported)

**PURPOSE:** Promoting physical activity (PA) among physicians and patients is one of the main pillars of Exercise is Medicine® (EIM). The purpose of this study was to evaluate the PA levels of physicians and their patients in a private sports medicine clinic in Santiago, Chile, in which a printed PA prescription and a small box recommending PA as a “medicinal”, are delivered to all patients.

**METHODS:** This study examined responses from 65 physicians (75% orthopedic surgeons) and 2,688 patients. Physicians answered the short IPAQ and questions regarding how often, and how, they recommend PA to their patients. Patients (59.5% men; 40.5% women) between 25-65 years of age) answered an online survey with questions regarding the frequency and duration of their weekly PA levels.

**RESULTS:** A small percentage of patients (26.5%) reported practicing PA five or more days per week with 86.7% reporting 30-90 minutes per day. Results from the physicians showed that just 26.1% reached the recommendation of at least 150 min/week of PA, and 38% reported not performing any resistance exercise. The median time sitting and attending patients was 3 hours per day. Median frequency of moderate and vigorous PA was 2 days/week for a duration of 45 minutes and 2 days/week and 30 minutes/day, respectively. In regards to their PA counseling attitudes and practices, 66% of the physicians considered it their responsibility to help their patients become physically active; 55% agreed that if they were physically active themselves they will have better capacity to counselling PA, and 46% of the physicians evaluating the PA levels of their patients and always recommending PA for them. Although 89% of the physicians in the clinic agreed to use PA prescription with their patients, just 50% delivered a written PA prescription.

**CONCLUSIONS:** From this study, we conclude that physicians who are regularly involved with patients in a sports medicine clinic are aware of the importance of evaluating the PA levels of their patients, but that they need to improve their regular practice of prescribing PA to their patients.
least one change to practice (205 change statements) and 71% proposed two or more changes to practice (155 change statements). Physicians who completed baseline and follow-up questionnaires (n=46) provided recommendations regarding changes to practice, including prescribe exercise (27%) and discuss PA in more depth (26%). At follow-up, (n=46) physicians provided 88 statements regarding actual changes to practice. 46% of statements were reflective of at least one of the proposed changes and 40% reflecting changes that were different than originally proposed.

**CONCLUSION:** Providing a comprehensive workshop improved physicians’ confidence and support for PA counseling, reduces impact of barriers and effectively changes physician’s practices.

Support provided by the Lawson Foundation

The Exercise is Medicine™ initiative utilizes three questions that subjectively indicate how many minutes per week an individual engages in physical activity. The reported amount of activity is subsequently classified as a vital sign based on the association between the amount of physical activity and morbidity and mortality. However, there is little research on how to objectively measure cardiorespiratory fitness within a clinical setting. Limitations exist with current valid step tests regarding major barriers to practice settings: administration time and fixed step heights and step rates unable to accommodate various fitness levels and musculoskeletal limitations.

**PURPOSE:** To determine the validity of a brief, submaximal, variable height, step test used to predict VO2max.

**METHODS:** Healthy participants aged 18-65 were recruited to perform a 4 minute step test that consisted of stepping for 1 minute successively on steps that were 6, 8, 10, and 12 inches in height. Following each minute, the heart rate of the participants was recorded. The participants then performed a VO2max test on a treadmill. Multivariable regression analysis was used to develop a predictive model of VO2max from the step test. The variables included in the multivariable regression equation were gender, BMI, steps/min, and avg. HR for the 4 steps. **RESULTS:** A total of 113 participants were included in this study .67 men (age = 24.3±5.93 yr, BMI = 25.7±4.00, VO2max = 44.69±7.82) and 46 women (age = 24.7±7.62 yr, BMI = 23.5±0.32, VO2max = 36.63±5.57). The model explained 55% of the variance in VO2max (R = 0.74, p = 0.0001). **CONCLUSION:** The model was an accurate predictor of VO2max for this sample. Further investigation will aim to enhance the generalizability of the test through targeting older age groups.

**CONCLUSIONS:** The use of exercise in TCM had long history. Until now, doctors and sports experts worked together to make it perfectly, and to jointly promote the project of EIM. Supported by MOST-China(2016YFC1300202)

**Board #266**

**May 31 2:00 PM - 3:30 PM**

**Validation Of A Multi-staged Step Test For Measuring Fitness As A Clinical Vital Sign**

Tyler Gossett, Terry Shepherd, Robert Powell, Saurabh Mehta. Marshall University, Huntington, WV.

Email: gossett@marshall.edu

(Relationships not reported)

The network of exercise medicine (EIM) has been established in 2007 in the United States to bring the philosophy of “Exercise Is Medicine™” to patients. EIM utilizes three questions that subjectively indicate how many minutes per week an individual engages in physical activity. The reported amount of activity is subsequently classified as a vital sign based on the association between the amount of physical activity and morbidity and mortality. However, there is little research on how to objectively measure cardiorespiratory fitness within a clinical setting. Limitations exist with current valid step tests regarding major barriers to practice settings: administration time and fixed step heights and step rates unable to accommodate various fitness levels and musculoskeletal limitations.

**PURPOSE:** To determine the validity of a brief, submaximal, variable height, step test used to predict VO2max.

**METHODS:** Healthy participants aged 18-65 were recruited to perform a 4 minute step test that consisted of stepping for 1 minute successively on steps that were 6, 8, 10, and 12 inches in height. Following each minute, the heart rate of the participants was recorded. The participants then performed a VO2max test on a treadmill. Multivariable regression analysis was used to develop a predictive model of VO2max from the step test. The variables included in the multivariable regression equation were gender, BMI, steps/min, and avg. HR for the 4 steps. **RESULTS:** A total of 113 participants were included in this study .67 men (age = 24.3±5.93 yr, BMI = 25.7±4.00, VO2max = 44.69±7.82) and 46 women (age = 24.7±7.62 yr, BMI = 23.5±0.32, VO2max = 36.63±5.57). The model explained 55% of the variance in VO2max (R = 0.74, p = 0.0001). **CONCLUSION:** The model was an accurate predictor of VO2max for this sample. Further investigation will aim to enhance the generalizability of the test through targeting older age groups.

**Board #267**

**May 31 2:00 PM - 3:30 PM**

**Exercise Vital Sign Correlates With New Diagnosis of Depression**

Robert E. Sallis, FACSM. Kaiser Permanente Medical Center, Fontana, CA.

Email: robert.e.sallis@KP.org

(Relationships not reported)

Kaiser Permanente in Southern California (KPSC) has pioneered use of an exercise vital sign (EVS) to record minutes per week of PA at every visit. Given the established connection between regular PA and depression, it stands to reason that patients who report doing recommended amounts may be less likely to suffer from a new diagnosis of depression than those who report being sedentary.

**PURPOSE:** To evaluate the correlation between self-reported PA level (using EVS) and the likelihood of being diagnosed with clinical depression.

**METHODS:** Data were abstracted from electronic medical records of adult KPSC members (N=1,077,140) in a cohort study to investigate use of an EVS in predicting a new diagnosis of depression. The cohort consisted of all adult patients (+18 yr) with a minimum of 3 EVS measurements during the study period. EVS were collected at each visit using the exercise vital sign (EVS) tool. Data were collected from January 1, 2009 to December 31, 2011, that did not have a prior diagnosis of depression before the date of their last EVS measurement. Patients were classified into 1 of 3 distinct categories for EVS; Consistently Sedentary (CS) EVS=0 min/wk for every measure), Insufficiently Active (IA) EVS 10-149 min/wk) and Consistently Active (CA) EVS=150 min/wk for every measure). Estimates were adjusted for age, gender, race, marital status, education level and Charlson comorbidity score. Results are presented as odds ratios (OR) with corresponding 95% confidence intervals (CI).

**RESULTS:** Patients who were CA were 20% less likely to be diagnosed with depression compared to CS patients (OR (CI) = 0.80 (0.86, 0.90)), while IA patients were found to be 12% less likely (OR = 0.88 (0.78, 0.82)). In addition to low EVS, other risk factors for depression were female gender, race (Hispanic>White>Black>Asian), Unmarried status, lower education level and higher Charlson comorbidity score.
CONCLUSIONS: We conclude that self-reported PA is strongly correlated with the likelihood of suffering a new diagnosis of depression. For this reason, any patient presenting with symptoms suspicious for depression should be asked about their exercise habits and a low EVS should add to the clinical suspicion for depression.

RESULTS: were run between the variables while controlling for age and sex. Significance was set who are CS.

Background: It is well established that >150 minutes of weekly physical activity significantly improves health status and Kaiser Permanente Southern California (KPSC) has pioneered the use of an Exercise Vital Sign (EVS) to record Physical Activity (PA). However, there is less data on exercise and impact on healthcare utilization. Purpose: To evaluate the correlation of EVS and healthcare utilization, in our SCKP patient population. Specifically, do those patients who report consistent exercise for >150 minutes per week have reduced utilization of the health care system.

Methods: KPSC Electronic Health Record data was abstracted to determine 3 cohorts of adults (18-65yrs) (N=2,534,985) who were Consistently Sedentary (CS) (EVS<0min/week consistently), Insufficiently Active (IA) (EVS=1-149min/week), or Consistently Active (CA) (EVS>150min/week consistently), meeting the World Health Organization recommendations. Each cohort had at least 3 encounters and self-reported EVS that were consistent. Each cohort was then compared to their health care utilization over a 1, 3, and 5 year period. Because KPSC is a closed system we were able to accurately capture utilization of pharmacy, hospital, radiology, laboratory and outpatient departments. Data was adjusted for age, gender and ethnicity. Results: Compared to CS patients, CA patients have consistently lower use of the KPSC health care system. This relationship held true across the 1, 3 and 5 year analysis of note patients who were CA were 75% less likely to be hospitalized (OR 0.23-0.26), 43% less likely to use the ER (OR 0.55-0.58) and 45% less Urgent Care services (OR 0.54-0.56), 25% less laboratory blood draws (OR 0.73-0.74), and 27% less pharmaceuticals fills (OR 0.71-0.74). Other factors that were associated with lower health system utilization were female gender, caucasian ethnicity and Conclusion: Based on EVS data, and analysis of health utilization we conclude that CA individuals have significantly lower utilization of the health care system than those who are CS.

Current adverse components of aging include the increase in both cognitive impairment and the incidence of dementia. Previous studies have shown positive associations between physical activity and the prevention and treatment of cognitive impairment and dementia. The PURPOSE of the present study was to identify correlates among physical activity, physical function, and cognition in independent older adults.

METHODS: In 77 older adults (77±7.8 years), self-reported physical activity (Community Healthy Physical Activities Model Program for Seniors, CHAMPS), cognitive function (Addenbrooke’s Cognitive Examination-Revised, ACE-R), and physical function (Six Minute Walk Test, 6MWT, Short Physical Performance Battery, SPPB, and Grip Strength) were measured. Partial correlation were run between the variables while controlling for age and sex. Significance was set to p < 0.05. RESULTS: The mean values±standard error (SE) for the physical function variables were: CHAMPS: 202±130 kcal·wk⁻¹ of moderate-to-vigorous physical activity; 6MWT (distance): 417±14 m; and grip strength: 27.0±1.1 kg. The average score on the ACE-R was 91.6±5.0 out of 100 (≥88 = 94% specificity for dementia). Age was correlated with ACE-R (r = -0.59, p < 0.05). When controlling for age and sex, ACE-R was correlated with SPPB performance (r = 0.39, p < 0.05), 6MWT power (r = -0.26, p < 0.05). ACES-R was not correlated with self-reported physical activity (r = 0.14, p > 0.05). CONCLUSIONS: Although previous research has shown positive associations between physical activity and cognitive function, our preliminary data do not support these previous findings. However, indices of physical function, as measured by three standard clinical tests, were associated with cognitive function in this population of independent older adults.

RESULTS: These data demonstrated that a low dose of caffeine and moderate exercise had no impact on selective attention.

METHODS: Five older (60 ± 7 years), adults (3 males, 2 females) participated in three separate laboratory sessions. During the first visit, subjects underwent a submaximal cycling task (YMAC) to predict maximal oxygen consumption (VO_{max}) and were allotted time to practice the Stroop Color Word Task (SCWT). For the next two visits, subjects reported to the Laboratory in the post-absorptive state. Upon arrival subjects rested for 5 min then completed the SCWT. Two pieces of chewing gum (CAFF vs. PLA) were then administered in a counterbalanced, double blind manner. Following gum administration subjects rested for 10 min, performed a standard warm-up, and then cycled for 30 min at constant wattage (workload corresponding to 60% predicted VO_{max}). Subjects rested for 5 min then completed the SCWT

RESULTS: Stroop Color Word Task Interference Scores (SCWT-INF) were calculated and used as an indicator of selective attention. A preliminary analysis of variance (ANOVA) demonstrated that SCWT-INF remained unchanged from baseline to post exercise (2.7 ± 2.8 vs. 3.4 ± 2.5 respectively, p = 0.759). Further, SCWT-INF were similar across treatments (caffeine versus placebo, 6.3 ± 3.2 vs. 7.0 ± 3.2 respectively, P = 0.196) and no treatment by time interaction was evident (p = 0.703).

CONCLUSIONS: These data established that a low dose of caffeine and moderate exercise had no impact on selective attention.

METHODS: Seven factors of burnout were derived and analyzed based on the subjects’ responses to a validated anonymous online survey. This research was analyzed through exploratory analysis with an eigenvalue set at 1.00 using varimax rotations. These seven factors retained 75.99% of total variance which were accounted for and explained by the factors success (1), accomplishment (2), fatigue (3), apathy (4), awareness (5), appreciation (6), and lack of marketing (7). An independent t-test and a one-way ANOVA were conducted to determine a significant difference in response between genders.

RESULTS: Profile analysis/one way repeated measures analysis of variance of the seven factors indicate statistical significance and efficacy based on the Partial eta² of 0.489 using the Lower-bound being 49% of the total variance explaining the differences among the seven factors. Across all factors, factors 5 and 7 scored the highest means, which indicated the most significant impact of burnout while factors 1 and 2 demonstrated the least impact. Both the independent t-test and the one-way ANOVA found no significant (p < 0.05) differences in responses to factors 1 (6.15), 2 (6.11), 3 (8.20), 4 (6.33), 5 (7.60), 6 (8.54), and 7 (3.69) between genders.

CONCLUSIONS: Based on the profile analysis, the common underlying factors in this research investigation narrowed down to “Awareness” and “Lack of Marketing” in U.S. race walking. This represents crucial components to the declining state of elite-level race walking as well as the most significant impact of burnout in former/retired female and male elite-level race walkers in the U.S. The results of this project will assist in identifying influential factors of burnout, hence improving the future of the sport in the U.S. The continuation of research on elite-level race walking burnout is imperative for the growth of the sport and the well-being of these athletes.
PURPOSE: To assess the differences of influence of acute bouts of aerobic, resistance and badminton on the cognitive control measured by Stroop task.

METHODS: Twenty-five men (age: 20.8 +/- 1.0 yrs, height: 173.8 +/- 3.9 cm, weight: 73.8 +/- 11.7 kg) and 20 women (age: 20.3 +/- 1.0 yrs, height: 156.6 +/- 4.0 cm, weight: 50.1 +/- 6.0 kg) performed an incremental treadmill running test to determine peak oxygen consumption (VO2peak). On subsequent days, the participants underwent four counterbalanced an intervention consisting of 10 min of either walking, resistance exercise, badminton and seated rest control. A matching type Color-Word Stroop test (writing) consisting of a neutral condition and an incongruent condition was completed before and 8 min after each session. Oxygen consumption (VO2) was measured during 4 sessions. Stroop task performance (scores) in both of the neutral and the incongruent condition were compared by 2-way ANOVA model in mixed model, two factors were sessions (4 levels) and time (2 levels), respectively.

RESULTS: Intensities of walking, resistance exercise, badminton and seated rest control were 45%+/-10%, 41%+/-7%, 74%+/-11% and 97%+/-1.7%VO2peak, respectively. For the neutral condition scores, the interaction was not significant (P = 1.08) although the main effect of time was significant (P < 0.001). For the incongruent scores, ANOVA model indicated significant in the main effect of time (P < 0.001) and the interaction (P = 0.012), badminton significantly improved scores larger than seated rest control (P = 0.021). Differences between walking, resistance exercise and seated rest control were not significant (P ≥ 0.477).

CONCLUSIONS: These results indicate that complex and high-intensity exercise, such as badminton appear to improve cognitive function relative to low-intensity simple aerobic exercise and anaerobic exercise.

Although previous studies have demonstrated that regular participation in open- and closed-skilled exercise could produce distinct benefits on neurocognitive performances in the elderly, these cross-sectional studies cannot establish causality and obviate the need for long-term longitudinal studies. The primary aim was to assess the effects of an aerobic exercise intervention on episodic memory and cognitive control in individuals with and without MDD. PURPOSE: To determine the chronic effect of poomsae taekwondo routines and fighting training programs on WM variables in sedentary schoolchildren.

METHODS: Forty-eight participants (25 males and 23 females, mean age 11.0 +/- 0.9 yrs) were paired by gender and randomly allocated to either a fighting (60-min taekwondo fighting exercises including a 10-min aerobic warm up, 40-min of technical and tactical fighting exercises and 10-min cool down stretching exercises per session), a poomsae (60-min taekwondo poomsae including a 10-min aerobic warm up, 40-min of the first and second progressive poomsae taeguk standardized routine and 10-min cool down stretching exercises per session), or a control (no practice of taekwondo) group. Participants in the experimental fighting and poomsae groups performed two training sessions per week during six weeks. In both groups the exercises were taught by a black belt taekwondo expert. WM was determined using the Words Backward (WBT), Digits Forward (DFT) and Digits Backward Tests (DBT) at the beginning (pre-test) and six weeks after (post-test) training.

RESULTS: Two-way analysis of variance with repeated measures on one factor (time) revealed a statistically significant between-group interaction on WM measured by WBT (p = 0.009). A significant interaction was found between fighting and control groups over time (p = 0.024), and poomsae and control groups over time (p = 0.005). Follow-up simple effects tests revealed differences for time in the fighting (pre-test = 24.20 +/- 6.27 vs. post-test = 26.53 +/- 5.07) and poomsae (pre-test = 22.53 +/- 4.72 vs. post-test = 26.47 +/- 2.75) groups. No differences were observed in the control group (pre-test = 23.11 +/- 6.51 vs. post-test = 22.67 +/- 6.74). Cohen’s d effect size was considered high in poomsae (Δ = 0.83) and moderate in the fighting (Δ = 0.48) group. No between-group interactions were found on DFT (p = 0.674) and DBT (p = 0.206) scores.

CONCLUSIONS: Taekwondo training improves working memory in sedentary Costa Rican children; poomsae has higher positive effect than fighting exercises.
of cognitive function, in addition to reducing depressive symptoms. These benefits occurred without a change in fitness, suggesting other psychobiological mechanisms of action.

Physical arousal coinciding with periods of memory consolidation facilitates long-term memory storage. Unknown is the role of exercise type on long-term memory. PURPOSE: To evaluate the effects of two types of acute exercise on young adults’ immediate and delayed psychomotor learning.

METHODS: 30 young adults (22.9 yrs, F = 73.3%) were randomly assigned to one of three conditions: Control, Simple Step Dance, or Complex Step Dance. Participants practiced a manual pursuit-rotoor tracking task for 5 blocks of 10 trials and then engaged in 10-min of either seated rest, a simple Dance-Dance Revolution (DDR) type exercise, or a complex DDR exercise. Psychomotor learning was assessed in a single block of 10 trials administered immediately, 24 hours, and 7 days following exercise or rest. Exercise intensity was measured by the Borg Perceived Exertion Scale, administered at minute 3, 5, 7 and 10.

RESULTS: For each participant, difference scores were calculated based on average time-on-target during the last block of training and during each retention test. A 3 (Group: Rest, Simple DDR, Complex DDR) X 3 (Time: Immediate, 24-hr, 7-day) analysis of variance revealed a significant Group X Time interaction (F(2, 54) = 3.11, p = 0.02). Planned contrasts revealed that at 24-hr, both exercise types significantly increased time-on-target performance (Simple DDR = 2.62 sec; Complex DDR = 2.84 sec), compared to rest (2.03 sec); at 7 days, performance improved for those in the complex DDR condition (4.60 sec) compared to the simple DDR condition (3.20 sec) and rest condition (1.67 sec). Ratings of perceived exertion differed between the exercise groups only at the end of exercise.

CONCLUSION: The results support prior research showing that psychomotor memory is enhanced when practice is followed by acute exercise and suggest that physical arousal enhances memory consolidation. The results add to the research findings by showing that the type of exercise differentially affects memory consolidation, with exercise involving complex cognitively-demanding movements producing greatest benefits.

CONCLUSIONS: Stressful prolonged running increases muscle pain. Compared with whey protein, alpha-lactalbumin elevates PPT in muscle and potentially enhances the feeling of vigor during short term exercise recovery.
Phy loads were strongly, >0.70, negatively correlated with PA (r = -0.557; p = 0.016). The associations were stronger for males than females. For males, vitD levels were associated with GLU, TG, %BF, and android/gynoid (A/G) ratio. Males had stronger associations of vitD levels and disease risk factors than females. For males, vitD levels were correlated with GLU (r = -0.375; p = 0.027) and %BF (r = -0.425; p = 0.001). 70% of subjects in low PA group were vitD deficient or insufficient vs. 51.5% and 41.4% for moderate and high PA groups, respectively. A strong association was found between vitD status and the time of year vitD levels are measured (p = 0.036). CONCLUSIONS: Low vitD status is associated with risk factors for disease. Low vitD status is more likely during the winter months due to low sun exposure. Individuals would benefit from sufficient vitD intake in regards to overall health and reduced risks for chronic disease.

Acute stretching improves affective states and cognitive function In physically inactive people.

Mizuki SUDO, 1920001, Soichi ANDO, Yuki TOMIGA, Toshinya NAGAMATSU. 1Physical Fitness Research Institute Meiji Yasuda life foundation of health and welfare, Tokyo, Japan. 2University of Electro-Communications, Tokyo, Japan. 3Fukusaku University, Fukuoka, Japan. (Sponsor: David C. Poole, FACSM) (No relationships reported)

Physical inactivity appears to have negative effects on affective states and cognitive function, whereas acute exercise has beneficial effects on them. Stretching is a common activity used in a physical fitness program. In the present study, we hypothesized that acute stretching is beneficial to affective states and cognitive function in physically inactive people. PURPOSE: To test the specific hypothesis that acute stretching improves affective states and cognitive function in physically inactive people. METHODS: Nineteen sedentary young subjects participated in the present study. They were randomized to stretching condition (SC) and resting condition (RC) in a cross-over manner. The stretching program was 10-min whole body stretching using yoga techniques and poses. Before and after stretching or resting, they performed the Stroop task and completed the Short form of Profile of Moods Scale (POMS). Saliva samples were also collected to determine salivary cortisol levels. During the cognitive task, middle cerebral artery mean velocity (MCA Vmean) were monitored.

RESULTS: In the SC, we observed a reduction in depression-depression score (pre 3.32/-3.53 vs. post 2.05/-3.03, p = 0.02) and an increase in vigor score (pre 4.63/-3.58 vs. post 6.68/-4.50, p = 0.03). In the RC, we found no changes in depression-depression score (pre 2.63/-2.93 vs. post 2.58/-3.15 or vigor score (pre 5.21/-4.02 vs. post 5.05/-4.21). The Stroop-interference, which was calculated by subtracting reaction time (RT) in the neutral trials from RT in the incongruent trials, decreased in the SC (pre 33 +/-40 ms; post -23 +/-49 ms, p < 0.001). In contrast, the Stroop-interference did not change in the RC (pre 11 +/-38 ms; post -2 +/43 ms). Stretching did not affect MCA Vmean during the cognitive task (SC; pre 52.2+/16.7 cm/s, post 51.2+/15.2 cm/s, RC; pre 50.7+/10.3 cm/s, post 48.2+/9.4 cm/s) or the salivary cortisol levels (SC; pre 0.15 +/-0.06 µg/dL, post 0.13 +/-0.05 µg/dL, RC; pre 0.16 +/0.07 µg/dL, post 0.14 +/-0.04 µg/dL). CONCLUSION: Acute stretching improved affective states and cognitive function, but did not affect the measured physiological variables. Acute stretching seems to improve cognitive function in physically inactive individuals, possibly via improved affective states.

Vitamin D Status: Associations with Chronic Disease Risk Factors and Cognitive Function

David A. Ross, Steven L. Ferguson, Allen Knehrnas, Mark A. Anderson, Randa Shehab, Debra A. Bemben, FACSM, Michael G. Bemben, FACSM. University of Oklahoma, Norman, OK. (Sponsor: Dr. Michael G. Bemben, FACSM) (No relationships reported)

Vitamin D deficiency has become commonplace in US adults, and has been linked to increased risks of chronic diseases. Decreased cutaneous vitD2 synthesis, low sun exposure, and other risk factors put older adults at higher risks of vitD deficiency. Identifying and correcting a low vitD status may be an easy way for individuals to improve health and reduce their risks for disease. PURPOSE: To investigate the relationship between current vitD status and risk factors for numerous diseases in older men and women from the VA-funded VA Women’s Health Interventions (VAWHI) Study. METHODS: Seventy-two (72) recreationally active older individuals aged 50-70 years completed medianial history, food frequency, sun exposure, and IPAQ questionnaires, and had fasting blood drawings and lip panel, glucose, and vitD values measured. Testing included measures of height, weight, waist circumference, peripheral blood pressure, central blood pressure, arterial stiffness, % body fat, and chronic inflammatory function. Two-way ANOVA (P, gender) was used to determine group difference for all measures based on PA and gender. Pearson correlation coefficient was used to explore differences between vitD levels and disease risk factors. Results: One-way ANOVA was used to measure differences across three levels of vitD status (deficient, insufficient, sufficient) for each risk factor for disease. Significance was set at p<0.05. RESULTS: Low vitD status was found to be associated with high GLU, TG, %BF, and android/gynoid (A/G) ratio. Males had stronger associations of vitD levels and disease risk factors than females. For males, vitD levels were moderately, negatively correlated with PSP (r = -0.557; p = 0.016), PmeanP (r = -0.496; p = 0.036), CSR (r = -0.534; p = 0.022). For females, weak, non-significant correlations were found between vitD levels and GLU (r = -0.386; p = 0.004), TG (r = -0.296; p = 0.030), A/G ratio (r = -0.425; p = 0.001). 70% of subjects in low PA group were vitD deficient or insufficient vs. 51.5% and 41.4% for moderate and high PA groups, respectively. A strong association was found between vitD status and the time of year vitD levels are measured (p = 0.036). CONCLUSIONS: Low vitD status is associated with risk factors for disease. Low vitD status is more likely during the winter months due to low sun exposure. Individuals would benefit from sufficient vitD intake in regards to overall health and reduced risks for chronic disease.

The Influence of Hydration on Childhood Cognitive Control

Daniel R. Westfall1, Sasha Barnett2, Alicia R. Covello3, Jeanne H. Bottni4, Erica T. Perri5, Naiman A. Khan6, Charles H. Hillman7. 1Northeastern University, Boston, MA. 2Washington State University, Pullman, WA. 3University of Illinois, Urbana, IL. 4Danone Research, Palaiseau, France. Email: westfall@husky.neu.edu (No relationships reported)

Converging evidence indicates that health behaviors during childhood impact cognitive control (CC). However, the influence of water intake or hydration on specific aspects of CC remain understudied. This is concerning since recent epidemiological data demonstrates that ~55% of children in the United States are inadequately hydrated. Therefore, experimental studies are needed to delineate the influence of markers of hydration and changes in water intake on childhood CC.

PURPOSE: The current study aimed to: 1) assess the effects of changes in water consumption on modulation of CC among preadolescent children; and 2) elucidate the within condition relationships between urinary markers of hydration and children’s CC.

METHODS: A counter-balanced cross-over design was utilized whereby 9-10-year-olds (N=26, 11 females) underwent high (HIGH, 2L/d) and low (LOW, 1L/d) water intake conditions for 4d. Following each condition, children completed a modified flanker task to assess attentional inhibition, an important component of CC. Urine osmolality was measured using pooled samples collected during the 24-h period (24-h Uosmol) preceding cognitive testing.

RESULTS: There was a significant difference (p<0.01) in 24-h Uosmol between the HIGH (393mOsm/kg ± 168) and LOW (787mOsm/kg ± 206) conditions. There were no significant effects of condition on flanker task performance (all p> .271). However, within condition analyses revealed that 24-h Uosmol was correlated with CC. During the HIGH condition, 24-h Uosmol was associated with congruent (r = .441, p = .024) and incongruent (r = -.468, p = .016) accuracy, indicating that higher 24-h Uosmol was associated with poorer accuracy.

CONCLUSIONS: Although there were no significant intervention effects on CC, these data link lower urine osmolality (i.e., better hydration) to greater CC among preadolescent children. Ongoing research is examining the effects of water modulation on changes in children’s CC while accounting for baseline hydration. Supported by Danone Research
and NatTV (preference score: 1.8±1.9; p=0.002) were significantly greater than NoTV (preference score: 3.0±2.7). There was no significant difference in preference scores between FavoTV and NatTV conditions (p=0.132) Part 2: despite this difference in preference for exercise there was no significant difference in treadmill walking time (FavoTV vs. NoTV: 50.0±26 vs. 44.7±3.2 minutes, respectively; p=0.102).

CONCLUSIONS: This study provides empirical evidence that inactive individuals prefer walking with television viewing versus without television. Further research is needed to determine if active television viewing can translate to observable changes in exercise behavior.

INTRODUCTION: The U.S. Preventive Services Task Force and NIH emphasize the use of weight-related screenings as a means to increase motivation of overweight/obese individuals to manage body weight. Yet, little is known about individual responses to receiving such screenings, which could inform future research.

PURPOSE: To examine the acute, qualitative responses to a common body weight and composition screening in a sample of women classified as ‘overfat’ by a validated body fat percentage (BF%) cutoff. METHODS: Of 14 volunteers responding to a study ad assessing personal experience to a weight screening, 10 women (30.21 ± 16.64 years; 39.39± 6.60%; 28.25 ± 6.15 kg/m²) were classified as ‘overfat’. Following DEXA testing, participants were provided with their weight and composition results, and then given 1-minute to evaluate. Participants were asked a series of questions guided by qualitative description regarding their experience. Interviews were digitally recorded, transcribed, and analyzed with open and axial coding to identify recurring themes. RESULTS: Five themes, represented here as internalized questions, emerged to summarize the individual experience: (1) Is this a threat to me? (2) Why is this a threat? (3) How does this make me feel? (4) Am I motivated? (5) What am I motivated to do? Theoretically, the results support a novel confluence of self-regulation and coping theories, where a weight-related discrepancy produced by the screening triggered perceptions of threat to self, including the appraisal of what is at stake during a stressful encounter (self-esteem, survival/health, attractiveness, social status, family, physical functioning), which guided the appraisal process. Subsequently, emotional and motivational responses varied, as did coping choices (physical activity, healthy/unhealthy dietary changes, heightened self-regulation, seeking social support). CONCLUSIONS: The findings support the use of screenings to heighten awareness to one’s body weight, yet highlight the complexity of individuals’ responses and importance of ‘appraisal stakes’. This study challenges the belief that screenings always trigger healthy, weight control efforts, while highlighting difficulties and potential bias in recruiting overweight women to volunteer for such screenings.

INTRODUCTION: While it has been shown that poor mental cognition is a risk factor for mortality at all stages in life. Studies have demonstrated that participants who report low levels of weekly physical activity consistently score lower in short-term memory, inductive reasoning, and verbal fluency tests. Intensity of exercise appears to be a critical component in the effectiveness of an exercise program on cognitive function, but little research on exercise’s effect on creativity has been conducted. Further research is needed in the areas of both exercise’s effect on creativity, and more specifically, various exercise intensity levels on creative function. PURPOSE: The purpose of this study was to investigate the relationship between exercise intensity levels in older adults and the creative component of mental cognition. METHODS: Participants included 14 females and 10 males aged 55-75 years. Each participant completed three creative functioning assessment tests including the Remote Associations Task (RAT), the Creative Uses Test, and the Torrance Test. Height and weight were measured and BMI was calculated. Each participant wore a physical activity monitor that recorded physical activity for one week. Participants were instructed to go about their daily routine as usual. Data were analyzed by linear regression. Results: Average daily steps walked and RAT score were significantly associated (p<0.05). There was no statistical relationship between amount of moderate intensity or vigorous intensity physical activity and scores on any creativity test. Those categorized as obese (BMI > 30) scored significantly lower on the RAT test but higher on the Creative Uses Test for both fluency and flexibility measures. Conclusion: Amount, but not intensity, of regular exercise had an influence on creative abilities. Additionally, there was a relationship between fitness and creativity. Obese individuals showed decreased convergent creativity abilities and increased divergent creative abilities. Further research is needed to support and explain this finding.

INTRODUCTION: The Biochemistry Laboratory Experience for Exercise Science Students.

PURPOSE: To examine the effects of an acute bout of exercise on attentional bias, mood, and memory in young adult females who differ in trait anxiety.

METHODS: Sixty-four participants between the ages of 18-34 years provided informed consent and completed two experiments involving tests of attentional bias, mood, and memory before and after a cycling protocol or seated rest control condition. Participants were categorized into low-trait anxious (n = 29) or high-trait anxious (n = 35) groups, and randomly allocated to experimental conditions. For both experiments, participants completed the assessments before and following 20 min of moderate intensity exercise or seated rest. Experiment 1 examined word-based attentional bias scores, F(1, 60) = 0.82, p = .37, η² = .01, nor incongruent response times, F(1, 60) = 0.97, p = .33, η² = .02. Exercise decreased picture-based attentional bias, but failed to reach statistical significance for bias scores, F(1, 59) = 3.03, p = .087, η² = .05, and incongruent response times, F(1, 59) = 3.45, p = .07, η² = .06. Trait anxiety levels did not impact exercise-induced changes in attentional bias. Enhancements in participants’ mood post-exercise were observed in both experiments, F(1, 60) = 14.92, p < .001, η² = .20 and F(1, 59) = 16.35, p < .001, η² = .23, respectively. The effects of exercise on memory were inconsistent.

CONCLUSION: The effects of acute exercise on attentional bias seem to depend on stimulus type. Results suggest that exercise has a greater impact on picture-based attentional bias pre- to post-exercise (Experiment 2) compared to word-based attentional bias (Experiment 1). Moderate intensity exercise improves measures of total mood disturbance, anger, confusion, state anxiety, vigor, and tension. This suggests that exercise may have a greater impact on subjective mood measures compared to the attentional processes associated with anxiety.

INTRODUCTION: Exercise's effects on the immune system have been well documented. While exercise can elicit both pro-inflammatory and anti-inflammatory effects, the precise mechanisms behind these responses are not fully understood. PURPOSE: To determine whether exercise intensity plays a role in the immune system's response to exercise. DESIGN: A randomized, controlled trial. SETTING: A university in the United States. SUBJECTS: Participants were healthy adults aged 18-65 years (n=30). INTERVENTION: Participants were randomly assigned to one of three exercise conditions: high-intensity aerobic exercise, low-intensity aerobic exercise, or a sedentary control condition. OUTCOMES: The primary outcome was immune system response, measured by the percentage of neutrophils and the production of cytokines. RESULTS: Participants who performed high-intensity aerobic exercise showed a significant increase in neutrophil percentage and a decrease in cytokine production compared to the low-intensity aerobic exercise and control groups. CONCLUSIONS: Exercise intensity plays a significant role in immune system response. High-intensity aerobic exercise elicits a pro-inflammatory response, while low-intensity aerobic exercise has a more anti-inflammatory effect. Further research is needed to investigate the role of exercise intensity in immune system response.
B-74 Free Communication/Poster - Exercise Psychology - Neuroscience
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F

1109 Board #288 May 31 2:00 PM - 3:30 PM
ERP Evidence of Preparation Strategy Change in Table Tennis Players with Varying Level of Difficulty
Yingzhi Lu, Xiaowen Li, Jiacheng Chen, Chun Xie, Chenglin Zhou. Shanghai University of Sport, Shanghai, China.

The task-preparation processes usually be affected by different factors, such as attentional demands, and skill levels. Researches in sport and motor field reported that skilled athletes are characterized by intense preparation of stimuli and employ highly developed strategies in the attention and motor domains, to respond to stimuli effectively.

PURPOSE: To investigate the effect of skilled level on the task-preparation strategy with varying level of attentional demands.

METHODS: 50 participants were grouped into Elites group (EG, n = 17), Amateur group (AG, n = 16) and Control group (CG, n = 17) based on the table tennis training years and skilled level. A modified cue-target paradigm was used in current study. It contains both cue stimuli (square means easy task, circle means hard task) and target stimuli (a ping-pang ball, may display on the left, right, up or down of the screen.). In the easy task, participants were asked to press the number key on corresponding position with the target, while in the hard task, the key on the opposite position needs to be pressed. Participants were asked to do a cognitive-motor task (release the “5” key, then press the target key and come back to hold the “5” key again.). Electroencephalograph was recorded during the task.

RESULTS: The accurate result showed the EG (0.99±0.01) performed better than both AG (0.97±0.03, p = 0.04), and in both reaction time (ms) and choice time, the EG (RT: 336.22±39.05; CT: 470.01±48.27) was faster than both AG (RT: 391.83±58.71; CT: 543.45±66.17) (ps < .001) and CG (RT: 426.47±56.18; CT: 582.85±77.08) (ps < .001). In the contingent negative variation (CNV)(1200-1500 ms, unitμV), only the easy task elicited larger CNV amplitude on the left hemisphere (1.95±1.67 than right hemisphere (0.59±1.36). The CNV amplitude on the left hemisphere was larger than on the right side in all conditions in the AG group and EG group (ps < .001). Similarly, mesenteric fat weights were significantly increased in AG group than both CG group (p < .001) and EG group (p = .023). Total fat weights were also increased in AG group than both CG group (p < .001) and EG group (p = .023).

CONCLUSIONS: Different task-preparation strategies were moderated by both the skilled level and task difficulty. It is likely that successful athletes in reactive sports are characterized by employing similar spatial preparation in the motor regions to respond to visual stimuli effectively.

1110 Board #289 May 31 2:00 PM - 3:30 PM
Exercise Training Rescues High Fat Diet-induced Neuronal Nitric Oxide Synthase Expression In Hippocampus And Cortex.
Yuki Tomiga, Saki Yoshimura, Aito Ito, Kentaro Kawanaka, Yoshinari Uehara, Hiroaki Tanaka, Yasuki Higaki. Fukuoka University, Fukuoka-shi, Japan.

Email: tomiga0507@gmail.com

(No relationships reported)

Western high-fat diet (HFD) consumption and being overweight induce hippocampal atrophy and deterioration of function. These alterations are associated with mental disorders, such as depression and anxiety. Exercise is an effective therapeutic treatment to combat obesity and enhance brain health. Numerous studies have demonstrated that neuronal nitric oxide synthase (nNOS) is a key regulator of affective behavior. Increased nNOS expression leads to anxiety, while reduced brain nNOS in an enriched environment that includes running exercise has anxiolytic effects. PURPOSE: We investigated whether HFD consumption and exercise training altered nNOS expression in the brain.

METHODS: Twenty 4-week-old male C57BL/6J mice were used. After 2 weeks of acclimatization, mice were randomly assigned to a standard diet (SD, n = 5) or HFD group (n = 15). After 6 weeks, HFD-fed mice were further divided into either a non-exercise (HFD, n = 7) or a HFD (12 weeks) with exercise group (HFD+Ex; n = 8). The HFD+Ex group was allowed free access to a running wheel. Western blotting was performed to determine nNOS protein expression levels in the hippocampus (Hp), cortex (Cx) and cerebellum (C) from SD, HFD and HFD+Ex mice. RESULTS: Body weights were significantly increased in HFD-fed mice (SD: 26.0 ± 0.4 g; HFD: 36.6 ± 1.5 g; HFD+Ex: 29.1 ± 0.5 g; p < .001). Similarly, mesenteric fat weights were increased in the HFD group, while exercise training mitigated this effect (SD: 0.16 ± 0.04 g; HFD: 0.56 ± 0.10; HFD+Ex: 0.25 ± 0.03; p <.01). Compared with that of SD mice, Hp and Cx nNOS expression levels increased significantly with HFD feeding (Hp: 1.90 ± 0.28 fold increase, p < 0.05; Cx: 1.89 ± 0.49; p < 0.01), HFD-induced Hp and Cx nNOS expression was reduced in HFD+Ex mice to levels comparable to those of the SD group, though the difference in the Cx was not significant (Hp: 0.86 ± 0.16 fold increase, Cx: 1.48 ± 0.22; p < 0.1000). While Hp and Cx nNOS expression levels were susceptible to HFD consumption and exercise, those in the Cc were unchanged (p > .05). CONCLUSION: We conclude that exercise training restores HFD-induced nNOS expression in the Hp and Cx. Our results indicate that HFD-induced brain dysfunction is regulated by nNOS in the Hp and Cx, and exercise has therapeutic potential for mitigating HFD-induced depression and anxiety via the nNOS/NO pathway.

Recent concussion consensus statements advocate for research on emotional sequelae and associated risk factors following sport-related concussion (SRC). Fear of re-injury-a frequent emotional response following orthopedic injuries-is one factor that might influence emotional sequelae following SRC. Researchers report that athletes with SRC demonstrate elevated mood disturbances compared to athletes with musculoskeletal injuries. Maladaptive psychological responses, such as fear of re-injury, may influence the clinical presentation of SRC and associated recovery outcomes such as subjective symptom reporting. The relationship between fear of re-injury throughout SRC recovery and post-concussion symptom reporting are unknown.

PURPOSE: To examine prospectively the relationship between fear of re-injury and symptom reporting in high school athletes with SRC.

METHODS: High school athletes (ages 14 - 18) with SRC were recruited for study and completed research measures at 3.40 days (SD = 1.60) following injury. Demographic data and total symptom severity scores were obtained from the Post-Concussion Symptom Scale (PCSS) and fear of re-injury was assessed via the Tampa Scale of Kinesiophobia (TSK). The TSK scores were categorized as sub-clinical, mild, moderate, and severe. Fear of re-injury categorizations were calculated for the sample and the relationship between TSK scores and symptom severity scores were examined with a Pearson’s product-moment correlation. Statistical significance was set at (p < .05).

RESULTS: Sixteen high school athletes (M = 15.75, SD = 1.0 years) participated in the study. The mean TSK score for the entire sample was 36.88 (SD = 5.96), which reflects moderate fear of re-injury. Fear of re-injury scores were above clinical cutoffs for the entire sample. More than half of the sample (56%, 9/16) were moderately fearful of re-injury. Twenty-five percent (4/16) and 19% (3/16) of the sample exhibited mild and severe levels of fear, respectively. The mean total symptom score was 23.94 (SD = 27.13). Total symptom scores and TSK scores were positively related (r = 0.67, p < 0.05).

CONCLUSIONS: Fear of re-injury is prevalent in high school athletes with SRC. Moreover, total symptom scores are positively correlated with fear and may influence management of SRC.
whether gender alone influenced recovery rates, findings suggest that males are more likely to recover at any time point when compared to their female counterparts ($p = 0.0019$).

CONCLUSIONS: History of at least one prior concussion in young athletes results in a higher initial symptom score and extended duration of post-concussive symptoms, thereby prolonging recovery time. According to our study, there are no gender-based differences in recovery time for those who sustain multiple concussions.

### 1113 Board #292 May 31 2:00 PM - 3:30 PM

#### Neurotransmitter Concentrations Do Not Predict TMS Measures of Excitability and Inhibition in the Motor Cortex


No relationships reported

Transcranial magnetic stimulation (TMS) provides measures of motor cortex excitability and inhibition. Pharmacological studies suggest the involvement of the neurotransmitters glutamate and GABA in mediating TMS measures of excitability and inhibition, respectively. PURPOSE: The aim of this study was to determine the relationship between TMS measures of excitability and inhibition and proton magnetic resonance spectroscopy (1H-MRS) quantitation of excitatory and inhibitory neurotransmitter concentration in the primary motor cortex.

METHODS: Thirteen (6 female, aged 20.6 ± 1.0 years) healthy individuals were tested at three time points: Baseline, 2 Weeks, and 2 Months. Amplitude of the motor evoked potential (MEPamp) was calculated as a TMS measure of excitability, and the duration of the cortical silent period (CSP) was determined as a TMS measure of inhibition. Concentrations of glutamate and GABA were obtained at similar time points using 1H-MRS.

RESULTS: MEPamp (p = 0.30) and glutamate concentration in the primary motor cortex (p = 0.73) were both similar across visits. However, glutamate concentration did not significantly predict MEPamp (R2 = 0.006, $p = 0.93$). CSP duration (p = 0.47) and GABA concentration within the primary motor cortex (p = 0.42), were also similar across visits. However, GABA concentration did not predict CSP duration (R2 = 0.0008, $p = 0.87$).

CONCLUSION: No relationship between TMS measures of cortical excitability or inhibition and 1H-MRS measures of glutamate and GABA were reported. These results suggest that additional factors may be responsible for excitability and inhibition, as assessed by TMS.

### 1114 Board #293 May 31 2:00 PM - 3:30 PM

#### The Effects Of An Eight Week Exercise Intervention On Brain Activity In Depressed And Non Depressed Individuals: A Fmri Pilot Study

Paul Yieider, Bernadette Murphy, Joanne Gourgouvelis, L1H 7KA, University of Ontario Institute of Technology, Oshawa, ON, Canada.

Email: paul.yieider@uoit.ca

No relationships reported

PURPOSE: Memory deficits is the most frequently reported cognitive symptom in people suffering with Major Depressive Disorder (MDD). Supporting clinical findings, neuroimaging studies investigating memory impairment in people with MDD have identified brain areas such as the prefrontal cortex and medial temporal lobe to be dysregulated during both memory encoding and retrieval. Exercise for brain health has been a common research theme for the past several years. Research has found that exercise protects against the development of neurodegenerative diseases, reverses brain volume loss in the elderly, upregulates neurogenesis in rodents and improves learning and memory. The aim of this study is to investigate the effects of an eight week exercise program on brain function during a memory task in people suffering with MDD and young healthy individuals.

METHODS: Eight medicated patients with a clinical diagnosis of MDD based on DSM-IV criteria and eight healthy controls completed an eight week supervised exercise intervention. Participants performed an associative memory fMRI task matching names to faces pre and post the exercise intervention. Region of interest (ROI; anterior hippocampus) and whole-brain analyses were conducted to examine changes in brain function pre and post the exercise intervention.

RESULTS: Following the eight weeks of exercise our ROI analyses revealed no group x time interaction, no main effect of group and a marginal main effect of time that did not reach significance. When examining the whole sample, collapsing across groups, increases in activity were present following the intervention in several regions, such as the basal ganglia, medial frontal and parietal lobe, and posterior cingulate. A regression analysis was conducted to determine if the change in activity pre/post was related to improvement in depression scores. We found those who showed the greatest improvement in depression scores had a reduction in activity in the left occipital and right motor regions. This finding suggests an improvement in sensory and motor processing.

### 1115 Board #294 May 31 2:00 PM - 3:30 PM

#### Effects of the FITKids Randomized Controlled Trial on Cognitive Control and Conflict Monitoring in Children

Eric S. Drollette1, Matthew B. Pontifex2, Lauren B. Raine3, Mark R. Scudder2, Robert D. Moore3, Shih-Chun Kao3, Darla M. Castelli4, Naiman A. Khan5, Arthur F. Kramer6, Charles H. Hillman7. 1University of Illinois at Urbana-Champaign, Urbana, IL. 2Michigan State University, East Lansing, MI. 3Northeastern University, Boston, MA. 4University of Pittsburgh, Pittsburgh, PA. 5University of South Carolina, Columbia, SC. 6University of Texas, Austin, TX.

Email: drollet1@illinois.edu

No relationships reported

PURPOSE: We investigated the influence of a 9-month physical activity intervention (FITKids: NCT01619826, NCT01334359) on cognitive control and conflict monitoring.

METHODS: Three hundred eight preadolescent children (8-9 years old) were randomized into an after-school physical activity intervention (n=139) or a wait-list control group (n=169). The FITKids intervention occurred following every school day and provided a sum of 70-minutes of moderate-to-vigorous physical activity per session. All children completed a pre-assessment measurement and a cognitive control task (i.e., flanker test) at pre- and post- intervention. Event-related brain potentials (ERPs) were recorded during flanker performance to determine neuroelectric underpinnings of frontally mediated changes in conflict monitoring (i.e., error-related negativity or ERN).

RESULTS: Results revealed greater improvements in fitness from pre- to post-test for the intervention group (1.8 mL/kg/min, 5.4% change) compared to the control group (0.6 mL/kg/min, 2.1% change) ($p = 0.02$). Further, increased performance was observed for the flanker task, requiring variable amounts of cognitive control, with greater change for the intervention group (9.3% accuracy; -8.5 omission errors, -2.0 omission error runs) compared to the control group (6% accuracy; -4.1 omission errors, -0.7 omission error runs) ($F[1,306]=6.1, p<0.02$).

CONCLUSIONS: These findings demonstrate that daily physical activity not only serves to improve fitness but also facilitates behavioral and functional neural processes associated with effective conflict monitoring in young children.

### 1116 Board #295 May 31 2:00 PM - 3:30 PM

#### Modifying Anterior Cruciate Ligament Injury Risk Factors in Female Athletes Through Real-Time Biofeedback

Michael A. Riley1, Scott Bonnette2, Christopher DiCesare2, Adam Kiefer2, Kevin Shackley1, Michael Richardson1, Gregory Myer, FACSM7. 1University of Cincinnati, Cincinnati, OH. 2Cincinnati Children’s Hospital Medical Center, Cincinnati, OH. 3University of Pennsylvania, Philadelphia, PA. 4Sponsor: Greg, FACSM

Email: michael.riley@uc.edu

No relationships reported

With a growing number of females participating in sport activities, the prevention of anterior cruciate ligament (ACL) injuries in female has become increasingly important. Overall, female athletes are more likely to injure the ACL than their male counterparts. Unfortunately, the majority of current preventive training programs face implementation challenges that reduce their widespread adoption as an ACL injury prevention program. The approach used in this study is an effort to overcome prior limitations using a real-time visual feedback training program to reduce biomechanical risk factors associated with ACL injuries.

PURPOSE: To develop and test effects of within activity response to real-time biofeedback method that targets and improves movement biomechanics associated with ACL injury risk in females.

METHODS: Twenty female collegiate athletes (19.7 yrs. (SD = 1.34), 1.74 m (0.09), and 72.16 kg (12.45)) participated. The study utilized a two-treatment crossover design. Participants were placed into either a real- or sham-first feedback group. The feedback focused on the technical performance of the unweighted back squat. After half the trials, participants were crossed over to receive the alternative treatment.
participant completed 110 squats—40 training squats for each feedback display and 10 squats during each test period. Participants’ ability to control the feedback was evaluated by a heat map analysis which consisted of calculating a score that indicated the percentage of time the movement caused the stimulus to occupy a correct value. Heat maps were created for pre- and post-tests and each training set of squats.

**Results:** During training sets there was a significant difference in the heat map scores between the real and sham feedback sets, t(19) = 2.94, p < .01. The heat map score during the real feedback sets [M = 60.73%; (6.47%)] was significantly greater than the score during the sham sets [M = 56.62%; (8.42%)] indicating that the real-time biofeedback promoted the desired response during exercise performance.

**Conclusions:** The heat map scores of participants were higher during the real feedback training sets than the sham feedback training sets indicating real-time biofeedback as a potential training method for modification of risk factors linked to non-contact ACL injury prevention.

### Board #296
**May 31 2:00 PM - 3:30 PM**
**Acute High-intensity Interval Training And Moderate-intensity Continuous Exercises Differentially Facilitate Cognitive Control**
Shih-Chun Kao1, Daniel Westfall1, Brendon Gordy1, Charles Hillman2. 1University of Illinois at Urbana-Champaign, Urbana, IL. 2Northeastern University, Boston, MA. 3Queen’s University, Kingston, ON, Canada. Email: shilchunkao@gmail.com

**PURPOSE:** The present study investigated the effects of a single bout of high-intensity interval training (HIIT) and continuous, moderate aerobic exercise (MAE) on inhibitory control. **METHODS:** The P3 component of an event-related related potential was collected in 64 young adults during a modified flanker task following 20 minutes of seated rest, 20 minutes of MAE, and 9 minutes of HIIT on separate days in counterbalanced order. **RESULTS:** Shorter overall reaction time was observed following MAE (392.2ms) and HIIT (384.8ms) compared to seated rest (402.6ms), t(63) ≥ 2.8, p’s ≤ .007. Response accuracy selectively improved following HIIT (93.2%) in the task condition requiring greater inhibitory control compared to seated rest (91.1%) and MAE (91.3%), t(63) ≥ 3.0, p ≤ .004. P3 amplitude was larger following MAE (14.4µV) compared to sham feedback training sets (13.1µV) and HIIT (11.6µV), t(63) ≥ 2.7, p ≤ .007. Decreased P3 amplitude and shorter latency were observed following HIIT (11.6µV; 393.6ms) compared to seated rest (13.1µV; 405.4ms), t(63) ≥ 2.6, p ≤ .012. **CONCLUSION:** The current results indicated that MAE may facilitate cognitive control via increased neural resource allocation, whereas HIIT may have a larger facilitation on cognitive control beyond MAE via more efficient neural resource allocation. These findings demonstrate that both single bouts of MAE and HIIT may be feasible approaches to enhance cognitive performance, albeit via different mechanisms of neural activation.

### Board #297
**May 31 2:00 PM - 3:30 PM**
**Comparing Before-and After-School Neurocognitive Performance in High School Athletes: Implications for Concussion Management**
Morgan Anderson, Samantha Mohler, Melissa Anderson, R.J. Elkin. University of Arkansas, Fayetteville, AR. Email: mmanders@uark.edu

**PURPOSE:** To compare before- and after-school CNT performance in non-concussed high school athletes.

**METHODS:** A randomized crossover design was used for this study. After receiving University IRB approval, 29 high school athletes (15 males, 14 females) completed CNT before-and after-school on separate days. The mean age of the sample was 15.72 ± 1.25 years old. A series of paired samples t-tests were conducted for each CNT outcome score (verbal and visual memory, reaction time, processing speed) for both time points. Statistical significance was set at p < .001. Significant differences for visual memory and reaction time were documented across both time points. Visual memory (p < .008) was significantly better before-school (86.14% ± 11.01) than after-school (81.57% ± 12.14) and reaction time (p = .001) was significantly slower before-school (0.60 ± 0.07 sec.) than after-school (0.57 ± 0.06 sec.).

**CONCLUSIONS:** This study suggests that time of day and the demands of a school day should be considered when determining the optimal timing for CNT assessment. More research is needed to determine the mechanisms for which the time of day and cognitive fatigue may impact CNT assessment scores.

### Board #298
**May 31 2:00 PM - 3:30 PM**
**Reliability And Validity Of The Japanese Version Of The Activities-specific Balance Confidence Scale After Stroke**
Satomi Ishige1, Sawako Wakui1, 2Hundedo University Graduate School, Chiba, Japan. 2Hundedo University, Chiba, Japan. Email: satomi_i_g@ yahoo.co.jp

**PURPOSE:** To investigate the reliability and validity of the Japanese version of the Activities-specific Balance Confidence Scale (ABC-J) among people > 6 month after stroke.

**METHODS:** ABC-J was translated with the step according to COSMIN’S CHECKLIST and Principals of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes Measures. In a cross-sectional study design, the sample size of this study was calculated according to psychometric recommendations described by Girardieu and Mary, and calculated with G*power. A convenience sample of 85 people was included (mean age 66.3 ± 9.2 years, between 0.5 and 20 years after stroke). The ABC-J was administered along with the Timed Up and Go test (TUG-T), the 10-meter walk test (10MW), the Berg Balance Scale (BBS), the Geriatric Depression Scale (GDS), and the Fall Efficacy Scale-International (FES-I). One or two weeks later, the ABC-J was again completed by 69 participants. Reliability was investigated in terms of reproducibility (the intra-class correlation coefficient: ICC, standard error and minimal detectable change) and internal consistency (Cronbach alpha), and one type of validity (criterion-related) were assessed with the Spearman correlation coefficients.

**RESULTS:** The mean score for the ABC-J was 58.6±24.0. The ABC-J showed excellent internal consistency (Cronbach’s alpha = .96) and substantial test-retest reliability (ICC = .96, 95% CI: .93, .97), with standard error and minimal detectable change values of 2.88 and 7.98, respectively. The ABC-J total score significantly correlated with TUG-T (r = -.53, 95%CI: -.67, -.35), 10MW (r = -.53, 95%CI: -.67, -.35), BBS (r = .59, 95%CI: .65, .72), GDS (r = -.29, 95%CI: -.47, -.08), and FES-I (r = .76, 95%CI: .65, .84) (all p < .001).

**CONCLUSIONS:** ABC-J is a valid and reliable measure for investigating balance confidence among people >6 month after stroke.

### Board #299
**May 31 2:00 PM - 3:30 PM**
**Jugular Compression Ameliorates Alteration in fMRI of Working Memory in High School Female Soccer Athletes**
Weihong Yuan1, Kim Barber Foss2, Tom Maloney1, Staci Thomas1, Brooke Gadd1, Jonathan D. Ellis1, Janet Adams2, Christopher DiCesare1, Jonathan Dudley1, Katie Kitchen1, James Leach1, David Smith1, Meekhib Altabay1, Kelsey Logan1, Ryan Galloway1, Julian Bailes1, Gregory D. Myer, FACSM1, 1Cincinnati Children’s Hospital Medical Center, Cincinnati, OH. 2University of Cincinnati College of Medicine, Cincinnati, OH. 3Northshore University Health System, Evanston, IL. Email: weihong.yuan@cchmc.org

**PURPOSE:** To investigate the effect of jugular compression on cerebral blood flow and working memory performance in high school female soccer athletes. The athletes were assigned to the non-collar group (n=12, age = 15.61±1.00 years) and the collar group (n=8, age = 15.30±1.19 years, p < .53). Head impact exposures were recorded during all practices and games using X2’s X-patch wearable sensor. A standard N-Back task was used to engage working memory during functional MRI at both pre- and post-season.

**RESULTS:** On average, the athletes in the two groups experienced a similar number of impacts (145±91 vs. 143±23, p > .0.5). Increased brain activation of working memory was observed from pre-season to post-season in the non-collar group (p<.05, corrected) but not in the collar group. Compared to the non-collar group, significantly lower

Abstracts were prepared by the authors and printed as submitted.
The current study explored the alteration of brain activation in female athletes after experiencing repetitive head impact during a high school soccer season. The significantly increased brain activation from pre- to post-season in the non-collar group suggested that greater effort was required for task completion. The absence of alteration of brain activation in the collar group suggests a potential protective effect, supporting the growing literature of null jugular compression in brain injury protection in sports.

### RESULTS:

A one-way ANOVA of frontal plane hip flexion (DLS: 96.83 ± 12.77, 105.63 ± 15.31 SLS: 73.68 ± 16.91, 31.91 ± 15.77) and hip flexion (DLS: 79.26 ± 11.39, 104.01 ± 13.02 SLS: 61.99 ± 18.71, 78.47 ± 15.57) in right lower extremity. Paired T-tests of the left leg showed no significant difference (p<0.05) between Qualysis and Myomotion for all hip and knee angles collected. Dartfish and Hudl showed no significant difference between knee angles and hip angles at peak knee flexion in the frontal plane bilaterally.

### CONCLUSION:

Between the four motion capture systems investigated, comparison of multiple joint angles cannot be made between those using three dimensions (Qualysis and Myomotion) and those using two dimensions (Hudl and Dartfish) as they utilize divergent methods to capture and quantify data. Within their subgroups, Qualysis and Myomotion were found to have no mean differences between hip rotation and abduction, but to differ in peak hip and knee flexion. No significant differences were found between the data captured by Hudl and Dartfish which demonstrates that the two systems are comparable when used in the clinical setting. However, in terms of forming diagnoses, three dimensional systems offer a more complete picture.

### Conclusion

Motion capture systems are used with increasing frequency in clinical settings to form treatment and referral decisions. However, these systems offer varying levels of efficacy and comprehensiveness in data capture and clinical appropriateness.

#### Purpose

The purpose of this study was to expand on previous research for a more in-depth comparison between various motion analysis systems including Qualysis and Myomotion as well as Dartfish and Hudl for a variety of joint angles and rotations during functional movements. METHODS: 15 females with a mean age of 24.2±1.27 years provided consent and were screened before data collection. Each participant performed three trials of both double limb squat (DLS) and single leg squat (SLS) which were captured on four motion analysis systems simultaneously (Qualysis, Myomotion, Dartfish, Hudl). Multi-plane hip and knee angles were collected at peak knee flexion for each movement performed. RESULTS: The comparison between Qualysis and Myomotion demonstrated a significant difference in peak knee flexion (DLS: 96.83 ± 12.77, 105.63 ± 15.31 SLS: 73.68 ± 16.91, 31.91 ± 15.77) and hip flexion (DLS: 79.26 ± 11.39, 104.01 ± 13.02 SLS: 61.99 ± 18.71, 78.47 ± 15.57) in right lower extremity. Paired T-tests of the left leg showed no significant difference (p<0.05) between Qualysis and Myomotion for all hip and knee angles collected. Dartfish and Hudl showed no significant difference between knee angles and hip angles at peak knee flexion in the frontal plane bilaterally.

#### Conclusions

Between the four motion capture systems investigated, comparison of multiple joint angles cannot be made between those using three dimensions (Qualysis and Myomotion) and those using two dimensions (Hudl and Dartfish) as they utilize divergent methods to capture and quantify data. Within their subgroups, Qualysis and Myomotion were found to have no mean differences between hip rotation and abduction, but to differ in peak hip and knee flexion. No significant differences were found between the data captured by Hudl and Dartfish which demonstrates that the two systems are comparable when used in the clinical setting. However, in terms of forming diagnoses, three dimensional systems offer a more complete picture.

### Conclusion

High-speed videography has been used to collect vast amounts of knee kinematic data, however, this method is restricted by a relatively small motion capture volume and is expensive. Consequently, alternative methods should be explored.

#### Purpose

To quantify sagittal-plane knee joint angles, using resistance changes from a high-definition nanocomposite piezoresistive strain sensor. METHODS: Nickel coated carbon fiber and nickel nanowires were cured in a silicone matrix, to create a piezoresistive strain gauge. This gauge was adhered to the knee, with Force Sensing Resistors (FSR) measuring the forces applied. The sensor was worn by participants, and knee angles were calculated using a vector-based method. RESULTS: Output from the nanocomposite strain gauge appeared to show a one to one linear relationship between knee angles and change in resistance for angles 20 degrees or more during walking and running (Figure 1). Hysteresis was present in the sensor as it was being loaded and unloaded.

#### Conclusions

Through appropriate non-linear models, the strain sensor data could be used to predict knee angles during walking and running, which would facilitate the inexpensive measurement of knee kinematics outside of the traditional biomechanics laboratory setting. Supported by NSF Grant CMMI1538447
The instantaneous slope was normalized to body mass to provide an index of power and GRF was calculated for the rising phase of each rep, in addition to the peak GRF. At 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were performed. A 5 speed, followed by progressive slowing of the remaining reps. Three trials of 20 reps the ability of an iPod to detect changes in chair rising speed, compared with an

RESULTS: Within individual subjects, across the range of speeds, the iPod values were highly correlated with the eGONI values (all R²>0.97), and the iPod vs. GRF R² values ranged between 0.82 and 0.95. For 3,148 trials pooled across all subjects, the R² was 0.91 for iPod vs. eGONI, 0.77 for iPod vs. GRF peak slope, and 0.72 for iPod vs. GRF peak. Across all subjects, the iPod vs. eGONI R² values ranged between 0.80 and 0.88 for max, min, and max-min. The iPod vs. GRF peak slope R² values ranged between 0.24 and 0.34, and between from 0.38 to 0.54 for iPod vs. GRF peak. CONCLUSION: A large range of chair rising speeds can be detected with the iPod. The iPod is an adequate substitute for an electronic goniometer or force platform to assess changes in leg power during an extended sit-to-stand task.

Modern smartphones are inexpensive, portable, user friendly, and contain sensitive gyroscopes. Apps can be used to sample, store, and wirelessly transmit data. Although each have conduct, field tests of sit-to-stand (STS) power provide only a relatively crude (timed or counted) outcome measure of global performance. Expensive lab-based biomechanics equipment is required to obtain measures of leg power (LP) for individual repetitions during brief 5x STS tasks. PURPOSE: To determine the ability of the iPod to detect movement speed for each rep during a 5x STS test, and make comparisons with an electrogoniometer (eGONI) and force platform. METHODS: Young adults (22.9 ± 2.9yrs, 21 men, 21 women) performed a 5x STS task as rapid as possible with strict form. Three trials were performed. A 5th generation iPod Touch was firmly attached (Velcro) to a strap around the lower thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were on a force platform (AMTI Accuray) in front of the chair. Concurrently, iPod gyroscope data (rad), knee joint angle (rad), and ground reaction force (GRF, N) were sampled at 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, and GRF were calculated for the rising phase of each rep. The peak GRF was also measured. The instantaneous slope was normalized to body mass to provide an index of power for each rep. For each device, the max, min, and max-min across the 20 reps were calculated. Correlations were computed between the devices for all subjects combined.

RESULTS: Within individual subjects, across the range of speeds, the iPod values were highly correlated with the eGONI values (all R²>0.97), and the iPod vs. GRF R² values ranged between 0.82 and 0.95. For 3,148 trials pooled across all subjects, the R² was 0.91 for iPod vs. eGONI, 0.77 for iPod vs. GRF peak slope, and 0.72 for iPod vs. GRF peak. Across all subjects, the iPod vs. eGONI R² values ranged between 0.80 and 0.88 for max, min, and max-min. The iPod vs. GRF peak slope R² values ranged between 0.24 and 0.34, and between from 0.38 to 0.54 for iPod vs. GRF peak. CONCLUSION: A large range of chair rising speeds can be detected with the iPod. The iPod is an adequate substitute for an electronic goniometer or force platform to assess changes in leg power during an extended sit-to-stand task.

Smartphones are inexpensive, portable, user friendly, and contain sensitive gyroscopes. Apps can be used to sample, store, and wirelessly transmit data. Although each have conduct, field tests of sit-to-stand (STS) power provide only a relatively crude (timed or counted) outcome measure of global performance. Expensive lab-based biomechanics equipment is required to obtain measures of leg power (LP) for individual repetitions during brief 5x STS tasks. PURPOSE: To determine the ability of the iPod to detect movement speed for each rep during a 5x STS test, and make comparisons with an electrogoniometer (eGONI) and force platform. METHODS: Young adults (22.9 ± 2.9yrs, 21 men, 21 women) performed a 5x STS task as rapid as possible with strict form. Three trials were performed. A 5th generation iPod Touch was firmly attached (Velcro) to a strap around the lower thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were on a force platform (AMTI Accuray) in front of the chair. Concurrently, iPod gyroscope data (rad), knee joint angle (rad), and ground reaction force (GRF, N) were sampled at 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, and GRF were calculated for the rising phase of each rep. The peak GRF was also measured. The instantaneous slope was normalized to body mass to provide an index of power for each rep. For each device, the max, min, and max-min across the 20 reps were calculated. Correlations were computed between the devices for all subjects combined.

RESULTS: Within individual subjects, across the range of speeds, the iPod values were highly correlated with the eGONI values (all R²>0.97), and the iPod vs. GRF R² values ranged between 0.82 and 0.95. For 3,148 trials pooled across all subjects, the R² was 0.91 for iPod vs. eGONI, 0.77 for iPod vs. GRF peak slope, and 0.72 for iPod vs. GRF peak. Across all subjects, the iPod vs. eGONI R² values ranged between 0.80 and 0.88 for max, min, and max-min. The iPod vs. GRF peak slope R² values ranged between 0.24 and 0.34, and between from 0.38 to 0.54 for iPod vs. GRF peak. CONCLUSION: A large range of chair rising speeds can be detected with the iPod. The iPod is an adequate substitute for an electronic goniometer or force platform to assess changes in leg power during an extended sit-to-stand task.

Modern smartphones are inexpensive, portable, user friendly, and contain sensitive gyroscopes. Apps can be used to sample, store, and wirelessly transmit data. Although each have conduct, field tests of sit-to-stand (STS) power provide only a relatively crude (timed or counted) outcome measure of global performance. Expensive lab-based biomechanics equipment is required to obtain measures of leg power (LP) for individual repetitions during brief 5x STS tasks. PURPOSE: To determine the ability of the iPod to detect movement speed for each rep during a 5x STS test, and make comparisons with an electrogoniometer (eGONI) and force platform. METHODS: Young adults (22.9 ± 2.9yrs, 21 men, 21 women) performed a 5x STS task as rapid as possible with strict form. Three trials were performed. A 5th generation iPod Touch was firmly attached (Velcro) to a strap around the lower thigh. An eGONI (Biometrics) was placed laterally across the knee joint. The feet were on a force platform (AMTI Accuray) in front of the chair. Concurrently, iPod gyroscope data (rad), knee joint angle (rad), and ground reaction force (GRF, N) were sampled at 100Hz. The peak slope (0.1s time constant) of the iPod pitch signal, eGONI signal, and GRF were calculated for the rising phase of each rep. The peak GRF was also measured. The instantaneous slope was normalized to body mass to provide an index of power for each rep. For each device, the max, min, and max-min across the 20 reps were calculated. Correlations were computed between the devices for all subjects combined.
on the S2 level. The summation of changed acceleration data was used to represent the balance performance, and the higher value indicated more instability. Data was analyzed with independent t-test with SPSS 20, and statistical significance was set as p<0.05.

Results and discussions: Significant difference was found between subjects with chronic stroke and healthy adults under four assessment postures: SWS with E/C (stroke 0.040±0.013 vs. healthy 0.032±0.007, p=0.048, unit: g), FTS with E/O (stroke 0.037±0.013 vs. healthy 0.032±0.006, p=0.027, unit: g), FTS with E/C (stroke 0.050±0.023 vs. healthy 0.035±0.006, p=0.000, unit: g), STS with E/C (stroke 0.099±0.075 vs. healthy 0.055±0.017, p=0.048, unit: g). The result demonstrates that a smartphone with built-in accelerometer can be used to discriminate the different balance performance between subjects with chronic stroke and healthy adults.

Conclusion: The study shows that smartphones may be a convenient, easy-to-use and valid tool for balance assessment on subjects with chronic stroke. The relationship between structure and function of the foot may play a role in lower extremity injuries. Three-dimensional scanning techniques of foot structure have recently been developed to automate anatomical foot measurements.

Purpose: To assess the reliability of foot morphology measures from a commercially available three-dimensional scanner in a young, female population.

Methods: 15 females participated in this study (age: 19.9±0.8 yrs, height: 1.71±0.1 m, mass: 66.3±13.8 kg). A hand-held 3D white light scanner was used to obtain specific foot related measures. Each subject had both feet scanned using a standardized foot position. Twelve measures were calculated: foot length, foot width, heel width, arch height, arch length, ball height, hall circumference, waist circumference, instep circumference, heel circumference, ball height, and instep height for both feet. Inter-rater reliability was assessed between two different raters on the same test day. Between day test-retest reliability (intra-rater) was evaluated by a single rater on two separate days. Additionally, within day test-retest reliability was evaluated from three separate scans from the same rater. Intraclass correlation coefficients ICC (2,1) were computed for each measure. Standard error of measurement (SEM) was also calculated for each variable.

Results: Between day test-retest reliability was excellent (ICC range=0.91-0.98) for left and right length and width measures (SEM 1.4±0.7mm). Between day height measures were lower with a range of 0.58-0.88 (SEM 1.6±0.5mm), with toe height exhibiting the lowest reliability, whereas, circumference measures ranged from 0.89-0.96 (SEM 2.7±0.4mm). Within day test-retest reliability was generally greater than between day reliability (range 0.75-0.99). Inter-rater reliability of height and width measures exhibited a range of 0.94-0.99 (SEM 1.1±0.5mm). The range of inter-rater reliability for height measures was 0.63-0.89 (SEM 1.7±0.05mm) and circumference measures were 0.90-0.97 (SEM 2.6±0.3mm).

Conclusion: The results indicate that height, width and circumference reliability were excellent for inter-rater, intra-rater, and within day test-retest. While generally acceptable, future work should investigate the lower reliability for height measures.

Purpose: To assess the reliability of foot morphology measures from a commercially available three-dimensional scanner.

Method: The results indicate that height, width and circumference reliability were excellent for inter-rater, intra-rater, and within day test-retest. While generally acceptable, future work should investigate the lower reliability for height measures.

The ability to produce and sustain rapid and repetitive movements is a vital aspect of almost any act of daily living (ADL). Without such ability, seemingly simple tasks such as walking would be all but impossible. Though commonly overlooked, the ability to rapidly and repetitively dorsiflex and plantar flex the foot is a crucial constituent of proper gait. So to that end, researchers have identified a means of assessing a person’s ability to rapidly and repetitively dorsiflex and plantar flex the foot known as the 10-second Foot-Tapping Test (FTT). Using the FTT, researchers have demonstrated that there is a marked decrease in foot tapping speed in clinical populations; e.g., multiple sclerosis, amyotrophic lateral sclerosis, cerebral myelopathy, and Parkinson’s disease; as well as degradations with age regardless of disease. It is hypothesized that this decline in foot tapping speed is attributed to changes taking place in the motor neurons responsible for the contraction of the muscles of the lower limbs. Despite showing a diminished foot tapping speed with disease and age, very little is known about the reliability of the FTT.

Purpose: Therefore, the purpose of this study was to evaluate the test-retest reliability and inter rater reliability measures of the FTT using video playback of the test.

Methods: Nine subjects were recruited for this study. Over the course of two visits, foot-tapping speed for each leg was measured using the FTT. During each visit the number of foot taps performed in 10 seconds was tested twice for each leg, yielding 4 tests per leg per subject over the course of two days. Each trial was video recorded and slowed down at varying speeds so as to allow each of the three raters to easily distinguish and count the individual foot taps, creating a total of 216 individual leg-test counts for analysis. Results: The FTT was found to have high inter rater reliability (Cronbach’s Alpha: 0.971) and immediate test-retest reliability (Pearson R Correlation: 0.918). Discussion: This study indicates that the FTT exhibits high test-retest and inter rater reliability using video analysis. However, going forward, more research must be done on the reliability of the FTT using “live” counting, across the many apparent variations in test administration methods, and of course within a larger and more diverse group of subjects.
RMS value, between average mBBESS score and diagnosis with a concussion, and between average RMS value and diagnosis with a concussion. RESULTS: The overall mean RMS value was 1.92 (±1.20 m²) while subjects (n=43) committed a mean of 1.20±0.88 balance errors during BESS testing on a firm surface. The coefficient of determination between calculated means of RMS and total mBBESS score for the subject pool was modest, however trended towards significant (R² = 0.08, p<0.05). The coefficient of determination between mean total BESS score and a positive concussion diagnosis was improved (R² = 0.08, p<0.05). A weak inverse relationship was found between calculated RMS and positive diagnosis with a concussion across healthy (R² = -0.010, p>0.8). The intraclass correlation coefficients for the c1 and c2 coefficients for the right and left feet were r = 0.82 and r = 0.010 (p>0.8). The intraclass correlation coefficients for the c1 and c2 coefficients for the right and left feet were 0.887 and 0.927 and .813 and .738, respectively. The correlation between the day 1 and day 2 mean c1 and c2 coefficients were r = 0.027 and r = 0.695 (p<0.001), respectively. CONCLUSIONS: The FTMD appears to be a more reliable method of assessing foot flexibility than DAH regardless of extremity that can be used by novice clinicians.

Multiple assessment methods exist to identify postural control deficits in both healthy and pathological populations. Though force platform technology is frequently used and validated in quiet stance conditions, few studies have explored the reliability of dual task assessments. Additionally, few studies have utilized non-linear metrics derived from ground reaction forces to determine differences in dual task conditions.

METHODS: The purpose of this study was to determine test-retest reliability of three different postural control assessments using both linear and nonlinear methodology.

METHODS: 24 healthy participants (3 male, 21 female, age 20.38 ± 1.46) attended a single testing session once a week for four weeks. Participants completed three trials of eyes open (EC) and eyes closed quiet standing (EO) and a sport-like postural task, the Wii Fit Soccer Heading Game (WFS). Raw Center of Pressure (CoP) was collected utilizing postural control assessment.

RESULTS: Significant differences were observed in 95% CE in EO (p = 0.016) and EC (p = 0.032) conditions. However, post hoc assessments determined no significant differences between time points 1, 2, 3, or 4. No significant differences were observed for PEV in the AP (p = 0.211) and ML (p = 0.403) directions, EC in the AP (p = 0.340) and ML (p = 0.239) directions were observed in the AP (p = 0.065) and ML (p = 0.122) directions across time. No significant differences were observed for EC SampEn in the AP (p = 0.961) and ML (p = 0.030) directions or EO in the AP (p = 0.434) and ML (p = 0.150) directions. CONCLUSIONS: The postural assessment metrics used for EO, EC, and the WFS conditions are a reliable metric across multiple weeks and do not indicate significant variability or a learning effect over time. Use of both linear and non-linear CoP measurements such as SampEn, PEV, and 95% CE show to be reliable over multiple time points, and thus should be taken into consideration for future studies utilizing postural control assessment.

CONCLUSION: The development of a seated clinical trunk test to assess lower extremity injury risk is necessary. Hayley Reed, Amanda Hickey, Chelsey Roe, Kathryn Lucas, Brian Noehren, FACS.M. University of Kentucky, Lexington, KY. (No relationships reported)

Poor neuromuscular control of the trunk is associated with numerous injuries, including anterior cruciate ligament tears. Currently, few reliable methods exist to clinically assess trunk neuromuscular control. The development of such a test could be used to screen individuals who require trunk neuromuscular control training for injury prevention and rehabilitation.

METHODS: The objective of this study was to assess the between and within session reliability of a new seated clinical trunk control test. METHODS: 10 healthy subjects (10 F, ages 21 ± 1.83, BMI 21.78 ± 3.01) with no prior lower extremity injuries were asked to sit on a wobble board placed on a solid surface on a plinth with their feet approximately 4 inches off the ground. Test length was 30 seconds and subjects had three practice trials followed by 2 test trials with their eyes closed. Performance on the test was measured as the time to the first predefined error and how many errors occurred in 30 seconds for each trial. An error occurred if the subject uncrossed their arms, opened their eyes, or if an edge of the wobble board touched the plinth. Reliability with and between days was assessed with an Intraclass Correlation Coefficient (ICC).

RESULTS: Between day reliability for the time to error was good (ICC=0.77) and the reliability for the number of errors was excellent (ICC=0.95). Both the time to error and number of errors had excellent within session rater reliability (ICC <0.99). The average time to error was (day 1: 17.3±9.2 seconds, day 2: 21.5±8.6 seconds, and the average number of errors was (day 1: 1.4±1.8 errors, day 2: 1.2±1.4 errors). The average difference for time to error within the same session was 0.1±0.1 seconds, and there were no differences in the number of errors.

CONCLUSION: The seated trunk control test shows good to excellent within and between day reliability for both the number of errors and time to the first error. Furthermore, there were minimal differences between trials, indicating that after the practice trials, there was no additional learning, yielding stable consistent results. These results indicate that the test is a reliable assessment of trunk neuromuscular control. Having established the tests reliability, subsequent studies should assess its ability to differentiate injured versus non-injured individuals.

METHODS: Currently, many commercial products or methods are being marketed for being the best way to improve overall balance and stability. Several of these products have not been tested or compared to see if stability range limits can be improved within a five week session by using these devices. Compare of Stability Scores on Adult Participants Using Commercial Balance Methods

Methods. Currently, many commercial products or methods are being marketed for being the best way to improve overall balance and stability. Several of these products have not been tested or compared to see if stability range limits can be improved within a five week session by using these devices. Purpose: The purpose of this study was to compare if commercial balance methods can improve Limit of Stability in healthy adult participants.

Methods: A 4 group pre-test/post-test non-equivalent control group design was selected for the protocol. Subjects were grouped into 4 categories, Bosu Balance Trainer (BBT), Slack-line Device (SLD), Vinyasa Yoga (VG) and Control Group (CG). All subjects (n = 148) were assessed pre and post via computerized posturography (Bertec, Inc, Columbus, OH). Limits of Stability (LoS) were determined for right lateral and anterior/posterior planes. The experimental groups (BBT, SLD, VY) practiced their skills twice a week for at least 30 minutes for 5 straight weeks. A 4 x 2 multivariate MANOVA was used to determine any significance (p <0.05) within subjects and between groups.
Results: Significance was observed in the frontal (p = 0.03) and right sagittal planes (p = 0.04) within the experimental groups. VY was significantly higher in the frontal plane (SD = 3.07 cm ± 1.9) than BBT (SD = 3.64 cm ± 2.2). SLD was significantly higher in the right sagittal plane (SD = 4.16 cm ± 1.7) compared to VY (SD = 3.67 cm ± 5.4) and BBT (SD = 3.31 cm ± 4.6). Post-hoc power scores demonstrated a value of 1.0 with regards to effect between subjects (group) and within subjects (time/time * group).

Conclusion: Commercial balance methods can contribute to increasing Limit of Stability (LoS) scores in healthy adults. However, there is not a definitive program or device that increases LoS in all planes, based upon the results of this study.

Reduction in balance has been identified as an indicator of risk of fall, and thus, an accurate and cost effective balance assessment tool is essential for prescribing effective postural control strategies. PURPOSE: To establish the validity of the Microsoft Xbox Kinect (Kinect v2) in assessing the whole body center of mass (CoM) excursion and velocity during single leg balance and voluntary ankle sway tasks among young and elderly subjects. METHODS: Twenty subjects (10 young; age: 25.0±2.5 years; height: 169.1±8.7 cm, weight: 74.0±17.8 kg), with no history of lower extremity injury, participated in this study. Subjects performed a total of six randomized trials; four single leg stand (SLS) and two ankle sway trials. A comparison between the balance outcome measures (anteroposterior (AP) and mediolateral (ML) CoM excursion and velocity and average sway length) from the Kinect v2 and a traditional three-dimensional motion analysis (3DMA) system was performed. RESULTS: Results from the SLS and voluntary ankle sway trials showed consistency, agreement, and correlation between systems was excellent (ICC > 0.75) for all CoM related variables when all subjects were considered a single group as well as when the elderly and young groups were analyzed. Concordance between systems ranged from poor to almost perfect depending on the group, task, and variable assessed. CONCLUSION: This new technique, using a low cost motion analysis technology, may enable real time, objective assessments of balance parameters in the clinical and research environments, which represents a clear advancement in clinical balance assessment and home-based rehabilitation programs.

The Star Excursion Balance Test (SEBT) is a simple clinical assessment of dynamic balance that is commonly used as a measure of performance and injury risk among healthy and injured populations. Continued efforts to improve the sensitivity and repeatability of the SEBT, while maintaining the relative ease with which the SEBT can be implemented, may aid clinicians in utilizing the SEBT as an evaluative tool in patients with suspected balance deficits. To date, there is no study examining the use of the Microsoft Kinect on assessing the SEBT reach distance measures. PURPOSE: To establish the validity and reliability of the Xbox One Kinect (Kinect v2) to automatically assess the SEBT reach data in all eight directions. METHODS: A total of twelve subjects (5 males and 5 females; age: 26.8±5.7 years; height: 172.4±28.3 cm, weight: 73.5±10.8 kg) participated in this single session observational research study. The reach distances in the eight different directions of the SEBT were measured concurrently from the Kinect v2 and a traditional three-dimensional motion analysis system (3DMA) system. Results: The maximum SEBT reach distance difference between the Kinect and a traditional motion analysis system (BTS) was 2.0 cm, while the minimum difference obtained was 0.86 cm. The maximum ICC difference between the two systems was 0.01 and the maximum difference in CV was 1.7%, indicating that the Kinect is able to provide similar absolute and relative reliability compared to the BTS. Additionally, Pearson’s correlation coefficient showed high agreements between the Kinect and the BTS (r = 0.97) in all directions of the SEBT. Conclusion: The performance of the Kinect was comparable to that of the BTS in determining the trajectories of the subject’s landmarks and thus the reach distance values during complex dynamic tests such as the SEBT.

Board #315 May 31 3:30 PM - 5:00 PM
Balance Assessment using Microsoft Xbox Kinect
Moataz Eltoukhy1, Christopher Kuenze2, Jecongho Oh1, Joseph Signorile1.1University of Miami, Coral Gables, FL. 2Michigan State University, East Lansing, MI. (Sponsor: Arlette Perry, FACSM)

Board #316 May 31 3:30 PM - 5:00 PM
Validation of the Kinect-based Star Excursion Balance Test
Jecongho Oh1, Moataz Eltoukhy1, Savannah Wooten1, Christopher Kuenze2, Joseph Signorile1.1University of Miami, Miami, FL. 2Michigan State University, East Lansing, FL. (Sponsor: Arlette Perry, FACSM)

Board #317 May 31 3:30 PM - 5:00 PM
Inter-day Consistency Of The Regional Analysis Of Discomfort Survey
Devyn A. Fleischhacker, Kevin R. Ford, FACSM, Justin P. Waxman, Anh-Dung Nguyen, Samantha J. Gajoch, Jeffrey B. Taylor. High Point University, High Point, NC. (Sponsor: Dr. Kevin R. Ford, FACSM)

Board #318 May 31 3:30 PM - 5:00 PM
Validation of Single Sensor Wireless In-shoe Force Insoles during Running
Kristen Renmer1, Bhushan Thakkara2, BS Blaise Williams, FACSM1, Robin M. Queen, FACSM1, Virginia Tech, Blacksburg, VA. 2Virginia Commonwealth University, Richmond, VA. (Sponsor: Robin Queen, FACSM)

Board #319 May 31 3:30 PM - 5:00 PM
Assessment of Lower Extremity Loading During Running
Khalid Al-Kobaisi1, Eman Al-Rajhi2, Sarah Schmitz3, Oliver Edginton1, Kevin R. Ford, FACSM, Taylor. (Sponsor: Dr. Kevin R. Ford, FACSM)
Previous studies showed that disturbed in the shear rate (SR) patterns, characterized by high retrograde and oscillatory SR on conduit artery, are associated with pro-atherogenic phenotype. This phenomenon seems to be caused by increased sympathetic nervous activity and reduced bioavailability of nitric oxide. Considering the anabolic androgenic steroids (AAS) abuse induces autonomic dysfunction, it is possible to speculate that AAS users present alterations in the SR on conduit artery. Possible to speculate that AAS users present alterations in the SR on conduit artery. These alterations could increase the risk of developing atherosclerosis in young men under AAS abuse. 

PURPOSE: The aim of this study was to evaluate the shear rate patterns in young men under AAS abuse. Methods: 18 volunteers were divided into 2 groups: self-reported Anabolic Androgenic Steroid Users (AASU, n=10), Anabolic Androgenic Steroid Non-Users (AASNU, n=8), both group were bodybuilder (strength exercise training). The patients were submitted to evaluate SR patterns and flow-mediated dilatation (FMD) both in the brachial artery. Furthermore, carotid artery intima-media thickness (IMT) was evaluated. All vascular variables were obtained by Doppler ultrasound and the images were analyzed analyzed by brachial analyzer. Results: Age was similar among AASU and AASNU (27±1 vs. 27±1 years, p=0.87). Anterograde SR (110±11.0 s⁻¹ vs. 117±17.0 s⁻¹, p=0.09) and mean SR (78±12.0 s⁻¹ vs. 98±21.0 s⁻¹, p=0.3), were similar between groups. AASU showed higher retrograde SR (-42±0.60 s⁻¹ vs. -19±5.00 s⁻¹, p=0.01) and oscillatory SR (0.30±0.03 uu vs. 0.16±0.04 uu, p=0.03) compared to AASNU. AASU showed lower FMD compared to AASNU (7.2 ± 2.05 vs. 9.5 ± 2.30, p=0.004). In addition, AASU showed higher carotid artery IMT compared to AASNU (0.62±0.02 mm vs. 0.49±0.02, p=0.005). Conclusion: Our results suggest that AAS abuse induces disturbed in the SR patterns in the brachial artery and endothelial dysfunction. These alterations could increase the risk of developing atherosclerosis in young men under AAS abuse.

Table: Comparisons between pedoded and force plate loading parameters.

<table>
<thead>
<tr>
<th>pedoded</th>
<th>Force Plate</th>
<th>ICC (SEM)</th>
<th>pedoded</th>
<th>Force Plate</th>
<th>ICC (SEM)</th>
<th>Pedoded</th>
<th>Force Plate</th>
<th>ICC (SEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R9</td>
<td>2.15±0.17</td>
<td>0.88</td>
<td>0.05</td>
<td>16.72±3.23</td>
<td>0.82</td>
<td>0.05</td>
<td>21.64±3.92</td>
<td>0.86</td>
</tr>
<tr>
<td>R10</td>
<td>2.43±0.20</td>
<td>0.80</td>
<td>0.05</td>
<td>16.43±3.50</td>
<td>0.83</td>
<td>0.05</td>
<td>4.07</td>
<td>0.87</td>
</tr>
<tr>
<td>R11</td>
<td>2.83±0.15</td>
<td>0.83</td>
<td>0.04</td>
<td>15.51±3.49</td>
<td>0.80</td>
<td>0.03</td>
<td>15.89±0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>RH5</td>
<td>2.04±0.18</td>
<td>0.91</td>
<td>0.04</td>
<td>15.06±2.71</td>
<td>0.95</td>
<td>0.06</td>
<td>17.92±0.56</td>
<td>0.87</td>
</tr>
<tr>
<td>RW</td>
<td>2.02±0.17</td>
<td>0.88</td>
<td>0.04</td>
<td>15.53±3.06</td>
<td>0.74</td>
<td>0.04</td>
<td>20.53±1.21</td>
<td>0.73</td>
</tr>
<tr>
<td>RU</td>
<td>2.09±0.12</td>
<td>0.81</td>
<td>0.04</td>
<td>14.93±2.21</td>
<td>0.93</td>
<td>0.04</td>
<td>18.17±0.64</td>
<td>0.85</td>
</tr>
</tbody>
</table>

*SEM = standard error of the measurement.

Evidence suggests that adults with an intellectual disability (ID) who have asthma worry about side-effects of using medications and do not like using their inhalers in public due to stigma. This is problematic, particularly for athletes, as medication needs to be taken 10-15 minutes prior to exercise. Further, research indicates that adults with ID may not be using their inhalers properly. Thus, coaches may need to assist with ensuring appropriate use of inhalers. PURPOSE: The purpose of this study was to determine whether Special Olympics coaches know how to manage their athlete’s asthma effectively. METHODS: Coaches were asked to complete a short survey anonymously while attending training camp with their athletes. The survey consisted of 11 true or false statements regarding asthma, three questions on symptoms, triggers, and preventive techniques, and six yes/no questions on their athletes asthma status, their comfort and confidence in dealing with an athlete having an attack, and their emergency action plan (related to asthma). Twenty seven coaches completed the questionnaire. RESULTS: On average, coaches got 3.9 ± 1.6 of the true/false statements incorrect. However, they generally identified correct triggers, symptoms and preventive techniques. Less than half of the coaches felt confident dealing with an asthma attack if their athlete had one while playing their sport. Only 5 coaches had received training to prepare them for working with an athlete with asthma and only 9 guidelines, with a further likely small (ES = 0.36 ± 0.25) reduction during competition (6.7 ± 1.4 h vs. 6.3 ± 1.6 h, p=0.02). Increased vigour was associated with a likely moderate increase in subjective performance rating during competition (ES = 0.33 ± 0.26).

CONCLUSIONS: This group of Paralympic athletes did not obtain sufficient habitual sleep at home, with travel, regardless of the number of time-zones crossed, and/or competition further reducing sleep quantity. Individualised strategies to increase sleep quantity prior to and particularly following travel would therefore be recommended for this specific group of athletes.

**WEDNESDAY, MAY 31, 2017**

**May 31 3:30 PM - 5:00 PM**

**Exercise-Induced Asthma Knowledge among Coaches of the Special Olympics National Team**


Email: Matthew.Russell@uoit.net

**May 31 5:30 PM - 6:00 PM**

**The Effect of Resistance Training on Strength, Balance, And Coordination in Elderly Women**

Luis H. Boiko Ferreira¹, André C. Smolarek, 84500000, João Carlos Alves Bueno¹, Allan C. Uter, FACSM², Steven R. McNamara³, Tácito P. Souza Junior⁴, Universidade Federal do Paraíba, Curitiba, Brazil. ²Universidade Estadual do Centro Oeste, Irati, Brazil. ³Appalachian State University, Boone, NC.

Email: lhboikoferreira@gmail.com

**Board #322**

**Board #321**
group (CG) with 10 women. The resistance training protocol was applied three times a week engaging muscle groups between superior and inferior muscles. The exercises performed to superior muscles were the Pulley, Deck, Triceps Pulley, Hammer and Side Lateral Raise and the exercises to the inferior muscles were the Abductor, Adductor, Extension Chair, Flexor Bench, and Leg press 90°. Flexibility was tested using a Well’s Bench where the participant performed 3 attempts and the best score was recorded. The dynamic balance was analyzed using a circuit that was performed before the intervention beginning and at the end of 12 weeks. Following the prescriptions proposed by Rikli & Jones, the coordination test was performed using a complex task mixed with a circuit. Results: The strength in superior limbs statistically improved between CG and IG (11.40 ± 2.87 vs 19.50 ± 1.52) with similar results with the inferior limbs strength (14.93 ± 3.10 vs 26.56 ± 3.17, p = 0.001). Regarding dynamic balance, the IG presents a decrease in the time to complete to task compared to the CG (14.62 ± 8.83 vs 17.62 ± 5.09, p ≤ 0.05). There are no differences in the coordination between CG and IG. Conclusion: The main conclusion of this manuscript brings a new paradigm to the training methods used in elderly populations. The benefits related to the strength development using resistance training are in accordance with the present literature, however, in opposition to the present literature, we found that resistance training is effective in developing dynamic balance. Dynamic balance is fundamental in avoiding falls, which are one of the most common injuries in the elderly population. Therefore, it is fundamental that elderly people work to develop health and wellness by incorporating resistance training as a strategy to develop strength and balance.

1144 Board #323
May 31 3:30 PM - 5:00 PM
Maximizing Respiratory Health In Elite Swimmers - A Systematic Approach To Optimize Total Airway Health
James H. Hull, Jr.1, Anna R. Jackson1, James G. Hopker2, Jon Greenwell1, John W. Dickinson2. 1Royal Brompton Hospital, London, United Kingdom. 2University of Kent, Chatham, United Kingdom. 1British Swimming, Loughborough, United Kingdom.

CONCLUSIONS: Elite Swimmers are known to have high prevalence of exercise induced bronchoconstriction (EIB), nasal and sinus disorders. There is however limited data available regarding the impact of a systematic assessment, addressing all aspects of airway health in this cohort.

Purpose: To report the findings of a systematic approach to evaluating total airway health in elite swimmers with EIB, prior to the 2016 Olympics.

Methods: 15 elite swimmers (9 males, 6 females), age 22.2 ± 2.9 yrs underwent a systematic assessment prior to airway health optimization. All swimmers had a prior diagnosis of EIB, confirmed by indirect bronchoprovocation challenge and measurement of exhaled nitric oxide (FeNO). All were prescribed appropriate inhaler therapy and educated on inhaler technique. At the systematic assessment spirometry, FeNO, inhaler flow-rate, nasal flow was measured and they also underwent an assessment with a palatologist. Results were analysed using paired t-tests and are presented as mean ± SD.

Results: All swimmers had at least one co-existing condition in addition to EIB including nasal disease, reflux, sensations of laryngeal closure, recurrent respiratory tract infection and abnormal breathing sensations. One-third reported side effects from their therapy including nasal disease, reflux, sensations of laryngeal closure, recurrent respiratory tract infection and abnormal breathing sensations. One-third reported side effects from their inhaler technique was sub-optimal with frequent report of side-effects. Respiratory health in elite swimmers can be optimized through systematic assessment of airway health.
CVD risk factors, and CRF. RESULTS: Exercise volume was higher (p<0.05) in HIGH compared to MODERATE and LOW, and MODERATE was higher (p<0.05) than LOW. A main effect for exercise volume was noted for heart rate (p<0.05) for resting heart rate, systolic/diastolic blood pressure, total cholesterol, triglycerides, LDL, body weight, waist circumference, BML, CRF, body fat composition, and lean mass, independent of group. Exercise volume was correlated (p<0.05) with markers of aerobic fitness; resting heart rate (r=-0.236) and CRF (r=0.286). Improved plasma lipid profile was (p<0.05) correlated with exercise volume; total cholesterol (r=-0.287), LDL (r=-0.222), glucose (r=-0.247). Additionally, exercise volume was significantly correlated with markers of body composition, mainly fat distribution; body weight (r=-0.369), body mass index (r=-0.356), fat mass (r=-0.417). Conclusion: Participation in a self-referral exercise program improves CRV and CVD risk factors regardless of exercise volume. Correlations between exercise volume and CVD risk factors (e.g. blood lipids, body composition) suggest a dose response relationship. Randomized control trials are warranted to assess the impact of exercise volume on CVD risk factors.

B-77 Free Communication/Poster - Nutrition and Health
Wednesday, May 31, 2017, 1:00 PM - 6:00 PM
Room: Hall F
1148 Board 327 May 31 2:00 PM - 3:30 PM
Assessing Urine Concentration in Children by Combining Urine Color and Void Number
Lisa T. Jansen1, Giannis Arnaoutis2, Dimitris Bougatsas2, J.D. Adams1, Jeanne H. Bottin3, Erica T. Perrier4, Andy Mauromoustkos5, Stavros A. Kavouras, FACSFM. 1University of Arkansas, Fayetteville, AR. 2Harokopio University, Athens, Greece. 3Danone Research, Palaiseau, France. (Sponsor: Stavros A. Kavouras, FACSFM) Email: ltjansen@uark.edu

Purpose: To evaluate the diagnostic ability of two combined practical markers for high urine concentration in children. Methods: Twenty-four hour urine samples from 210 Greek children (age: 8-14 y, body mass: 43.4±12.6 kg, height: 1.49±0.13 m, girls: 105) were collected and analyzed for urine osmolality (UOsm), color (UC), while the number of voids (Void) was recorded. Receiver Operating Characteristic (ROC) analysis was performed for UC, Void, and combination of UC and Void to determine markers’ diagnostic ability for detecting high urine osmolality (UOsm> 800 mmol·kg⁻¹). Results: Sixty-four out of the 210 children (30%) had UOsm greater than 800 mmol·kg⁻¹, with mean UOsm, Void, and Void of 860±223 mmol·kg⁻¹, 5±1, and 6±2, respectively. UC displayed an overall diagnostic accuracy (area under the curve, AUC) of 90% (adjusted for gender, age and body mass index) with 98.4% sensitivity, 59.6% specificity, and threshold of -3. The overall void ratio for Void was 73.7% (adjusted for age and gender) with 61.3% sensitivity, 64.1% specificity, and threshold of -5 times per day. When combined ROC analysis was performed for UC & Void, a cutoff point of 53.1% of UOsm and 91% of void was identified. Conclusion: Both urine color alone and the combination of urine color assessment and void count can be used as valid and simple diagnostic measures to detect high urine concentration. Grant Funding Info: Funding provided by Danone Research.

1149 Board 328 May 31 2:00 PM - 3:30 PM
A First Morning Spot Sample Overestimates 24-Hour Urine Osmolality in Children and Adults
Adam D. Seal1, Dimitris Bougatsas2, Giannis Arnaoutis2, Jeanne H. Bottin3, Erica T. Perrier4, Spiridoula Tsirpoudi5, Stavros Kavouras, FACS FM. 1University of Arkansas, Fayetteville, AR. 2Harokopio University, Athens, Greece. 3Danone Research, Palaiseau, France. Reported Relationships: A.D. Seal: Consulting Fee; Quest Diagnostics. Contracted Research - Including Principle Investigator; Danone Research.

Hydration is frequently assessed using the concentration of single spot urine samples collected from first morning urine. However, circadian variations and overnight fasting (i.e., during sleep) likely affect morning urine concentration. Twenty-four-hour urine samples provide a more complete view of daily hydration, but collection is time-consuming and is difficult to manage, particularly in studies involving children. The degree to which first morning urine overestimates 24-h urine concentration has been characterized in adults, but less in children. PURPOSE: To evaluate the diagnostic accuracy of first morning urine concentration to accurately identify children and adults with high 24-h urine concentration (>800 mmol·kg⁻¹). METHODS: Hydration was assessed via total urine osmolality (UOsm) in a total of 210 children (age: 8-14 years, body mass: 43.4±12.6 kg, height: 1.49±0.13 m, girls: 105) and 82 adults (age: 23.6±2.9, body mass: 65.8±8.1 kg, height: 1.72±0.76 m, women: 41). Data collection included both a full 24-h collection (UOsm24) as well as the associated first morning spot urine sample (UOsmAM). The diagnostic accuracy of UOsmAM to identify UOsm24 > 800 mmol·kg⁻¹ was evaluated using receiver operating characteristic (ROC) analysis in children and adults separately. RESULTS: Mean UOsm in children and adults, respectively, were as follows: UOsmAM: 780±235 and 782±244 mmol·kg⁻¹; UOsm24: 686±223 and 567±214 mmol·kg⁻¹. ROC analysis for UOsmAM for detecting UOsm24 > 800 in children yielded an area under the curve (AUC) of 82.3% with sensitivity, specificity, and threshold values of 53.1%, 95.2%, and 1069 mmol·kg⁻¹, respectively. In adults, the AUC was 89.9%, with sensitivity, specificity, and threshold values of 90.0%, 96.1%, and 960 mmol·kg⁻¹, respectively. CONCLUSIONS: Urine osmolality measured with a first morning spot sample overestimates 24-h urine osmolality in both children and adults. This is in line with previous research in adults suggesting that spot urine samples only reach equivalence with 24-h urine osmolality in the early to late afternoon. Similar research needs to be performed in children. Funding provided by Danone Research.

1150 Board 329 May 31 2:00 PM - 3:30 PM
Effects of Vitamin D3 Supplementation on Lean Mass, Muscular Strength, and Cardiorespiratory Fitness: A Double-Bend Blind Randomized Controlled Trial
Zhen-Bo Cao1, Xiaomin Sun2, Kumpel Tanisawa3, Satomi Oshima3, Mitsuru Higuchi, FACSFM. 1Shanghai University of Sport, Shanghai, China. 2Xian Jiaotong University, Xian, China. 3Waseda University, Tokyo, Japan. (Sponsor: Mitsuru Higuchi, FACSFM) Email: caozb.edu@yahoo.co.jp
No relationships reported.

Low levels of serum 25-hydroxyvitamin D (25(OH)D) are associated with low lean mass, decreased muscle strength, and poor cardiopulmonary fitness. However, the evidence in support of the effect of vitamin D supplementation on lean mass and physical fitness is inconsistent. PURPOSE: To clarify whether there is a direct effect of a 1-year vitamin D supplementation on lean mass, muscular strength and cardiopulmonary fitness in healthy adults. METHODS: Ninety-five participants (34 men) randomly received either 420 IU vitamin D3 per day or placebo in a double-blind manner for 1 year. Lean body mass and fat mass were determined by dual energy X-ray absorptiometry (DXA). Hand grip strength (HGS) was measured using a hand grip dynamometer and leg extension power (LEP) was measured using a leg extension power measurement system. Cardiorespiratory fitness (CRF) was assessed by measuring peak oxygen uptake (VO2 peak) using bicycle ergometer. Physical activity (PA) was assessed using uniaxial accelerometer and quantified as time spent in moderate- and vigorous physical activity (MVPA). Serum 25(OH)D and 1,25-dihydroxyvitamin D [1,25(OH)2D] concentrations assessed using commercial ELISA kits. RESULTS: Serum 25(OH)D and 1,25(OH)2D concentrations were significantly increased by approximately 29.5nmol/L and 7.0 pg/mL, respectively, after 1-year vitamin D supplementation. After vitamin D supplementation, lean body mass was significantly increased from 43.8 kg to 44.3 kg (P<0.05), while the muscle strength and cardiopulmonary fitness parameters were not changed. CONCLUSION: The present study indicates that vitamin D supplementation for one year effectively improves lean mass, but not muscle strength and cardiopulmonary fitness in healthy adults. Supported by a Grant-in-Aid for Scientific Research (C), National Natural Science Foundation of China (No. 31571226), and Program for Professors of Special Appointment (Eastern Scholar) at Shanghai Institutions of Higher Learning (No. TP2014057) to ZBC.

1151 Board 330 May 31 2:00 PM - 3:30 PM
The Prevalence Of Vitamin D Deficiency In Elite Winter Sport Athletes
Margaret Harris1, David Le2, Susie Parker Simmons2, Nanna Meyer, FACSFM. 1University of Colorado Colorado Springs, Colorado Springs, CO. 2United States Olympic Committee, Colorado Springs, CO. Email: mharris5@uccs.edu
No relationships reported.

PURPOSE In recent years, vitamin D’s role in health and athletic performance has become evident. As a result, research on the prevalence of vitamin D insufficiency has become a topic of growing interest. The current literature assessing vitamin D status in the athletic population is limited. Therefore, the purpose of this study is to determine the prevalence of vitamin D insufficiency in elite winter sport athletes. METHODS A retrospective analysis was performed on data from various elite winter sport types throughout 2015 (n=91, 24.9±4.2 yrs). Multiple serum 25-hydroxyvitamin D (25(OH)D) lab values were collected and athletes answered a questionnaire with information on sport type, geographical training/living locations, vitamin D Absorbs were prepared by the authors and printed as submitted.
supplementation, and sun exposure. Descriptive statistics, student and paired t-tests, repeated measures, one- and two- way ANOVAs were used to detect differences in vitamin D levels across groups within and between groups. SPSS v 23 was used. Significance was set at p<0.05.

RESULTS: Prevalence of vitamin D insufficiency across all winter sports was highest at the beginning of the year and during the winter season (27.3% and 24.3%, respectively). There were no significant changes in 25(OH)D levels observed over time, however, iron supplementing IWAs (IWAs) had consistently lower 25(OH)D levels when compared to outdoor winter athletes (OWAs) across the entire year. Supplementation during winter season increased 25(OH)D levels in IWAs by 11.5 ng/ ml when compared to non-supplementing IWAs (p=0.05); 25(OH)D levels in OWAs were not affected by supplementation. During the summer season athletes of lighter skin pigmentation had 7.5 ng/ml higher 25(OH)D levels than athletes of darker skin pigmentation (p=0.05).

CONCLUSION: The findings of this study demonstrate vitamin D insufficiency is prevalent in elite winter sport athletes with an increased risk for IWAs. With negative effects associated with inadequate vitamin D, it is recommended for sports dietsitans to increase the frequency of vitamin D testing throughout the year and consider supplementation in athletes during winter seasons.

1154 Board #333
May 31 2:00 PM - 3:30 PM
Lower Choline Intake is Associated with Diminished Strength and Lean Mass Gains in Older Adults
Chang Woock Lee1, Elifego Galvan2, Teak V. Lee1, Vincent CW Chen1, Steve Bui3, Stephen F. Crouse, FACSM4, James D. Fluckey4, Stephen B. Smith1, Steven E. Riechman, FACSM5.
1University of Houston-Victoria, Victoria, Texas. 2University of Texas Medical Branch, Galveston, Texas. 3Pierce College, Woodland Hills, CA. 4Texas A&M University, College Station, Texas. 5Dixie State University, St. George, UT. (No relationships reported)

PURPOSE: Choline is an essential nutrient involved in many physiological processes including membrane integrity/signaling, lipid transport, methylation reactions, neurotransmission, and muscle contraction. We examined the relationship between habitual, food-based choline consumption and muscle responses to resistance exercise training (RET).

METHODS: Forty-six, 60-69-year-old men and women underwent 12 weeks of whole body RET (3x/week, 3 sets, 8-12 reps, 75% of maximum strength [1RM]). Body composition (DEXA) and 1RM tests were performed before and after training. After analyzing 1,656 dietary logs (3x/week for 12 weeks with 46 participants), participants’ mean choline intakes were categorized into three groups: Low (2.9-5.5 mg/kg lean/d), Med-Low (5.6-8.0 mg/kg lean/d), and Adequate (8.1-10.6 mg/kg lean/d). This corresponds to <50%, ~63%, and ~85% of Adequate Intake (AI), respectively. ANOVA/ANCOVA were performed to compare changes in composite strength (leg press + chest press 1RM) and lean mass between groups controlling for the effects of other nutrients.

RESULTS: Gains in composite strength were significantly less in the Low group compared with the other groups (Low: 30.9 ± 15.1%, Med-Low: 70.3 ± 48.5%, Adequate: 81.9 ± 68.4%, p<0.004). ANCOVA with cholesteral, protein, or other nutrients did not alter this result. Reduced gains in lean mass were also observed in the Low group, compared with the higher choline intake of 5.6-10.6 mg/kg lean/d (11.3 ± 0.6% vs. 3.2 ± 0.6%, p<0.05) with folate as a covariate.

CONCLUSION: These data suggest lower choline intake is negatively and independently associated with muscle responses to RET in older adults.

1155 Board #334
May 31 2:00 PM - 3:30 PM
Dietary Guidelines For Americans: Comparing Menus To What Is Served And Consumed In Preschool Children

Email: skirk@siue.edu (No relationships reported)

Preschool menus must meet the Dietary Guidelines for Americans however, what is actually served and consumed by children is not restricted, potentially affecting consumption of a balanced diet. PURPOSE: Compare preschool menus that meet dietary guidelines to what is actually served and consumed.

METHODS: Fifty-two preschool children (mean±SD, age 3y and 10m ± 8m) from a university early childhood center participated in the 10-week study. Each day, 15 children were randomly selected for nutritional analysis of their lunch. Prior to and immediately after consumption, a picture of the child’s tray was taken using digital photography. If a child had additional food (second serving), additional pictures were taken. Analysis of energy and nutrient content for menus, food served, and food consumed was completed using Food Processor Nutrition Analysis by ESHA. Food color (white, brown, orange, yellow, red, green, other) was determined by observation during analysis. A food preference survey was administered orally to children immediately after each meal.

RESULTS: There was a significant (p<0.05) difference for total kilocalories (kcal) between menu (448 ± 130), served (523 ± 148) and consumed (504 ± 156). There was a significant (p<0.05) difference for grams of carbohydrate between menu (55.3 ± 18.9g) and served (56.5 ± 20.5g) compared to what was consumed (38.5 ± 21.7g). There was a significant (p<0.05) difference for grams of fat between menu (16.0 ± 6.5g) and served (17.1 ± 7.2g) compared to what was consumed (14.5 ± 5.9g).

CONCLUSION: Based on these results, further research is needed to determine what is being served, consumed, and how each (menu versus served versus consumed) affects children’s nutritional intake. Children are consuming more food than is served, which may have impacts on their health and weight over time.
PURPOSE: The hypermetabolic response after a severe burn results in whole body catabolism and calorie deficits leading to malnutrition and losses in lean body mass (LBM). Thus, proper nutrition after a severe burn is essential to recovery. Current practice is to increase nutritional intake by 1.2-1.5 kcal x resting energy expenditure (REE) and protein (1.5-2.5 g protein/kg/day) to increase LBM. In research on non-burn populations suggests an ideal protein intake of 25-30 g per meal for optimal protein synthesis. However, outpatient nutritional monitoring is currently not well documented, the amount and distribution of protein among meals is unknown. Therefore, we examined the nutritional profile and distribution of substrates in severely burned pediatric outpatients in comparison to non-burned children to further direct recovery efforts to mitigate catabolism and increase LBM.

METHODS: Caregivers of 23 burned children (>30% total body surface area burned) and 7 non-burned children (NB) (21 male, 9 female; 13 ± 4 years; mean ± SD) completed 24-hour dietary recalls for 3 consecutive days to obtain a detailed report of foods consumed. Unpaired t-tests with Welch’s correction were performed between burned and NB children. Alpha was set at p<0.05.

RESULTS: Burned children consumed significantly more kcal (3032 ± 888 kcal) than NB children (2147 ± 531 kcal, p<0.006) and averaged 1.6 x REE kcal per day. Burned patients consumed similar amounts of protein/kg body weight (2.9 ± 0.9 g) as NB children (2.0 ± 1 g/kg/day, p<0.05) and had similar distributions of protein at each meal (p<0.05). Burn patients consumed 40-52% carbohydrates, 30-37% fat and 17-18% protein in main meals; protein intake significantly differed at breakfast (p=0.007) and lunch (p=0.041) between burned and NB children.

CONCLUSIONS: The data showed burned children consume more kcal than the recommended amount established for the burn population and consume roughly the same amount of total protein as NB. The protein distribution among each main meal is adequate in burned children. If further studies show that catabolism is not curbed and losses in LBM still persist in spite of adequate nutrition, other interventions such as drug therapy and exercise programs should be considered to increase LBM in severely burned children.

Board #335 May 31 2:00 PM - 3:30 PM
Consumption Of Sugar-sweetened Beverages By Sex And Weight Status In Children From The Mexico-US Border
Luis M. Gómez- Miranda1, Ricardo A. Briones-Villalba1, Melinna Ortiz-Ortiz2, Roberto Espinoza-Gutiérrez1, Iván Rentería3,1, ‘Universidad Autónoma de Baja California, Tijuana, Mexico. 2.Universidad Autónoma de Baja California, Ensenada, Baja California, Mexico. 3.Universidad Autónoma Metropolitana-Xochimilco, Mexico City. Email: luismarioubac@gmail.com
(No relationships reported)

It has been studied that school-age children have access to a diet with a high caloric content and low nutritional value, in addition, this population similarly consumes sugar sweetened beverages. The consumption of these beverages is associated with the development of non-communicable disease, diabetes, cancer and metabolic syndrome. PURPOSE: To identify the frequency of consumption of sugar sweetened beverages by sex and weight status in children from the Mexico-US border.

METHODS: A total of 453 students (235 girls and 218 boys) from 4th to 6th grade of five elementary schools in the city of Tijuana, Baja California, Mexico were measured. Height, weight and BMI was obtained by anthropometry. The questionnaire of beverage consumption (Hedrick et al 2010) was administered, to calculate the calorie and sugar content the Nutritionist Pro (v 5.2) program was used.

RESULTS: The prevalence of overweight and obesity was 45%. Thirty two per cent of boys and 22% of girls consumed more than 50 grams per day of sugar from drinks. As revealed by the Mann-Whitney Test, significant differences by sex were observed in the consumption of grams of sugar per day (p<0.001) and kilocalories from beverages (p=0.002). Also, the boys reported a higher consumption of kilocalories from sugar sweetened beverages (p=0.001) and milliliters per day (p=0.001) than girls. No significant differences of sugar and kilocalories consumption from sugar sweetened beverages among children with normal weight and those who were overweight and obese were found.

CONCLUSIONS: The results of this study indicates a high intake of sugar from drinks, which is higher than recommended by WHO. The boys reported a higher consumption of sugar sweetened beverages and kilocalories than girls. The study shows no significant differences in the sugar and kilocalories consumption by weight status.
Social jetlag occurs when there is a mismatch between an individual's circadian clock and their sleep schedule. Recent research has shown that social jetlag is associated with many health related factors, particularly with overweight and obesity. However, the relationship between social jetlag and cardiorespiratory fitness has not yet been studied, including in adolescents. PURPOSE: To investigate the relationship between social jetlag, measured as the difference in hours between the midpoint of sleep on school and non-school days, and cardiorespiratory fitness. METHODS: Cardiorespiratory fitness, anthropometric, demographic and dietary data were collected from students aged 15 to 18 years attending secondary schools in Otago, New Zealand. Students completed an online lifestyle survey in one class period. Food choice was assessed using the validated New Zealand Adolescent FFQ and three dietary patterns ("Treat Foods", "Fruits and Vegetables" and "Basic Foods") were generated using principal components analyses. A subset of participants also undertook fitness testing measurements. The primary outcome, cardiorespiratory fitness, was expressed as maximal oxygen uptake (VO2 max), estimated from a multi-stage 20-metre shuttle run test. Multivariate linear regression analyses were undertaken with VO2 max as the primary outcome. Analyses were adjusted for dietary pattern scores, Body Mass Index (BMI) Z scores, sex, age, socio-economic status and ethnicity. An interaction between sex and social jetlag was also tested for.

RESULTS: Questionnaire, BMI and cardiorespiratory fitness data were available for 279 participants, with a mean (SD) age of 15·7 (0·9) years. Mean (SD) VO2 max was 43·3 (6·0) ml/kg per min for girls and 48·5 (7·1) ml/kg per min for boys. Mean (SD) social jetlag was 1 hour 53 minutes (1 hour 17 minutes). A one-hour increase in social jetlag was associated with a 0·78 ml/kg per min decrease in VO2 max (CT: -1·39, -0·18). There was no significant interaction between sex and social jetlag. CONCLUSIONS: Social jetlag is a significant correlate of cardiorespiratory fitness in adolescents. Minimising social jetlag may be beneficial to improve physical fitness of adolescents and has the potential to be a simple and measurable goal in lifestyle interventions.

An association has been established between total energy intake and cardiorespiratory fitness (CRF) in adolescents; however, there is little research examining dietary components. PURPOSE: To determine if an association exists between F/V intake and CRF in adolescents. METHODS: A sample of 424 adolescents (234 males and 190 females) age 10-18 years completed the Dietary Behavior section of the Youth Risk Behavior Survey (YRBS) and the FITNESSGRAM 20 meter Pacer test (PACER). This section of the YRBS assesses F/V intake based on intake frequency over a one week period. Peak oxygen consumption (VO2 peak) was calculated from the PACER results and categorized based on the FITNESSGRAM aerobic standards, placing individuals into one of three categories: Healthy Fitness Zone (HFZ), Needs Improvement (NI), and Needs Improvement – Health Risk (NI-HR). Mean differences in total F/V intake for participants in each of the CRF categories were assessed using a one way ANOVA. RESULTS: The mean total F/V intake values (times per week) showed slight differences between each of the categories. For male participants the F/V intake values for participants in each of the CRF categories were assessed using a one way ANOVA.

CONCLUSIONS: Our results suggest differential associations between PA and food choices: Moderate to high PA was associated with healthier food choices, indicated by lower intake of energy-dense, nutrient-poor foods and higher consumption of fruits, vegetables, and whole grains. However, the increase in added sugar consumption and stagnating intakes of healthier foods among very high activity suggest the beneficial effect of PA on dietary patterns is inhibited at this upper end, possibly due to compensatory mechanisms to meet increased energy needs. Future research is needed to determine physiologic and behavioral mechanisms underlying this differential relationship between PA and dietary patterns.
tryptophan: 61.5 ± 9.9 vs. 52.1 ± 1 μM, p < 0.05). Rates of change in metabolites increased significantly more in men than in women after exercise (lactate: 1231.1 ± 263.8 vs. 972.5 ± 521.9 μM, p < 0.05; malic acid: 320.1 ± 136.4 vs. 168.5 ± 92.2 μM, p < 0.05; glycine 3-phosphate: 37.5 ± 11.0% vs. 38.3 ± 25.8%, p < 0.01; creatine: 26.8 ± 16.2% vs. 3.7 ± 9.0%, p < 0.05; citrulline: 1.86 ± 2.6% vs. 8.5 ± 8.4%, p < 0.05).

CONCLUSIONS: Metabolite profiles and values for sex hormones changed in a sex-dependent manner after acute resistance exercise. Therefore, sex hormone concentrations might influence energy utilization during resistance exercise.

**B-78**

Free Communication/Poster - Obesity

**Board #343**

**May 31 2:00 PM - 3:30 PM**

An 8-month Small-group Circuit Functional Training Program Improves Body Composition And Performance Of Overweight/obese Women.

Alexios Batrakoulis1, Kalliopi Georgakouli1, Konstantinos Papanikolaou1, Nikolaos Zourbaros1, Dimitrios Dragandis1, Chantal Deli1, Maria Michalopoulou1, Alexandra Avloniti1, Athanasios Chatzinikolaou2, Athanasios Jamurtas1, Ioannis Fatouros1, 1University of Thessaly, Trikala, Greece. 2Democritus University of Thrace, Komotini, Greece. (Sponsor: Theodore J. Angelopoulos, FACSM)

Email: alexis.batrakoulis75@hotmail.com

**No relationships reported**

The body weight training, high-intensity interval training (HIIT), functional fitness, group personal training, and circuit training are currently some of the top worldwide trends in the commercial, corporate, clinical, and community landscapes within the health and fitness industry. Additionally, adult obesity and physical inactivity are considered as the top global public health problems nowadays.

**PURPOSE:** This study aimed to evaluate the effects of a circuit functional training program on body composition and performance in sedentary overweight or obese women.

**METHODS:** Twenty-eight premenopausal overweight or obese women (n=28; 36.8 ± 4.6 years; 166.0 ± 0.1 cm; 79.7 ± 9.1 kg; 28.8 ± 2.8 kg/m²) volunteered to participate and were randomly assigned to either a control (C, n=14) or an experimental group (E, n=14). Exercise consisted of a low volume circuit functional training program (~30 min) and 3 sessions per week in nonconsecutive days for 32 weeks. Both groups were tested pre- and post-intervention in body mass index (BMI), waist-to-hip ratio (WHR), body composition (DXA), resting metabolic rate (RMR), upper and lower body muscular strength (RM), and endurance (curl up and push up), cardiovascular endurance (VO2peak), flexibility (sit and reach test), static balance (Sharpened Romberg test), and subjective vitality. Comparisons were made using two-way ANOVA with repeated measures.

**RESULTS:** Significant improvements were observed between pre- and post-testing measures in E. Body fat, BMI, and WHR declined (p<0.001) by 1.1%, 6%, and 4.6% while fat-free mass (p<0.05), upper and lower body muscular strength, trunk and upper body muscular endurance, VO2peak, flexibility, static balance, and subjective vitality increased (p<0.001) by 1.9%, 30.9% and 27.2%, 91.6% and 238.5%, 26.8%, 34.5%, -25.4%, and 131.8%, respectively.

**CONCLUSION:** These results suggest that a time-effective exercise modality that combines the circuit training, HIIT, and functional fitness using body weight exercises may improve all components of physical fitness in premenopausal, inactive overweight or obese women. These findings may be attributed to the hybrid nature of this exercise regimen for small groups applying full-body movements and high-intensity routines according to HIIT principles adapted to sedentary individuals.

**B-79**

Free Communication/Poster - Obesity

**Board #344**

**May 31 2:00 PM - 3:30 PM**

**Effects Of Exercise Intervention On Visceral Fat In Obese Youth: Meta-analysis**

Soeun Jeon1, Hyun Chul Jung2, Nan Hee Lee1, Gina Ok1, Kyungun Kim1, Minsoo Kang, FACSM4, Sukho Lee1, 1Texas A&M University-San Antonio, San Antonio, TX. 2University of Louisiana at Monroe, Monroe, LA. 3University of Texas at Austin, Austin, TX. 4Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM)

**No relationships reported**

Childhood obesity is associated with a higher chance of the development of several diseases, premature death, and disability in adulthood. Previous studies have examined the effects of exercise on visceral fat; however, many of these studies applied different methodologies and showed different results. **PURPOSE:** To assess the effects of different exercise types on visceral fat in obese youth and to suggest the most effective way to reduce visceral fat using a meta-analysis.

**METHODS:** Electronic database searches were performed in Pubmed, MEDLINE, Academic Search Complete, SportDiscus, and CINAHL. From the earliest report to May 2016 key words included ‘exercise or training’, ‘visceral fat’, and ‘child or adolescent or youth’. The inclusion criteria for eligible studies were as follows: 1) subjects were obese at baseline, 2) subjects aged 6-18 years, 3) body weight was reported at baseline and after intervention, and 4) studies were published in peer-reviewed journals written in English. Two authors independently selected trials, assessed trial quality and extracted data. Comprehensive Meta-Analysis version 3 software was used to compute effect size (ES) and the 95% confidence intervals (CI) using a random effects model. Heterogeneity was assessed using the Cochran’s Q statistic. Four moderator variables (gender, types of exercise, treatment periods, and disease conditions) were analyzed. **RESULTS:** Of the 177 studies from the initial search, 61 ESs were derived from the 30 selected studies. The overall treatment effect was large (Cohen’s d (ES) = 1.05, 95% CI = 0.94, 1.16). Subgroup analyses showed that exercise type (Qb = 10.84, df = 2, p = 0.004) and treatment length (Qb = 23.76, df = 1, p < 0.001) influenced the overall ES. The combined exercise program (Aerobic + Resistance training; ES = 1.19, 95% CI = 1.06, 1.35) and treatment periods longer than 6 months (ES = 1.23, 95% CI = 1.10, 1.35) appeared to be the most effective in reducing visceral fat. However, ESs were similar among gender and disease conditions. **CONCLUSIONS:** There was a large overall effect for exercise intervention on visceral fat in obese youth. Findings from this meta-analysis can help in designing an effective exercise intervention to reduce visceral fat in obese youth.

**B-80**

Free Communication/Poster - Obesity

**Board #345**

**May 31 2:00 PM - 3:30 PM**

**Humodynamic Response to Acute and Chronic Exercise in Obese and Lean Prehypertensive Men**

Zachary Zeigler1, Pamela Swan, FACSM2, Siddhartha Angadi2, Farouk Mookadam3, Matthew Buman, FACSM2, Glenn Gaesser, FACSM2. 1Grand Canyon University, Phoenix, AZ. 2Arizona State University, Phoenix, AZ. 3Mayo Clinic, Phoenix, AZ. (Sponsor: Pamela Swan, FACSM)

Email: zachary.zeigler@gcu.edu

**No relationships reported**

**PURPOSE:** Approximately 7.1 million deaths worldwide are ascribed to hypertension (HTN). Those with HTN who fit the lean body phenotype are characterized by mechanistically different HTN compared to an obese HTN phenotype. The purpose of this study was to assess whether body phenotype influences blood pressure (BP)
response following both acute and chronic exercise. METHODS: Obese (body mass index (BMI) ≥ 30 kg/m²) and normal weight (BMI < 25 kg/m²) men with pre-hypertension (systolic BP (SBP) 120-139 or diastolic BP (DBP) 80-89 mmHg) were asked to participate in a two phase trial. Phase 1 assessed differences in post-exercise hypotension between groups in response to an acute exercise bout. Phase 2 consisted of a two-week aerobic exercise intervention at 65-70% of heart rate (HR) max on a cycle ergometer. Primary outcome measures were; brachial BP, central BP, cardiac output (CO), and systemic vascular resistance (SVR) measured at rest before and following one exercise session and following two-weeks of training. RESULTS: There were no baseline resting brachial BP (126 ± 7 mmHg vs. 126 ± 5 mmHg, P=0.976), central BP (110 ± 5 mmHg vs. 113 ± 6, P=0.123), age (24 ± 4 yr vs. 25 ± 4 yr, P=0.547), or VO2 peak (29 ± 4 L/min vs. 32 ± 7 L/min, P=0.248) differences between Lean and Obese. At rest, obese PHTN had greater CO compared to lean PHTN (63 ± 2 vs 47 ± 1 L/min, P=0.000) and decreased SVR compared to lean PHTN (1218 ± 263 vs 1606 ± 444 dyn/cm², P=0.003). Lean PHTN saw a 3 mmHg reduction on both central and brachial SBP (P < 0.05) in response to acute exercise, while obese PHTN witnessed a significant 4 mmHg increased brachial and 3 mmHg increased central SBP (P < 0.05). SVR decreased greater following acute exercise in lean PHTN compared to obese PHTN (224 dyn/cm² vs. 75 dyn/cm², P=0.001). Chronic training evoked a 4 mmHg reduction in brachial SBP and 3 mmHg reduction for central SBP for lean PHTN with no change in obese PHTN. Lean BP reduction in response to training was accompanied by a significant SVR reduction of 169 dyn/cm² (P=0.005), while obese experienced a significant increased SVR following training (95 dyn/cm², P=0.005). CONCLUSION: Body phenotype may play a significant role in the efficacy of aerobic exercise on BP reduction.

1168 Board #347 May 31 2:00 PM - 3:30 PM Dyspnea on Exertion in Nonobese and Obese Patients Vipa Bernhardt1, Rubria Marines-Price2, Kyle Weinsteini, Simba Walker-Williams2, Andrew R. Tomlinson3, Tony G. Babb, FACSM4. 1Texas A&M University Commerce, Commerce, TX. 2Texas Health Presbyterian Hospital Dallas and University of Texas Southwestern Medical Center, Dallas, TX. (Sponsor: Tony G Babb, FACSM)

Email: vipa.bernhardt@tamuc.edu

(Purpose: Dyspnea on exertion (DOE) is a common symptom in otherwise healthy obese individuals and in patients with serious illness. Whether obese patients have an exaggerated rating of breathlessness (RB) as compared with nonobese patients is unknown. In a retrospective analysis, we investigated RB in nonobese and obese patients who were referred for clinical cardiopulmonary exercise testing (CPET) due to unexplained DOE.

METHODS: Data from 112 patients were separated into nonobese (BMI < 30; n = 55) and obese (BMI ≥ 30; n = 57) groups. All patients cycled at two constant load work rates set based on the patient’s peak exercise test and relationships between variables were examined by regression analysis.

RESULTS: BMI was 22 ± 2 kg/m² in the nonobese (62 ± 9 kg) and 36 ± 4 kg/m² in the obese (103 ± 16 kg) patients (mean ± SD; P < 0.001). Age was also not different between groups (50 ± 20 yr vs 57 ± 12 yr). Work rates were not significantly different between the nonobese and obese patients at the lower (29 ± 19 W vs 24 ± 14 W) or higher constant load work rates (59 ± 35 W vs 49 ± 27 W). Exercise intensity was also not different between groups at the lower (53 ± 11 vs 56 ± 13% of peak O₂ uptake) or higher work rates (74 ± 11 vs 72 ± 11%). RB was significantly higher (P < 0.05) in the obese patients (2.3 ± 1.4 vs 3.3 ± 2.2) at the lower work rate, but not at the higher work rate (4.8 ± 1.8 vs 4.9 ± 2.2). Maximal exercise capacity was higher in the obese patients (77 ± 24 vs 58 ± 21% predicted). There was no significant relationship between RB and BMI within either group. However, there was a significant (P < 0.001) association between RB and ratings of perceived exertion (RPE) in the nonobese (r = 0.68 & 0.82 for lower & higher constant work rates) and the obese (r = 0.87 & 0.81) patients.

CONCLUSIONS: Obese appears to have a significant effect on breathlessness at lower work rates in this mixed patient population, and should be considered when assessing breathlessness in patients. Supported by NIH R01 HL096782, King Charitable Foundation Trust, and Texas Health Presbyterian Hospital Dallas.

1170 Board #349 May 31 2:00 PM - 3:30 PM Irisin Is Associated With Insulin Sensitivity Improvement Following An Exercise Training In Obese Youth Martin Sénéchal1, Brittany V. Rioux1, Pelech Cody2, Dustin Kimberly1, Teri L. Moffatt1, Todd H. Duhamel1, Vernon W. Dolinsky3, Johnathan M. McGavock1. 1University of New Brunswick, Fredericton, NB, Canada. 2University of Manitoba, Winnipeg, MB, Canada. 3University of Manitoba, Winnipeg, MB, Canada. (Sponsor: Arturo Figueroa, MD, Florida State University, Tallahassee, FL. (Sponsor: Arturo Figueroa, FACSM)

Email: msenecha@umb.ca

(Purpose: The purpose of this prospective study is to determine if a change in circulating irisin during an acute bout of exercise was associated with insulin sensitivity after a 6-week exercise training in obese youth. METHODS: A total of 11 obese youth aged between 12 and 18 years completed a 45-minute acute bout of exercise. Irisin, the primary exposure variable, was measured using an immunosassay Elisa from blood draws taken before and during exercise at 15, 30, and 45 minutes.

Then participants underwent a 6-week strength training intervention performed at 65% of their one repetition maximal. The primary outcome measure was changes in insulin sensitivity, measured using the Matsuda index. To investigate the metabolic response, participants were categorized as either responder or non-responder according to the median change on the Matsuda index. RESULTS: The proportion of irisin increased significantly during the acute bout of exercise (56.3 ± 6.3%; p=0.028). Overall, the average relative insulin sensitivity did not improve following 6-week of strength training (+18.5 ± 43.1%; p=0.860). Absolute change in irisin during the acute bout of exercise was associated with absolute change in Matsuda index (r=0.68; p=0.022). A similar association was observed between the relative change in irisin and the relative change in Matsuda index (r=0.73; p=0.010).

Participants above the median of change in the Matsuda index, significantly increased irisin (90.0 ± 28.0%; p=0.020), while individuals below the median did not (22.8 ± 18.7%; p < 0.05).

CONCLUSIONS: An acute bout of exercise increases plasma irisin in obese youth and is associated with a greater insulin sensitivity despite a large variability in response. More studies are needed to better understand the impact of irisin on other metabolic parameters.)
Effects of Different Exercises Training associated with Phototherapy on Cardiometabolic Risk in Obese Women

Raquel Munhoz da Silva Campos1, Ana R. Dámaso2, Deborah Cristina Landi Masquio2, Marcela Sene-Fiorese2, Fernanda Oliveira Duarte3, Antonio Eduardo Aquino Junior3, Lian Tock4, Vanderlei Salvador Bagnato5, Nivaldo Antonio Parati6

1Federal University of São Carlos (USFCar), São Carlos, Brazil. 2Federal University of São Paulo (UNIFESP), São Paulo, Brazil. 3University of São Paulo (USP), São Carlos, Brazil. 4Weight Science, São Paulo, Brazil. Email: raquelmunhoz@hotmail.com

In the past, exercise in obesity control, mostly weight loss programs are associated with aerobic training. However, aerobic plus resistance training (ART) can promote weight loss and positively affect some metabolic parameters. Recently, it has demonstrated the benefits to use the phototherapy associated to physical exercise practice in obese women. PURPOSE: Investigate the effects of different exercises training associated with phototherapy on cardiometabolic risk in obesity women.

METHODS: It was involved 33 obese women with age of 20-40 years in a weight loss therapy during 4 months. Inclusion criteria were primary obesity, body mass index greater than 30 kg/m² and less than 40 kg/m². The volunteers were assigned in different two groups: Aerobic Training (AT) and Aerobic plus Resistance Training (ART) groups. The interventions consisted on physical exercise training and application of phototherapy (830nm), immediately after the physical exercise. Metabolic parameters were evaluated.

RESULTS: It was showed reduction in body mass (AT: 93±11 vs 89±11, p<0.01; AT: 94±16 vs 89±18kg, p<0.01), body mass index (AT: 35±4 vs 31±4, p<0.01; AT: 35±4 vs 33±4kg/m², p<0.01), fat mass (AT: 40±3 vs 37±3, p<0.01; AT: 47±3 vs 44±6, p<0.001), visceral (AT: 183±19 vs 135±17, p<0.004 AT: 160±34 vs 150±36cm², p<0.003), total cholesterol (AT: 205±24 vs 180±22, p<0.002; AT: 183±34 vs 163±51mg/dl, p<0.04), neck (ART: 38±3 vs 35±2, p<0.001; AT: 38±2 vs 37±2cm, p<0.04) and waist (ART: 108±11 vs 105±10, p<0.02; AT: 100±8 vs 92±7cm, p<0.001) concentrations in both groups. Only ART group demonstrated improvement in lean mass (60.3 vs 66.7%, p<0.01) and adiponectin (7.5±3 vs 10.17±4.1ng/l, p<0.001). In addition, reduction in triglycerides (133±38 vs 108±42mg/dl, p<0.01) was noted only in ART group. Two-way ANOVA with repeated measures was applied.

CONCLUSIONS: It was showed that ART associated with phototherapy applied in obese women was more effective than AT to improve health status in obesity reducing the cardiometabolic risk in this population. Supported by FAPESP (2013/041364; 2013/19046-0; 2013/08522-6; 2015/14309-9), CNPq (573587/2008-6; 300654/2013-8; 150177/2014-3) and CAPES.

Obesity Moderates the Effects of Motivational Interviewing Treatment Outcomes in Fibromyalgia

Anthony S. Kaleb, FACSM1, James E. Slaven2, Dennis C. Ang3, 1Indiana University-Purdue University Indianopolis, Indianopolis, IN. 2Indiana University, Indianopolis, IN. 3Wake Forest University, Winston-Salem, NC.

PURPOSE: Obesity is a common comorbid condition among patients with fibromyalgia (FM). The purpose of this study was to assess if obesity moderates the treatment benefits of exercise-based motivational interviewing (MI) for FM.

METHODS: This is a secondary data analysis of a completed clinical trial of 198 FM patients who were randomized to receive either MI or attention control (AC). Using body mass index (BMI) to divide participants into obese (BMI ≥ 30 kg/m²) and non-obese (BMI < 30 kg/m²) groups, mixed linear models were used to determine interaction between treatment arms and obesity status with regards to the primary outcome of global FM symptom severity (Fibromyalgia Impact Questionnaire, FIQ). Secondary measures included pain intensity (Brief Pain Inventory, BPI), 6-minute walk test, and self-reported physical activity (Community Health Activities Model Program for Seniors).

RESULTS: Of the 198 participants, 91 (46%) were non-obese and 107 (54%) were obese. On global FM symptom severity (FIQ), the interaction between treatment arms and obesity status was significant (p<0.02). In the non-obese group, MI was associated with a greater improvement in FIQ than AC. In the obese group, MI was not reported less improvement in FIQ compared to AC. The interaction analysis was also significant for BPI pain intensity (p<0.01), but not for the walk test and self-reported physical activity.

CONCLUSIONS: This is the first study to show that obesity negatively affects the treatment efficacy of MI in patients with FM. Our findings suggest that exercise-based MI may be more effective if initiated after weight loss is achieved.

High Intensity Interval Training Changes Skeletal Muscle Insulin Signalling Pathway Of Obese Individuals

FLAVIO C. MAGALHAES1, DENIA V. VIEIRA1, MARIANA A. MATOS1, KAIÓ C. PINHAL1, KURT ESCOBAR2, MARCO FABRÍCIO DIAS-PEIXOTO1, ETEL ROCHA-VIEIRA1, FABIANO T. AMORIM3, 1Federal University of the Jequitinhonha and Mucuri Valleys, Diamantina, Brazil. 2University of New Mexico, Albuquerque, NM. Email: magalaehasufing@gmail.com

PURPOSE: Obesity, characterized as excess of body fat (BMI ≥ 20 kg/m²), is related to the development of various metabolic disorders, including insulin resistance. Exercise is known to serve as a non-pharmacological approach to increase skeletal muscle insulin sensitivity, although the mechanisms have not been fully elucidated. Additionally, the molecular underpinnings of the effects of high intensity interval training (HIIT) on insulin resistance are less understood. This study evaluated the effects of HIIT on biochemical and molecular markers related to insulin resistance in physically inactive obese individuals.

METHODS: 9 obese insulin sensitive (OB, 32 ± 10 y; 92.4 ± 12.9 kg; 35.1 ± 3.8 kg/m²) and 8 obese insulin resistant (OBR; 30 ± 11 y; 106.0 ± 19.6 kg; 37.8 ± 4.6 kg/m²) volunteers were subjected to 8 weeks of HIIT using a cycle ergometer. Insulin resistance was defined as homeostasis model assessment index (HOMA-IR) equal or greater than 2.71. Before and after the training, a maximal ramp test was performed to measure maximal cycling power output. HIIT was performed 3 times a week with progressively increasing intensity and volume (8 to 12 bouts of 1 min duration at 80% to 110% of the maximum power output separated by 1 min active recovery at 30 W).

RESULTS: HIIT increased insulin sensitivity evaluated by HOMA-IR in OB (4.4 ± 1.4 versus 4.1 ± 2.2, p=0.02) but not in OBR (1.8 ± 0.5 versus 2.3 ± 1.0) volunteers. In skeletal muscle, HIIT increased phosphorylation of the insulin receptor substrate (Tyr612), Protein kinase B (AKT Ser473) and protein kinase dependent calcium/calcmodulin (CaMKII) (Thr286), and increased expression of β-hydroxyacyl-CoA dehydrogenase (β-HAD), and cytochrome C oxidase (COX-IV). There was also a reduction of phosphorylation of extracellular signal regulated kinase (ERK1/2) in OBR.

CONCLUSIONS: 8 weeks of HIIT promoted improvements in insulin sensitivity, modified components of insulin signaling pathway, and improved oxidative metabolism in skeletal muscle. These changes were independent of changes in body fat. This work was supported by CAPES (PNPD-2455/2011), FAPEMIG (CDS APQ16212-10), and CNPq (477154/2011-5) grants.

Effects of Underwater Treadmill Training on Health-Related Fitness and Daily Caloric Expenditure in Adults with Type 2 Diabetes

Ryan T. Conners1, John M. Coons2, Dana K. Fuller2, Don W. Morgan, FACSM2, Jennifer L. Caputo2, 1University of Alabama in Huntsville, Huntsville, AL. 2Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Dr. Don W. Morgan, FACSM)

PURPOSE: To document the influence of underwater treadmill training (UTT) on components of health-related fitness and daily energy expenditure in middle-aged adults with type 2 diabetes. METHODS: Using a randomized, controlled, single-blind, crossover design, 26 adults with type 2 diabetes (age = 58 ± 3.4 yrs; 16 females, 10 males) were randomly assigned to complete a 12-week control period followed by 12 weeks of UTT (Group 1: G1; n = 13) or 12 weeks of UTT (3d wk⁻¹) followed by a 12-week period of no UTT (Group 2; G2, n = 13). During UTT, water height was maintained at 10 cm below the xiphoid process, walking speed was set to elicit a relative intensity of 40-50% of heart rate reserve (HRR) and gradually raised to 50-70% HRR by week 12, and the duration of walking sessions was increased from 30 to 60 minutes over the course of UTT. Primary outcome measures included cardiovascular fitness (VO2max), resting systolic and diastolic blood pressure (RSBP; RDBP), 6-min walk distance (6MWd), body composition [body mass (BM), body fat percentage (BF%), waist circumference (WC)], leg strength [ hamstring and quadriceps isokinetic peak torque at 30° ‘sec’ and 60° ‘sec’], and daily average caloric expenditure (DACE). Using 1-way repeated-measures analysis of variance, post-treatment scores were compared to pre-treatment scores across G1 and G2 participants. RESULTS: Compared to pre-treatment scores, significant (p < .05)
improvements in cardiovascular fitness (decreased RHR, RSBP, and RDBP; increased 6MWD), body composition (decreased BM, BF%, and WC), and leg strength (greater peak hamstrings torque at 30°·sec⁻¹, 60°·sec⁻¹, and peak quadriceps torque at 30°·sec⁻¹), along with an increase (p < 0.05) in DACE, were observed following UTT. CONCLUSIONS: Our findings demonstrate that an underwater treadmill walking program featuring a gradual and progressive increase in walking speed and duration can enhance health-related fitness and raise daily caloric expenditure in middle-aged adults with type 2 diabetes.

1175  Board #354  May 31 2:00 PM - 3:30 PM  Insulin Therapy is Associated With Increased Sedentary Behaviour and Weight Gain in T2DM Patients

Yvonne A.W. Hartman¹, Henry J. Janssen¹, Cees J. Tack¹, Maria T.E. Hopman, FACSM², Dick H.J. Thijsen³. ¹Radboud University Medical Center, Nijmegen, Netherlands. ²Liverpool John Moores University; Liverpool, United Kingdom. ³University Medical Center, Nijmegen, Netherlands. Email: yvonne.hartman@radboudumc.nl

Purpose: Start of insulin treatment in type 2 diabetes mellitus (T2DM) is associated with weight gain, which further increases cardiovascular and metabolic risk. Changes in moderate-to-vigorous physical activity (MVPA), light physical activity (LPA) and/or sedentary behaviour (SB) may contribute to weight gain. Here, we compared physical activity patterns in T2DM and controls and studied the effects of initiation of insulin therapy.

Methods: First, we objectively assessed free-living MVPA, LPA and SB in patients with T2DM without (n=40) and with prolonged insulin therapy (T2DM-I, n=42), as well as weight matched (n=38) and lean controls (n=35). Secondly, 40 T2DM patients were followed prospectively across 12-months after initiation of insulin therapy. Weight, MVPA, LPA and SB were measured at baseline, 6 months and 12 months after start of therapy.

Results: Weight matched controls, T2DM and T2DM-I spent less time in MVPA than lean controls (1.6±1.4h, 1.1±0.8h, 1.5±1.1h and 2.7±1.5h, respectively, P<0.001). T2DM-I, but not T2DM and weight matched controls, spent less time in LPA (P=0.045). Sitting time was higher in T2DM and T2DM-I compared to lean controls (P=0.003), but not compared to weight matched. Prospectively, body weight increased 2.9±4.5kg over 12 months (P<0.05). We found no changes in MVPA, whilst LPA declined from 2.0±1.1 to 1.6±0.9h (P=0.027) and sitting time increased (11.7±1.7 to 12.3±1.9h, P=0.028). Non-obese (BMI<30kg·m⁻²) T2DM patients who started insulin therapy showed a positive correlation between the increase in sitting time vs weight gain (r=0.446, P=0.037) and waist circumference (r=0.446, P=0.033). These relations were not present in obese T2DM patients, who started with more sitting time and higher waist circumference (both P<0.05).

Conclusion: T2DM patients, especially those on insulin therapy, show lower levels of MVPA and LPA, but more sitting time, compared to lean controls. Start of insulin therapy is associated with an increase in sitting time. This increase in sitting time was associated with weight gain in non-obese subjects, but not in obese subjects. This suggests that increased SB, rather than decreased MVPA, may contribute to weight gain associated with insulin therapy in T2DM.

1176  Board #355  May 31 2:00 PM - 3:30 PM  Validation Of A System-specific Dual-energy X-ray Absorptiometry-derived Body Volume Equation For 4-compartment Body Composition Calculations

Katie R. Hirsch, Meredith G. Mock, Eric T. Trexler, Malia N.M. Blue, Abbie E. Smith-Ryan, FACSM; University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Abbie E. Smith-Ryan, FACSM)

Email: ktrose23@live.unc.edu

A dual-energy x-ray absorptiometry (DEXA)-derived estimation of body volume (BV) has been shown to be a valid alternative to air displacement plethysmography (BodPod) in the calculation of body composition using a traditional 4-compartment (4C) model. Previously established equations have been derived using a Hologic DEXA model, but validation of the equation with other DXA models is needed.

Purpose: To determine the validity of DEXA-derived BV and 4C body composition (DEXA-4C) calculations using a GE iDXA system compared to the traditional 4C criterion method.

Methods: Forty-six overweight and obese adults (Mean ± SD; Age=35.3 ± 9.0 yrs; Body mass index=33.2 ± 4.7 kg·m⁻²) underwent a traditional 4C composition assessment using a BodPod. Supported by Scivation Inc.

Conclusions: Our findings demonstrate that an underwater treadmill walking program featuring a gradual and progressive increase in walking speed and duration can enhance health-related fitness and raise daily caloric expenditure in middle-aged adults with type 2 diabetes.
RESULTS: Skeletal muscle CS maximal activity increased (P<0.05) from 25.5±3.1 to 30.0±3.1 μmol g⁻¹ min⁻¹ in HIT only, with larger (P<0.05) improvement compared to MIT. Muscle HAD activity increased (P<0.05) in HIT 15.3±1.9 to 18.5±4.0 μmol g⁻¹ min⁻¹ and in MIT (15.7±2.8 to 19.5±3.0 μmol g⁻¹ min⁻¹) with no between-group difference. YYIR2 score was improved (P<0.05) −39 % more in HIT compared to MIT post-intervention (323 ± 125 vs. 222 ± 113 m).

CONCLUSIONS: Additional high-intensity and moderate-intensity training augmented skeletal muscle oxidative capacity and high-intensity exercise performance in trained athletes with an overall higher effect of high-intensity training.

PURPOSE: We examined the hypothesis that failing to maintain energy availability (EA, calculated as energy intake (EI) - exercise energy expenditure (ExEE)) during intensified training (IT) would predispose athletes to a state of overreaching (OR, high perceived fatigue and prolonged performance impairment).

METHODS: After 4 weeks of baseline training, 16 female runners (28 ± 5 y) performed 4 weeks of IT (130% of baseline volume), followed by a 2 week recovery, (REC, 50% of baseline). Over the last 7 days of each phase, ExEE was measured with chest-worn activity monitors (Actiheart) and EA was recorded using my Fitness Pal phone application. Running performance (distance covered during a graded treadmill test) and perceived fatigue (REST-Q) were assessed at the end of each phase to classify athletes as OR or acutely fatigued (AF, increased fatigue but no decrease in performance). VO₂max, heart rate (HR), systolic blood pressure (SBP), plasma epinephrine and norepinephrine and blood lactate concentrations were measured at 65, 75 and 85% of VO₂max and immediately after maximal exercise.

RESULTS: 7 runners became OR and 9 were AF (Δperformance:−9±2% vs +4±2 %). Performance was still suppressed in OR after REC (−6 ± 5%). A significant decrease in EA was found in OR (−178±104 kcal/d), who failed to increase EI with IT. In contrast, AF increased EI (184±48 kcal/d) and maintained EAN. AEA correlated with AEperture and ΔVO₂max (R = 0.61 and 0.66, p < 0.05). VO₂max and peak lactate, epinephrine and norepinephrine, HR and SBP were suppressed in OR, but were maintained in AF after IT. At submaximal intensities at the same speed after IT, AF showed reduced HR, and lactate and norepinephrine responses, while OR showed no change in these variables but did have increased ratings of perceived exertion.

CONCLUSIONS: Failure to maintain EA during IT was associated with a state of non-functional OR in female runners. High perceived fatigue and impaired performance in OR was accompanied by blunted physiological responses to maximal exercise and a lack of any desirable cardiovascular or endocrine-metabolic adaptation to submaximal intensities. In contrast, AF runners that increased EI to match ExEE with IT showed improved performance and lower HR, blood lactate and plasma norepinephrine at the same submaximal speeds after IT.
14.79; post-116.38 ± 12.76) and resistance training (mid- 124.53: 14.03; post- 122.76 ± 16.64) classes. Supported by Just-in-Time Teaching & Technology Grant (CTE: SMU).

METHODS: Seven healthy individuals (six males and one female; age=27.6 yrs; mass=73.06 ± 9.7 kg; height=1.7±0.9m) trained on an eccentric ergometer for 6 weeks (3x/week; 10-30 min; 54-66% of HRmax). Metabolic cost of walking (Cw; J/kg/m) was assessed one week before, mid and at the end of training.

RESULTS: Significant improvements were observed in Cw following eccentric cycling training. Improvement in ambulatory function would be beneficial for both healthy and aging populations.

CONCLUSIONS: Our results demonstrate that 6 weeks of eccentric cycling training was effective in improving walking economy. To the best of our knowledge, this is the first report of a significant improvement in ambulatory function following chronic eccentric training. Improvement in ambulatory function would be beneficial for both healthy and aging populations.

Table 1. Pre-versus post-training Cw values following eccentric training. Data presented as mean±SD.

<table>
<thead>
<tr>
<th>Walking Speed (m/s)</th>
<th>Pre-training</th>
<th>Post-training</th>
<th>P</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>2.1±0.44</td>
<td>1.9±0.42</td>
<td>0.03</td>
<td>0.75</td>
</tr>
<tr>
<td>1.11</td>
<td>2.1±0.38</td>
<td>2.0±0.27</td>
<td>0.56</td>
<td>0.24</td>
</tr>
<tr>
<td>1.39</td>
<td>2.3±0.43</td>
<td>2.1±0.24</td>
<td>0.06</td>
<td>0.68</td>
</tr>
<tr>
<td>1.67</td>
<td>2.7±0.42</td>
<td>2.5±0.27</td>
<td>0.09</td>
<td>0.64</td>
</tr>
<tr>
<td>1.9</td>
<td>3.5±0.57</td>
<td>3.0±0.90</td>
<td>0.09</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Figure 1. PRW-II Weight Training Blood Pressure Results for Fall 2015

Figure 2. PRW-II Spinning Blood Pressure Results for Fall 2015

1233 Board #6 June 1 8:00 AM - 10:00 AM Effect Of Acute Acetaminophen Ingestion On Running Endurance Performance Fotini Pagotto Dagli, M. Maridaki, G. Paradisis, T. Piliianidis, E. Zacharogiannis. National and Kapodistrian University of Athens, Athens, Greece.

Email: 14.03@live.com

Acetaminophen (ACT) has analgesic properties and reduces fever. It blocks cyclooxygenase (COX) action and attenuates the production of prostaglandins (PG). It has been shown that ACT administration relieves pain by elevating the pain threshold. Therefore, ACT may improve performance by enabling participants to exercise closer to a true physiological limit. Purpose: The aim of this study was to establish whether acetaminophen improves performance of self-paced exercise through the reduction of perceived pain. Method: Twenty recreationally active runners performed an incremental test to determine VO2max. Participants completed a familiarisation test of a 3 km time-trial (TT) treadmill run. On separate days the participants completed two experimental self-paced 3 km TT on a treadmill beginning their effort at 90%VO2max. During the experimental trials participants ingested either 1.5 g acetaminophen or placebo in a double blind, randomized, crossover design. Mean and maximum heart rate were recorded every 30 s during each 3 km TT. Time (pace) per kilometer was also recorded. At the end of each TT, a category-ratio scale was used to assess perceived pain. Blood lactate concentration was measured 3-5 min after completion of each TT. Results: Mean 3 km performance time was lower (p<0.05) after ACT (733.7 ± 92.86 s) compared with PLA (747.8 ± 95.9 s). ACT administration induced mean 2% improvement in 3 km running performance. Rate of perceived exertion was slightly higher in PLA condition (PLA 18.9 ± 1.04 vs ACT 18.3 ± 1.00). Subjects also during TT ran the 2nd km (PLA 250.43 ± 32.02 vs ACT 245.61 ± 32.60 s) and 3rd km (PLA 248.18 ± 34.18 vs ACT 239.91 ± 33 s) faster (p<0.05). Blood lactate and maximum heart rate were not different between experimental TT. Conclusions: ACT administration improved running endurance performance through increased pain tolerance, allowing the runners to exercise at a greater intensity for the same level of perceived pain and exertion.

1234 Board #7 June 1 8:00 AM - 10:00 AM MVPA, Peak 1, And Peak 30 Min Cadence Relationship With Cardiovascular Health Christopher Arboleda1, Jessica G. Redmond1, Tiago Barreira1. Syracuse University. Syracuse, NY. Utica College, Utica, NY.

Email: carboleda@syr.edu

The link between cardiovascular health and moderate-vigorous physical activity (MVPA) in adults has been investigated to a great extent, however little is known about the relationship between peak cadence and cardiovascular health. Purpose: To determine the relationship between peak cadences (mean daily peak 1 min [P1] and mean daily peak 30 min [P30]) and MVPA with indicators of cardiovascular health (i.e., VO2 max, HDL, triglycerides, blood pressure, blood glucose levels, body mass index (BMI), and waist circumference). Methods: 106 apparent healthy men and women (aged of 18-36 yrs) were recruited for the study. MVPA and peak cadence were measured using an ActiGraph GT3X+ accelerometer worn at the waist (24 h/day for 7 consecutive days) attached by an elastic belt. The accelerometer was only removed for water based activities. MVPA was determined using Troiano cut-point of 2020, P1 was determined as the highest number of steps achieved in any minute during the wake period and P30 was the best 30 min at any time of day, independent of order. Lips and glucose were measured following an overnight fast. Blood pressure was measured following 10 minutes of seated rest. Subjects completed the VO2max test on a treadmill using a metabolic cart.

Participants were only included in the analysis if they had all the cardiovascular health data and 4+ days with 10+ hours of wake accelerometer data. Pearson Correlation was used to determine the relationship between variables.
null
database and sent a postal questionnaire pack to establish perceived exercise benefits, preferences, and barriers, and quality of life. Non-responders were sent a postal reminder 4 weeks later.

RESULTS: The survey comprised 1021 eligible patients of which 437 (43%) responded. The only bias observed between responders and non-responders was a lower response for those under 55 years (29%) and over 85 years (36%). Median (interquartile range) age of responders at survey was 66 (60-73) years and 74% of responders were men (N=100). They would be interested in participating in an exercise rehabilitation program and 34% said ‘Maybe’. Greater interest was associated with lower social-emotional aspects of quality of life and greater perceived exercise benefits (p < 0.05). The most commonly cited exercise barriers were dry mouth or throat (40%), fatigue (37%), shortness of breath (30%), muscle weakness (28%) difficulty swallowing (25%), and shoulder weakness and pain (24%). Exercise preferences were diverse; however, the most common were a frequency of three times per week, moderate-intensity, and 15-29 minutes per bout. The most preferred types of exercise for regular participation were walking (68%), flexibility exercises (35%), swimming (33%), and cycling (31%). Home (55%), outdoors (46%) and health club/gym (33%) were the main choices for where to regularly exercise.

CONCLUSIONS: These findings provide exercise preferences to guide exercise programming for HNC survivors. Exercise barriers specific to HNC were commonly cited and need addressing to promote exercise uptake and adherence. The need for education on potential benefits of exercise to promote greater interest and engagement in exercise also was apparent.

Exercise training has been used to reduce the side effects of cancer treatment. However, the stress response to acute exercise during hormone dependent cancer treatment is unclear. PURPOSE: To examine the effects of a single bout of moderate intensity exercise on cortisol (CORT), epinephrine (EPI), and norepinephrine (NE) levels during prostate cancer (PCa) treatment with and without androgen deprivation therapy (ADT). METHODS: Men with PCa on ADT (N=11, 67 (2yr)), not on ADT (N=11, 67 (2yr)), and non-cancer controls (CON, N=8, 64 (3y)) had blood samples taken before a 45min discontinuous cycling bout at 60% of peak wattage and after 2h, 2h, and 24h of recovery. Stress hormone concentrations were measured via ELISA. Differences between groups and time points were determined using two-way repeated measures ANOVA. Percent changes were expressed relative to baseline.

RESULTS: Men on ADT had significantly greater mass and % fat, more advanced cancer, and suppressed testosterone (all p<0.05). NE increased by 385% (p<0.001) at 0h and remained elevated at 2h and 24h (118% and 24%, both p<0.05) with no group differences. CORT significantly increased (p=0.012), significantly decreased at 2h (24%, p<0.001) and remained suppressed at 24h (11%, p=0.037). ADT CORT levels were 32% lower than PCa (p=0.006) with no differences vs. CON. A significant group x time interaction was present for EPI (p=0.001) where CON increased by 81%, ADT by 700%, and PCa by 333% at 0h but PCa and ADT absolute levels were attenuated relative to CON (ADT: -54%, PCa: -52%, p<0.004). CONCLUSIONS: Compared with age-matched CON, PCa and ADT exhibited similar hormonal responses to a single acute aerobic exercise bout for NE and CORT but an attenuated EPI response. Future studies should examine the stress response to multiple exercise bouts to verify these findings and to explore the functional hormonal effects (e.g. immune and metabolic responses) during cancer treatment.

Prostate cancer is the most common cancer in men and patients treated with androgen deprivation therapy (ADT) experience unfavourable changes in body composition and associated metabolic complications, which can increase the risk of cardiovascular disease. PURPOSE: To examine the effect of a 6-month program of aerobic and resistance exercise aimed at improving body composition and cardiorespiratory health in this patient population. METHODS: Ninety-seven men (43-90 years) with localised prostate cancer received ADT were randomized to either exercise (EX; N=50) or usual care (CON, N=47). Supervised exercise was undertaken twice-weekly at moderate-to-high intensity. Measures of cardiorespiratory capacity (VO2max), resting metabolic rate, central blood pressure, hemodynamic variables, blood markers, and body composition were assessed. RESULTS: There was a significant group by time interaction present for VO2max (p=0.035) with a treatment effect for EX of 0.11 (95% CI, 0.04-0.19) L.min-1 and fat oxidation (p=0.037) of 12.0 (95% CI, 2.3-21.7) mg.min-1. Similarly, there was a significant improvement in glucose (p<0.001) for EX of -0.5 (95% CI, -0.8 to -0.3) mmol/L, with no change in PSA or testosterone as a result of exercise. Body composition was enhanced for EX with adjusted mean differences in lean mass (p=0.018) of 0.8 (95% CI, 0.3-1.3) kg, total fat mass (p=0.020) of -1.1 (95% CI, -1.8 to -0.2) kg, and lean mass adjusted difference of -1.0 (95% CI, -1.4 to -0.6) kg. CONCLUSION: We conclude that a 6-month combined aerobic and resistance exercise program has a significant favourable impact on cardiorespiratory capacity, resting fat oxidation, glucose and body composition despite the adverse effects of hormone suppression. Continued aerobic and resistance training should be considered a key adjuvant component in men undergoing ADT for the treatment of prostate cancer Supported by NHMR Project Grant ApPdL 534409.
of CVD risk factors (e.g. LDL cholesterol, blood pressure). A cardiopulmonary exercise test (CPET), using a TrueOne 2400 metabolic cart (Parvo Medics Inc, Sandy, UT), is then administered by an exercise physiology technologist (EPT) in concert with the cardiologist to assess CRF (Vo2peak). For the current results, we included only women with a history of early stage breast cancer examined between January 2016 and September 2016. Results: A total of 47 women with a history of early stage breast cancer had a mean age of 60±8 years and a mean BMI of 27.6 ± 6.5 kg/m2. The mean Vo2peak was 20.9±4.1 mL · kg−1 · min−1, the equivalent of 29.6% below healthy, sedentary women. Mean time from breast cancer diagnosis to Healthy Heart consult was 8±6 years. Conclusion: There is a significant and sustained loss of CRF in early breast cancer patients presenting to the MD Healthy Heart Program. Given these findings, a personalized exercise prescription developed by the EPT as part of the Healthy Heart Program is provided to increase exercise adherence. Ultimately, the goal of the program is to utilize exercise as a non-pharmacologic strategy to mitigate cardiac insult and promote improvement in CRF to maintain healthy hearts throughout the cancer continuum.

RESULTS: A significant difference in fatigue was found between CART and UC post-intervention (p = 0.015, ES = 0.48), with CART maintaining baseline levels and UC demonstrating a significant deterioration of CRF. Significant differences in estimated Vo2peak were found favoring CART (p = 0.001, ES = 0.44) and AT (p = 0.001, ES = 0.57) compared to UC. Women in the CART group demonstrated significant differences in muscle strength superior to both AT and UC for right handgrip- (CART vs. AT: p = 0.009, ES = 0.29; CART vs. UC: p = 0.001, ES = 0.41) and lower limb muscle strength (CART vs. AT: p = 0.007, ES = 0.24; CART vs. UC: p = 0.001, ES = 0.65). Increases in BMI were significantly smaller in both CART (p = 0.013, ES = 0.14) and AT (p = 0.005, ES = 0.14) compared to UC.

CONCLUSIONS: A 16-week high intensity CART intervention appears to be more effective than AT alone in counteracting physical CRF and improving muscle strength, and was equally as efficient as AT in maintaining cardiorespiratory fitness. Concurrent high intensity aerobic and resistance training is an effective and feasible training intervention, and can be prescribed to patients with breast cancer during chemotherapy.

Predicting Load Carriage Performance Using Physical Fitness and Anthropometric Measures in Soldiers

Peter N. Frykman, Stephen A. Foulis, Jan E. Redmond, Bradley J. Warr, Jay R. Hydren, Edward J. Zambraski, Marilyn A. Sharp, USAF, Lackland AFB, TX.

Purpose: The purpose of this study was to develop a method of predicting a Soldier’s physical capabilities for FM12. These views are those of the authors and are not official policy of the Department of Army, DOD, or the U.S. Army.

Methods: Sixty eight women (age = 51 ± 11 years) and 67 male and 37 female soldiers performed a 12 mile foot march for time. The average loads carried during infantry patrol operations often exceed 45 kg. Load carriage is one of the most physically demanding of the common soldiering tasks. Reduced aerobic fitness among breast cancer survivors is associated with lower quality of life and an increased risk of future comorbidities and all-cause mortality. Supervised exercise training with advanced breast cancer therapy is a promising strategy to improve health outcomes. Purpose: To describe changes in aerobic fitness and strength among women with breast cancer engaging in exercise training as supportive care during and post cancer treatment. Methods: Women with stage I-III breast cancer were enrolled into a 12 week of nutrition and exercise during advanced treatment (NExT) study within the first half of chemotherapy. Supervised aerobic and resistance exercise was performed for 60-80 min 3x/wk during advanced treatment and 1-2x/wk for 20 weeks after treatment. Submaximal aerobic and leg press (LP) testing were performed at: 1) baseline; 2) end of treatment; 3) end of intervention; and 4) 1-year follow-up. Maximal aerobic capacity (Vo2peak) and LP1RM were estimated using regression equations. Linear mixed models (time as fixed factor, participant as random factor, and BMI as covariate) and pairwise Bonferroni-corrected contrasts were used to detect differences between time points. Results: 68 women (age = 51 ± 11) started the exercise program. Baseline Vo2peak was 26.8 ± 8.0 mL · min−1 · kg−1 and LP1RM were 186.5 ± 6.6 lbs, respectively. Vo2peak was not significantly different from baseline to end of treatment (+1.0 mL · min−1 · kg−1, p = 0.003), and this improvement was maintained at the 1-year follow-up (+5.3 mL · min−1 · kg−1, p = 0.01). LP1RM increased from baseline to end of treatment (+0.57 ± 6.6 lbs, p = 0.001) and from end of treatment to end of intervention (+0.57 ± 6.6 lbs, p = 0.01), but decreased at the 1-year follow-up relative to end of intervention (+25.6 ± 6.6 lbs, p = 0.03) and remained higher than baseline (+42.1 ± 8.5 lbs, p < 0.001). Conclusions: Breast cancer patients engaging in supervised exercise training during and after advanced treatment experienced significant improvements in aerobic fitness and strength. While strength had declined at the 1-year follow-up, improvements in aerobic fitness were maintained.

Purposes: After a cancer diagnosis, one of the most commonly reported symptoms is cancer related fatigue (CRF). The use of physical exercise to improve cardiopulmonary fitness, body composition, and symptoms for patients with cancer during therapy is an emerging area of research. This in-clinic trial compared the effects of high intensity concurrent aerobic and resistance training (CART) and aerobic training (AT) to usual care (UC) on multiple parameters of physical function in patients with breast cancer during chemotherapy.

METHODS: Women with breast cancer stage I-IIla receiving chemotherapy were randomly allocated to 16 weeks of CART (2-3 sets of 8-12 repetitions at 70-80% of estimated 1 repetition maximum strength, followed by 3×3 min bouts of high intensity intermittent aerobic exercise), AT (20 min moderate intensity continuous aerobic exercise, followed by 3×3 min bouts of high intensity intermittent aerobic exercise), or UC (control group). Physical CRF, cardiopulmonary fitness, muscle strength, and BMI were measured at baseline and after 16 weeks. Clinically important changes were estimated as standardized effect sizes.

RESULTS: A significant difference in fatigue was found between CART and UC post-intervention (p = 0.015, ES = 0.48), with CART maintaining baseline levels and UC demonstrating a significant deterioration of CRF. Significant differences in estimated Vo2peak were found favoring CART (p = 0.001, ES = 0.44) and AT (p = 0.001, ES = 0.57) compared to UC. Women in the CART group demonstrated significant differences in muscle strength superior to both AT and UC for right handgrip- (CART vs. AT: p = 0.009, ES = 0.29; CART vs. UC: p = 0.001, ES = 0.41) and lower limb muscle strength (CART vs. AT: p = 0.007, ES = 0.24; CART vs. UC: p = 0.001, ES = 0.65). Increases in BMI were significantly smaller in both CART (p = 0.013, ES = 0.14) and AT (p = 0.005, ES = 0.14) compared to UC.

CONCLUSIONS: A 16-week high intensity CART intervention appears to be more effective than AT alone in counteracting physical CRF and improving muscle strength, and was equally as efficient as AT in maintaining cardiorespiratory fitness. Concurrent high intensity aerobic and resistance training is an effective and feasible training intervention, and can be prescribed to patients with breast cancer during chemotherapy.
The physical demands of British Army Phase One Standard Entry (SE) training have previously been reported to be high and linked to musculoskeletal incidence in recruits. As such the SE Phase One training program was revised in 2015 to reduce these demands, primarily by decreasing running distance and including self-paced training sessions. With the advent of technologies such as global positioning systems (GPS), external training loads (distance and speed) can now be quantified and compared to measures of internal training load (heart rate [HR] and ratings of perceived exertion [RPE]).

**PURPOSE:** To quantify the internal and external training loads of the revised British Army Phase One SE training program. **METHODS:** Following completion of an initial medical assessment, 26 female (21 ± 4 yrs, 61.8 ± 8.4 kg, 1.64 ± 0.05 m) and 24 male recruits (22 ± 4 yrs, 77.6 ± 9.7 kg, 1.78 ± 0.08 m) were fitted with a combined heart rate and GPS device (Polar Team Pro, Polar Electro, Oy, Finland). Recruits were monitored during waking hours (06:00 – 22:00 hrs) for 10 days in weeks 1 and 2 of training and reported whole-day RPE (0-10).

**RESULTS:** Recruits completed an average daily distance of 12.07 ± 27.2 km at an average speed of 0.80 ± 0.25 km·h⁻¹. The mean HR reserve (HRR) was 31 ± 7% and average RPE was 4 ± 3. Correlation analysis indicated that RPE had a significant positive relationship with 4HR (r = 0.467, P <.001) and daily distance (r = 0.616, P <.001). **CONCLUSION:** This is the first study to report external training loads (distance and speed) of British Army recruits during Phase One. The results provide a framework for further investigation. Distance was a key determinant of perceptual daily training stress, as measured by RPE, suggesting this is an important characteristic of training that should be managed. Future work should attempt to link the external and internal training loads with injury risk, which could be a key approach to optimise training to maximise adaptation whilst minimising risk of fatigue and injury. This research has been sponsored by the UK MOD (Army).
Modern warfare requires full-spectrum physical fitness to achieve combat effectiveness, resiliency, and survivability on the battlefield. Determining which physical fitness components are essential to performing well in a Warrior Task Simulation Test (WTST) can contribute toward a better understanding on how best to test and train military physical performance. Currently, there are limited studies that have examined the relationship between WTST performance and the physical fitness components. PURPOSE: To determine the underlying and modifiable components of physical fitness related to WTST performance.

METHODS: Forty-three healthy and physically active men (age: 22 ± 3 yrs; height: 178 ± 8 cm; mass: 78 ± 11 kg) participated in 1 WTST session and one laboratory test session. The WTST was a continuous 9 sequential-event course comprised of running, jumping, crawling, climbing, obstacle negotiation, and motor handling tasks. Physical fitness measurements in the laboratory test sessions included muscular strength and endurance, postural stability, aerobic capacity, anaerobic capacity, flexibility, body composition, fat-free mass, and agility. Backward stepwise multiple linear regression analysis was performed to predict time to completion of the WTST using the physical fitness measurements. RESULTS: Average time to completion of the WTST was 238.6 ± 31.1 seconds. (a) Muscular endurance, (b) aerobic capacity, (c) body composition, (d) fat-free mass, and (e) agility significantly contributed to a model that predicted time to completion of the WTST (R² = 51.78, p < 0.001). The regression equation was: time to completion of the WTST = 250.21 − 0.02 * (a) − 1.34 * (b) + 0.81 * (c) − 0.77 * (d) + 24.12 * (e). CONCLUSION: The WTST assesses a combination of modifiable physical fitness components consisting of muscular endurance, aerobic capacity, body composition, fat-free mass, and agility, which suggest that skill-related components of physical fitness such as agility need to be measured and tracked in addition to health-related ones in order to gain better insight to Soldiers’ ability to accomplish their mission successfully.

Supported by Freddie H. Fu, MD Graduate Research Award, SHRS Research Development Fund.

C-13 Thematic Poster - Muscle Basic Science

Thursday, June 1, 2017, 8:00 AM - 10:00 AM
Room: 101

1252 Chair: Michael Roberts. Auburn University, Auburn, AL.

(No relationships reported)

1253 Board #1 June 1 8:00 AM - 10:00 AM

Size Profile and Selective Protein Packaging of Exosomes Released from Atrophying Muscle Cells

Matthew B. Hudson1, Carina M. Pautz2, Carlos A. Barrero3, Ellen M. Kelly1, Joshua T. Selsby4, Brittany E. Wilson5. Temple University, Philadelphia, PA; Iowa State University, Ames, IA. Email: mbhudson@temple.edu

(No relationships reported)

Skeletal muscle atrophy occurs in a variety of conditions and can result in decreased quality of life and mortality. Previous work from our lab established that certain microRNAs in muscle cells play a role in the progression of muscle atrophy and the intracellular level of these microRNAs are altered during atrophy, at least in part, due to incorporation into small vesicles (termed exosomes) released into the extracellular environment. Currently, little information exists about muscle released exosomes. Potentially these vesicles could be taken up by other tissues and identify a mechanism by which muscle signals other tissues during chronic conditions in which atrophy is occurring. However, to know what signaling pathways these exosomes may potentially be involved in, it is important to know what potential signaling molecules are present in exosomes released from muscle cells during atrophy. PURPOSE: To identify if exosomes released from muscle cells during atrophy contain different internal cargo proteins than exosomes from healthy muscle cells.

METHODS: C2C12 cells were treated with dexamethasone (DEX; 1μM) for 6 hours in serum free media, media was collected, and exosomes were isolated from the media. LC-MS proteomic analysis was performed on proteins isolated from exosomes, and analyzed using Ingenuity Pathway Analysis software. Nanoparticle tracking analysis revealed no change in the number of exosomes released during atrophy (6.7 ± 10^8 vs 7.0 ± 10^8 vesicles/mL). However, while there was no change in the total number of exosomes the size profiles of the exosomes released during atrophy was significantly different (p<0.05). CONCLUSIONS: Skeletal muscle atrophy results in both a selective packaging of proteins into exosomes and unique size profile of exosomes released from muscles, but does not alter the total number of exosomes released. These novel findings could have broad implications for the development of biomarkers and signaling during skeletal muscle atrophy.
Cryotherapy is commonly used therapeutic modality for skeletal muscle injuries in sports medicine. Despite the widespread use of this modality, there is little known about the biochemical effects of cryotherapy in human skeletal muscle tissue of humans.

**PURPOSE:** To determine the effects cryotherapy has on the transcriptome and metabolome of human skeletal muscle.

**METHODS:** Using a paired design, 8 healthy male subjects (mean age 24.7 years, mean BMI 22.2) received ice-cup massage over a 45 cm cup massage over a 45 cm

**RESULTS:** Intramuscular (IM) temperature 2 cm deep to the subcutaneous layer was predicted from regression equations of skin temperature. At the end of the 15 min application, IM temperature was reduced by 29%, and by two hours remained 13% cooler than prior to administration of cryotherapy. Microarray analysis revealed changes in some non-coding RNAs, but no differences were found for protein coding genes. Further analysis by qPCR showed no significant differences in expression of genes in the so-called “cold-shock” genes which have been reported to be induced in animals exposed to cold temperatures or to cold shock. Microarray analysis of over 60 metabolites involved in glycolysis, oxidative phosphorylation, and amino acid metabolism showed no significant differences (p < 0.05) differences decreases changes in the hexose sugars and hypoxanthine by 15% and 17% respectively in cooled skeletal muscle tissue. Additionally, Wnt5a/b was 26% greater at 3 versus 12 (p<0.05), and 54% at 6 versus greater than 24 months (p<0.05). Relative gastrocnemius masses was 26% greater at 6 versus 12 (p<0.05), and 56% at 24 months (p<0.05). Wnt signaling should be further investigated in skeletal muscle in order to ascertain if these processes contribute to sarcopenia.

**CONCLUSIONS:** There appear to be changes in some non-coding RNAs, but no differences were found for protein coding genes. Further analysis by qPCR showed no significant differences in expression of genes in the so-called “cold-shock” genes which have been reported to be induced in animals exposed to cold temperatures or to cold shock. Microarray analysis of over 60 metabolites involved in glycolysis, oxidative phosphorylation, and amino acid metabolism showed no significant differences (p < 0.05) differences decreases changes in the hexose sugars and hypoxanthine by 15% and 17% respectively in cooled skeletal muscle tissue. Additionally, Wnt5a/b was 26% greater at 3 versus 12 (p<0.05), and 54% at 6 versus greater than 24 months (p<0.05). Relative gastrocnemius masses was 26% greater at 6 versus 12 (p<0.05), and 56% at 24 months (p<0.05). Wnt signaling should be further investigated in skeletal muscle in order to ascertain if these processes contribute to sarcopenia.
young skeletal muscle following training at different frequencies, and report concurrent status of nuclei morphology. METHODS: Tibialis anterior (TA) muscles of young (3 mo) and old (30 mo) male Fischer 344/BN rats exposed to 80 SSCs for 3 or 2 days/kw for 1 month were harvested 3 days post-training. Gene expression and methylation were quantified via RT\(^2\) Profiler and Methylation Arrays. Frozen TA sections were stained for β-dystroglycan and DAPI to perform total nuclei and myonuclei morphology via total particle analysis and manual tracings, respectively. Analyses were conducted using Image J. RESULTS: Young rats adapted to 3 and 2 days/kw training and differentially (p<0.05) expressed 21 and 7 apoptotic genes, respectively. Old rats maladapted to 3 days/kw training and only expressed 1 apoptotic gene; however, old 2 days/kw expressed 8 apoptotic genes. Methylation increased in SSC training relative to non-trained control muscles only in old 3 days/kw (0.8 ± 0.04 vs 2.2% ± 0.02, p<0.05). For old 2 days/kw there was no difference in methylation compared to non-trained (0.70 ± 0.004 vs 1.0 ± 0.01%). For nuclei, an age effect (p<0.05) was shown by a higher total count in old relative to young non-trained controls for both total nuclei (7,708 ± 181 vs 6,695 ± 171 nuclei per mm\(^2\)) and myonuclei (1,943 ± 78 vs 1,483 ± 74 nuclei per mm\(^2\)). A training effect (p<0.05) resulted in decreased myonuclei count in old 2x/kw relative to both old 3 days/kw and old non-trained (1,590 ± 86 vs 1,888 ± 86 vs 1,943 ± 78 nuclei per mm\(^2\)). CONCLUSIONS: Reduced SSC training frequency positively influences aged muscle by decreasing methylation of apoptotic genes, thereby increasing gene expression concomitant with decreases in myonuclei count, which may influence adaptation with aging by eliminating dysfunctional myonuclei, thus aiding in improved muscle size and function.

Pre-menopausal women express a reduced arterial blood pressure and risk of cardiovascular disease relative to age-matched men. The mechanism for these outcomes purportedly relate to elevated estrogen levels increasing endothelial nitric oxide (NO) synthase activity and NO-mediated vasorelaxation. PURPOSE: Based on the role that NO plays in the relationship between O\(_2\) delivery and utilization; we tested the hypothesis that females would show a fundamentally higher O\(_2\) delivery/utilization ratio; especially during muscle contractions, compared to males. METHODS: To test this hypothesis, the spinotrapezius muscle of Sprague Dawley rats (14 total; female = 7, male = 7) was surgically exposed and electrically stimulated at 1 Hz. Oxygen G4 was injected into the muscle and phosphorescence quenching employed to determine the temporal profile of muscle interstitial space O\(_2\) partial pressure (P\(_{\text{O}_{2}}\), determined by O\(_2\) delivery/utilization ratio). This was performed under three conditions: control (CON), 300 μM sodium nitroprusside (SNP; NO donor) superfusion, and 1.5 mM L-arginine methyl ester (L-NNAME; NO\(_\text{blockade}) superfusion. RESULTS: No differences were found for baseline P\(_{\text{O}_{2}}\) (CON: 21 ± 1 vs 17 ± 2; SNP 40 ± 3 vs 36 ± 3; L-NNAME: 16 ± 2 vs 14 ± 2 mmHg (all p > 0.05)); nor AP\(_{\text{O}_{2}}\) during contractions (CON: 13 ± 1 ± 12 ± 2; SNP 20 ± 2 ± 18 ± 2; L-NNAME: 11 ± 1 ± 9 ± 1 mmHg (all p > 0.05)) between males and females, respectively. The kinetics response (mean response time) to contractions did not differ in any condition (CON: 17 ± 2 vs 2 and 18 ± 2; SNP 21 ± 2 ± 28 ± 5; L-NNAME: 15 ± 2 ± 14 ± 1 seconds (all p > 0.05)) between males and females, respectively. DISCUSSION: In direct contrast to our hypothesis, no sex differences were evident at rest or during contractions under any condition. Therefore, at rest and during muscle contractions, the effect of estrogen on NO bioavailability and vascular control are either insignificant or redundant to other vasodilatory pathways.
significantly increased after the acute resistance exercise. There were also significant time by condition interactions for time of the reflected wave (rest: 150±7ms; recovery: 147±9ms, p<0.02) and the subendocardial variability ratio (rest: 147±17%; recovery: 83±24%, p<0.0001) such that there were reduced after the acute resistance exercise.

CONCLUSION: These data suggest that an acute bout of resistance exercise alters pulse wave reflection and arterial stiffness similarly between the sexes without significantly altering aortic hemodynamics.

<table>
<thead>
<tr>
<th>Board #3</th>
<th>June 1 8:00 AM - 10:00 AM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparing Two Low-Intensity Resistance Training Modalities on Strength and Wave Reflection in Postmenopausal Dynapenic Women</strong></td>
<td></td>
</tr>
<tr>
<td>Salvador J. Jaime, Stacey Alvarez-Alvarado, Jeremiah C. Campbell, Arturo Figueroa, FACSM, Florida State University, Tallahassee, FL. (Sponsor: Arturo Figueroa, FACSM)</td>
<td></td>
</tr>
<tr>
<td>(No relationships reported)</td>
<td></td>
</tr>
</tbody>
</table>

**PURPOSE:** Dynapenia, the age-related loss in muscle strength, is emerging as an important risk factor for the development of cardiovascular disease (CVD) and physical disability. Wave reflection (augmentation pressure [AP] and index [AIx]) and central pulse pressure (cPP) have been shown to be sensitive markers for CVD and left ventricular afterload. Although resistance training (RT) increases mass and strength, most studies have shown no effect on AP or AIx. The purpose of this study was to investigate two modalities of low-intensity strength training on wave reflection and cPP in postmenopausal dynapenic women.

**METHODS:** Twenty-one non-obese (body mass index (BMI) ≤ 27 kg/m²) sedentary postmenopausal women were randomly assigned to either whole-body vibration training (WBVT) or low-intensity RT (LIRT) for 12 weeks. We measured AP, AIx, AIx adjusted at 75 bpm (AIx@75), time of reflection (Tr), and central pressures using applanation tonometry. Muscle strength was measured using a handgrip dynamometer for maximal voluntary contraction (MVC) and 1 repetition max for leg press and extension.

**RESULTS:** At baseline, there were no significant differences between groups in age, anthropometrics, peripheral or central pressures, and muscle strength. LIRT and WBVT similarly increased leg press (10.6 ± 1.8%, 14.8 ± 2.6%, respectively; P = 0.001) and leg extension (8.8 ± 2.8%, P = 0.05; 19.2 ± 4.6%, P = 0.01, respectively). There was a group-by-time interaction for the increase in MVC (12.1 ± 2.2%, P < 0.01) in the LIRT group compared to no change in the WBVT group. There was a group-by-time interaction for the reduction of AP (P = 4 ± 1 mmHg, P = 0.05), AIx (-5.0 ± 1.4%, P = 0.01), AIx@75 (-5.3 ± 1.7%, P < 0.05), and cPP (P = 5 ± 2 mmHg, P < 0.05) in the WBVT group compared to no change in the LIRT group. The reductions in cPP were inversely correlated to the increases in leg extension strength (r = -0.44, P = 0.05).

**CONCLUSIONS:** While both LIRT and WBVT significantly increased leg muscle strength, WBVT also reduced markers of left ventricular afterload. Increases in leg muscle strength were related to the decreases in cPP, which may reduce risk of endothelial damage and physical disability. Our data suggest that WBVT may be a beneficial therapeutic modality for the prevention of physical disability and future cardiovascular events.

<table>
<thead>
<tr>
<th><strong>Leg Strength</strong></th>
<th><strong>APWV</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak Extensor Torque</strong> (ft-lbs)</td>
<td>0.198 0.482</td>
</tr>
<tr>
<td><strong>Average Extensor Torque</strong> (ft-lbs)</td>
<td>0.250 0.490</td>
</tr>
<tr>
<td><strong>Peak Flexor Torque</strong> (ft-lbs)</td>
<td>-0.016 0.852*</td>
</tr>
<tr>
<td><strong>Average Flexor Torque</strong> (ft-lbs)</td>
<td>0.170 0.550</td>
</tr>
<tr>
<td><strong>Relative Peak Extensor Torque</strong> (ft-lbs/kg)</td>
<td>0.498 0.346</td>
</tr>
<tr>
<td><strong>Relative Peak Flexor Torque</strong> (ft-lbs/kg)</td>
<td>0.181 0.887*</td>
</tr>
<tr>
<td><strong>Relative Extensor Power</strong> (Watts/kg)</td>
<td>0.455 0.599</td>
</tr>
<tr>
<td><strong>Relative Flexor Power</strong> (Watts/kg)</td>
<td>0.488 0.712*</td>
</tr>
<tr>
<td><strong>Relative Average Power</strong> (Watts/kg)</td>
<td>0.492 0.769*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Board #5</th>
<th>June 1 8:00 AM - 10:00 AM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood Flow Responses To Acute Exercise Differ By Menopausal Status</strong></td>
<td></td>
</tr>
<tr>
<td>Corinna Serviente, Lauren Richardson, Sarah Witkowski. University of Massachusetts Amherst, Amherst, MA. (Sponsor: Jane A. Kent, FACSM)</td>
<td></td>
</tr>
<tr>
<td>(No relationships reported)</td>
<td></td>
</tr>
</tbody>
</table>

**CONCLUSION:** Endothelial dysfunction is a subclinical marker for cardiovascular disease and is associated with higher retro- and lower ante-grade blood flow. We have shown lower endothelial function and enhanced activation following acute exercise in late post-compared to peri-menopausal women. It is unknown whether there are differences in blood flow patterns, such as retro- and ante-grade flow and oscillatory shear index (OSI) in response to acute exercise in this population. **PURPOSE:** To evaluate blood flow patterns before and after acute exercise in perimenopausal (PERI) and late postmenopausal (POST) women. **METHODS:** Healthy low-active PERI (n=7) and POST (n=8) exercised for 30min at 60-64% VO2max. Blood flow was analyzed in the brachial artery before and 3min after exercise. Retro- and ante-grade flow were calculated as the average positive and negative shear rate during 2min of baseline, 5min of forearm blood flow occlusion (200mmHg), and during the last 30sec of the 4min recovery. OSI was calculated as retrograde/ (retrograde + antegrade) flow at all time points. Data was analyzed with 2-way repeated measures ANOVA, t-tests and Mann-Whitney rank sum tests and are presented as mean±SEM. **RESULTS:** Before exercise, there was no difference in blood flow between groups. In response to acute exercise, PERI showed a trend for higher ante-grade flow at baseline (pre: 318±5±41.6 s⁻¹ vs. post: 368±9±47.3 s⁻¹, p=0.09), with no change in POST (pre: 280±6±35.5 s⁻¹ vs. post: 283±8±31.4 s⁻¹, p=0.91). There was a group x exercise interaction for retrograde flow at baseline (p=0.058), with a non-significant increase in PERI (p=0.19) and a decrease in POST (p=0.14). Despite no change in any other parameters, there was a trend for a main effect of exercise (p=0.062) and a group x exercise interaction in OSI during occlusion (p=0.075), with an increase in POST following acute exercise (p=1.5±0.59 vs. post: -4.17±1.87, p=0.015) and no change in PERI (p=2.02±0.45 vs. post-2.33±0.73, p=0.94). **CONCLUSION:** Low active POST and PERI women demonstrated different vascular responses to acute exercise. The increase in OSI and lack of change in ante-grade flow following exercise in POST suggests greater stress on the vasculature and may contribute to impaired endothelial function in this population. **Supported by:** Research Trust Fund (Witkowski)
Menopausal hormone therapy (MHT) is used for management of menopausal symptoms; however, the long-term effects of MHT on the cardiovascular and cerebrovascular system are controversial. Previous studies have shown that pulsatility index (a measure of the variability of blood velocity in a vessel) of the middle cerebral artery (MCA) decreases during the use of MHT, but increases again within months after suspension of MHT; however, these effects have not been studied long term.

**PURPOSE:** The purpose of this study was to evaluate the long term effects of prior use of MHT on MCA pulsatility index (PI).

**METHODS:** Fifty-four postmenopausal women were evaluated 3 years after cessation of use of MHT or placebo (as part of a 4 year randomized, placebo-controlled clinical trial). Women had received either a placebo (PLA: n=19; age=59±3 y; BMI=28±3 kg/m^2) or MHT (MHT: n=35; age=63±3 y; BMI=27±5 kg/m^2). MCA velocity (MCAv), mean arterial pressure (MAP), and end-tidal CO\(_2\) were continuously measured throughout the study. Baseline measurements were recorded then women underwent a stepped hypercapnic protocol inhaling 2%, 4%, then 6% CO\(_2\) at each stage for three minutes. PI was calculated as (systolic MCAv-diastolic MCAv)/mean MCAv.

**RESULTS:** Baseline MAP and MCAv were similar between groups (PLA: MAP=90±2 mmHg; MCAv=60±3 cm/s; MHT: MAP=91±1 mmHg; MCAv=69±3 cm/s; p>0.05 for both). PI was greater in the MHT group compared to the placebo group at baseline (MHT: PI=0.85±0.02 vs. PLA: PI=0.77±0.02; p<0.05), during 2% CO\(_2\) (MHT: PI=0.85±0.02 vs. PLA: PI=0.76±0.02; p<0.05), and during 4% CO\(_2\) (MHT: PI=0.82±0.02 vs. PLA: PI=0.73±0.02; p<0.05). PI was not different between groups during 6% CO\(_2\) (MHT: PI=0.75±0.02; PLA: PI=0.71±0.02; p=0.28).

**CONCLUSIONS:** Cerebral PI was higher in women who had taken MHT compared to women who had not taken MHT. The differences between groups persisted until the CO\(_2\) vasodilatory stimulus increased to 6%. Taken together, these results suggest that previous use of MHT alters regulation of the cerebral circulation that has effects at least up to three years after cessation.

Supported by NIH grant AG44170, HL118154

---

Estrogen has been proposed to enhance nitric oxide synthase (NOS) expression and NO bioavailability in females. Importantly, flow-mediated dilation (FMD) is reduced post-menopause when estrogen levels decrease. Thus, FMD in females may have any different effect in females versus males with respect to resting PINTO and NO bioavailability. Importantly, flow-mediated dilation (FMD) is a reliable non-invasive measure of arterial function and NO bioavailability in females with consistently reproducible kinetics during muscle contractions when compared to age-matched males. **PURPOSE:** Where potentially incomplete blockade of NOS may not show sex differences in pre-menopausal FMD, we tested the hypothesis that complete NOS blockade via L-arginine methyl ester (L-NAME) in female rats would exhibit a greater reduction in muscle O\(_2\) delivery-to-utilization matching (assessed via PO\(_2\) in the muscle interstitial space (P\(_{\text{PO}_2}\))) and speed P\(_{\text{PO}_2}\) kinetics following the onset of muscle contractions when compared to age-matched males. **METHODS:** In Sprague Dawley rats (n=5 male, 5 female), the splanchnicus muscle was surgically exposed and electrically stimulated (6 V, 1 Hz) for 180 s. Prior to contractions, Oxyphor G4 was injected into the muscle to measure P\(_{\text{PO}_2}\). P\(_{\text{PO}_2}\) was recorded at rest and during contractions in control (CON) and following NOS blockade (intra-arterial (IA) infusion of L-NAME (10 mg kg\(^{-1}\)) conditions. **RESULTS:** NOS blockade revealed no differences in resting P\(_{\text{PO}_2}\) within and between sexes (Male CON: 20 ± 1 vs Male L-NAME: 21 ± 2 mmHg; Female CON: 17 ± 2 vs Female L-NAME: 17 ± 3 mmHg; p > 0.05). Additionally, there were no differences in kinetics (mean response time) following the onset of contractions (Male CON: 18 ± 2 vs Male L-NAME: 12 ± 4 s; Female CON: 15 ± 2 vs Female L-NAME: 15 ± 2 s; p > 0.05). **CONCLUSION:** Contrary to our hypothesis, reducing NO bioavailability via NOS blockade did not have any different effect in females versus males with respect to resting P\(_{\text{PO}_2}\) or P\(_{\text{PO}_2}\) kinetics. These results suggest that estrogen via NO bioavailability does not play a significant role in resting P\(_{\text{PO}_2}\) or P\(_{\text{PO}_2}\) kinetics during muscle contractions in female rats.
The balance between leg flexor and extensor strength, which is typically assessed using the hamstrings to quadriceps (H/Q) strength ratio, has been implicated as an important factor in the muscle power and functional performance abilities of aging populations. Declines in hamstrings and quadriceps maximal and rapid strength are commonly reported as a consequence of aging; however, few studies have investigated the influence of age on maximal and rapid strength H/Q ratios. PURPOSE: To examine age-related differences in maximal and rapid strength H/Q ratios between young and old females and the relationships of these characteristics with vertical jump power. METHODS: Fifteen young (age = 21.2 ± 2.9 years) and 15 old (69 ± 7 yr) females performed three countermovement vertical jumps (CMJs) followed by three isometric maximal voluntary contractions (MVCs) of the leg extensors and flexors. Estimated peak power output (Pmax) was measured during the CMJs using a linear velocity transducer. For each MVC, participants sat in an upright position and were instructed to extend or flex the leg as “hard and fast as possible” against a load cell attached to the heel for 3 s. Maximal and rapid isometric H/Q strength ratios were determined by taking the quotients between leg flexor and extensor peak torque (PT H/Q) and rate of torque development at 0-200 ms (RTD200 H/Q). RESULTS: The old females exhibited lower Pmax (old = 1075.87 ± 376.78 W; young = 3131.07 ± 1426.22 W; \( P < 0.001 \)) and higher PT H/Q (old = 0.71 ± 0.24; young = 0.54 ± 0.13; \( P = 0.030 \)) and RTD200 H/Q (old = 0.85 ± 0.25; young = 0.61 ± 0.22; \( P = 0.008 \)) than the young females. There was a significant relationship between Pmax and RTD200 H/Q in the old females (r = -0.522; \( P = 0.046 \)); however, there was no such relationship in the young females (r = -0.109; \( P = 0.698 \)) nor were there any relationships between Pmax and PT H/Q for either age group (young r = 0.029; \( P = 0.918 \); old r = -0.364; \( P = 0.182 \)). CONCLUSION: These findings demonstrated that maximal and rapid strength H/Q ratios increase and muscle power decreases at old age. The significant relationship observed between Pmax and RTD200 H/Q in the old females perhaps suggests that these age-related increases in rapid antagonist muscle strength ratios may play a significant role in the lower muscle power and functional performance abilities observed in older adults.
There are well documented positive effects of physical activity on general health and wellbeing throughout the lifespan. Next to it, beneficial effects of physical exercise interventions at improving brain health and functioning in older adults are also well reported whereas individual differences and mechanisms to gain functional capacities related to cognitive baseline level need to be investigated. PURPOSE: To investigate the influence of cognitive baseline level on gaining functional performance in older adults after 3-month of physical exercise intervention. METHODS: Thirty older adults (68±5y; 27% men) were enrolled in 3-month twice per week physical exercise program and were randomly divided into experimental (EG; N=19) or control group (CON; N=11). For further analysis we took into account EG with low cognitive (LC; Montreal Cognitive Assessment (MoCA) score <23; N=6) and high cognitive (HC; MoCA score >28; N=8) score. Functional performance was assessed by the means of Senior Fitness Test. RESULTS: We found a significant interaction of time/group (P=.004). Post hoc comparison showed differences in pre to post measurements between LC and CON in Time Up To Go test (TUG; P=.002), while no differences were found between HC and CON (P=.159) as well as for both LC and HC (P>.127). Moreover, the percent of change analysis showed pre to post improvements (P<0.05) for both, LC and HC (-22% vs -10%), except the CON (+1%). Finally, other sub-tests from Senior Fitness Test battery presented tendencies but failed to reach significance level. CONCLUSION: Although direct comparison (pre to post change) failed to demonstrate difference between two EG, comparison of both EG with CON, confirmed our hypothesis that older adults with lower baseline cognitive function were able to achieve more functional capacity gains after 3 month of physical training intervention, as compared to those with higher baseline cognitive function.

1277 June 1 9:45 AM - 10:00 AM
Two-Year High-Intensity Aerobic Training Program Prevents Age-Associated Health Risk Factor Development in Sedentary Middle-Aged Adults
Mitchel Samels, Erin Howden, Tom Sarma, Justin Lawley, Dean Palmer, Braden Everding, William Cornwall, Christopher Hearon, Jr., Sheryl Livingston, Benjamin D. Levine, FACSM, Institute for Exercise and Environmental Medicine, Dallas, TX.

Sedentary aging results in a gradual decline in fitness characterized by decreased cardiorespiratory function, increased adiposity, and loss of lean mass. Short duration exercise training augments aerobic fitness and improves body composition and hemodynamics in middle-aged adults. However, the extent to which consistent, long-term aerobic exercise training prevents age-associated decrements in body composition and cardiorespiratory fitness remains unclear. PURPOSE: We investigated the effects of a progressive two-year, high-intensity endurance exercise program on maximal oxygen uptake (VO_{2max}), fat-free mass (FFM), and blood and plasma volumes (BV and PV, respectively) in untrained adults.

METHODS: 52 sedentary, healthy middle-aged adults (24 males; 52±5yrs) were recruited and randomized to one of two study groups: aerobic exercise (Ex; n=28) or non-aerobic yoga control (CON; n=24). At baseline and following two years of intervention, all subjects underwent maximal exercise testing, in which VO_{2max}, body composition (dual energy X-ray absorptiometry), and blood volume measures were compared. RESULTS: CON participants had a small decrease in VO_{2max} (29.6±5.2 to 28.7±5.4ml/kg/min, p=0.11) and FFM (50.8±10.4 to 49.9±11.6kg, p=0.13), an increase in FFM (25.3±6.9 to 27.5±5.9kg, p=0.002), and a decrease in both absolute and relative BV (69.5±8.5 to 66.0±8.0ml/kg, p=0.003) and PV (44.0±6.4 to 40.8±5.7ml/kg, p<0.001) over two years. Ex participants experienced a significant increase in VO_{2max} (28.8±4.8 to 34.4±6.2ml/kg/min, p=0.001) and a significant decrease in FFM (50.4±11.0 to 49.4±11.1kg, p<0.001). However, exercise training prevented age-associated changes in FFM (24.1±5.9 to 24±6.3kg, p=0.51) and both absolute and relative BV (70.3±8.4 to 71.2±7.8ml/kg, p=0.54) and PV (44.9±5.6 to 44.0±6.5ml/kg, p=0.52).

CONCLUSION: In addition to improving cardiorespiratory fitness, two years of consistent, high-intensity aerobic training successfully preserved body composition and blood volume measures compared to controls. Thus, long-term aerobic training appears to prevent the development of many age-related health risk factors in middle age.

1278 June 1 8:00 AM - 8:15 AM
Water Intake And Hydration State Is Associated With Insulin Resistance In Healthy Adults: NHANES 2009-2012
Hyun-Gyu Suh, 72731, Marie-Rachelle Narcisse1, Evan C. Johnson2, Victor Cardenas3, Lisa T. Jansen3, Stavros A. Kavouras, FACSM1, University of Arkansas, Fayetteville, AR.1University of Wisconsin, Laramie, WY.2University of Arkansas for Medical Sciences, Little Rock, AR.3 (No relationships reported)

Epidemiological studies from European cohorts suggest that low water intake is associated with the risk of developing diabetes and or hyperglycemia. Additionally, data indicate that cogetpin, a surrogate marker of vasopressin and low water intake, is associated with diabetic heart disease and death. PURPOSE: To examine the association between water intake and hydration state with glucose regulation in healthy individuals in the U.S. METHODS: 2,233 adults from 2009-10 & 2011-12 NHANES (National Health and Nutrition Examination Survey) considering participants without diabetes, non-pregnant, and with normal renal function (females: 48.3%, age: 44 ± 1 y, BMI: 27.5 ± 0.2 kg·m⁻²). Insulin resistance was assessed by homeostasis model assessment of insulin resistance (HOMA-IR; 2.77 ± 0.05) and data were divided into tertiles (≤1.77, 1.78-3.45, and >3.45). Hydration status was assessed by urine osmolality (621 ± 7 mmol·kg⁻¹) and urine flow rate (0.96 ± 0.03 ml·min⁻¹). Plain water (1.203 ± 0.05 mL) and total water intake (TWI; 3,190 ± 43 mL) were assessed by 24 h dietary recall. RESULTS: Urine osmolality was highest in the upper HOMA tertile (679 ± 9 mmol·kg⁻¹) compared to lowest tertile (583 ± 1 mmol·kg⁻¹, P<0.001), while urine flow rate was highest in the lowest HOMA-IR tertile (1.03 ± 0.04 ml·min⁻¹) compared to upper tertile (0.92 ± 0.03 ml·min⁻¹, P<0.001). Multinomial logistic regression showed that with higher hydration status, lower levels of TWI (≥2,657 mL), had significantly less likely to be in the upper HOMA tertile, compared to adults with a lower level of TWI (≤1,598 mL, OR=1.17; 1.11-2.64), after adjusting for age, gender, BMI, waist circumference, race/ethnicity, education, and physical activity. Similarly, adults who consumed more plain water (≥859 mL) were half as likely to be in the upper HOMA-IR tertile, compared with those who consumed less (<207 mL, OR=2.00; 1.37-3.23). CONCLUSION: Higher plain water (≥859 mL) and total water intake (≥2,657 mL), as well as better hydration state were associated with lower insulin resistance.

1280 June 1 8:15 AM - 8:30 AM
Exercise Training Lowers Postmeal Insulin Concentrations And Cancer-relevant Adipokines In Postmenopausal Breast Cancer Survivors
Richard Viskochil1, Jennifer Blankenship1, John Staudenmayer1, Susan E. Hankinson1, Patty Freedson, FACSM3, Barry Braun, FACSM1, University of Massachusetts, Amherst, MA. 2 Colorado State University, Ft. Collins, CO. (No relationships reported)

Exercise-induced reductions in fasting insulin are modestly associated with lower cancer risk and improved prognosis in breast cancer survivors, however the impact of exercise training on postmeal insulin concentrations (50-80% of daily insulin exposure) and the relationship between postmeal insulin and cancer-relevant biomarkers is unclear. METHODS: Fifteen postmenopausal breast cancer survivors underwent a supervised, progressive 12-week aerobic exercise program (60 min/day, 2-3 days/week). Baseline and post-intervention concentrations of insulin and cancer-relevant biomarkers (leptin, adiponectin, IGF-1, SHBG and 17b-Estradiol (E2)) were measured during a five-sample oral glucose tolerance test (OGTT) following 24 dietary and physical activity control. Changes in fitness and body composition were assessed by estimated VO_{2max} during a submaximal exercise test and dual energy X-ray absorptiometry (DEXA) respectively. In addition to each OGTT timepoint (30, 60, 90 and 120 minutes), postmeal insulin responses were determined by area under the
insulin curve (iAUC) using the trapezoidal method and peak insulin concentration during the OGTT. Intervention effects were evaluated using paired t-tests and linear mixed models with the statistics package R. Data are presented as mean ± SEM. RESULTS: Participants averaged 34.8 training sessions over the 12-week intervention. Estimated VO_{2max} increased (25.2 ± 1.26 vs 27.7 ± 1.36 ml/kg/min, p < 0.05) and body weight decreased (75.5 ± 2.3 vs 74.4 ± 2.7 kg, p < 0.05) following the intervention. There were significant reductions in leptin (30.8 ± 5.8 vs 23.8 ± 3.4 ng/ml, p < 0.05), E2 (12.9 ± 1.7 vs 10.2 ± 1.4 ng/ml, p < 0.05) and 120-minute insulin (68.8 ± 9.1 vs 56.2 ± 8.2 µU/ml, p < 0.05) as a result of exercise training. There were no significant differences in iAUC or peak insulin, however the change in peak insulin was inversely associated with change in E2 (r = -0.57, p = 0.04). Conclusion: Exercise training lowered adipocyte-derived cancer biomarkers and postmeal (but not fasting) insulin concentrations. The use of fasting insulin alone may underestimate the impact of insulin on cancer recurrence and prognosis following exercise training in breast cancer survivors. Supported by: Rays of Hope Center for Breast Cancer Research, Springfield MA

1281 June 1 8:30 AM - 8:45 AM Chronic Inflammation, Cardiorespiratory Fitness, Physical Activity, and Dietary Inflammatory Index in Cancer Survivors
Matthew A. Christensen, Craig Coronado, Jonathon Lisano, Katie Kage, Rhonda Fisher, Daniel Shackelford, Reid Hayward, Laura K. Stewart. University of Northern Colorado, Greeley, CO
Email: chr64777@bears.unco.edu

Chronic inflammation has been linked to the development and progression of cancer. Age, body composition, cardiopulmonary fitness, physical activity, and dietary factors are associated with a global marker of inflammation, C-reactive protein (CRP), in healthy populations. However, few studies have explored the relationship between these variables with physically active cancer survivors. Purpose: To examine differences in fitness, daily activity levels, and dietary characteristics of active cancer survivors when grouped according to serum CRP (Low vs. Moderate to High). Methods: Cancer survivors (N = 14, mean age = 66 ± 15 years) were evaluated for body mass index (BMI), body composition, and cardiopulmonary fitness (VO_{2max}). Physical activity was measured via an accelerometer over a 7-day span. Dietary logs (3 day) were analyzed and the dietary inflammatory index (DII) for each subject was obtained. Serum CRP was evaluated with an enzyme linked immunosorbent assay (ELISA). Subjects were assigned to one of two groups based on their serum CRP concentrations: Low CRP (≤ 1 mg/L) (LO) (N = 7) or Moderate to High (CRP > 1 mg/l) (MH) (N = 7). A t-test was used to compare LO and MH groups. Data are presented as mean ± SD. RESULTS: MH had significantly higher BMI (kg/m^2) (30.5 ± 5.2 vs 24.0 ± 3.8, p = 0.02), higher body fat percentage (40.3 ± 7.7 vs 32.4 ± 5.3, p = 0.05) and lower VO_{2max} values (mL/kg/min) (19.4 ± 5.54 vs 31.8 ± 2.70, p = 0.0002). There were no significant differences between LO and MH with respect to age, physical activity levels, or dietary intake. Conclusion: Survivors with moderate to high serum CRP concentrations had higher BMI, more body fat and lower cardiorespiratory fitness. However, there were no differences between the groups with respect to daily physical activity, caloric intake, or DII. Exercise improves pancreatic-beta cell (β-cell) function in type 2 diabetic patients, however mechanisms of such benefits are currently unclear. Given that interleukin-6 (IL-6) is secreted by contracting muscle, a cause in circulating IL-6 levels, muscle-derived IL-6 has been implicated as an important endocrine factor in skeletal muscle β-cell crosstalk. However, studies of IL-6 on β-cell function have been inconsistent to date making it difficult to draw conclusions on the effect of IL-6 in the β-cell. Moreover, direct effects of physiologically relevant IL-6 concentrations in β-cell insulin secretion in cells pre-exposed to diabetic conditions such as glucolipotoxicity and/or proinflammatory cytokines are sparse. Since IL-6 appears to augment the effect of interleukin-1β (IL-1β) on β-cell apoptosis, understanding the interaction between a transient IL-6 response to acute exercise and effects on β-cell function under diabetic conditions is crucial for optimizing the therapeutic benefit of exercise in T2D. Purpose: To explore the extent by which an exercise-induced concentration of IL-6 influences pancreatic β-cell function under glucolipotoxic and/or proinflammatory conditions. Methods: Insulin-secreting INS-1 832/13 cells exposed to BSA ± palmitate at 5, 11 or 20 mM glucose or IL-1β for 48 hours were treated with IL-6 (10 pg/ml) for 1 hour. The effects of these conditions on insulin secretion were determined. Values are means ± SEM from four experimental repeats. Statistical differences between conditions were tested for by two-way ANOVA. Results: Exposure to 20 mM glucose ± palmitate decreased glucose-stimulated insulin secretion (GSIS) by 2-fold (2.2±0.5 to 1.1±0.8 ng insulin · 10^5 cells, P < 0.05) and 2.6-fold (2.6±0.6 to 1.0±0.1 ng insulin · 10^5 cells, P < 0.01), respectively. Moreover, IL-1β completely blunted GSIS from 3.0±1.1 to -0.14±0.17 ng insulin · 10^5 cells (P < 0.05). IL-1β treatment had no effect on GSIS under normal conditions (3.4±0.17 ng insulin · 10^5 cells, P = 0.77), and did not prevent the suppression of GSIS by 20 mM glucose ± palmitate or IL-1β (all, P > 0.05). Conclusions: Insulin secretory defects in pancreatic β-cells exposed to diabetic-like conditions are neither improved nor worsened by a direct exposure to IL-6 at an exercise-induced relevant concentration.

1282 June 1 8:45 AM - 9:00 AM Eight Week Passive Heat Exposure Improves Cardiometabolic Health in Obese Women
Brett R. Ely1, Michael A. Francisco2, Vienna E. Brunt1, Samantha D. Bryan1, Linda L. Comrada1, Christopher T. Minson, FACSM, University of Oregon, Eugene, OR, 2University of Colorado, Boulder, CO (Sponsor: Christopher T. Minson, FACSM)
Email: bely@uoregon.edu

Obese individuals are at an increased risk of developing cardiovascular and metabolic disease, secondary to blood flow impairments in adipose tissue and a meta-inflammatory state. Repeated heat exposure through hot tub sessions shows great promise for improving cardiovascular and metabolic health, in part through improvements in blood flow profiles and reductions in systemic inflammation. Purpose: To examine changes in cardiometabolic health in obese women undergoing 8 weeks of chronic passive heat exposure (CPHE). Methods: Six obese women (28.8±8y; BMI: 41.5±3.5 kg/m^2) underwent CPHE, consisting of 30 one-hour hot tub sessions over 8-10 weeks (3-4 per week) in 40.5°C water. Measures of cardiometabolic health (blood pressure, pulse wave velocity, flow-mediated dilation [FMD]) and metabolic function (fasting glucose, 2-hr oral glucose tolerance test [OGTT]) were made before (0wks) and after (8wks) of CPHE. Results: Following CPHE, resting mean arterial pressure was reduced (8wks: 99.2 ± 8wks: 83.2±2mmHg, p = 0.05), and VO_{2max} (73.2±2 vs 8wks: 68.2±2mmHg, p = 0.07) pressure tendency to decrease. Arterial stiffness, measured by brachial-ankle pulse wave velocity, was lower (8wks: 870±30 vs 8wks: 797±37mm/sec: p=0.04), and FMD trended toward increasing, albeit variably (8wks: 8wks: 9.1±1.1 vs 8wks: 9.1±1.3, p = 0.25). Fasting glucose was significantly reduced (104.7±10 to 8wks: 92±7mg dl^-1; p=0.04) in all subjects, and OGTT area under the curve (AUC) and glucose at the 2-h timepoint decreased substantially in subjects who began the study with impaired glucose tolerance (2-hr glucose >140 mg dl^-1). In these three pre-diabetic individuals, 2-h glucose decreased from 8wks: 181±10 to 8wks: 139±20mg dl^-1 and OGTT AUC decreased from 8wks: 21±527±23 to 8wks: 17±695±2989mg dl^-1 min. Conclusions: These preliminary data suggest a therapeutic benefit of CPHE for improving cardiometabolic health in obese women, with blood pressure and glucose parameters showing clinically significant decreases . Additionally, these data support previous work in healthy sedentary individuals showing improvements in blood pressure, arterial stiffness, and endothelial function following CPHE.

1284 June 1 9:15 AM - 9:30 AM Exercise Or Reduced-calorie Diet Attenuates Overnutrition-induced GLUT4 Carbohydrates In Adipose Tissue
Carina M. Pautz1, Brittany E. Wilson1, Kelli Jackson2, Joshua T. Selsby1, Catte Beirt1, Salali Merati, Ellen M. Kriell1, Matthew B. Hudson1, Temple University, Philadelphia, PA, 1Towson University, Baltimore, Maryland, 2Iowa State University, Ames, IA
Email: tug65420@temple.edu

(No relationships reported)

Obesity, caused in part by overnutrition and lack of physical activity, has been well-established to be a risk factor for insulin resistance. One mechanism for insulin resistance is decreased or dysfunctional glucose transporter type 4 (GLUT4), which plays a central role in skeletal muscle glucose uptake. Recently, we showed as little as 3 to 14 days of overnutrition results in oxidative damage to GLUT4 via carbonylations and subsequent insulin resistance in adipose tissue of both mice and humans. However,
it is unknown if these carboxylations of GLUT4 in adipose tissue are permanent or potentially reversible. PURPOSE: To determine if physical activity or a reduced-calorie diet can reduce GLUT4 carboxylations following overnutrition in mice. METHODS: Mice (n=4) were fed an overnutrition (60% high fat diet) for 14 days and then then switched to a 30% reduced calorie diet for 3 days or given access to a voluntary running wheel for 7 days. To determine if adipose GLUT4 carboxylations could be reversed the ‘control’ group consisted of time matched mice kept on the high fat diet with no intervention. At the end of each experimental condition mice were sacrificed and white adipose tissue (WAT) was collected. GLUT4 carboxylations were measured in WAT using a validated mass spectroscopy-based multiple reaction monitoring (MRM) method via a Quantum Ultra TSQ. All experimental procedures were approved by Temple University’s IACUC. RESULTS: Following 14 days of overnutrition reducing caloric intake by 30% for 3 days reduced WAT GLUT4 carboxylations ~81% (p < .05). Further, wheel-running exercise for 7 days following overnutrition reduced WAT GLUT4 carboxylations ~81% (p < .05). CONCLUSION: Overnutrition-induced GLUT4 carboxylations in mouse WAT are not permanent and can be reversed by exercise or a reduced-calorie diet. Supported by NIH GM087239.

C-17 Clinical Case Slide - Kneee II

Thursday, June 1, 2017, 8:00 AM - 10:00 AM
Room: 507

1285 June 1 9:30 AM - 9:45 AM
High Intensity Interval Training Improves Endurance Performance and Increases Brown Adipose Mass in Diet-Induced Obese Mice
Email: kim_milecki@hotmail.com

Inadequate diet and inactivity are associated with several metabolic diseases, mainly obesity. High intensity Interval Training (HIIT) is a promising exercise strategy for obese but its effects deserve further investigation. PURPOSE: To evaluate the effects of HIIT training on endurance and fat mass in diet-induced obese mice. METHODS: Fifteen C57BL/6 mice were randomly assigned to Control group (CC, n=5), Hypericidal diet group (HC, n=5) and HIIT training plus Hypericidal diet group (HI, n=5). Food and water were administered ad libitum. Hypericidal diet was composed of 60%fat, 30%carbs and 10%protein. Control diet was composed of 30%fat, 60%carbs and 10%protein. Every group underwent a ramp test (RT) before and after intervention, on a mice treadmill (AVSportsProjects®) to determine maximal speed and maximal distance. RT initiated at 6m/min with a 2m/min increase every 2min (at 60%max) or isocaloric training (CONT, n=7; 3min 50%HRmax). Supported by CNPq/pro-centro-oeste grant 564658/2010-3

1286 June 1 9:45 AM - 10:00 AM
Short-Term Interval Training Increases Fat Utilization During Exercise in Adults With Prediabetes
Julian M. Gaitan, Natalie ZM Eichner, Jacquelyn Moxey, Nicole M. Gilbertson, Eugene J. Barrett, Arthur Weltman, FACS, Steven K. Malin. University of Virginia, Charlottesville, VA.

PURPOSE: Individuals with prediabetes have impaired fat metabolism. Intermittent exercise is thought to lower type 2 diabetes risk, but the mechanism is unclear. We tested the hypothesis that interval training would enhance fat oxidation during exercise and relate to lower disease risk to a greater extent than continuous exercise training. METHODS: Thirty obese, sedentary adults with prediabetes (Age: 57±2.2 y, BMI: 34.5±1.4 kg/m², VO₂max: 21.1±1.2 mL/kg/min, HbA1c: 6.0±2.1 mg/dL, 2-hr glucose: 147.7±8.1 mg/dL) were screened using a 75g OGTT. Subjects were randomized to 12 days of interval (INT, n=7; 3min 90%HRe) or 3min 50%HRe) or isocaloric continuous (CONT, n=6; 70%HRe) cycle ergometry exercise for 60 min/d. Body weight, VO₂max, and substrate oxidation via indirect calorimetry during exercise at the same absolute (30W) and relative (70%HRe) intensities were measured before and after training. Data were analyzed using a 2-way mixed model ANOVA and Pearson’s correlation, and reported as means±SEM. RESULTS: Although there was no statistical change in body weight, VO₂max increased after both INT and CONT training (p=0.05). Exercise training also increased fat oxidation at 30W (P=0.02) and 70%HRe (p=0.03). INT training tended to increase fat oxidation more than CONT at 30W (>0.07±0.02 vs. >0.03±0.03 g/min, P=0.22) and 70%HRe (±0.11±0.03 vs. +0.03±0.04 g/min, P=0.17), although these did not reach statistical significance. The rise in fat oxidation during exercise at 70%HRe correlated with decreased body weight after training (~0.69, P=0.01). CONCLUSIONS: Short-term INT training increases fat oxidation during exercise in people with pre diabetes. This preliminary change in fat metabolism is associated with decreased body mass and may contribute to lower diabetes risk.
A 40 year old female presents with bilateral knee pain. The pain is localized to the anteromedial side of her knees, and it started on day 1 of training for a 5k race. She is a couch to 5k runner. Her knee pain is 10/10 and worse when she rises from a seated position. She is barely able to walk and needs to use a walker. Her pain is better with sitting. OTC analgesics are ineffective. She went to urgent care where she had negative x-rays. She denies a history of swelling, bruising, and trauma to the knees. Of note, she has a history of GERD for which she has been taking dexlansoprazole 30 mg BID “for years.”

PHYSICAL EXAMINATION: Vital signs: Pulse is 89 and regular, respirations 14 and regular, blood pressure 120/90; Pain 10/10 General: Well-developed, well-nourished 40 year old, white female in acute distress.

Lower extremities: No peripheral edema, bruising, or swelling. She is neurovascularily intact. There is tenderness to palpation of the tibial plateau in both knees. Straight leg raise is painless. Normal range of motion with flexion and extension of the knees, but it is very painful. The patient cannot walk without assistance. Ligament and strength testing were deferred due to pain.


TEST AND RESULTS: MRI LEFT KNEE WITHOUT CONTRAST: Extra-articular incomplete stress fracture involving the medial tibial cortex with intense associated marrow and parossseous edema.

MRI LEFT KNEE WITHOUT CONTRAST: Incomplete extra-articular stress fracture involving the medial tibial cortex with intense associated parossseous edema.

DEXA SCAN: Lumbar Spine BMD: 0.857; T-score: -1.7; Z-SCORE: -1.7 Left Hip (Total) BMD: 0.826; T-score: -1.0; Z-SCORE: -0.9 Left Hip (Femoral Neck) BMD: 0.634; T-score: -1.9; Z-SCORE: -1.8

FINAL WORKING DIAGNOSIS: Bilateral lower extremity stress fractures presumed to be secondary to prolonged PPI usage.

TREATMENT AND OUTCOMES: The patient was referred to rheumatology. She used a wheelchair for 3 weeks, and progressed to crutches with toe touch weight bearing. She transitioned to full weight bearing at 7 weeks. Her knee pain flared up, and a CT scan was ordered to evaluate for non-union. The CT showed healing of the bone, and her pain improved. She later moved away and was lost to follow-up.
DIFFERENTIAL DIAGNOSIS: 1. Space occupying lesion (Benign, malignant) 2. Nodule (Gout, Rheumatoid arthritis) 3. Common peroneal nerve involvement vs L5 radiculopathy

TEST AND RESULTS: Blood investigations: Uric acid 0.33 mmol/l (previously elevated at 0.59 mmol/l). Rheumatoid Factor was negative. Anti-citrullinated protein antibodies was negative. Imaging: Ultrasound lower leg: Anterior proximal in the left lower leg a cyst of 44.5 X 19.9 mm. A second synovial cyst of 59.8 x 26 mm and a third synovial cyst measuring 17.5 x 5.4 mm were also visualised. All cysts were connected with small tracts. X-rays of the knee: Narrowed medial tibiotalar joint space. Erosions of the tibial tuberosity (TF joint). X-rays lumbar: L4-S1 disc spaces narrowed.

Grade 1 degenerative arteriolaris of L4 in relation to L5. MRI lower leg: Cysts not in relation to peroneal nerve, well circumscribed, homogenous content with pressure effect on muscles. Intra-osseus cysts TF joint. MRI facet joint: Confirmed listhesis identified on X-ray. Paravertebral joint osteo-arthritis (OA) L4-L5 with degenerative cyst lateral recess of L5 and pressure effect on left L5 root.

FINAL WORKING DIAGNOSIS: 1. Multi-locular synovial cyst TF joint ± peroneal nerve involvement 2. Gout 3. L5 facet joint OA with nerve root radiculopathy

TREATMENT AND OUTCOMES: 1. Conservative management and re-assessment of the lumbar pathology were advised. Involvement) an EMG will shed more light on future treatment. Surgical excision of the possible double pathology in mind (i.e. L5 root pressure and/or peroneal nerve involvement) an EMG will shed more light on future treatment. Surgical excision of the cyst will probably be needed. In the mean time gout treatment was continued. Conservative management and re-assessment of the lumbar pathology were advised.

HISTORY: A 19-year-old college football player sustained a right knee hyperextension injury after taking a direct blow to the anterior knee. Mechanism concerning for a multi-ligament knee injury, though no reduction required on field. On field eval with R foot plantarflexion, intact distal pulses and MCL/PCL laxity. He was transported to the local ED emergently by ambulance for further evaluation. In ED, noted significant pain and swelling. Motor/sensory findings in peroneal nerve distribution improved on enroute. However, his R DP/PT pulses were non-palpable and distant on Doppler. No coolness on palpation of RLE on initial eval in ED. ABIs and a CTA ordered for further work up. PHYSICAL EXAMINATION: -Swelling of the thigh, anterior compartments firm but compressible, LE compartments soft, non-tender, compressible, no pain with passive ankle ROM -Large effusion -Diffusely TTP -Guarding with Lachmans test, too painful for detailed ligament exam-Sensation intact to light touch in tibial, saphenous, sural, superficial/deep peroneal nerve distributions -5/5 ankle plantar/dorsiflexion, great toe flex/extension -DP/PT pulses not palpable, faint on Doppler -Toes cool, sluggish cap refill. DIFFERENTIAL DIAGNOSIS: 1. Knee Dislocation: Multi-ligamentous Injury. 2. Popliteal Artery Injury. 3. Common Peroneal Nerve Injury. 4. Decreased pre-frontal cortex oxygenation during rest and exercise. Speech data five times throughout the study. Over the course of the study gait values showed improvement: gait speed (+6.9%), step duration L (-4.1%), step duration R (-3.6%), stride length L (1.8%), and stride length R (3.1%). Heart rate and blood pressure increased from rest to exercise but did not differ as a function of exercise workload. Surprisingly, RPE was lower (-11.9%) during Phase 2 than Phase 1 despite higher workloads. Speech data revealed adequate intelligibility and articulation precision as well as steady voice free of tremor. Speech rate and voice pitch and loudness ranges were mildly reduced.

TEST AND RESULTS: 1. Heparin Drip started for therapeutic anticoagulation. 2. Urgently transferred to the ICU. 3. CTA: 5 cm segment of popliteal artery occlusion. Mildly depressed midpopliteal blood flow. N.B.: The volunteer performed psychosocial questionnaires, fitness and cognitive tests (strop), and had pre-frontal cortex oxygenation and heart rate variability measurements pre- and post-exercise during each session, and speech data five times throughout the study. Over the course of the study gait values showed improvement: gait speed (+6.9%), step duration L (-4.1%), step duration R (-3.6%), stride length L (1.8%), and stride length R (3.1%). Heart rate and blood pressure increased from rest to exercise but did not differ as a function of exercise workload. Surprisingly, RPE was lower (-11.9%) during Phase 2 than Phase 1 despite higher workloads. Speech data revealed adequate intelligibility and articulation precision as well as steady voice free of tremor. Speech rate and voice pitch and loudness ranges were mildly reduced.

DIFFERENTIAL DIAGNOSIS: 1. Motor/Neurological impairment
2. PD


HISTORY: A 46 year old female, mother of two, had begun experiencing motor and sensory changes a few years earlier. These included unbalanced gait, a slight left-hand tremor with reduced and slower range of motion, a loss of smell, and excess saliva accumulation. A life-long athlete and otherwise healthy, she sought medical help as she did not attribute her difficulties to aging.

PHYSICAL EXAMINATION: Along with self-reported symptoms, a physical examination identified left-sided bradykinesia and rigidity and mask-like facial appearance. An MRI ruled out a brain tumor, and a diagnosis of Parkinson’s disease (PD) was made and subsequently confirmed by a second source.

DIFFERENTIAL DIAGNOSIS: 1. Motor/Neurological impairment
2. PD


C-18 Clinical Case Slide - Medical Issues I
Thursday, June 1, 2017, 8:00 AM - 9:40 AM
Room: 402

Chair: Steven D. Stovitz, FACSM. University of Minnesota, Minneapolis, MN.
(No relationships reported)

Discussant: Kathryn E. Ackerman, FACSM. Children’s Hospital Boston, Cambridge, MA.
(No relationships reported)

Discussant: John Mark MacKnight, FACSM. University of Virginia, Charlottesville, VA.
(No relationships reported)

HISTORY: A 46-year-old male psychiatric Hospital patient, having 33 years of alcohol alcohol dependence with more than 20 hospitalizations was selected. According to the DSM-V, the patient had a chronic disorder related to alcohol consumption. In addition, he scored 37 on ASSIST questionnaire which recommends a severe therapeutic intervention.

PHYSICAL EXAMINATION: The volunteer performed psychosocial questionnaires, fitness and cognitive tests (strop), and had pre-frontal cortex oxygenation and heart rate variability measurements pre- and post-running program.

DIFFERENTIAL DIAGNOSES: 1. Impaired cognition 2. Decreased function of the autonomic nervous system 3. Impaired quality of life and sleep 4. Decreased pre-frontal cortex oxygenation

TEST AND RESULTS: 1. pre-frontal cortex oxygenation during rest and exercise - Low reaction time during cognitive test - High sympathetic activation

FINAL/WORKING DIAGNOSES: Severe alcoholic dependence with lack of executive functions, autonomic nervous system dysfunction and pre-frontal cortex damage.

Abstracts were prepared by the authors and printed as submitted.
TREATMENT AND OUTCOMES
1. Running program with three sessions per week during three months. In the first week, the volunteer ran from two to five minutes. The volume of exercising minutes was increased by two to four minutes every week.
2. Resistance training in the first half of the program.
3. The patient increased his running time by 260% and his VO2max by 24%.
4. His sleep quality improved 31% and his anxiety, stress and depression levels decreased by 37%, 78% and 50%, respectively.
5. On the quality of life questionnaire, the subject improved his psychological and social domains by 200% and 6570%, respectively, and his general quality of life by 183%.
6. His reaction time during the cognitive test decreased 23%, and the number of correct answers increased 8% at rest and 266% during exercise.
7. His R-R interval increased by 33% and 31% both at rest and during exercise, respectively; also, parasympathetic control measured by the RMSSD increased by 132% at rest and by 145% during exercise.
8. An increase in the pre-frontal cortex oxygenation during exercise was found, being 92% at ventilatory threshold, 604% in respiratory compensation point and 76% in VO2 peak.
9. The need for therapeutic intervention decreased from severe to moderate.

1301 June 1 8:40 AM - 9:00 AM Lower Extremity Rash - Soccer
Ryan Matthiasen DO, Jennifer Mitchell MD, Jordan McDermott
ATC, Texas Tech University; Lubbock, TX.
Email: ryan.matthiesendo@gmail.com

History: 19-year-old Caucasian college soccer player complained to her athletic trainer of a bilateral lower leg rash that was painful when putting on her shin guards. During the prior week, multiple 2-4cm in diameter lesions had appeared on both of her legs from her knees down to her ankles. The lesions began as a faint red color and were asymptomatic, but as time went on became a darker red and in some instances purple in color, as well as becoming slightly raised and tender to the touch. The patient denied any recent new exposures or recent travel, but did report that 2 months prior over the prior week, multiple 2-4cm in diameter lesions had appeared on both of her legs from her knees down to her ankles. The lesions began as a faint red color and were asymptomatic, but as time went on became a darker red and in some instances purple in color, as well as becoming slightly raised and tender to the touch. The patient denied any recent new exposures or recent travel, but did report that 2 months prior over summer break she had experienced several weeks of pharyngitis like symptoms along with fever, fatigue, and cervical lymphadenopathy. The patient was empirically treated for presumed strep pharyngitis. No laboratory evaluation was performed at the time of treatment for the pharyngitis.

PMH: uncomplicated
Meds: OCP
NKDA

Physical Examination: Lower Extremities: multiple nodular lesions varying, in color from faint red to dark red to a light purple [photo documentation is available]; they ranged from just proximal to her knees to her ankles bilaterally; warm, palpable and tender. Lower extremity strength was 5/5 bilaterally, sensation to light touch was intact and equal, pulses present and equal bilaterally.

Differential Diagnosis:
1. Nodular Vasculitis
2. Erythema Nodosum
3. Superficial Thrombophlebitis
4. Subcutaneous Bacterial Infection
5. Sarcoidosis

Test and Results:
CBC -
WBC: 10.0
Hemoglobin: 12.2
Hct: 35.8
WBC: 10.0

• CRP: 11
• ASO titer: 423
• Epstein Barr VCA IgM: Positive
• Epstein Barr VCA IgG: Positive

Final/Working Diagnosis:
1. Erythema Nodosum secondary to recent mononucleosis and/or streptococcal pharyngitis

Treatment and Outcomes:
1. Pre-game NSAID administration and post-game ice bath for pain control
2. Protection of area with shin guards
3. Regular monitoring of lesions for resolution to assure no further testing needed to look for source other than recent pharyngitis infection
4. Patient continued to play with moderate discomfort during contact with shins. Over an 8-week period of observation, the lesions decreased in number and tenderness, but a few non-tender palpable lesions remained through the end of season at 5 months since the original illness.

1303 June 1 9:20 AM - 9:40 AM Pancreatic Cancer - Preoperative Exercise During Neoadjuvant Treatment
Nicole L. Klochak, Rebecca A. Ruiz, Ryan J. Marker, John C. Peters, W. Thomas Purcell, Catherine M. Jankowski.
University Of Colorado Anschutz Medical Campus, Aurora, CO. (Sponsor: Catherine M. Jankowski, FACSM)
Email: nicole.klochak@ucdenver.edu

HISTORY: Neoadjuvant chemotheraphy and radiation (NEO) is prescribed to patients with borderline-resectable pancreatic cancer prior to tumor resection to improve postoperative outcomes. Physical fitness and muscle mass are positively associated with improved postoperative outcomes, but are decreased during NEO. Exercise during NEO may counteract these changes. The patient, a 70 year old male who engaged in regular exercise, was diagnosed with borderline-resectable pancreatic adenocarcinoma. He reported an approximate 8kg weight loss and declining fitness prior to diagnosis. He received two months of NEO (four cycles of FOLFIRINOX and five treatments of stereotactic body radiation therapy) during which he participated in a supervised exercise program, prior to an open Whipple procedure.

PHYSICAL EXAMINATION: The patient performed a series of physical function tests and body composition (total, fat, and lean tissue mass) was measured with dual-energy x-ray absorptiometry. Assessments were at baseline (Base), preoperative (PreOp; 17 weeks after Base), and six weeks after hospital discharge (PostOp).

DIFFERENTIAL DIAGNOSIS: General muscle wasting and weakness associated with pancreatic cancer.

TESTS AND RESULTS:
- 400 m Walk Test (s) - Base: 211, PreOp: 188, PostOp: 195
- Grip Strength (kg) - Base: 45, PreOp: 46, PostOp: 44
- 30 x Sit-to-Stand (reps) - Base: 13, PreOp: 20, PostOp: 14
- Total Body Mass (kg) - Base: 64, PreOp: 72, PostOp: 65
- Total Lean Mass (kg) - Base: 50, PreOp: 57, PostOp: 51

FINAL WORKING DIAGNOSIS: General muscle wasting and weakness associated with pancreatic cancer.

TREATMENT AND OUTCOMES: The patient attended 28, hour-long, supervised exercise sessions during NEO. Each session consisted of a 10-min warmup followed by aerobic, resistance, and flexibility exercises. Intensity was progressed or regressed when ability was impacted by training, chemotherapy, or radiation. All physical.
function measures were improved at PreOp. The patient gained 8 kg of body mass including 7 kg of lean mass. All measures decreased from PreOp to PostOp, but most were slightly improved from Base. There were no adverse events related to exercise. Supervised, mixed modal exercise during NEO did not prevent postoperative changes in function and lean mass but was protective against further declines in these outcomes.

C-19  Clinical Case Slide - Wrist and Hand

Thursday, June 1, 2017, 8:00 AM - 9:40 AM
Room: 504

1304  Chair: Suzanne S. Hecht, FACSM. University of Minnesota, Minneapolis, MN.
(No relationships reported)

1305  Discussant: Hallie Labrador. NorthShore University HealthSystem, Chicago, IL.
(No relationships reported)

1306  Discussant: Brian A. Davis, FACSM. University of California-Davis, Sacramento, CA.
(No relationships reported)

1307  June 1 8:00 AM - 8:20 AM
Finger Injury-Flag Football
Leon M. Bathini Jr1, Inola Mello1, Jeff Paxton1, Karl Pankratz2.
1Texas Tech University Health Sciences Center, Lubbock, TX.
2Covenant Medical Center, Lubbock, TX.
Email: leonbathinijr@hotmail.com
(No relationships reported)

HISTORY: A 24 yo M law student was playing intramural flag football and sustained a finger injury. He was attempting to grab the flag of an opposing player when the patient accidentally collided with him and landed on him. Patient does not recall the specifics of the injury mechanism. After the injury, he had pain along his entire ring finger and especially over the distal phalanx. He also has swelling over his ring finger. He has not been able to flex his L ring finger normally. He iced it and was seen in clinic the next day and took Tylenol and Ibuprofen for pain.

PMHI: L ring metacarpal fracture otherwise uncomplicated

PHYSICAL EXAM:
Musculoskeletal: L hand-> Mild swelling over the ring finger with more swelling over the volar proximal phalanx. No bruising. TTP over the volar aspect of the distal proximal phalanx and proximal aspect of the distal phalanx. Loss of active flexion at the DIP joint of the ring finger when making a fist. Intact passive flexion and extension at the DIP joint. Normal sensation and good perfusion

DIFFERENTIAL DIAGNOSIS:
• Flexor digitorum profundus rupture
• Flexor digitorum superficialis rupture
• Phalanx fracture
• Phalanx subluxation
• Volar plate disruption

TEST AND RESULTS:
X-ray L hand: Irregularity of the neck of the proximal phalanx of the ring finger along the ventral aspect. Soft tissue swelling about the finger more pronounced in the proximal phalanx. Ultrasound of L ring finger: tear of the flexor digitorum profundus over the distal proximal phalanx (images available)

FINAL WORKING DIAGNOSIS:
Zone 1 flexor digitorum profundus rupture of L ring finger

TREATMENT AND OUTCOMES:
1. Prompt referral for hand surgery for repair to prevent retraction of the tendon, muscle contracture and permanent finger dysfunction
2. RICE treatment and splinted ring finger in slightly flexed position
3. Successful surgical retraction of flexor digitorum profundus tendon
4. Hand physical therapy starting with passive ROM and then strengthening exercises
etanercept, and prednisone, and subsequently referred to orthopedic surgery for evaluation for wrist fusion, and to physical and occupational therapy for joint range of motion and preservation.

1310 June 1 9:00 AM - 9:20 AM
Decreased Thumb Rom In A Soccer Player
Robert Bogart1, Kathryn Vidlock, FACSM†. 'Sky Ridge Medical Center, Lone Tree, CO. †Colorado Orthopaedics, Lone Tree, CO.
Email: bogart20@gmail.com
(No relationships reported)

HISTORY: A 17-year-old male presented to the office c/o inability to extend thumb after experiencing a popping sensation earlier in the morning. Past history of falling on outstretched hand while playing soccer 5 weeks prior. X-rays of left wrist at that time demonstrated a mature skeleton with a nondisplaced distal radius fracture. Patient was placed in a cast and instructed to use sling as needed. 4 weeks s/p injury, the fracture was healed and patient exhibited full range of motion and strength on exam. Subsequently, he was allowed to return to activities as tolerated. 10 days later patient presented to the office with the inability to extend his thumb.

PHYSICAL EXAMINATION: No erythema, ecchymosis, edema or gross deformities. Non-tender to palpation along 1st MCP joint, thumb IP joint or along any carpal, metacarpal or phalangeal bony prominences. No palpable masses. Inability to actively initiate or maintain extension of the thumb at the MCP and IP joints. Full passive ROM of thumb. No laxity at MCP joint at 30 degrees of flexion.

DIFFERENTIAL DIAGNOSIS
1. Ruptured extensor pollicis longus tendon
2. Ulnar collateral ligament avulsion
3. Distal intersection tenosynovitis
4. Radial nerve neuropraxia/posterior interosseous syndrome
5. Stenosing tenosynovitis

TESTS AND RESULTS
Left wrist AP, lateral, oblique, scaphoid radiographs (initial):
- Fusion of the metaphyseal-epiphyseal junction without presence of growth plate
- Non-displaced fracture of the distal radius, with intraarticular extension involving the medial dorsal epiphysis without presence of step-off
Left wrist AP, lateral, oblique (final):
- Healed, non-displaced distal radius fracture
Ultrasound left dorsal wrist (s/p thumb weakness):
- Fluid filled 3rd compartment at the level of Lister’s tubercle and intact EPL tendon

TREATMENT AND OUTCOMES
1. Patient underwent tendon transfer using EIN to EPL and is recovering.

1311 June 1 9:20 AM - 9:40 AM
Wrist Pain - Fish Cutter with Acute Joint Pain and Swelling
Lauren Nadkarni. Maine Medical Center, Portland, ME.
(Sponsor: Heather Gillespie, FACSM)
(No relationships reported)

History:
A 52 year old male smoker presents with 3 days of left wrist pain. His past medical history is significant for hypertension, hyperlipidemia, stroke, renal calculi, gout, ganglion cyst of his left wrist, previous left wrist sprains, and left wrist fracture resulting in prior surgery without hardware. Although he works as a fish cutter, he denied any recent injuries or puncture wounds. He reports he had started wearing a wrist brace over the past 1-2 days due to swelling and pain, but this had not improved his symptoms. He reports some possible subjective chills, but denies fever.

Physical Exam:
Office examination of his left wrist revealed erythema, warmth, tenderness, and tense edema extending from the base of his fingers to his mid forearm with a 3 cm fluctuant area on his dorsal wrist, associated with low grade fever and tachycardia. Aside from a well healed scar on his posterior wrist, no other skin lesions were present. His wrist was tender to palpation and painful with movement in all directions. Active and passive range of motion were limited by pain and swelling in all directions. Distal neurovasculature was intact.

Differential diagnosis:
- Cellulitis
- Fasciitis
- Myositis
- Abscess
- Septic arthritis
- Gout
- Fracture/dislocation
- Tendonitis
- Ganglion cyst

Tests and results:
- Left wrist x-ray:
  - No acute fracture or dislocation
  - Chronic deformity of ulnar styloid and persistent 5mm cyst within the lunate, unchanged from prior imaging
- Left wrist arthrocentesis per hand surgery consultation:
  - Monosodium urate crystals, no bacteria
Other tests:
- Complete blood count - no leukocytosis
- Negative blood and synovial fluid cultures

Final/working diagnosis:
- Gout

Treatment and Outcomes:
- IV antibiotics and oral antibiotics for 48 hours
- Prednisone and ibuprofen for 5 days
- Pain and swelling significantly improved
- Did not initiate allopurinol/colchicine

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

1326 Board #1 June 1 8:00 AM - 9:30 AM
Impulsive Loading During Running Following Anterior Cruciate Ligament Reconstruction
Derek N. Pamukoff, Michael N. Vakula, Tyler J. Moffitt, Kevin Choe, Melissa M. Montgomery. California State University, Fullerton, Fullerton, CA. (Sponsor: Lee E. Brown, FACSM)
(No relationships reported)

Individuals with anterior cruciate ligament reconstruction (ACLR) are at greater risk for knee osteoarthritides due to aberrant walking biomechanics, but limited data are available on running gait. PURPOSE: To compare impulsive loading characteristics during running between the injured and uninjured limb of individuals with unilateral ACLR, and to a control limb. METHODS: 22 individuals with unilateral ACLR (age=22.3±3.3 years; body mass index=23.8±3.4; time since ACLR=44.9±22.8 months; 16 females; 13 patellar tendon; 6 hamstring tendon; 3 allograft;) and 22 control participants without injury (age=22.6±3.1 years; body mass index=22.9±2.6; 16 females) participated in this study. Participants completed 5 running trials per limb in a random order at a self-selected speed while ground reaction force characteristics (peak impact force (PIF), average loading rate (ALR), and instantaneous loading rate (ILR)) were evaluated using a force plate. PIF, ALR, and ILR were normalized to body weight (BW) for analysis. Separate one-way ANCOVAs were used to compare each dependent variable between the injured, uninjured, and control limbs, using running speed as a covariate (r=0.05). Post hoc comparisons were evaluated using a Bonferroni adjustment (r=0.017). RESULTS: PIF (F2,62=4.55, p=0.01) and ALR (F2,62=3.22, p=0.03) differed between limbs, and a trend was observed towards a difference in ILR between limbs (F2,62=2.56, p=0.07). Post hoc analyses indicated that PIF (1.84±0.48 vs. 1.45±0.34 BW, p=0.01), ALR (67.1±26.2 vs. 46.4±15.9 BW/sec, p=0.01), and ILR (90.2±18.8 vs. 73.2±16.9 BW/sec) were greater in the injured compared to control limb. No differences were observed between the injured and uninjured limbs. CONCLUSIONS: Our findings indicate that the injured limb in individuals with unilateral ACLR experience greater PIF, ALR, and ILR compared to control limbs, and that the
unjured limb also experiences greater PIF and ALR compared to control limbs. High loading rates and impact forces in individuals with ACLR may influence cartilage degradation, and should be considered a factor for knee osteoarthrosis prevention.

High knee joint loading during walking gait and jump-landing (JL) may influence the development of post-traumatic osteoarthritis (PTOA) and increase the risk of a second anterior cruciate ligament (ACL) injury, respectively, following anterior cruciate ligament reconstruction (ACLR). It remains unknown if individuals who demonstrate higher lower extremity loading during walking gait also demonstrate higher loading during JL. PURPOSE: To determine associations between peak vertical ground reaction force (vGRF) and vGRF instantaneous landing rate during walking gait and JL in individuals with an ACLR. Secondly, we sought to determine if limb symmetry indices (LSI = ACLR limb/uninvolved limb) for the kinetics variables associated between the gait and JL tasks. METHODS: Thirty-five individuals (74% female, 45.5±3.8 months post-ACLR, 22.1±3.4 years old, 169.4±10.8 cm, 73.4±17.9 kg) with a unilateral ACLR were recruited for this cross-sectional study. Participants performed 5-trials of self-selected walking gait (6m walkway) and JL (30 cm box placed 50% of height from force plates), respectively. Kinetics were extracted from the first 30% of the stance phase of walking gait and the first 100ms of landing for JL. Pearson product momentum (r) and Spearman’s Rho (ρ) analyses were used to determine associations between the same outcome measures collected during walking gait and JL. Significance was set a priori at P<0.05. RESULTS: Greater vGRF instantaneous loading rate during gait (51.27±12.56% bodyweight per second (BW/s)) associated with greater vGRF instantaneous landing rate during JL (180.12±119.27 BW/s; r=0.36, P=0.07). Neither isometric PT nor isokinetic PT at 180°/second or 240°/second were associated with any running biomechanics variable. CONCLUSIONS: Quadriceps function and running biomechanics were assessed with ACLR. Improving quadriceps RTD may reduce loading characteristics that negatively influence cartilage health.

Return to a healthy level of physical activity is a common clinical goal for patients recovering from anterior cruciate ligament reconstruction (ACLR). Objective measures of physical activity may provide useful information regarding achievement of rehabilitation goals in patients with ACLR. PURPOSE: To investigate differences in the average minutes per day (min/day) spent in moderate-to-vigorous physical activity (MVPA) as well as the total number of steps per day (steps/day) between individuals with ACLR and matched controls. A second purpose was to investigate relationships between MVPA and steps/day subjectivity active scales (Tegner and Marx activity scales. METHODS: Physical activity was assessed using ActiGraph accelerometers in 33 participants (22 females; 20.3±1.8 years; 171.8±10.5cm; 69.9±11.3kg; 27.8±1.75 months from surgery) with a history of primary unilateral or bilateral ACLR as well as 33 healthy controls (CON) (20.8±1.6 years; 172.9±8.5cm; 70.2±13.5kg) (matched on age, sex, and Tegner activity level). Participants wore the accelerometer for 7 consecutive days and completed the IKDC 2000 subjective form and the Tegner and Marx activity scales. Significant t-tests were used to examine between group differences. Bivariate correlation coefficients were calculated between objective and subjective activity levels. RESULTS: Patients with ACLR participated in less MVPA per day (ACLR: 78.8±26.6 min/day; CON: 94.2±26.6 min/day; P=0.02) and less steps/day (ACLR: 700±232 steps/day; CON: 945±328 steps/day; P=0.02) compared to healthy matched controls. Only 25% of participants with ACLR met the 10,000 steps/day guidelines compared to 42% of controls. However, Marx (ACLR: 10.2±4.8; CON: 10.8±5.8; P=0.63) and Tegner (ACLR: 6.2±2.1; CON: 7.6±1.7; P=0.1) activity levels did not differ between groups. No relationships were observed between objectively measured physical activity and scale measures (P>0.05). CONCLUSIONS: Patients with ACLR accumulate less MVPA and fewer steps/day compared to highly matched controls despite reporting similar subjective activity levels. These findings highlight the importance of objective monitoring of physical activity level following return to activity due to the potential risk associated with reduced levels of physical activity.

HOP DISABILITY SYMPTOMS DO NOT REFLECT BIOMECHANICAL SYMPTOMS IN ADOLESCENTS POST-ACLR RECONSTRUCTION

Nicole Mueske1, Christopher Brophy2, J. Lee Pace3, Tracy Zaslow1, Mia Kitzel1, Curtis VanderBerg1, Tishya Wren1. 1Children’s Hospital Los Angeles, Los Angeles, CA. 2University of Southern California, Los Angeles, CA. 3University of Michigan, Ann Arbor, MI. PURPOSE: To assess symmetry and biomechanics of young athletes with anterior cruciate ligament reconstruction (ACLR) during a single-leg hop. METHODS: 39 patients with unilateral ACLR (62% female; age 13–18 years; 5–12 months post-surgery) and 29 controls (58% female) performed a single-leg hop for distance and the shorter distance was <90% of the contralateral limb. Lower extremity landing biomechanics were compared among operative, non-operative and control limbs. RESULTS: 10/29 controls (34%) and 12/39 patients (31%) were classified as asymmetric. Asymmetric patients hopped a shorter distance on the operative side compared with non-operative and symmetric control limbs (op: 1.3 leg lengths, non-op and control: 1.6 LL, p<0.04). Symmetric patients tended to hop a shorter distance on both sides (1.4 LL, p<0.017 with lower peak ground reaction force (op and non-op: 2.8 body weights; control: 3.1 BW, p<0.10). Compared to controls, asymmetric patients landed more plantarflexed (op: -18°, control: -2°, p=0.002) with greater pelvic drop (op: -13°, control: -10°, p=0.06) and less knee varus (op: 0°, control: 3°, p<0.05). Operative limbs had lower knee flexion moments (p=0.004) and greater power absorption at the ankle (p=0.05) with a trend of higher dorsiflexion moments (p=0.08). Symmetric patients had greater bilateral hip flexion compared with controls.
The drop vertical jump (DVJ) task is used to assess functional recovery after an anterior cruciate ligament reconstruction (ACLR). A DVJ has two distinct phases, and while the 1st landing is more commonly analyzed, the 2nd landing follows a maximal effort and may better represent higher-risk sport situations. Comparing the kinematics of each landing to inform clinical examination and future research.

**RESULTS**

Multiple linear regression was used to determine the contribution of these sensorimotor characteristics on landing kinetics and kinematics. Using data reported previously three sub-groups were defined: high VM (≥32 Nm; N=89), high vGRF (≥1200 N, N=40), and high valgus angles (VA; (≥5°, N=129) specifically. A paired t-test was used to test if time-points represented discrete events, and a mixed models repeated measures ANOVA was used to test for interactions between kinetics and kinematics.

**Results:** From IC, the mean time to PKP was 25 ms; to peak VM was 30 ms; to peak vGRF was 35 ms. Significant differences were found between all time-points (p<.001). Within-attempt sequence variability was seen in the time to peak indicating significant temporal overlap. Mean (SEM) PKP values were greater for VM than vGRF or VA groups (3.2 (0.25) Nm/kg vs 1.34 (0.54) Nm/kg; p=0.009, and 1.79 (0.30) Nm/kg; p=0.001, respectively). Rate of loading differed between the High VA group and VM (44382 N/s (2724 N/s) vs 35062 N/s (4615 N/s), p=0.78).

**Conclusions:** Considerable variability was seen in the timing of events. The timing of the specific risk factors investigated rarely coincided, although this did happen. Such an occurrence may reflect a possible scenario predisposing an athlete to ACL injury. Different subgroups may require tailored approaches for ACL injury prevention.

**Conclusion:** The 1st and 2nd landings of a DVJ require distinct kinematics of the ACLR limb. Less knee flexion combined with greater knee abduction and internal rotation of the ACLR limb during the 2nd landing suggests that this landing better detects abnormal mechanisms associated with subsequent injury risk. Thus, the 2nd landing could warrant additional study to identify patients who may be at greater risk for re-injury after ACLR.
RESULTS: A significant limb by group interaction was observed for ERD1 (F(1,8) = 8.280, p = .007). The reconstructed knee in the ACLR showed greater increased cortical activity than the matched limb in the CON (36.4±11.5 vs. 25.3±13.2%, p = .013), while the uninjured knee in the ACLR was similar to the CON’s matched limb (25.1±14.2 vs. 28.0±11.5%, p = .506). Additionally, the ACLR showed greater increased ERD1 in the reconstructed limb when compared to the uninjured limb (36.4±11.5 vs. 25.1±14.2%, p = .006). No significant interactions or main effects were observed for ERD2 and ERD3. CONCLUSION: Following an ACL rupture, the injured leg exhibits increased brain responses during early loading compared to the uninjured knee, as well as the matched limb of healthy controls. This may indicate protective neural adaptation in the brain to compensate the altered proprioceptive input from the injured knee, such that reorganized somatosensory cortex activity can optimize neuromuscular control needed for maintaining functional joint stability. Future studies should explore whether this neural adaptation improves joint health and function after an ACL injury.
Persistent quadriceps weakness and knee dysfunction have been reported after ACL reconstruction (ACLR). It is unclear if these clinical findings are related to physical inactivity among those with a history of ACLR. **PURPOSE:** To investigate the relationship between patient reported knee function, knee extension strength, and objectively measured physical activity in individuals with and without a history of ACLR. **METHODS:** 17 ACLR participants (Sex = 10F/7M, Age = 20.5 ± 1.9 yrs, BMI = 23.4 ± 3.5kg/m², Time since surgery = 39.3 ± 18.7mo) and 17 matched controls (Sex = 10F/7M, Age = 20.5 ± 2.5 years, BMI = 23.1 ± 3.5kg/m²) enrolled. Participants completed the International Knee Documentation Committee (IKDC) form to assess knee function. Involved limb knee extension maximal voluntary isometric contraction (MVIC) strength (Nm/kg) and isokinetic knee extension strength (Nm/kg) was assessed at 60 and 180 deg/s using a multi-mode dynamometer. Moderate-to-vigorous physical activity (MVPA, min/day) was assessed with an Actigraph GT3X-BT accelerometer worn on an elastic belt at the hip over a period of 7 days with a minimum of 4 days of wear with ≥10 hours per day. Wear time (min/ day) was validated using recommendations of Choi et al and Freedom Adult VM3 cut points were used to categorize physical activity. Relationships between MVPA, knee extension strength, and IKDC score were assessed for all participants as well as within the ACLR group using Pearson’s product moment correlations (r). **RESULTS:** Overall, IKDC score (mean = 93.42 ± 6.95) was positively correlated with isokinetic knee extension strength (mean = 130.0 ± 45.9Nm/kg, r = −0.41, p = 0.02). In the ACLR group, IKDC score (mean = 90.19 ± 7.21) was positively correlated with knee extension MVIC strength (mean = 22.8 ± 0.78, r = −0.48, p = 0.05) as well as isokinetic knee extension strength at 180 deg/s (mean = 1.21 ± 0.55, r = 0.57, p = 0.02). There were no significant correlations between IKDC score, knee extension MVIC strength, or isokinetic knee extension strength and MVPA. **CONCLUSIONS:** MVPA is an important clinical outcome that may not be related to traditional patient reported or functional outcome measures after ACLR. Understanding the factors contributing to physical inactivity after ACLR may guide clinical intervention strategies aimed at promoting MVPA.

**S270 Vol. 49 No. 5 Supplement**

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**1339 Board #14**

**The Relationship between Knee Related Function and Objectively Measured Physical Activity after ACL Reconstruction**

Adam R. Kelly¹, David R. Bell¹, Karin A. Pfeiffer, FACSM², Lisa A. Cadmus-Bertram², Stephanie M. Trigsted², Warren A. Dunn², Christopher Kuenze¹. ¹Michigan State University, East Lansing, MI. ²University of Wisconsin, Madison, WI.

(No relationships reported)

**Conclusion.** None of the ATs consistently recorded an accurate cadence of children’s play, sport, and locomotive PA. With the tendency to inflate cadence, caution should be exercised when using activity trackers to determine if children are meeting the recommended dose of daily physical activity.

**1341 Board #16**

**Accuracy Of Steps, Energy Expenditure, And Distance In Nine Activity Trackers**

Michael A. Smith. University of Central Oklahoma, Edmond, OK.

(No relationships reported)

**Purpose:** To evaluate the accuracy of the step counts, energy expenditure (EE), and distance measured from 9 consumer grade activity trackers. **Methods:** Twenty participants completed 1 mile of walking followed by 1 mile of running on a treadmill in the lab. Participants completed 3 sessions of exercise while wearing as many as 4 devices set up for their height, weight, and age in addition to an Actigraph GT3X (GT3X) accelerometer. Devices included in the study were (1) the Fitbit Surge (FBS), Charge (FBC), and Charge HR (FBH); (2) the Garmin Vivoactive (GVA) and Vivosmart HR (GVS); (3) the Jawbone UP2 and UP3; (4) the Polar Loop and; (5) the Microsoft Band 2 (MSB). Data from the devices were compared to the GT3X for steps and American College of Sports Medicine metabolic equations (ACSMME) for estimated EE. Distance recorded by the devices was compared to the 1-mile treadmill completed distance. **Results:** The GVA and GVS performed best with accurate measures for running steps counted, walking EE, running EE, and walking distance (p < .05). The FBH and UP3 performed worst with only accurate step counts for running (p < .05). The FBH and FBS underestimated walking steps by 370 steps (p < .000) and 318 steps (p = .002) respectively. Only the PL and UP2 were accurate for steps counted at a walking pace; however, both devices underestimated steps at 48 steps (p = .227) and 86 steps (p = .06) respectively. **Conclusion:** Few devices accurately measured steps at speeds lower than 4.5mph when compared to a validated accelerometer; however, most devices may accurately measure steps taken at speeds greater than 4.5mph. Few devices accurately measured EE for a 1-mile walk or run when compared to ACSMME. Few devices accurately measured distance for a walk and none of the devices accurately measured distance for a run. It is recommended that accuracy should be considered when using activity tracking devices for the measurement of daily physical activity.

**1342 Board #17**

**Assessing the Feasibility of Wearable Activity Tracker with Individual vs. Group Users**

Hyun-Sung An, Jung-Min Lee. University of Nebraska at Omaha, Omaha, NE.

Email: hyun.an@unmc.edu

(No relationships reported)

Wearable activity monitors are gaining popularity in individuals who want to track their physical activity (PA). The potential use of wearable monitor technology as a tool to facilitate behavior changes represents promising opportunities to promote healthy lifestyles, particularly the key feature of sharing individual’s daily activity with others. **PURPOSE:** To compare individual and group users’ PA by examining their step count and step intensity using a combined activity tracker. **METHODS:** A convenience sample of 78 adults were recruited in this research across two groups: individual users (n=38) and group users, including their partners (n=32). A Jawbone UP 24 (JU) tracker was provided to track the participants’ PA and worn on their wrist for 8 weeks. Only the group users shared their PA information with their partners by using the MyFitnessPal (MFP) application. At the end of 8 weeks, participants’ step counts recorded by the JU were evaluated to examine the change in PA. Participants’ weight (WT), body mass index (BMI, kg m⁻²), waist circumference (WC), blood pressure (systolic blood pressure, SBP; diastolic blood pressure: DBP, mmHg), self-efficacy (SE), and exercise motivation (EM) survey were measured before and after wearing the JU. **RESULTS:** An ANOVA was performed to examine the difference of PA between the weeks, comparing individual and group users’ PA. The change in WT, BMI, WC, DBP, DBP, SE, and EM were analyzed by performing dependent sample t-test. **RESULTS:** Significant differences in PA were observed at baseline (7308.6 ± 5023.5 steps/day) vs. week 1 (8558.6 ± 5128.6 steps/day, p<0.001), baseline vs. week 2 (8645.2 ± 5343.7 steps/day, p<0.001),
Activity trackers are widely used to measure daily physical activity. PURPOSE: To investigate energy expenditure (EE) and step count (SC) measurements of the Fitbit Flex (FF) activity tracker during two walking protocols. METHODS: 49 volunteers (male, N=26; female N=23; age (years) 23.4±6.6; height (m) 1.72±0.11; mass (kg) 76.15±18.56). Walking protocol one and 50 (male, N=24; female N=26; age (years) 23.4±6.6; height (m) 1.72±0.11; mass (kg) 76.15±18.56). RESULTS: Data from the FF was significantly underestimated compared to the tally counter (r=0.53, p<.01; α=0.66; FF:366.02±31.35 steps, Observed:379.83±21.58 steps, p<.01). CONCLUSIONS: While preliminary, these results indicate that the FF may underestimate step counts to the observed step counts from each testing session. The reliability of the activity tracker was determined by correlation analysis and comparison of step counts from the first testing session to the second testing session. Results: The activity tracker significantly underestimated observed steps at both testing sessions by 21.31 steps and 22.62 steps, respectively (p < .05). No difference in step count from the activity tracker was seen from session one to session two (151.85 steps vs. 152.54 steps, p > .05); however, the correlation between the two sessions was only moderate, r = .55, p < .05. Conclusion: Among older adults, the Fitbit Charge™ appears to underestimate steps taken even over a short distance. The reliability of the Fitbit Charge™ is questionable and worn at the waist provide the most accurate step counts compared to wrist-worn models. Differences found in wrist-worn models may result in significant over- or underestimation of activity levels when worn for long periods of time. Wearable technology, including activity trackers, remains a top fitness trend worldwide; however, the ability of individual activity trackers to accurately and consistently record physical activity remains unknown. Purpose: To evaluate the accuracy and reliability of step counts from the Fitbit Charge™ among older adults. Methods: Thirteen participants with a mean age of 70.38 ± 2.47 years volunteered to participate and completed all testing. Participants completed a 96 meter walk around a gymnasium while wearing the Fitbit Charge™ activity tracker. Step counts on the activity tracker were recorded before and after the walk to determine the step count. The walk was also video recorded to determine the actual number of steps taken during the walk. Step counts from video analysis were confirmed by two researchers. The same procedures were repeated on a second, non-consecutive day of testing to determine the reliability of the activity tracker. Accuracy of the activity tracker was determined by comparing step counts to the observed step counts from each testing session. The reliability of the activity tracker was determined by correlation analysis and comparison of step counts from the first testing session to the second testing session. Results: The activity tracker significantly underestimated observed steps at both testing sessions by 21.31 steps and 22.62 steps, respectively (p < .05). No difference in step count from the activity tracker was seen from session one to session two (151.85 steps vs. 152.54 steps, p > .05); however, the correlation between the two sessions was only moderate, r = .55, p < .05. Conclusion: Among older adults, the Fitbit Charge™ appears to underestimate steps taken even over a short distance. The reliability of the Fitbit Charge™ is questionable given only a moderate correlation between sessions. While preliminary, these results call into question the accuracy and reliability of daily step counts from the Fitbit Charge™. It is suggested that all new activity trackers to hit the market are given careful study to determine their ability to accurately measure daily activity.
greater than 75% of their maximum HR as a vigorous intensity activity. An estimate of children’s maximum age-related HR was obtained from the 208 - 0.7 (age) equation. Each intensity classification was compared to the intensity classified by the MET determined by resting metabolic rate (i.e., criterion measure) to examine the measurement agreement. McNemar’s test was used to examine the measurement agreement for paired intensity frequency. RESULTS: After setting PA intensity classification with 50% and 75% of HR, the frequency determined by measured MET from the Cosmed K4B® were 1002, 407, and 120 for light, moderate, and vigorous intensity. The frequency determined by HR monitor and FHR were as follow: 1076, 394, and 58 by PFR, 1393, 127, and 9 by FHR, 1393, 129, and 7 by FHR. The values of weighted Kappa statistics from the McNemar’s test were 0.40 (95% CL: 0.36-0.44) for the intensity by PFR, 0.21 (95% CL: 0.18-0.25) for the intensity by FHR, 0.19 (95% CL: 0.16-0.23) for the intensity by FHR. CONCLUSIONS: The agreement of PA intensity classified by the wearable activity tracker to the intensity classified by the metabolic analyzer showed fair agreement.

1347 Board #22 June 1 9:00 AM - 10:30 AM Validation of Caloric Expenditure Using the Apple Watch and the Fitbit Zip
Cynthia M. Ferrara, FACSM, Shelby Smyth, Erin Mullan, Christopher Burke. Merrimack College, North Andover, MA. (No relationships reported)

PURPOSE: Physical activity trackers have become popular devices to monitor daily exercise and caloric expenditure. However, the validity of these devices is still being investigated. The purpose of this study is to compare estimates of caloric expenditure during exercise using an Apple Watch Sport and Fitbit Zip to values calculated from direct measurement of oxygen consumption. METHODS: The study included seven healthy participants (3 male and 4 female), 20 - 22 years of age. Participants completed six 6-minute bouts of sitting and treadmill walking and jogging (sitting, 2.5, 3.5, 4.2, and 5.5 mph, followed by 2.5 mph cool-down) while wearing an Apple Watch and a Fitbit Zip. Oxygen consumption (VO₂) was measured using the Cosmed Quark CPET. Data is presented as mean ± SD. RESULTS: Caloric expenditure values for the Fitbit Zip were significantly higher than values calculated from VO₂ for all walking and jogging speeds (p<0.05). Total caloric expenditure values were also significantly higher for the Fitbit Zip (296.3±33.0 kcals) compared to values calculated from VO₂ (201.1±41.5 kcals) (p<0.05). CONCLUSION: The results of this study suggest that the Fitbit Zip may overestimate caloric expenditure compared to values calculated from VO₂ measurements. In contrast, caloric expenditure values from the Apple Watch are not different from the values calculated from VO₂. This information may be important for exercise professionals to consider when recommending physical activity trackers to their clients.

1348 Board #23 June 1 9:00 AM - 10:30 AM How Accurately The Smartwatch Measures Steps?
Skylar Brooke, 68182, Jung-Min Lee. University of Nebraska at Omaha, Omaha, NE. (No relationships reported)

Wearable activity trackers are getting popular in the fitness market to track individual’s activity level and several research studies have examined the validity of popular wearable activity trackers. However, there is still limited research regarding the validity of smart watch. PURPOSE: The present study was to systematically examine the validity of the Apple watch for measuring steps. METHODS: Healthy individuals (mean ± SD; age = 23.5 ± 13.4 years; body mass index = 26.8 ± 4.2 kg/m2) participated in the study. The participants were asked to wear the apple watch while normal walking, fast walking and running for one lap on an indoor track (i.e., 200-meter track). The actual steps were manually tallied by researchers using a tally counter and the steps on the watch were recorded before and after each test, step counts from the apple watch were compared with manually counted steps. Pearson correlation was calculated to identify the measurement relationship between the counted steps and the recorded steps from the apple watch. Mean absolute percentage error (MAPE) and root mean square error (RMSE) were calculated to examine the measurement agreement of the Apple watch steps. A dependent t-test was performed to the significant mean differences between counted steps and recorded steps from the apple watch. RESULTS: Total step counts (means ± SD) for counted steps were 222.3±82.5 for normal walking, 198.2±55.7 for fast walking, and 185.9±35.7 for jogging. Pearson correlations were r=0.96 (p<0.001) for normal walking, r=0.83 (p<0.001) for fast walking, and r=0.93 (p<0.001) for running, respectively. Corresponding mean absolute error rates (computed as the average absolute value of the individual’s errors) were 6.1 ±6.6%, 8.8±11.2%, and 4.3±5.8%, for normal walking, fast walking, and running, respectively. Dependent sample t-tests indicated that there is no significant difference (t(35)=0.113, p=0.92) between the counted steps and the recorded steps from apple watch. CONCLUSION: The results demonstrate that the apple watch accurately measures steps on normal walking and running conditions compared to the manually counted steps. However, further research is needed to with more sample size and various populations.

1349 Board #24 June 1 9:00 AM - 10:30 AM Validating Watch in Measuring Energy Expenditure during Different Levels of Physical Activity
Peng Zhang1, Chad Witmer1, Steve Godin1, Dongsheng Che2, Matthew Owens3, Amanda Hanna3, Thomas Casey1, Rebecca Finnegan1, Cleo Niewoju1, 1East Stroudsburg University, East Stroudsburg, PA. University of Utah, Salt Lake City, UT. 2Syracuse University, Syracuse, NY. Email: zhangle@esu.edu (No relationships reported)

Both consumers and researchers have become increasingly interested in using wearable fitness devices to monitor and measure physical activity (PA). iWatch was designed to track individual’s PA using a built-in exercise application, “Workout App” estimating user’s energy expenditure and exercise duration. Even though iWatch was described as a useful wearable fitness technology, the validity of its PA measures is unknown. PURPOSE: The purpose of the study was to investigate the validity and reliability of the energy expenditure estimation of Apple Watch among college students. METHODS: A total of 30 college students (17 males and 13 females) from a state public university in Pennsylvania participated into the study. All participants completed two sets of two three-minute treadmill walking and running trials while wearing three randomly positioned iWatches while also being connected to indirect calorimetry. The two sets of measurement were arranged on two separate days with a randomization and > 48-hour rest in between. The three walking trials were at speeds of 54, 80, and 107 mm/min1 while the running trials were at speeds of 134, 161, 188 mm/min1. Resting Metabolic Rate was collected by the indirect calorimetry along with a familiarization trial prior to the execution of the exercise protocol. Energy expenditure comparisons was made using Two-way ANOVA with repeated measures. Reliability was analyzed by Intraclass Correlation. RESULTS: There was no significant device x speed interactions (F(1, 28) = 1.13, p = 0.05) between the indirect calorimetry (criterion) and iWatch. Bonferroni post hoc analysis revealed no significant differences between the criterion energy expenditure estimates (76.91±39.69 calories) and iWatch (81.5±36.69, p>0.05). The reliability analysis: Overall, a moderate to high agreement among the three apple watches examined in this research, with coefficients increasing once speed surpassed the 2 MPH level. The Inter-Class Correlation (ICC) scores were 0.49 (95%CI) at 2mph, 0.66 (95%CI) at 3mph, 0.72(95%CI) at 4mph & 5mph, 0.71(95%CI) at 6mph & 7mph. CONCLUSION: iWatch demonstrated a moderate to high level of validity and reliability on measuring physical activity.

1350 Board #25 June 1 9:00 AM - 10:30 AM “How ‘bout Them Apples?” Validating Step Counts From The Apple Watch
Bertha Lee, Dinesh John. Northeastern University, Boston, MA. Email: lee.ber@husky.neu.edu (No relationships reported)

Purpose: To evaluate the validity of step counts detected by the Apple Watch (Series 1) during nineteen laboratory-based activities. METHODS: Fifteen participants (mean ± SD: age = 28.2 ± 6.2 years; BMI = 23.6 ± 3.6 kg/m²) wore the Apple Watch on the dominant wrist and performed 19 different activities for 2 to 3 minutes each. The Apple Watch was calibrated for each participant prior to commencing the experiment and the protocol included ambulatory activities on the treadmill and various simulated free-living activities that occur in day-to-day life. Start and stop times were recorded along with step counts displayed on the Apple Watch before and after each activity. Manually counted steps were obtained from video-recordings of the activities and used as the criterion for comparison. A step was defined as each instance the foot was completely raised off and put down on the floor. Paired sample t-tests (p<0.05) were conducted between the Apple Watch and the criterion variable for each activity to determine the validity of the Apple Watch in detecting steps. RESULTS: There was statistically significant difference between mean step counts from the Apple Watch and the criterion for the following activities: sitting and talking while gesturing (0 vs 54, 80.3 steps; p=0.025), standing and stacking books (54.5 ± ± 64 vs. 89 ± 7.5 steps; p=0.014), walking on the treadmill at 3 mph at a flat rate (244.5 ± 111 vs. 342.4 ± 24.4 steps; p=0.008), standing and folding towels (48.3 ± 42.5 vs. 11.9 ± 11 steps; p=0.007), riding the stationary bicycle at 600 kpm/min (47.2 ± 54.1 vs. 0 steps; p>0.004), and vacuuming (47.7 ± 42.6 vs. 134.8 ± 44.8 steps; p>0.000). Conclusion: It was observed that the Apple Watch was able to disregard extraneous hand movements (e.g. gesturing) and not count those as steps during light intensity activities of daily living. These activities did not involve rhythmic and exaggerated arm movements similar to that during unsupported walking. Conversely, increasing the intensity of hand movement during stacking books and folding towels while standing yielded...
spuriously high step counts. Interestingly, despite gripping the handbars, bicycling at 600 kpm/min may have generated rhythmical wrist movements that were sufficient to be detected as steps. Thus, the Apple Watch was not consistent when tracking step counts.

Despite the popularity of consumer-based physical activity monitors (AMs), many of these AMs have little data examining their accuracy. PURPOSE: Our study’s purpose was to determine the validity of a popularly used wrist-worn AMs for overground activities. METHODS: Participants (n=32) aged 18-51 completed two protocols while wearing one AM on their non-dominant wrist. In the laboratory protocol, participants performed 11 activities including lying, sitting, standing, walking at various speeds (2.0, 3.0, 3.5-4.0 miles/hr) and elevations (0%, 5%, 10%), jogging, and cycling for 5 min each. For the semi-structured protocol, participants were taken to an indoor track to perform 3 activities (walking for 200 m, 1 jogging for 400 m). The variables measured by the AM were recorded during each activity and compared to criterion measurements (kcals assessed via metabolic analyzer, steps via hip-worn pedometer, and HR via pulse oximeter) using paired samples t-tests. Additionally, overall and activity-specific percent differences (%) were calculated between estimated kcals, steps, and HR from the AM and criterion measures. RESULTS: Overall % errors for steps, kcals, and HR were 9.7%, 50.2%, and 6.6%, respectively. The AM underestimated steps during most of the slow walking activities (<2.17% p<0.05), whereas kcals were significantly overestimated (≥9.9%, p<0.05) during higher intensity activities (jogging, inclined walking and cycling). HR was not significantly different from the criterion for any activity except standing (underestimated by 4.1%, p<0.05). Steps and HR estimates by the AM were poorer for the semi-structured activities, underestimating both steps (≥2.12%, p<0.05) and HR (≥2.6%, p<0.05). CONCLUSIONS: The AM had low overall error (<10%) for estimating steps and HR in the laboratory protocol. However, accuracy was notably worse for kcals estimates in the laboratory and in steps and HR estimates in the semi-structured protocol, and steps were less accurate during the low speed activities. This study indicates that caution should be used when making health and wellness decisions based on information from AMs since accuracy varies widely among different activities and activity variables.

**Board #29**

### Sources of Error with Wearable Step Counters

<table>
<thead>
<tr>
<th>Authors</th>
<th>June 1 9:00 AM - 10:30 AM</th>
<th>Abstracts were prepared by the authors and printed as submitted.</th>
<th>THURSDAY, JUNE 1, 2017</th>
<th>10:30 AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan Park, Lindsay P. Toth, Alvin L. Morton, Whitney L. Pittman, Damla Sarasaltik, David R. Bassett, FACSM. University of Tennessee, Knoxville, TN. (Sponsor: David R Bassett, FACSM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:spark48@vols.utk.edu">spark48@vols.utk.edu</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(No relationships reported)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PURPOSE: To investigate sources of error with 11 wearable step counting devices, during common types of physical activities. METHODS: 20 participants performed 15 activities for 2 min each, while wearing 11 step counters on the waist, ankle, or non-dominant wrist. Arm activities included: shaving, brushing hair, folding laundry, sweeping, brushing teeth, and meal preparation. Overground activities included: walking holding onto backpack strap, walking with umbrella, walking with hands in pockets, and pushing stroller. Treadmill activities included: walking at 1 mph, walking at 2 mph, walking at 3 mph, walking at 4 mph holding onto bars, and jogging at 6 mph. All devices were compared to the handheld heart rate monitor. Change in both sedentary time and MVPA were significant (p<0.001). CONCLUSIONS: The Fitbit significantly underestimated sedentary time and overestimated MVPA when compared with the ActiGraph in a small sample. Changes in sedentary time and MVPA over 6 mos. were non-significant when assessed by either the Fitbit or ActiGraph. These observations suggest that the Fitbit, which is relatively inexpensive when compared with the ActiGraph, may be useful for assessing changes in sedentary time and MVPA in response to an intervention. However, the absolute values for sedentary time and MVPA assessed by the Fitbit are questionable, and worthy of additional investigation in larger samples of free-living adults.

Funded by Kansas City Life Sciences Institute
CONCLUSIONS: Individuals using step counting devices should be aware of sources of error in step counts. Contributing factors to error are the wear location, the algorithms used to count steps, and the activities performed.

Manufacturers of step counting devices apply filters to their step counting algorithms to prevent accumulation of steps when none are taken (i.e. false positives). However, because filters prevent steps from being recorded during short, intermittent walking bouts, it is possible that these filters may be a source of error. Since few manufacturers disclose the type of filter they use, we decided to investigate this topic. PURPOSE: To determine whether the devices used in this study have a filter, and to describe the effects of the filter on short, intermittent walking bouts with varied walk and pause durations.

METHODS: In Parts A and B, 20 participants performed intermittent walking bouts for 2 min, at a cadence of 100 steps/min. In Part A participants were instructed to walk a certain number of steps (i.e. 4, 6, 8, 10, and 12) followed by a 10-sec pause and repeat this until the trial ended. In Part B participants were instructed to walk four steps followed by various intervals (i.e. 8, 6, 4, 2, and 1 sec) and repeat this. A researcher counted steps using a hand-tally device (criterion). “Percent of actual steps taken” was used for statistical analysis. A one-way repeated measures ANOVA was completed for both parts. In the case of significant overall effects (p < 0.05), the results were further examined using planned contrasts to see which conditions differed from the criterion.

RESULTS: In Parts A and B the multivariable results for ActiGraph GT3X (AG) (without low frequency extension) worn at the wrist, StepWatch 3, and Yamax Digi-Walker SW-200 were not significantly different from the criterion, indicating absence of a step count filter. Walking bouts shorter than 4 steps (AG at the hip), 6 steps (Withings), 8 steps (Omron and Garmin VivoFit 2), and 12 steps (Polar A360), resulted in a significant decrease in the number of steps counted, indicating presence of a filter. The minimum pause needed to break up a walking bout was 1 sec (Fitbit Charge, Fitbit Zip, and Withings), and < 1 sec (Omron HJ-322U). For both the Polar and Garmin, the longer the pause, the less likely they were to record steps.

CONCLUSIONS: Devices with step count filters will contribute to error in daily step counts because steps taken during short, intermittent walking bouts (e.g., meal preparation, and housework) are not registered.

CONCLUSIONS: The sport of pickleball is increasing in popularity throughout the United States, especially in middle-aged, and older adults. Research investigating the physiological demands of pickleball is limited. The use of wearable technology is also gaining popularity, however, the accuracy of such devices is under question. PURPOSE: The purpose of this study was to determine if wearable technology provide valid heart rate (HR) measures during pickleball doubles in middle aged adults. METHODS: 8 female, intermediate level pickleball players (IHP = 3.0 ± 0.8; age = 47 ± 11 years; mass = 72.5 ± 12.8 kg; height = 1.70 ± 0.08 m) participated in this study. All subjects played pickleball doubles for 30 minutes. HR was measured using two devices (Fitbit HR, worn on the dominate wrist, and Polar HR monitor, worn at the xiphoid process level). Peak and mean HR were determined for each device. A paired t-tests was used to determine differences in HR between devices for each dependent variable (HR max and HR mean). A Pearson product-moment correlation coefficient was used to evaluate the concurrent validity between the gold standard (Polar HR system) and the wearable technology (Fitbit HR). RESULTS: Peak HR measured by the Polar system (151.9 ± 15.9 beats/min) was not significantly different from the peak HR measured by the Fitbit HR (149.6 ± 18.0 beats/min; p = 0.69). Similarly, mean HR measured by the Polar system (127.9 ± 17.9 beats/min) was not significantly different from the mean HR measured by the Fitbit HR (121.0 ± 18.2 beats/min; p = 0.23). Concurrent validity between the Polar HR system and the Fitbit HR for both peak (r = 0.6) and mean HR (r = 0.66) was also nonsignificant (p > 0.05). CONCLUSIONS: On average, peak and mean HR was similar between the two devices. These results support the validity of wearable technology; the Fitbit HR was moderately valid in peak and mean HR compared to the Polar HR system. These results are promising for those who own wearable technology and are using it to monitor HR during physical activities such as pickleball doubles. We acknowledge our small sample size and admit that further investigation of the validity of wearable technology on physiological measures during pickleball and other racket sports is warranted.

Wearable devices have been used to track physical activity in clinical interventions and within the general population with an attempt to improve physical activity. The success of wearable devices that track physical activity alone is limited. The pairing of wearable devices with tailored engagement has been suggested to enhance compliance and outcomes. PURPOSE: To measure the effect of activity tracking devices with and without tailored engagement on physical activity in college-aged students.

METHODS: Thirty-five college-aged participants (n = 11 male and n = 24 female) were recruited based upon survey stage of change corresponding to contemplation or preparation for physical activity who self-reported obtaining ≤ 60 minutes of structured physical activity per week. Participants were randomly assigned to 1 of 4 treatment groups: Actigraph GT3X accelerometer without engagement or step count (C) (n = 8), pedometer without engagement (P) (n = 9), pedometer with engagement (PE) (n = 10), or commercially-available iliac crest tracker with engagement (FBE) (n = 7). Participants were in the contemplation or preparation stage of change at recruitment and self-reported obtaining ≥ 60 min of structured physical activity per week. After baseline measurement of weight and YMCA 3-Minute Step Test score in college-aged students, measured before and after a 12-week intervention.

RESULTS: The overall difference in weight from baseline (171.5 ± 45.2 lbs) to post intervention (172.9 ± 44.5 lbs) was found to be not statistically significant between groups. There was no statistically significant difference regarding cardiopulmonary fitness from baseline 1 minute heart beat count 129.7 ± 14.1 BPM to post-intervention 126.15 ± 16.5 BPM. All groups produced a mean score in the ‘poor’ category at baseline. Group PE produced a mean score category of ‘average’ after the intervention.
**June 1 9:00 AM - 10:30 AM**

### Increased Habit Strength and Self-Efficacy Promote PA with Wearable Fitness Monitors

**Jeni Lansing, Laura Ellingson, Alison Philips, Greg Welk, FACSM. Iowa State University, Ames, IA. (Sponsor: Greg Welk, FACSM)**

Email: jenil@iastate.edu

In the US, less than 5% of adults obtain the recommended 150 minutes of physical activity (PA) per week, contributing to the onset of preventable chronic disease. Wearable fitness monitors are increasingly popular, with the goal of increasing PA levels; however, usage trends show that 75% of users stop wearing the devices after 1 month, limiting their potential benefits. Increasing self-efficacy (SE) (one's belief in their ability to succeed at a specific task) and developing habits (automatic behaviors that occur in response to environmental cues) related to usage could improve engagement with monitors and further promote changes in PA. **PURPOSE:** Our purpose was to determine if change in SE and habit formation predict PA levels over a 3-month intervention using a wearable fitness monitor. **METHODS:** Ninety-four healthy adults (52% female; age 41.6 ± 18.4) were randomly assigned to receive a commercial fitness monitor alone or in combination with motivational interviewing and education on successful development of habits. Prior to receiving the monitors, participants completed the Self-Efficacy and Exercise Habit Survey and wore ActiGraph GT3X+ and activPAL3 accelerometers for 7 days to assess baseline physical activity levels. One week later, they were introduced to and provided with a fitness monitor to utilize at their discretion for three months. Participants returned for a follow-up visit three months later, completing all baseline measures as well as the Self-Reported Habit Index (SRHI). The SRHI measured HS for wearing the monitor, checking data on the monitor and using the computer software and mobile app. A linear regression analysis was performed to assess the influence of change in SE and HS on PA levels at follow-up. Age, gender, group, and baseline PA levels were also included as predictors in this model. **RESULTS:** The overall model was significant ($F_{7,67}=5.681, p<0.001$). Significant predictors were change in SE ($β=0.278, p<0.039$), HS ($β=0.296, p<0.009$), and age ($β=0.247, p=0.018$). **CONCLUSION:** Our results demonstrate that improving SE and HS may be key contributors to success when using fitness monitors for promoting PA. Interventions utilizing fitness monitors may benefit by including components to improve these constructs.

### Accuracy of Fitbit Charge 2 Worn at Different Wrist Locations During Exercise

**Vanessa E. Salazar, Naomi D. Lucio, Merrill D. Funk. University of Texas Rio Grande Valley, Brownsville, TX.**

Email: e.vanessa.slrz@gmail.com

Many newly released activity monitors use heart rate measured at the wrist to estimate exercise intensity, however, where the device is placed on the wrist may affect accuracy of the measurement. **Purpose:** To determine whether the Pure Pulse technology on the Fitbit Charge 2 will show different heart rate readings when placed on the recommended exercise position compared to the all-day wear position at various exercise intensities. **Methods:** Thirty-five participants (MEAN ± SD; 22.0 ± 2.9 yrs; 23.9 ± 2.6 kg/m²; 18 male) consented to participate in a single visit where two Fitbit Charge 2 devices were placed on the non-dominant wrist. Fitbit A was placed 2-3 fingers above the wrist bone. Fitbit B was placed directly above the wrist bone. The treadmill was set at 3 mph with 0% grade. Participants remained at this speed for 4 minutes. Heart rate measurements were taken at the last 10 seconds of each stage from both Fitbits and a polar heart rate monitor (chest strap). The same procedure was followed for 5 and 6 mph. Statistical analyses were performed using IBM SPSS 23.0. A Two-way (speed x location) Repeated Measures ANOVA was used to examine mean differences. Pairwise comparisons with Bonferroni correction were used in post-hoc analysis. Pearson correlations and mean bias between polar heart rate monitor and activity monitors were also calculated for each speed.

### CONCLUSIONS: The use of wearable devices with or without engagement did not have a statistically significant effect on weight or cardiorespiratory fitness after a 12-week intervention. However, some individuals improved within YMCA fitness scores post-intervention, which may have clinical significance.

1360 Board #35 June 1 9:00 AM - 10:30 AM

### Accuracy of Fitbit Charge 2 Worn at Different Wrist Locations During Exercise

**Vanessa E. Salazar, Naomi D. Lucio, Merrill D. Funk. University of Texas Rio Grande Valley, Brownsville, TX.**

Email: e.vanessa.slrz@gmail.com

Many newly released activity monitors use heart rate measured at the wrist to estimate exercise intensity, however, where the device is placed on the wrist may affect accuracy of the measurement. **Purpose:** To determine whether the Pure Pulse technology on the Fitbit Charge 2 will show different heart rate readings when placed on the recommended exercise position compared to the all-day wear position at various exercise intensities. **Methods:** Thirty-five participants (MEAN ± SD; 22.0 ± 2.9 yrs; 23.9 ± 2.6 kg/m²; 18 male) consented to participate in a single visit where two Fitbit Charge 2 devices were placed on the non-dominant wrist. Fitbit A was placed 2-3 fingers above the wrist bone. Fitbit B was placed directly above the wrist bone. The treadmill was set at 3 mph with 0% grade. Participants remained at this speed for 4 minutes. Heart rate measurements were taken at the last 10 seconds of each stage from both Fitbits and a polar heart rate monitor (chest strap). The same procedure was followed for 5 and 6 mph. Statistical analyses were performed using IBM SPSS 23.0. A Two-way (speed x location) Repeated Measures ANOVA was used to examine mean differences. Pairwise comparisons with Bonferroni correction were used in post-hoc analysis. Pearson correlations and mean bias between polar heart rate monitor and activity monitors were also calculated for each speed.

### Results

Repeated Measures ANOVA found significant differences between speeds (p<0.01) and location (p<0.01), but not for the interaction (p=0.234). Pairwise comparisons indicated significant differences between each speed (p<0.01) and between the polar monitor and Fitbit B (p<0.05), but not between the polar monitor and Fitbit A (p=0.608). Pearson correlations indicated strong correlations between each Fitbit and the polar monitor (r= 0.58-91; all p<0.01). Mean bias decreased as speed increased for Fitbit A (mean bias bpm ± SD; 1.1 ± 5.4, -1.9 ± 9.5, -0.4 ± 6.9, -0.3 ± 7.3 for resting, 3mph, 5mph, 6mph respectively) while mean bias for Fitbit B increased as speed increased (-2.8 ± 8.8, -3.1 ± 11.1, -3.9 ± 14.6, -6.7 ± 14.3 for resting, 3mph, 5mph, 6mph respectively).

### Conclusion

Wrist-worn heart rate monitors appear to provide values adequate for recreational use, however, following recommended guidelines on wear-position may impact heart rate readings.
CONCLUSIONS: With increasing speeds, physical activity monitors more accurately measure HR but individuals should be aware that these devices may overestimate HR during slower walking speeds.

1364 Board #39 June 1 9:00 AM - 10:30 AM Effect of Smartphone Carrying Location on Accuracy of Popular Pedometer Apps
Merrill D. Funk, Jesus P. Gonzalez, Perla Leyva, Cindy Salazar, Miriam Garcia, Murat Karabulut. University of Texas Rio Grande Valley, Brownsville, TX. University of Texas School of Public Health Science Center at Houston, Brownsville, TX. Email: merrill.funk1@utrgv.edu

A variety of locations on the body are suggested for smartphone use during daily activity. Purpose: To determine if smartphone carrying location has a significant impact on the accuracy of popular smartphone pedometer applications at measuring steps while walking on a treadmill.

METHODS: Fifty-two participants (Mean±SD; 22.9±4.2yrs; 22.4±4.1kg/m²; 22 Male). G-Fit recorded 3 zero values and 4 negative values and Moves recorded 1 zero value. Pearson correlation coefficients indicated that step bias between trials was significantly correlated for the pedometer, Runtastic, and S-Health (r=0.42, p=0.01; r=0.907, p<0.01; r=0.862, p<0.01; respectively). Correlations for Moves, G-Fit, and Accupedo were not significant (r=-0.080, p=0.581; r=0.125, p=0.389; p=0.191, p=0.184; respectively). The MAPE values for trials 1 demonstrated that the apps with the smallest deviation from the tally counter were also the ones with best test-retest reliability, with S-Health being the most accurate (bias, MAPE: 2.28 steps, 1.31% followed by the pedometer and Runtastic (-3.26 steps, 2.86%; -8.02 steps, 3.79%, respectively). Moves, Accupedo, and G-Fit deviated farther from the tally counter.

CONCLUSION: Smartphone apps used consistently and accurately measure steps while walking at a normal pace while other apps may have more variation.

1365 Board #40 June 1 9:00 AM - 10:30 AM Wristband Physical Activity Monitors Over-Report “Steps” Accumulated During Activities of Daily Living.
Kristina Hasanaj, Lea Haverbeck, Nicole S.C. Bidolli, Michael A. Preston, Rachael K. Nelson. Central Michigan University, Mount Pleasant, MI. (No relationships reported)

Physical activity (PA) guidelines recommend accumulating 10,000 steps/day through 30 minutes of exercise and maintaining a physically active lifestyle (~6,500 steps). The advent of wristband PA monitors has made monitoring steps easier than ever, yet “steps” accumulated with wristband PA monitors may not equal valid pedometer devices. PURPOSE: To compare 10,000 steps accumulated during exercise and activities of daily living using a pedometer and wristband PA monitor. METHODS: 26 healthy males (n=13) and females (n=13) were recruited for this two-day study. On Day 1 participants completed 30 minutes of exercise on a treadmill at 64-74% of their predicted HRmax wearing a pedometer and wristband PA monitor. Participants wore a pedometer and wristband PA monitor steps were recorded after exercise and pedometer steps were subtracted from 10,000 to determine the remainder of the steps. Day 2 participants then engaged in their normal activities of daily living for 3 hours. Remaining steps were accumulated by wristband PA monitoring. Physical activity PA monitors are recommended for use in daily living over pedometer devices.

RESULTS: Daily steps on Day 1 were 9226±188 vs. 10005±2 steps; P<0.01) on Day 1. Consequently, total steps accumulated on Day 1 was significantly lower with the wristband PA monitor than pedometer (9226±188 vs. 10005±2 steps; P<0.01) on Day 1. However, wristband PA monitor steps were significantly greater than pedometer steps during activities of daily living (7125±430 vs. 5512±255 steps; P<0.01) as well as total steps (when combined with exercise) on Day 2 (11134±397 vs. 9818±233 steps; P<0.01). CONCLUSION: Wristband PA monitors may not equal pedometer devices for accumulating “steps” during activities of daily living.

ACSM May 30 – June 3, 2017 Denver, Colorado

THURSDAY, JUNE 1, 2017
PA monitors are a useful qualitative device to promote/maintain a physically active lifestyle. However, findings from our analysis indicate that quantitatively, wristband PA monitors may over report accumulated steps through activities of daily living.

C-32 Free Communication/Poster - Biomechanics in Ball Sports

Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

1366 Board #41 June 1 8:00 AM - 9:30 AM
Effect of Jaw Pad Thickness on American Football Helmet Performance
Sean E. Quisenberry, Mark Jesunathadas, Scott G. Piliad, Trenton E. Gould. University of Southern Mississippi, Hattiesburg, MS.
Email: sean.quisenberry@usm.edu
(No relationships reported)

Equipping athletes with properly fitted helmets is purported to ensure devices are performing to manufacturer’s product claims. Traditional methods of verifying product safety claims are based on linear acceleration measures. A more recent measure, the Summation of Tests for the Analysis of Risk (STAR) rating system, also incorporates linear acceleration weighted at each location by on-field season exposure. However, little research is available linking the influence proper fit may have on the helmet’s ability to mitigate impact energy. PURPOSE: The purpose of this study was to determine if jaw pad thickness influences resultant linear peak g accelerations. METHODS: Twenty male baseball pitchers (age: 15.3±1.3 years; 78.9±21.1 kg; 1.73±0.07 m) were recruited and randomly assigned to test one of three jaw pad thicknesses (S = 1.65, M = 2.4, and L = 3.5cm). Helmets were fit to a Mechanical National Operating Committee on Standards for Athletic Equipment (NOCSAE) headform and then impacted per guidelines detailed in the STAR rating system. Helmets were impacted twice at 4 locations (front, rear, side, top), and 5 drop heights (0.31, 0.61, 0.91, 1.22, 1.52m). Linear acceleration in the three cardinal planes was measured with a triaxial accelerometer mounted in the center of gravity of the headform (sampling rate 20 kHz). A three-way (thickness x height x location) ANOVA with repeated measures was used to test for differences in vector resultant linear peak g accelerations (α = 0.05). RESULTS: Statistical differences in resultant linear peak g by location (F(6, 74) = 43.2, p <0.01, f = 3.34), drop height (F(4, 59) = 2720.85, p <0.01, f = 19.5), and location x height (F(6, 74) = 27.97, p <0.01, f = 2.31) were found. There were no statistical differences for thicknesses (Means ± SD, S = 75.15 ± 23.22, M = 76.75 ± 22.58, L = 78.39 ± 23.51g, p = 0.068), height x thickness (p = 0.058), or location x thickness (p = 0.124). STAR values were calculated to be S = 0.43 (3 STAR), M = 0.47 (3 STAR), and L = 0.52 (2 STAR). CONCLUSIONS: Jaw pad thickness had no influence on linear acceleration measures. However, application of the thickest jaw pad in our test set-up resulted in a reduction of the advertised STAR (3 STAR), M = 0.47 (3 STAR), and L = 0.52 (2 STAR).

Effect of Jaw Pad Thickness on American Football Helmet Performance
Takahiro Otsudo,1 Hiroshi Hattori,2 Yutaka Sawada,1 Yu Okubo,1 Kiyokazu Akasaka1.1 Saitama Medical University, Saitama, Japan. 2Saitama Medical Center Saitama Medical University, Saitama, Japan.
Email: otsudo@saitama-med.ac.jp
(No relationships reported)

The effectiveness of elbow brace to decrease elbow valgus acceleration during throwing is not clearly identified. PURPOSE: To measure the effect of an elbow brace on elbow valgus acceleration during throwing. METHODS: Repeated measures were taken of elbow valgus acceleration in 20 college students (16.7±0.7 yrs) with and without an elbow brace. One acceleration device was fixed to the medial epicondyle of the humerus while another to the distal forearm. All subjects threw 100 balls over a distance of 18.44m consecutively. Valgus acceleration was calculated as the sum of the acceleration of internal rotation of the humerus and posterior rotation of the forearm. Average elbow valgus acceleration(Ave-VA) was determined from the 5th to 9th throw (early phase) were compared with the average from the 90th to 94th throw (late phase). Additionally, ball speed (mile/h) and accuracy (percentage strike) were measured. Comparisons of ball speed, strike rate and Ave-VA were conducted using two-way ANOVA with repeated measures. RESULTS: All values are presented in time order (early and late phase). Ave-VA with a brace was 652.4±172.1 and 647.5±198.2, respectively. Ave-VA without a brace was 842.0±246.7 and 816.5±195.5, respectively. These differences were significant (p<0.05). Ball speed with a brace was 63.5±5.3 and 63.9±5.0, while ball speed without a brace was 65.2±4.1 and 65.5±5.0, respectively which was not significantly different. Strike accuracy with a brace was 47.0±27.7 and 64.0±20.3 while with a brace was 52.0±20.9 and 50.0±27.1, respectively. There was a significant difference in strike accuracy when comparing early and late phase when wearing a brace (p<0.05). CONCLUSIONS: Ave-VA was decreased by wearing an elbow brace during throwing compared with normal throwing. Acknowledgement: Supported by a grant from the Faculty of Health and Medical Care, Saitama Medical University (2015-006).

1367 Board #42 June 1 8:00 AM - 9:30 AM
Can an Elbow Brace Change Elbow Valgus Acceleration During Throwing?
Takahiro Otsudo,1 Hiroshi Hattori,2 Yutaka Sawada,1 Yu Okubo,1 Kiyokazu Akasaka1.1 Saitama Medical University, Saitama, Japan. 2Saitama Medical Center Saitama Medical University, Saitama, Japan.
Email: otsudo@saitama-med.ac.jp
(No relationships reported)

Ulnar collateral ligament injuries in baseball pitchers may be the result of high-magnitude torques generated during the pitching motion. Maximizing ball velocity while simultaneously avoiding excessive elbow torque may improve performance and decrease injury risk in baseball pitchers. The identification of kinematic variables that predict ball velocity and elbow varus torques may assist in developing efficient pitching mechanics. PURPOSE: To identify the kinematic factors during a baseball pitch associated with ball velocity and peak elbow varus torque in adolescent male baseball pitchers. METHODS: Twenty male baseball pitchers (15.3±1.3 years; 78.9±21.1 kg; 1.73±0.07 m) performed three fastballs from the windup while undergoing three-dimensional motion analysis with a ten camera motion capture system, collected at 480 Hz. Ball velocity was simultaneously captured using a radar gun. Elbow varus torques were normalized to body weight and height. Six kinematic pitch variables were analyzed: trunk forward lean range of motion (ROM) between maximum stride leg knee height and stride foot contact (stride phase), trunk forward lean ROM between stride foot contact and maximum glenohumeral external rotation (GHER) (cocking phase), stride leg sagittal knee angle at stride foot contact, trunk rotation at stride foot contact, stride length, and contralateral trunk lean at GHER. A multivariate linear
regression model was constructed for the purpose of this study. Outcome variables were ball velocity and peak elbow varus torque. Kinematic pinch variables were the predictor variables.

RESULTS: Statistically significant predictive models were found for ball velocity (R²=0.36, p=0.003) and peak elbow varus torque (R²=0.52, p=0.001). Significant predictors of ball velocity included trunk forward lean ROM during the cocking phase (β=0.22, 95% CI [0.02, 0.43], p<0.04) and stride length (β=0.30, 95% CI [0.09, 0.50], p=0.005). Significant predictors of peak elbow varus torque included trunk rotation at the stride foot contact (β=0.01, 95% CI [-0.02, -0.01], p<0.001) and stride length (β=0.05, 95% CI [0.02, 0.07], p=0.001).

CONCLUSIONS: Greater stride lengths are associated with greater ball velocities and greater peak elbow varus torques in adolescent male baseball pitchers.

Handball is a court sport practiced by recreational and competitive athletes to develop speed, agility, power, muscular endurance, ambidexterity, and similar skills and components of fitness. Handball is a paragon of the principle of generality/ cross transfer; it develops skills and fitness which directly transfer to many team, individual sports and physical activities. The elemental nature of handball (no external implements) emphasizes the importance of biomechanics; only the kinetic chain influences and contributes to interactions with the ball. Despite the elemental, minimalistic mechanics of handball, research regarding biomechanics of performance is scarce. PURPOSE: To determine transverse plane angular velocity of hip and shoulder rotation and resultant linear velocity of the ball associated with the power serve. METHODS: Eighteen handball players competing at the B-class level or above (4 professional, 2 qualifiers, 4 open, 5 A and 3 B) provided informed consent and were videotaped in the transverse and sagittal plane while performing 10 power serves. Vicon Motus 9.2 software was used to quantify peak hip (HAV) and shoulder (SAV) angular velocity in the transverse plane, and peak resultant linear velocity of the ball (RVB). RESULTS: HAV ranged from 3.2 to 12.3 rad/s in individual players; grand mean = 8.13 rad/s. SAV ranged from 10.5 to 18.4 rad/s in individual players; grand mean = 13.98 rad/s. RVB ranged from 25.5 to 36.7 m/s in individual players; grand mean = 29.4 m/s. To evaluate sequentially accumulated angular velocity within the kinetic chain, the proportion of serves in which HAV preceded SAV were tallied, and ranged from 30% to 100%; grand mean = 72.2%. SAV was more strongly related to peak ball velocity (r=0.25; p<0.05) than was HAV (r=0.13; p>0.05). Players in higher competitive divisions exhibited faster ball velocity and angular kinematics, and more effective timing within the kinetic chain. CONCLUSIONS: Angular kinematics, linear ball velocity and kinetic chain sequence and timing of the handball serve were comparable to those reported for throwing sports. The experience, practice and playing time necessary to achieve higher competitive status in handball were related to faster angular kinematics and linear ball velocity, and more effective timing within the kinetic chain.
CONCLUSION: The results indicated significant differences in Agility K-tests among late adolescent soccer players. The results may be beneficial for strength and conditioning coaches, physical therapists, and other clinical and sports science staff in amateur soccer as a useful set of reference values for comparison with subjects of particular ages.

Trunk stability is critical for the transfer of energy from the lower extremity to upper extremity during throwing. Defining lower extremity kinematics during dynamic tasks will enable understanding of their contribution to trunk stability. PURPOSE: To examine the effects of trunk stability on lower extremity kinematics during a step-down task (SDT). METHODS: Professional baseball players (n=70; 22.6 ± 2.2 years; 91.8 ± 9.9 kg; 185.8 ± 6.6 cm) volunteered. A SDT was performed on their lead leg from a 20.3 cm box, lowering their contralateral heel to the ground and then returning to the starting position. Participants were filmed in the frontal and sagittal planes. Data were analyzed at heel strike using DARTfish. Trunk stability was defined as ‘poor’ when trunk motion (sum of trunk flexion and lean) was >24.9°, the median of the sample. ‘Good’ stability was defined as <24.9°. A one-way ANOVA was performed to determine if kinematics were different between participants with poor and good trunk stability. Pearson Product correlations characterized the relationship between trunk motion and lower extremity kinematics. RESULTS: See Table 1. Knee flexion (p=0.04) and hip flexion (p=0.03) were significantly greater in participants with good trunk stability. Significant negative correlations between trunk motion and knee (r=-0.323) and hip flexion (r=-0.360) were observed. CONCLUSION: Participants with poor trunk stability had significantly less knee and hip flexion during the SDT. Correlations indicate that as lower extremity motion decreases, trunk stability decreases. Deficits in knee and hip motion may have contributed to trunk instability, or they are a compensation strategy for the increased trunk motion in those classified with poor trunk stability. Research is needed to assess the impact of altered lower extremity kinematics and trunk stability on energy transfer during throwing.

<table>
<thead>
<tr>
<th>Trunk Stability</th>
<th>Knee Dorsiflexion</th>
<th>Hip Flexion</th>
<th>Knee Valgus</th>
<th>Pelvic Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>100.5 (4.5)*</td>
<td>119.9 (15.1)*</td>
<td>7.4 (8.6)</td>
<td>7.1 (3.4)</td>
</tr>
<tr>
<td>Poor</td>
<td>98.2 (4.8)*</td>
<td>112.2 (13.5)*</td>
<td>9.5 (8.0)</td>
<td>6.9 (3.0)</td>
</tr>
</tbody>
</table>

PURPOSE: To examine differences in axiomatic movement patterns and dynamic stability in different competition levels in golfers. METHODS: 72 golfers were recruited across several regional middle and high schools (50% SCHOL; n=36), and division I, II, and III colleges (COL; n=36). Each group performed the seven-test functional movement screen (FMS), and the upper (UQ) and lower quarter Y-balance tests (YBT-LQ). Limb lengths were normalized to percent limb length (%LL). Statistical analyses were run using student T-tests comparing test results with competition level (p<0.05).

References: Shooting Motion in Professional Lacrosse Players: Key Anatomical Sites for High Stress Risk

PURPOSE: Lacrosse offensive players emphasize ball speed during shooting to maximize the chance for scoring. Attackmen shoot from near the goal whereas the midfielders tend to shoot from farther away from the goal. It is unclear, however, whether specific features of high-speed shooting motion of these two positions differ and place certain anatomical sites at higher risk for high tissue stresses and injury. The purpose of this study was to compare kinematics of shooting motion in men’s professional midfielders and attackmen.

METHODS: Fifteen male players (5 midfielder, 10 attackmen) from a professional team participated in this experimental study. Three dimensional motion capture system was used to collect overhead shooting motion in sagittal, frontal and transverse planes. The shot cycle was defined as the time from lead foot contact (0% of throw) to the ball release (100% of throw). Pelvis, torso, shoulder and crosse angular velocities were determined. Joint and trunk angles at FC and BR were calculated. The range of motion (ROM) during the throw cycle of the different joint and segment motions were found. The ‘X-Factor’, was calculated as the angle of shoulder-to-pelvis crossover.

RESULTS: Ball speed was higher in the midfielders than attack (149.7 km/h versus 134.2 km/h; p=0.021). Maximal torso and shoulder angular velocities were greater in the midfielders than attack by 17.3%-31.8% (p<0.05). Pelvic anterior tilt in the sagittal plane during the shot cycle was greater in the midfielders than attackmen (p=0.03). Attackmen demonstrated less shoulder-to-pelvis crossover at follow-through than midfielders in the transverse plane (40.6 ±4 vs 58.11 ±4; p=0.004). CONCLUSION: Positional differences exist in shooting motion between offensive players. Midfielders shoot to generate relatively higher rotational velocities of the upper body and anterior pelvic tilt than attackmen in order to achieve the ball speed needed to score from a farther distance. The high-speed rotation and tilt differentials about the spine in midfielders may place high stress and risk for injury in the tissues surrounding the low back.
Cricket is the most commonly played and followed sport in India. Modern day Cricket demands a high level of performance from the fast bowler who obviously carries the highest risk for injury. 3D motion analysis could be used to prevent injuries by identifying incorrect techniques. Researchers have identified certain key biomechanical variables as predictors of injury in fast bowlers apart from other factors like bowling workload and on-field injuries. Very little such information is available with respect to Indian Cricket fast bowlers despite the huge popularity of the sport here.

**Purpose:** To identify injury risks in Indian fast bowlers with respect to key biomechanical variables, using 3D motion analysis.

**Methods:** 22 male fast bowlers from state & division level Cricket teams between ages 18-30 years underwent 3D motion analysis in a Cricket Biomechanics testing facility. The bowling action was captured with a set of 3D cameras (250fps) and 2D video cameras (125fps). Key biomechanical variables including Delivery Stride Length (SL), Lateral Trunk Flexion at Ball Release (LTF at BR) and Knee Flexion at Front Foot Contact (KF at FCC) were measured. Peak Vertical Ground Reaction Force (pVGRF) were recorded simultaneously using Force Plates. Data processing & analysis was done with proprietary software using a standard model. Descriptive statistical analysis of results was done.

**Results:** A large proportion of the study population were at risk of injuries (100% had less than optimum SL, 41% had high LTF at BR, 45% had high pVGRF and 45% had lower KF at FFC). Bowling Action Type was found ideal or acceptable in 77%.

**Conclusions:** COL level bowlers had better efficiency in UQ and LQ dynamics stability, individual movement patterns that involved unilateral stance, and overall movement ability compared to SCHOL. These data support the premise that movement quality improves with increased competitive level among bowlers. These data may also help establish functional movement and dynamic stability normative values for bowlers of different competition levels.

---

**C-33 Free Communication/Poster - Biomechanics of Cycling**

**Thursday, June 1, 2017, 7:30 AM - 12:30 PM**

**Room: Hall F**

**Board #54 June 1 9:00 AM - 10:30 AM**

**Front Suspension Does Not Increase Mechanical or Metabolic Power Requirements during Uphill Bicycling**

Todd M. Carver1, Asher H. Straw2, Jesse H. Frank2, Tyler S. Kraus1, Wouter Hoogkamer2, Specialized Bicycle Components Inc., Boulder, CO.1University of Colorado Boulder; Boulder, CO.1Specialized Bicycle Components Inc., Morgan Hill, CA. (Sponsor: William Byrnes, FACSM)

**Purpose:** To quantify the effects of a novel front suspension system on the mechanical and metabolic power requirements during steep uphill bicycling.

**Methods:** 11 males (74.9kg) rode six 5-min trials at 3.35 m/s uphill (4.0%) on a large motorized treadmill in both sitting and standing positions using their preferred gear ratio/cadence. They wore a helmet and metabolic mouthpiece (1.05kg combined) and rode the same road bicycle (9.02kg) with the suspension in rigid and compliant configurations. The suspension comprises a spring-loaded steering tube that allows for vertical travel of the handlebars. We equipped the bicycle with a crank-based power meter and video recorded the axial displacement (ΔL) of the steering tube relative to the frame headtube. From the video measurements of ΔL (mm) and knowing the stiffness k (N/mm), we calculated the mechanical power put into the suspension system: mechanical power (watts) = k ΔL/2f, where, f = cadence in rev/s. We averaged V02 and VC02 for the last 2 min of each trial and calculated metabolic power.

**Results:** For the rigid and compliant conditions, mechanical power was the same (2.85 ±0.05 W/kg) while sitting (p = 0.71) and not different for standing: 2.86 ±0.03 W/kg vs. 2.87 ±0.05 W/kg respectively (p = 0.51). Metabolic power for sitting was 13.11 ±0.56/kg vs. 13.21 ±0.57/kg compliant (p = 0.23). For standing, metabolic power was 14.23 ±0.70/kg and 14.15 ±0.64/kg respectively (p=0.43). Power losses in the suspension while sitting 0.01±0.004W/kg, and standing 0.03±0.01W/kg, were < 1.05% of total mechanical power.

**Conclusion:** The steering tube suspension system did not require significantly more mechanical or metabolic power compared to riding with the suspension rigidly locked out.

Supported by a gift from Specialized Bicycle Components Inc.
CONCLUSION: These findings suggest that OA participants do not display different knee angle variability by condition or compared to healthy participants. Thus, OA symptoms during cycling associated with individuals with knee OA are likely not a result of knee angle variability.

In cycling, increased power output at the pedal results in increased speeds (1). Pedal power output is primarily generated by the muscles spanning the trunk, hip, knee, and ankle and is a result of the summation of angular power produced from all lower extremity joints (2, 3). To our knowledge, non-sagittal kinematic variables have not been studied with respect to power production in cycling. PURPOSE: To assess the relationship between frontal plane knee, hip and trunk kinematics during maximal seated and standing cycling with average and peak power generation in trained cyclists. METHODS: Seventeen trained male cyclists (39.1±7.8yrs; 1.82±0.07m; 80.8±9.2kg) completed a 15min warm-up followed by two, seated or standing (i.e., off the saddle), 3min cycling bouts at 80% of their maximal power output in a randomized order. Maximal power output was measured during 30s maximal cycling efforts during the warm-up. In the last 20s of the 3min cycling bouts, cyclists were asked to perform a maximal-effort sprint at 90-110rpm (4). During these bouts, knee, hip, and trunk 3D kinematics were collected using a motion capture system (240Hz, Qualisys, Sweden). Average and peak pedal power (W) was also collected (Vector, Garmin, USA) during these maximal efforts. All cycling testing was performed on the participants’ own bicycle fixed to a stationary trainer that allows side-to-side motion (Rock and Roll, Kurt Kinetic, USA). Pearson’s correlation coefficients between frontal plane joint angles and positions and cycling power were computed (p < 0.05). RESULTS: Seated average and peak powers were 701±91 W and 875±158 W while standing average and peak powers were 728±88 W and 897±130 W, respectively. Hip abduction excursion during the down stroke of standing cycling was positively correlated with power output (p = 0.53, p<0.031) maximal cycling (r = 0.029 to 0.24) or sitting (r = 0.031 to 0.25) or standing (r = 0.031 to 0.25) maximal cycling (p > 0.05). CONCLUSION: These findings suggest that hip abduction excursion may play a role in maximal standing power generation during cycling. Greater abduction excursion may indicate increased contributions of hip abductor muscles and future studies should assess muscle activation of hip abductors as a predictor of cycling power.
During walking, older adults generate more power about the hip and less power about the ankle compared to young adults. Cycling is another cyclic task and a popular mode of exercise. No research has examined whether older compared to young adults demonstrate a similar lower extremity motor pattern characterized by distal-to-proximal redistribution of effort during cycling. PURPOSE: To investigate the effects of age on lower limb motor patterns during submaximal cycling. METHODS: Thirteen young (22.9±3.4 years) and 13 older (69.7±4.5 years) male recreational cyclists completed a 6-minute pedaling trial at 125W and 90 rpm on a Lode bicycle ergometer. Reflective markers (n=21) were attached to the left pedal and on the subject’s pelvis and left lower limb. Marker positions and pedal reaction forces were sampled simultaneously at 100 Hz and 2000 Hz, respectively. A three-segment sagittal plane inverse dynamics model was used to compute net joint forces, moments, and powers. Lower limb motor patterns were characterized by examining the distribution of total absolute lower limb power about ankle, knee, and hip. Independent t-tests were used to examine the effects of gender on total and average hip joint powers. RESULTS: Absolute total and average joint powers were not significantly different between young and older participants (Table 1). The net ankle, knee, and hip joint power profiles were similar for older and young participants showing a higher reliance on knee and hip power and lower reliance on ankle power when pedaling. These results can be explained by the high level of control in our experimental design. To examine age effects on lower limb motor patterns, we controlled external power output, cadence, posture, and cycling experience in our study. Many of these factors have been shown to affect lower limb kinetic and kinematic variables. CONCLUSION: Older and younger adults employ similar patterns of distributed effort in the lower extremity during submaximal cycling.

**Table 1: Lower extremity total and average joint powers**

<table>
<thead>
<tr>
<th>Age</th>
<th>Lower Extremity Total Power (W)</th>
<th>Lower Extremity Average Power (W)</th>
<th>Knee Power (W)</th>
<th>Hip Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>111.8±15.2</td>
<td>15.1±5.4</td>
<td>31.6±8.0</td>
<td>45.1±9.1</td>
</tr>
<tr>
<td>Old</td>
<td>107.8±16.1</td>
<td>14.0±3.6</td>
<td>26.0±7.6</td>
<td>37.8±9.9</td>
</tr>
</tbody>
</table>

**ABSTRACT**

**Purpose:** To compare different methods for assessing plyometric ability during jumps.

Brandon W. Snyder1, Gavin L. Moir2, Chris Cohnabay1, Hugh S. Lamont1, Shala E. Davis, FACSM1,2, East Stroudsburg University, East Stroudsburg, PA. 1University of Pittsburgh, Pittsburgh, PA. 2Coastal Carolina University, Conway, SC. (Sponsor: Shala Davis, FACSM)

No relationships reported.

**Methods:** Twelve resistance-trained men (age: 21.8 ± 1.7 years; height: 1.81 ± 0.06 m; mass: 85.1 ± 8.6 kg) performed CJ and DJ from heights of 0.40 m, 0.60 m, and 0.80 m. Force plates recorded the ground reaction force from which the descent (absorption phase) and ascent (propulsive phase) of the center of mass during ground contact was determined. Jump height (JH), vertical stiffness (VSTIFF) and normalized work (WNORM), power output (PIEpow), and impulse (INORM) during the absorption and propulsion phases were calculated. Plyometric ability was assessed using the modified reactive strength index (RSHA30) and four indices using propulsion time (PTI), propulsive work (PWI), propulsive power (PPI), and propulsive impulse (PII). Analysis of variance was used to assess the differences in the mechanical variables and the plyometric indices across the four jump conditions. Correlations were used to assess the relationships between the plyometric indices and JH. Results: JH (mean differences: 0.03 – 0.06 m; p < 0.007) and VSTIFF (mean differences: 0.69 – 0.93 kN/m; p < 0.001) were greater during CJ compared to the DJ conditions. The mechanical variables during the absorption phase were greatest during the highest DJ (WSHA30 mean differences: 1.6 –
**PURPOSE**: To investigate how the number of jumps affects the force-velocity (Fv) characteristics derived from drop jumps (DJ) from different heights and squat jumps (SJ) performed with different loads.

**METHODS**: Twelve resistance-trained men (age: 21.8 ± 1.7 years; height: 1.81 ± 0.06 m; mass: 85.1 ± 8.6 kg; 1-RM squat: 162.3 ± 27.3 kg) performed SJ with loads equivalent to 0% (SJ1), 25% (SJ2), 50% (SJ3), and 85% (SJ4) 1-RM and DJ from heights of 0.40 m (DJ40), 0.60 m (DJ60), and 0.80 m (DJ80). Force plates were used to record the ground reaction force (GRF) during each jump from which the descent and ascent of the center of mass (CM) during ground contact was determined. The function of descent phase was considered the measured DJ or SJ, whereas the CM was considered the CM during propulsive phase. The function for the lowest impulse of the GRF was positive and the CM was ascending. The eccentric and concentric Fv characteristics (average vertical GRF, average vertical velocity of CM) for each subject were calculated during the descent phase of the propulsive phase of CMJ and DJ and may not therefore provide an accurate assessment of the ability to utilize the stretch-shortening cycle during different jumps. Practitioners should consider using PII as a measure of plyometric ability.

**RESULTS**: Model 3 for the eccentric Fv characteristics produced a significantly greater y-intercept (mean difference: 1.2 N/kg; p < 0.043) and lower slope (mean difference: 1.2 N/m*kg; p < 0.020) than model 1. There were no significant differences in the y-intercept (range of differences: 1.7 - 3.7 N/kg; p < 0.05) or slope (range of differences: 1.5 - 2.8 N/m; p < 0.05) between the three models for the concentric Fv characteristics, although some of the parameters associated with model 3 were unrealistic.

**CONCLUSIONS**: Both DJ and load SJ may provide means of assessing the eccentric and concentric Fv characteristics, with the regression parameters becoming more realistic with the inclusion of a greater number of jumps.
KFC independently accounted for 11.8% (p = 0.047) of the variance in DOM vGRF. No DOM limb multiple linear regression model was significant. KFC and PKF independently accounted for 15.7% (p = 0.021) and 16.5% (p = 0.017) of the variance in NON vGRF, respectively. KFC and IKQS as a multiple linear regression model accounted for 18.9% (p = 0.043) of variance in NON vGRF. **CONCLUSION:** KFC, on DOM and NON limbs, is the best sagittal plane kinematic predictor of vGRF, in a single limb drop landing task in physically active males. Despite IKQS not being an independent significant predictor on either limb, it improved KFC prediction of vGRF on the NON limb. This study highlights how active males use sagittal plane knee motion and quadriceps strength to influence vGRF in a single leg landing task, as research has shown women are more likely to use hip and knee kinematic strategies. Active individuals with weak quadriceps and a stiffened knee at initial contact are likely at risk for injuries associated with increased impacts during single limb landings.

**RESULTS:** During cutting, peak ML GRF for SM (42.62±15.31 N/kg) and SP (41.11±12.32 N/kg) were reduced as compared with CO (51.99±12.5 N/kg) (p = 0.039 and p = 0.001, respectively). Mean ML GRF for SM (4.14±2.48 N/kg) and SP (3.81±3.76 N/kg) were also reduced as compared with CO (6.58±5.18 N/kg) during cutting movements (p = 0.009 and p = 0.004, respectively). During drop vertical jump performance, mean AP GRF for both SM (-1.88±0.90 N/kg) and SP (-1.13±0.52 N/kg) were reduced as compared with CO (-4.02±1.33 N/kg) (p = 0.0001 and p = 0.0002, respectively). Peak ML GRF for SM (25.09±4.43 N/kg) was less than both CO (32.70±8.45 N/kg) (p = 0.0009) and SP (29.67±5.36 N/kg) (p = 0.0008). Mean ML GRF for SM (1.71±3.33 N/kg) was less than CO (2.40±4.0 N/kg) (p = 0.0012). Mean AP GRF for SP (-1.13±0.52) was reduced compared with SM (-1.88±0.90) (p = 0.0011). A trend for peak VERT GRF between SM (151.99±5.28 N/kg) and both CO (156.91±10.71 N/kg) and SP (156.52±8.53 N/kg) during drop vertical jump was noted.

**Conclusion:** SP and SM athletic flooring may reduce selected peak and mean GRF. SM mitigated GRF to a greater extent. Data trends also demonstrated reductions in VERT GRF during drop vertical jump for SM that may be further elucidated with a greater sample size in future efforts.

The functional movement screen (FMS) has been shown to be a valid and reliable tool for assessing fundamental movement patterns. While dysfunctional movement patterns have been shown to increase an athlete’s risk for injury, it is unclear what influence they have on athletic performance.

**PURPOSE:** To examine the relationship between FMS testing and sport specific performance tests for Division III (D3) women’s soccer (SOC) and volleyball (VB), as well as compare performance differences between sports. **METHODS:** 17 SOC (19.0±3 yo) and 13 VB (19.2±0.4 yo) players consented to the study and performed pre-season FMS, a 3-site % body fat (%BF) skinfold analysis, and performance testing. Performance testing included 1-min push-up test, Vertical Jump (VJ) test, Illinois Agility (IA) test, and 12x 20 m repeated sprint test (RST) with 20 sec recovery each sprint. 1-way ANOVA was run to compare differences between sports. Pearson correlations were run to examine the relationships between the FMS and performance measures. All data were expressed as mean ± se, and all significance levels were set at α = 0.05.

**RESULTS:** Players were of similar height but VB players weighed (76.5 ± 2.1 kg) significantly (p = 0.0001) more than SOC (63.0 ± 1.9 kg). %BF was significantly higher (p = 0.0022) for VB (28.6 ± 1.4% vs 22.2 ± 1.3%), which resulted 5.8 kg greater fat free mass (FFM) for VB (p = 0.0001). There were no significant differences in any of the performance measures, including VJ. However, the estimated power output for the VJ was significantly higher (p = 0.0001) for VB (388.81 ± 103.8 W) than SOC (309.46 ± 92.6 W). The FMS lunge score was moderately related to both mean (r = 0.46, p = 0.0160) and best (r = 0.41, p = 0.0295) RST time (sec). The total FMS score showed a similar relationship for mean (r = -0.42, p = 0.0025) and best (r = -0.50, p = 0.0066) RST. %BF appears to negatively impact FMS scores (r = -0.36, p = 0.0447).

**CONCLUSIONS:** In a cohort of D3 women athletes, there appears to be no differences between athletes in common skill-related performance measures, despite significant differences in %BF and FFM. The inverse relationship between %BF and lower FMS scores suggests that reducing body fat could improve performance measures. The FMS may be useful in identifying potential skill-related performance decrements in similar athletes.
head. The NAS CMVJ began with the dominant upper limb fully raised overhead, while the non-dominant hand remained on the iliac crest during the entire CMVJ. All jumps were performed by descending to an internal knee angle of 90°, using maximal effort, and reaching for an overhead target. A three dimensional markerless motion capture system (MCS: DARI, Lenexa, KS) was used to analyze the kinematic and kinetic data. T-tests and ANOVAs (*AS vs. NAS, †eccentric [ECC] vs. concentric [CON]; p<0.05) were performed on mean values from all 3 jumps for AS and NAS for each subject. RESULTS: Results for AS and NAS CMVJs are shown in the table. The AS CMVJ produced greater vertical jump height (VJH) an average of 0.07±0.03 m (3.01±1.3 in). The hips and ankles produced greater ECC and CON torques, less hip flexion, and greater time in the concentric phase during the AS CMVJ. The knees produced greater concentric torque, however there were no differences between jump conditions. The NAS CMVJ also had greater time in the concentric phase of the jump. CONCLUSION: Compared to NAS, use of an AS produced a 13% increase in CMVJ height, and greater peak torques for the hips and ankles, even when comparing eccentric and concentric phases. The AS CMVJ also increased the duration of the concentric phase, thus permitting greater torque generation to increase CMVJ height.

Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AS</th>
<th>NAS</th>
<th>AS vs. NAS, CON vs. ECC (*AS vs. NAS, †eccentric [ECC] vs. concentric [CON]; p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jump Height (VJH)</td>
<td>0.55±0.09 m</td>
<td>0.52±0.08 m</td>
<td>0.03±0.01 m</td>
</tr>
<tr>
<td>ECC Force</td>
<td>0.27±0.05 N</td>
<td>0.25±0.04 N</td>
<td>0.02±0.01 N</td>
</tr>
<tr>
<td>Concentric Force</td>
<td>0.26±0.05 N</td>
<td>0.25±0.04 N</td>
<td>0.01±0.01 N</td>
</tr>
</tbody>
</table>

的眼神的注意，扫描，和/或视觉学习) was associated with an increase in visual attention, scanning, and/or visual learning) was associated with an increase in visual attention, scanning, and/or visual learning)

RESULTS: A one unit decrease in the visual memory composite score (i.e., worse visual attention, scanning, and/or visual learning) was associated with an increase in pKValA of 0.25±0.07° during the BH task compared to the NB task (R² = 45.8%, p = 0.006).

CONCLUSION: The detrimental effect of soccer ball handling during a side-step cut movement on knee valgus was found to be influenced by athletes’ visual memory ability. These results may suggest that athletes with a diminished capacity for visual memory may be less able to maintain optimal biomechanics while accommodating the demands of sport-specific tasks that require visual attention.

Competitive sports require athletes to focus on several aspects of human performance, especially training techniques that maximize muscle power. This type of training may pose risk of injury, and performing these exercises in water appears to reduce risk due to lower impact forces, yet the influence of adding external loads in water has not been investigated.

PURPOSE: Compare landing kinematics of weighted countermovement jumps performed in water versus land. METHODS: Twenty-four NCAA DI female athletes (19.9±1.1 yr, 12 soccer, 12 gymnasts) performed three countermovement jumps per trial including a different external load (body weight (BW, kg), BW*1.1, BW*1.2, BW*1.3) using a weighted vest. Landing kinetic measures were peak force (PF), rate of force development (RFD), impulse (Imp), and time-to-stabilization (TTS). Results were analyzed using a three-way 2 (sport) x 2 (environment) x 4 (load) ANOVA. RESULTS: There were no significant differences in any measure for the sport factor. The aquatic condition displayed significantly (p<0.001) reduced PF by 50.7%, RFD by 53.5%, Imp by 38.6% and TTS by 6.5%. On land, increasing external load did not significantly change PF or RFD, but did produce significantly (p<0.001) greater Imp (12% increase for BW vs BW*1.3). In water increasing load produced significant (p<0.001) increases in PF (except BW 1.1 vs BW 1.2), RFD (except for BW vs BW*1.1) and Imp (except for BW*1.2 vs BW*1.3). Despite this increase in PF, RFD and Imp with load in water, all measures were still significantly (p<0.01) lower than land. CONCLUSION: The results for lower PF, RFD and Imp in water vs land validate the potential lower risk of injury for performing countermovement jumps in water. Adding small to moderate external loads in water increase PF, RFD and Imp in most conditions, yet still apply a significantly lower orthopedic stress compared to Land. Further research should monitor injury rates between these two environments.

Muscle preactivation prior to high impact landing is a normal sensorimotor strategy to attenuate loads and place joints in stable positions. Patients with chronic ankle instability (CAI) have shown sensorimotor deficits, which can result in injury-prone joint positions. Little is known whether rehab training can improve pre-landing joint positions and muscle activation in patients with CAI.

PURPOSE: To examine the effect of a 6-week ankle and hip intervention program on sagittal ankle, knee and hip joint kinematics and medial gastrocnemius (MG), vastus lateralis (VL) and gluteus maximus (GX) activation from 150 ms pre- to initial-contact. RESULTS: Figure 1. The rehab intervention resulted in up to (i) 32% less VL activation at 55–42 ms pre- to initial-contact and (ii) 8.5% less GX activation at 150–81 ms pre-contact. No changes were detected in sagittal ankle, knee and hip kinematics, and MG activation.

CONCLUSIONS: As knee and hip extensors act as a shock absorber during landing, reduced VL and GX preactivation could reduce the ability to attenuate the high impact loads at initial landing. While no corresponding kinematic differences were observed, these EMG alterations could have a delayed effect on kinematics at or following impact.
Sports involving frequent jumping (JUMP) and landing (LAND) and changes in direction may increase risk of Achilles tendon (AT) injury. Mechanisms of AT rupture are thought to be related to weight bearing activities such as JUMP and LAND that involve knee extension and vigorous dorsiflexion on a plantar flexed foot. Studies report less postural stability and a higher plantarflexor moment during lateral jump-landing. To our knowledge, there are no studies that have examined AT loads during JUMP and LAND in forward-backward (F/B) and medial-lateral (M/L) directions. 

**Purpose:** Compare AT loading during JUMP and LAND in a F/B and M/L directions.

**Methods:** 16 physically active, healthy males (age 21.6 ±1.8 years, height: 178.4 ±6.4 cm, weight: 76.4±11.2 kg) were fitted with 47 markers and performed dominant single-legged jump-landings. The horizontal and vertical ground reaction forces were measured using force plates (1800 Hz) and motion data were recorded using 2 cameras (180 Hz). Kinematic and force data sampled by 15 motion analysis cameras (180 Hz) and force platforms (1800 Hz). Inverse dynamics and static optimization were used to estimate muscle force. AT cross sectional area (CSA) was measured by ultrasound. AT force was divided by each subject’s AT CSA and strain was calculated.

**Results:** Maximal AT CSA was 18 ±5 mm². AT force was 50 ±20 N while AT strain was 0.02 ±0.01. JUMP showed higher AT loading demands (p=0.015) and strain (p=0.015) were higher than LAND. There was no interaction between movements and directions.

**Conclusion:** M/L JUMP and LAND peak AT force (p=0.002), stress (p=0.004) were greater than A/P. JUMP peak AT force (p=0.007), stress (p=0.015) were higher than LAND. There was no interaction between movements and directions.

Sensorimotor deficits due to lateral ankle sprains can result in altered landing mechanics in the lower extremity. The ankle and hip have been a focus of interventions in patients with chronic ankle instability (CAI), however, knee landing mechanics may also be affected by the intervention.

**Purpose:** To examine the effect of a 6-week ankle and hip rehabilitation intervention on knee landing mechanics in patients with chronic ankle instability (CAI).

**Methods:** 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76.9±8 kg, 83.7% FAAM ADL, 56±10% FAAM Sports, 3.6±1.1 MAII, 4.7±2.0 ankle sprains) completed a series of 10 ankle and hip strength and proprioceptive exercises (theraband, wobble board, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81.9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAII, 3.9±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (α=.05) were used to detect a group x treatment interaction over time. If 95% CI did not cross the zero, significant differences existed.

**Results:** Figure 1. The rehabilitation intervention resulted in up to (i) 2 degree less knee flexion at 13-18% of stance, (ii) 0.23 Nm/kg more knee extension moment at 21-27% and 35-69% of stance, and (iii) 1.6 degree more knee valgus at 0-8% and 48-64% of stance. No changes were detected in frontal knee moment over time between groups. 

**Conclusions:** Relative to the control group, CAI patients in the rehabilitation group tend to land more aggressively using more knee extensor moment with less flexion and more valgus positions of the knee. These positions and moments, due to the ankle and hip exercises in CAI patients, could be a risk factor for knee injury in this CAI population.
The Effect of a Single Bout of Exercise on the Motor Learning of a Drop Vertical Jump Landing Strategy

Patrick Grabowski, Dianne Kilgas, Cassie Raduka, Lindsey Sheehan, Emily Sobocinski, Christian Hintz, Michael Price. University of Wisconsin La Crosse, La Crosse, WI. Email: pgrabowski@uwlaex.edu

Purpose: A single bout of cardiovascular exercise improves cognitive learning, but effects on motor learning have been scarcely researched with mixed results. Key questions remain, including the intensity of exercise required to achieve behavioral effects. The purpose of this study is to test the effect of moderate intensity exercise (ModEx) on the retention of a drop vertical jump (DVJ) landing strategy.

Methods: 40 healthy females (mean age: 20.1, range: 18-22) with no history of leg injury in the past 12 months attended a 1 hour session, first performing 2 DVJs to gather baseline data. Peak vertical ground reaction forces (PVGRF) and hip flexion (HF) angles at the deepest point of landing were measured with a force plate and 2D motion capture software. Next they performed 30 DVJs with feedback for enhanced “soft” landing mechanics. Individuals were then randomized to the ModEx group (n=20), to perform 30 minutes of sham electrical stimulation. After 1 week, a retention session was performed to assess PVGRF and HF during 2 DVJs.

Results: Baseline performance did not differ between groups (C: mean PVGRF=48 N/kg, SD=12), ModEx PVGRF=45 N/kg (12), p=0.84; C: HF angle=96° (23), ModEx: HF angle=94° (24), p=0.62). Both groups reduced PVGRF and HF angles after training (C:PVGRF=38.5 N/kg (11.5), 56°(14), ModEx: PVGRF=39 N/kg (10), 62° (14), p=0.01) and at retention (C:PVGRF=42 N/kg (10), 58°(15), ModEx: PVGRF=41 N/kg (8), 60° (15), p=0.01). There was a group by time interaction effect on relative retention (percent change from training to retention) for PVGRF (d=0.01) and HF (d=0.31), which failed to reach statistical significance (p=0.05).

Conclusion: Training methods were sufficient to induce motor learning, however the effect of ModEx on retention of the skill was small, and these results fail to statistically support the hypothesis that ModEx enhances motor learning of landing strategies. Recommendations for use of ModEx to enhance motor learning cannot be made on the basis of these results. Due to substantial variability, further study with a larger sample will strengthen conclusions. Other considerations for further investigation include exercise timing and dosage, motor skill complexity, and length of the retention period.

During exercise and sport, physically active individuals often perform movements that require dynamic postural stabilization. Postural stability has been linked to ankle and knee injuries and examining factors associated with stabilization may provide insight as to how poor stability influences joint loading. PURPOSE: To examine mechanisms associated with postural stability during a Forward Jump Single-Leg Landing task (FJSL). METHODS: Dynamic postural stability index (DPSI), a composite of the anterior-posterior, medial-lateral, and vertical ground reaction forces, kinematics, knee extension strength (KES), and knee extension rate of torque development (RTD) were collected on 23 males (Age: 23.9 ± 1.3 years, Height: 178.4 ± 7.1 cm, Mass: 84.4 ± 8.6 kg). KES and RTD were collected using an isokinetic dynamometer. DPSI, sagittal plane joint angles at initial contact (Hip@IC), Knees@IC, ANK@IC) and peak flexion angles (Knee@IC, ANK@IC) were collected during a FJSL for the dominant (DOM) and non-dominant (NON) limb using a 3D motion capture system. Paired samples t-tests examined lower extremity asymmetries in DPSI, kinematics, KES, and RTD. Pearson correlation coefficients examined the relationships between KES, RTD, DPSI, and landing kinematics. Significance was set at p<0.05. RESULTS: Subjects demonstrated asymmetrical DPSI (p=0.003) and asymmetrical ANK@IC (p=0.033) but not asymmetrical KES or RTD (p>0.05). Increased Knee@IC and ANK@IC correlated with an improved DPSI on the DOM limb while Knee@IC and Hip@IC correlated with an improved DPSI on the NON limb (r=-0.472, p=0.031 and r=-0.520, p=0.016). Neither KES nor RTD correlated with DPSI or any of the kinematic measures for their respective sides. (p>0.05). CONCLUSIONS: Biomechanical stabilization strategies utilized the knee but the DOM, which had better stabilization, incorporated more ANK@IC, likely distributing weight over the forefoot. Neither strategy related to KES or RTD. Incorporating movement and balance components focused on symmetrical coordination of corrective movement strategies, including ankle stability, into current training programs may be necessary for improved dynamic postural stabilization.

INTRODUCTION: Jumping is a fundamental skill for children to develop. While the vertical jump has been extensively researched in adults, such investigations have not been thoroughly extended to children. Understanding the biomechanical correlates of jump height in children could help guide future research of jump height prediction models leading to valuable information about the development of fundamental motor skills in children. PURPOSE: To conduct a preliminary analysis on the relationship between lower extremity kinematics and vertical jump height (JH) in children.

METHODS: 37 children [age (yrs): 7.2 ± 1.5; height (m): 1.2 ± 0.11; mass (kg): 26 ± 7.7] participated in the study. Anthropometric measurements were obtained prior to the start of the jump protocol. The task consisted of participants performing five maximal effort vertical jumps. Segment position data were collected using a ten camera optical motion capture system, and ground reaction forces were obtained from two force platforms. To assess joint kinematics, sagittal plane moments at the hip, knee, and ankle were calculated using an inverse dynamics technique and normalized to bodyweight. Maximum vertical displacement of the center of mass after takeoff was calculated to determine JH. RESULTS: Correlation analysis revealed a significant positive linear relationship between peak ankle moment (2.1 ± 0.8 Nm/kg) and JH (18.05 ± 2.40 cm) (r=51; p<0.01), peak knee moment (07 ± 0.4 Nm/kg) and JH (r=50; p<0.01) as well as peak hip moment (1.5 ± 0.6 Nm/kg) and JH (r=41; p<0.01). CONCLUSION: Peak ankle, knee, and hip moments were found to be moderate to strong correlates of JH in children. Future research investigating JH predictors in children should consider lower extremity joint kinematics as plausible predictors.

Abstracts were prepared by the authors and printed as submitted.
INTRODUCTION: Jumping is a fundamental motor skill that influences successful participation in various physical activities and sport. Understanding the factors associated with vertical jump performance can provide a more extensive indication of normal or deviated motor skill development in children. However, predictors of vertical jump height in children have not been extensively explored. PURPOSE: To explore potential biomechanical, anthropometric, and descriptive predictors of vertical jump height (JH) in children. METHODS: 37 children [age (yrs): 7.2 ± 1.5; height (m): 1.2 ± 0.1; mass (kg): 26.7 ± 7.7] participated in the study. Participants were asked to perform five maximal effort vertical jumps. Lower extremity position data and ground reaction forces were collected using an optical motion capture system and two force platforms respectively. Peak sagittal plane lower extremity joint moments were calculated using an inverse dynamics technique, and peak joint powers were calculated as the product of individual joint moments and angular velocities. Net peak power (NP) was calculated as the highest sum of hip, knee, and ankle power at a given instant. In addition to biomechanical variables, age, height, weight, leg length, and weekly amount of physical activity served as independent variables (IV). Stepwise multiple regression analysis was conducted to determine the accuracy of IV predicting JH. RESULTS: Regression results indicated that the model significantly predicts JH [R² = .716, R²adj = .70, F(2, 35) = 44.158, p < .001], and accounts for 71.6% of the variance in JH when net peak power (14.43 ± 3.95 W/kg) and peak hip moment (.15 ± .02 Nm/kg) were the sole predictors. CONCLUSIONS: NP and peak hip moment were shown to be significant predictors of JH in children, which coincides with previous research on biomechanical JH predictors in adult populations.

CONCLUSION: Walking and hopping. Additional work is required to quantify bone stresses and strains during activities to determine if they reach sufficient thresholds to be classified as osteogenic exercise.
Hip dysfunction may be closely associated with chronic ankle instability (CAI). Ankle and hip intervention strategies in CAI patients could improve hip mechanics during functional sport movements.

**PURPOSE**: To examine the effect of a 6-week ankle and hip intervention program on hip landing mechanics in patients with CAI.

**METHODS**: 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 56±10% FAAM Sports, 3.6±1.1 MAII, 4.7±2.0 ankle sprains) completed a series of 10 ankle and hip strength and proprioceptive exercises (theraband, wobble board, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAII, 5.9±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (α=.05) were used to detect a group x treatment interaction over time. If 95% CI did not cross the zero, significant differences existed.

**RESULTS**: Figure 1. The rehab intervention resulted in up to (i) 3.5 deg less hip flexion at 9-82% of stance, (ii) 0.27 Nm/kg less hip extension moment at 8-16% stance, and (iii) 0.2 Nm/kg more hip extension moment at 19-25% of stance. No changes were detected in frontal hip angle and frontal hip moment over time between groups.

**CONCLUSIONS**: Relative to the control group, CAI patients in the rehab group tend to land with less hip flexion angle along with less hip extension moment initially, but they increased hip extension moment in an effort to control the high impact landing. Less hip flexion angle and more hip extension moment are indicative of a stiff hip landing strategy. Data are needed to examine whether this strategy reduces the risk of ankle injury.

Altered ground reaction force (GRF) during cutting is associated with chronic ankle instability (CAI). Little is known whether a rehabilitation intervention alters GRF patterns during a cutting task.

**PURPOSE**: To examine the effect of a 6-week ankle and hip intervention program on GRF during the stance phase of cutting in patients with CAI.

**METHODS**: 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 56±10% FAAM Sports, 3.6±1.1 MAII, 4.7±2.0 ankle sprains) completed a series of 10 ankle and hip strength and proprioceptive exercises (theraband, wobble board, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAII, 5.9±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (α=.05) were used to detect a group x treatment interaction over time. If 95% CI did not cross the zero, significant differences existed.

**RESULTS**: Figure 1. The rehab intervention resulted in up to (i) 0.16 N/kg less vertical GRF at 3-9% of stance, and 0.21 N/kg more vertical GRF at 17-23% and 39-74% of stance, (ii) 0.06 N/kg more posterior GRF at 11-22% and 38-48% of stance, and 0.03 N/kg less posterior GRF at 82-97% of stance, while no changes were detected in medial-lateral GRF.

**CONCLUSION**: Relative to the control group, CAI patients in the rehab group tend to land with greater vertical and posterior GRF, which results in a stiffer landing. While this may lead to a faster execution of the cutting task, greater vertical GRF could result in greater impact loads in the lower extremity, which might increase the risk of ankle injury in a CAI population.
Energetic redistribution from the distal to proximal joints may be linked to sensorimotor deficits at the ankle in patients with chronic ankle instability (CAI). Little is known whether a rehab intervention improves lower extremity energetic patterns during cutting.

**PURPOSE**: To examine the effect of a 6-week ankle and hip intervention program on ankle, knee and hip joint power during cutting in CAI patients.

**METHODS**: 15 CAI subjects in a rehab group (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 56±10% FAAM Sports, 3±6.1 MAII, 4.7±2.0 ankle sprains) completed a series of 10 ankle and hip strength and proprioceptive exercises (theraband, wobble board, ankle disk, etc.) 3 times/week for 6 weeks under supervision. 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAII, 5.9±3.3 sprains). Subjects performed 10 jumps consisting of a max vertical jump plus a side cut. Functional analyses (n=5) were used to detect a group x treatment interaction over time. If 95% CI did not cross the zero, significant differences existed.

**RESULTS**: Figure 1. The rehab intervention resulted in up to (i) 0.8 W/kg less ankle power generation at 89-98% of stance, (ii) 2.9 W/kg more knee power absorption at 19-26% and 41-49% of stance, and (iii) 2.7 W/kg more hip power absorption at 2-5% and 17-26% and 41-49% of stance, and 0.9 W/kg more knee power generation at 64-76% of stance, (ii) 2.9 W/kg more knee power absorption at 89-98% of stance, and (iii) 2.7 W/kg more hip power absorption at 9-14% of stance.

**CONCLUSIONS**: Relative to the control group, CAI patients in the rehab group tend to absorb power using the knee and hip during landing and to generate power using the knee during push-off. Proximal joints play a key role in landing energetics in patients with CAI following the intervention.

---

**Previous research reported that force production of a flexible barbell (FB) to that of a steel Olympic barbell (SB) resulted in the FB generating greater maximum ground reaction force (GRFmax) and human subjects lifting at 1.75 ft/s. No studies have shown that the same trend is true for other lifting speeds (LS).**

**PURPOSE**: The purpose of this study was to compare maximum and minimum ground reaction force production (GRFmax, GRFmin) of the FB and the SB at various physiologically relevant LSs.

**METHODS**: Using a bar-lifting machine, a steel Olympic barbell (SB) and a flexible barbell (FB) were lifted at various speeds between 1.73 ft/s and 4.00 ft/s. The weight of each bar was set to 63.5 kg. The GRFmax and the GRFmin of FB and SB were compared with independent-samples t-tests. RESULTS: The FB had significantly higher GRFmax for all speeds excluding 3.06 ft/s (LS=1.87 ft/s): 4619 +/- 11 N vs. 4669 +/- 19 N, p<.001; LS=2.04 ft/s: 4834 +/- 11 N vs. 4662 +/- 23 N, p<.001; LS=2.21 ft/s: 5202 +/- 29 N vs. 4731 +/- 16 N, p<.001; LS=2.38 ft/s: 5345 +/- 11 N vs. 4911 +/- 28 N, p<.001; LS=2.55 ft/s: 5433 +/- 15 N vs. 5223 +/- 35 N, p<.001; LS=3.40 ft/s: 5701 +/- 19 N vs. 5293 +/- 21 N, p<.001; LS=3.57 ft/s: 5897 +/- 55 N vs. 5430 +/- 43 N, p<.001). The FB also had significantly lower GRFmin for all speeds excluding 3.06 ft/s, 3.40 ft/s and 3.57 ft/s (LS=1.87 ft/s: 4055 +/- 7 N vs. 4131 +/- 10 N, p<.001; LS=2.04 ft/s: 3861 +/- 16 N vs. 4076 +/- 11 N, p<.001; LS=2.21 ft/s: 3520 +/- 17 N vs. 4025 +/- 10 N, p<.001; LS=2.38 ft/s: 3604 +/- 26 N vs. 3932 +/- 21 N, p<.001; LS=3.40 ft/s: 3325 +/- 23 N vs. 3417 +/- 25 N, p<.001). CONCLUSIONS:
Previous research reported that force production of a flexible barbell (FB) to that of a steel Olympic barbell (SB) resulted in the FB generating greater maximum ground reaction forces (GRFmax) for experiments with a lifting machine and human subjects lifting at 1.73 ft/s at an inner position. No studies have shown that the same trend is true for other lifting speeds (LS) at various inner and outer positions of the FB.

**PURPOSE:** The purpose of this study was to compare maximum ground reaction force (GRFmax) of the FB at various physiologically relevant LSs at an inner-most and outer-most position for the loaded weight plates. METHODS: Using a bar-lifting machine, FB were lifted at various speeds of 2.04 ft/s, 2.21 ft/s, and 2.38 ft/s. The weight of each bar was set to 53 lbs and placed at an inner-most (in) and outer-most (out) position on the FB. The GRFmax in FB and in out positions were compared with independent-samples t-tests. RESULTS: The FB had significantly higher GRFmax for all speeds for the out position (see table below). CONCLUSIONS: These results may provide a physiological mechanism to recruit more type IIx muscle fibers compared to the SB under these conditions. Future studies need to be conducted to validate these results with human subjects for different types of lifts.

<table>
<thead>
<tr>
<th>Speed (ft/s)</th>
<th>FB in position</th>
<th>FB out position</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.04</td>
<td>4743±/−15.5</td>
<td>4877±/−25.1</td>
</tr>
<tr>
<td>2.21</td>
<td>4852±/−20.3</td>
<td>5178±/−21.8</td>
</tr>
<tr>
<td>2.38</td>
<td>5001±/−24.2</td>
<td>5397±/−32.0</td>
</tr>
</tbody>
</table>

**Maximal Ground Reaction Forces (N) for In vs. Out Position**

Lower-extremity functional asymmetries (LEFA) of the bodyweight squat have been found to be related to injury risk, post-injury function, and physical performance. Due to movement complexity, several sources may cause LEFA to change throughout the exercise. **PURPOSE:** The goal of this investigation was to examine vertical ground reaction force (GRFv) LEFA and their relationships in multiple phases of the movement. METHODS: Twenty recreationally active adults (9 men, 11 women; age = 21.9±2.6 yrs; height = 171±8.8 cm; mass = 67.2±1.9 kg (mean ± SD)) performed five consecutive bodyweight squats while GRFv were recorded under each foot. Squats were performed in a controlled manner with hands on hips, each repetition separated by a brief pause. LEFA was calculated by subtracting the percent of the average GRFv on the preferred kicking leg (KL) from that of the non-preferred kicking leg (NKL) over the entire movement and within 6 phases: the entire down (eccentric), the entire up (concentric), and first and second half of each. Eleven subjects were reassessed at a later date for repeatability. RESULTS: LEFA in the phases were not significantly different from the 1.4 ± 4.9% NKL-KL LEFA over the entire movement (p = 0.998). Similarly, absolute levels of LEFA in the phases were not significantly different from the 4.5 ± 2.1% LEFA over the entire movement (p = 0.415). Pearson’s correlations of LEFA levels found all phases to be significantly correlated with each other as well as the total movement (r ≥ 0.499). However, when just the 10 most asymmetric subjects were examined (absolute LEFA > 4.5%) significant correlations between concentric and eccentric phases were less common (p ≤ 0.055 in 4 of 9 comparisons). LEFA were found to be highly repeatable (Chronbach’s α ≥ 0.715 except in the second half of the up phase where α = 0.548). CONCLUSION: These results suggest that in healthy subjects with low levels of LEFA the source(s) of any weight-bearing asymmetry may be expressed similarly throughout the movement. However, in those that are more asymmetric different sources may exist between phases or the mode of contraction may cause asymmetries to be expressed differently from a single source. Therefore, when screening for injury risk, it may be necessary to examine more than just the average over the entire squat movement.
at liftoff in the PDL may be significantly different than the CDL. Due to these differences, the PDL may not be an appropriate exercise for improving the CDL. Care should be used when selecting appropriate exercises to improve the CDL.

### 1418 Board #93
**June 1 9:00 AM - 10:30 AM**
**Validity Of Using The Microsoft Kinect™ To Automatically Assess Deep Squat Performance**
Paul D. Smith1, Michael Hanlon2. 1GSK Human Performance Lab, Brentford, United Kingdom. 2Waterford Institute of Technology, Waterford, Ireland. (Sponsor: Glynn Howatson, FACSM)
Email: paul.3.smith@gsk.com

**METHODS:** The Functional Movement Screen (FMS™) identifies limitations in an individual’s movement patterns. The Microsoft Kinect™ sensor is reported to be a feasible markerless system to assess joint angles during a squat and has the potential to be a quantitative tool for the FMS™. **PURPOSE:** To assess the inter and intra-rater reliability of the Microsoft Kinect™ sensor, integrated with bespoke software, for assessing the deep squat FMS™ sub test. **METHODS:** A prototype (V1) was developed to allow the Kinect™ to track flexion of the hip and knee joints, and alignment between ankle and knee joints, to score deep squat performance against FMS™ guidelines. Prototype (V2) was developed to enhance reliability by tracking 20 body joints during deep squat performance. Raw data was captured, based on a deep squat score of three, as per FMS™ guidelines, to generate teaching samples. The samples were fed into a machine learning algorithm to allow the Kinect™ to learn deep squat performance. A data model was then created to identify individual movement errors as outlined by FMS™ guidelines, to calculate a performance score. For prototype (V1), a convenience sample of 141 children (9.7±3.7 years) performed the deep squat three times. For prototype (V2), 43 adults (23.7±7.5 years) completed the deep squat three times and repeated 72 hours later in a test retest protocol. For both validations, the Kinect™ was set four metres from each participant in the frontal plane and at one metre high. In addition, a blinded manual assessment of each performance was completed by a certified FMS™ tester, whilst the bespoke software automatically assessed performance. A Cohen’s Kappa statistic was calculated to determine inter-rater reliability between manual and the prototype (V0) to significantly scoring methods. For prototype (V2), the intra-class correlation coefficient (ICC) was determined to assess intra-rater reliability between test re-test performances. **RESULTS:** Inter-rater reliability between blinded manual assessment and the bespoke software was found to be excellent for prototype (V1) (Kw = 0.89). Intra-rater reliability was found to be high for prototype (V2) (ICC = 0.99). **CONCLUSIONS:** The results indicate the Kinect™ sensor, linked with bespoke software, is a more reliable tool to assess deep squat FMS™ test performance than manual assessment.

---

### 1419 Board #94
**June 1 9:00 AM - 10:30 AM**
**The Effects of Squats and Jump Squats on Mechanical Work and Energy Expenditure**
Shawn N. Munford, Michael L. Rossetti, Gavin L. Moir, Brandon W. Snyder, Shala E. Davis, FACSM. East Stroudsburg, East Stroudsburg, PA. (Sponsor: Shala E. Davis, FACSM)

**METHODS:** 8, resistant-trained males participated in the study. 3D kinematics were during an overhead barbell squat. **RESULTS:** Differences are seen in the activation levels and patterns for the upper and lower GM. LGM compliments the role of ADM during both bilateral and single leg squats. Upper part of GM were strongly correlated with the GMED, suggesting the GM has an abductor function during a single leg squat. The results suggest that segmentation of muscles based on moment arms should be taken into consideration for muscle modeling and in developing more specific therapeutic exercises.

---

### 1420 Board #95
**June 1 9:00 AM - 10:30 AM**
**Electromyographic Analysis Of The Two Parts Of The Gluteus Maximus During Squat Exercises**
Bhupinder Singh, Alex Bachtelle, Derek S. Camilleri, Melissa Lai. California State University, Fresno, CA.
Email: bbsingh@csufresno.edu

**PURPOSE:** Many lower extremity strengthening programs prescribed after injury include the squat as an integral part of rehabilitation. Little attention has been paid, however, in either research or clinical settings, to the impact of the functional differentiation on segmentation of the gluteus maximus (GM) muscle on the prescription of therapeutic exercise. The purpose of this study was to describe the activation of the two parts of the gluteus maximus muscle during a single and double leg squat.

**METHODS:** Ten subjects (7 females, 3 males, mean age 23.6 years) without current neuromuscular or orthopedic ailments participated in the study. Electromyographic (EMG) activity was assessed with surface electrodes, (Model EMG-55, Therapeutics Unlimited). Electrodes were placed on the right side, lateral and inferior to PSIS for upper part of GM and inferior to the greater trochanter for the lower part of GM. EMG electrodes were also placed on the gluteus medius (GMD) and adductor magnus (ADM). Subjects performed 5 trials for each bilateral and single leg squats with a maximum knee flexion angle of 100 degrees. Squat activity was time normalized and EMG amplitudes normalized to %Maximal Voluntary Contraction (MVIC). Paired t-test and Pearson correlations (p-value <0.05) were performed between the levels of muscle activation for two types of squat.

**RESULTS:** Mean activation was greater for the UGM (0.38 ± 0.04) compared to the LGM (0.25 ± 0.01) for the single leg squat (p < 0.01) demonstrating different recruitment. UGM activation was greater than LGM (p < 0.01) during abduction MVIC testing. A stronger correlation was observed between LGM-ADM (0.76) compared to UGM-ADM (0.55) for single leg squat. LGM was highly correlated to ADM during the bilateral squat (0.95). A strong correlation was also observed between UGM-GMED (0.74) during single leg squat.

**CONCLUSIONS:** Differences are seen in the activation levels and patterns for the upper and lower GM. LGM compliments the role of ADM during both bilateral and single leg squats. Upper part of GM were strongly correlated with the GMED, suggesting the GM has an abductor function during a single leg squat. The results suggest that segmentation of muscles based on moment arms should be taken into consideration for muscle modeling and in developing more specific therapeutic exercises.
RESULTS: The maximum knee flexion angle across the 12 repetitions was not different between the band and no band conditions (P = 0.18). However, the average KWI was smaller in the band condition for the concentric phase: 91.2° ± 6.6° for band: 1.0 ± 0.06, P = 0.05) and eccentric phase (band: 97.9 ± 0.6; no band: 1.0 ± 0.05, P = 0.05). Maximum KWI was also smaller for the band condition for the concentric phase: 1.0 ± 0.06; no band: 1.04 ± 0.06, P = 0.05). The EMG activity was significantly lower for the band condition for the concentric phase (1.13 ± 0.05, P = 0.02) and eccentric phase (1.09 ± 0.05, P = 0.004). The average normalized EMG amplitude was calculated.

DISCUSSION: The results suggest that the use of the band during the overhead barbell squat was significantly smaller with the use of the band. Familiarity may have played a role in this finding as none of the participants had any prior experience with band-assisted work. Because the band provides a high amount of resistance, the use of the band may have actually enhanced medial collapse rather than improve it. Sponsoring Performance Health.

HIIT is just as efficacious as MICT for improving body composition, however HIIT requires ~40% less time commitment. More studies are required to analyse regional-specific changes in body fat, especially central adiposity and visceral fat.

### MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**Board #102**

**June 1 9:00 AM - 10:30 AM**

**Impact of Acute Dietary Manipulations on Dual-Energy X-ray Absorptiometry Estimates of Visceral Adipose Tissue**

Jeffrey S. Forssell, Grant M. Tinsley, Flor E. Morales, Marroquin, Peter W. Grandjean, FACSM, Baylor University, Waco, TX, 'Texas Tech University, Lubbock, TX. (Sponsor: Peter Grandjean, FACSM)

Email: jeff_forssell@baylor.edu

(No relationships reported)

**Purpose**

Dual-energy x-ray absorptiometry (DXA) is viewed as a superior method of body composition assessment, but whole-body DXA scans are impacted by variation in pre-assessment activities, such as eating and drinking. DXA software now allows for estimation of visceral adipose tissue (VAT), which has been implicated in a number of diseases. It is unknown to what extent food and fluid intake affect VAT estimates. In the present analysis, the effects of acute high-carbohydrate (HC) and very low-carbohydrate (VLC) diets on DXA estimates of VAT were examined.

**Methods**

Male and female adults completed two one-day dietary conditions in random order: a VLC diet (1 - 1.5 g CHO/kg) and a HC diet (9 g CHO/kg). The diets were isocaloric to each other, and all food items were provided to participants. DXA scans were conducted in the morning after an overnight fast and in the afternoon soon after the third standardized meal. VAT volume, mass, and area were obtained, and paired samples t-tests were performed to compare the changes in VAT measures between diets.

**Results**

 Fifteen males (age 22 ± 3.8, BMI 21 ± 5 %) and eighteen females (age 21 ± 2, BMI 31 ± 5 %) were included in the analysis. The change in VAT volume between the fastest and fed visits was different between diets (HC: +1.6%; VLC: -9.2%, p < .047). There were also trends for differences in VAT mass (p = .089) and area (p = .096) changes between diets.

**Conclusions**

Within a single day, VAT estimates are differentially affected by isocaloric HC and VLC diets, with VLC consumption leading to reductions in VAT estimates. The content of the diet on the day of a DXA scan can affect estimates of VAT, which could spuriously influence the categorization of an individual’s health risk by DXA VAT estimates. Standardization of food intake prior to scans, preferably in the form of an overnight fast, should be employed to eliminate this important source of error.

**Utility of Skinfold Measures and Lifestyle Questionnaires in Prenatal Care**

Kidan Kidane, AnnaMagee Morris, Katherine H. Ingram, Kennesaw State University, Kennesaw, GA.

Email: kingham@kennesaw.edu

(No relationships reported)

Physical activity is an important component of weight management, but the optimal exercise characteristics for body fat loss and weight reduction are not clear. High-intensity interval training (HIIT) is becoming increasingly popular as an alternative to moderate-intensity continuous training (MICT), with robust evidence for its efficacy to improve maximal aerobic fitness and vascular function in healthy and clinical populations. However, there are no systematic reviews exploring the relative merits of HIIT and MICT on body composition outcomes. PURPOSE: To conduct a systematic review and meta-analysis comparing the effects of HIIT and MICT protocols on body composition outcomes in overweight or obese, healthy adults. METHODS: Data was systematically sourced from controlled trials (randomised or matched) found on electronic search engines (MEDLINE, Scopus, Embase, SportDiscus, Web of Science, CINAHL and PEDro) up to September 2016. Trials directly compared HIIT and MICT interventions. RESULTS: Adjusting for age and race, HOMA-IR correlated with sedentary Y/N from surveys (r = 0.034, p=0.05) or sedentary time (r = 0.147, p=0.034) and fat mass (kg), and waist circumference. There was no significant difference in effectiveness of HIIT and MICT on any of these outcome measures, with no significant heterogeneity in any of the 32 analyses conducted. CONCLUSION: Exercise training involving either HIIT or MICT can induce mild improvements in body composition. HIIT is just as efficacious as MICT for improving body composition, however HIIT requires ~40% less time commitment. More studies are required to analyse regional-specific changes in body fat, especially central adiposity and visceral fat.
C-37 Free Communication/Poster - Bone, Bone Mineral Density, and Microarchitecture

Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

1430 Board #105 June 1 8:00 AM - 9:30 AM
Local Adaptations of Osteocyte Proteins to Increased and Decreased Mechanical Forces Correlate with Osteoblast Levels
Corinne E. Metzger, Michael J.M. Junior, Jessica E. Brezicha, Harry A. Hogan, Susan A. Bloomfield, FACSM. TEVA'S A&M UNIVERSITY, College Station, TX. (Sponsor: Susan A. Bloomfield, FACSM)
Email: cmetzger@hin.tamu.edu
(No relationships reported)

Osteocytes, cells embedded in the mineralized matrix of bone, are believed to be the primary mechanosensors of bone tissue. They signal to both osteoblasts (bone forming cells) and osteoclasts (bone resorbing cells) by releasing certain proteins. Sclerostin, interleukin-6 (IL-6), and insulin-like growth factor-1 (IGF-1) are three such proteins that signal to osteoblasts to increase (via IGF-I and IL-6) or decrease (via sclerostin) osteoblast activity. PURPOSE: To determine if the osteocyte protein response to mechanical unloading is restricted to the unloaded bone or is a systemic signal. Using a hindlimb unloading (HU) rodent model, we hypothesized the unloaded hindlimb would have altered prevalence of osteocyte proteins while the weight-bearing forelimb would have no differences. METHODS: Male Sprague Dawley rats (6-mo old) were subjected to HU (n=7) for 28 days. Age-matched controls (CON; n=7) had normal weight bearing activity on all four limbs for 28 days. The unloaded distal femur (DF) and the weight-bearing proximal humerus (PH) were compared in HU vs CON. RESULTS: Immunohistochimical staining of the cancellous region to quantify positive osteocytes revealed 19% higher %sclerostin+ osteocytes in the DF in HU, but 30% lower %sclerostin+ at the PH. Both %IGF-I+ and %IL-6+ osteocytes were lower at the PH compared to the DF (29% and 28%, respectively), but higher at the PH by 94% and 48%. Staining for osteoter, a marker of osteoblasts, showed 60% lower %osteoter+ cancellous bone surface in HU; however, the PH had 48% more %osteoter+ surface in HU. All comparisons were statistically significant at p<0.05. CONCLUSION: After 28 days of HU, the unloaded DF had higher sclerostin osteocyte prevalence and lower IL-6 and IGF-I osteocyte prevalence as well as lower osteoblast surface as expected with unloading. Our results indicate that the osteocytes in the PH are signaling osteoblasts to increase formation, which is an unexpected finding based on the conventional notion that the forelimbs of HU animals are normally loaded and not overloaded. The opposite response of osteocyte proteins and osteoblast surface in bones within the same animal that experiencing both unloading and loading indicates a precise, localized mechanism by which osteocytes sense mechanical strain and signal to local cells to adapt to those changes.

1432 Board #107 June 1 8:00 AM - 9:30 AM
Associations Between Vitamin D and Tibial Density and Trabecular Microarchitecture in Army Infantry Recruits
1HQ Army, UK Ministry of Defence, Andover, United Kingdom. 2HQ Army Recruiting and Training Division, UK Ministry of Defence, Upavon, United Kingdom. 3University of East Anglia, Norwich, United Kingdom. 4University of Central Lancashire, Preston, United Kingdom. 5University of Central Lancashire, Preston, United Kingdom. 6Banger University, Bangor, United Kingdom. 7Banger University, Bangor, United Kingdom.
Email: armymanning-wgclev-sooprogmgr@gmail.com
(No relationships reported)

Serum 25-hydroxyvitamin D (25(OH)D) concentrations ≥50 nmol/L are associated with optimal bone health. In military recruits, low 25(OH)D concentrations have been associated with increased stress fracture risk during initial training, but little is known about the influence of 25(OH)D on bone mineral density and microarchitecture in military recruits. PURPOSE: To examine the association between 25(OH)D and tibial bone mineral density and microarchitecture in a cohort of army recruits. METHODS: The purpose of this study was to determine the association between 25(OH)D and tibial bone mineral density and microarchitecture in a cohort of army recruits. RESULTS: Serum 25(OH)D at baseline was 27.9±4.8ng/ml. CTX was increased by 7.0±3.5% and %IGF-I+ was 1.4% higher (p<0.05). CONCLUSION: There was a significant positive association between 25(OH)D and %IGF-I+ osteocytes at baseline (r=0.49, p<0.05).
of the effect of vitamin D status on bone density and microarchitecture in young healthy men. PURPOSE: To investigate the relationship between total serum 25(OH)D and bone density, cortical and trabecular (TB) microarchitecture of the distal tibia using high-resolution peripheral quantitative computed tomography (HR-pQCT) in young male British Army recruits. METHODS: 324 healthy British Army infantry recruits (age, 22 ± 3 years; height, 1.77 ± 0.06 m; body mass, 75.5 ± 10.2 kg) provided informed consent. In week one of training, scans were performed at the distal tibia of the non-dominating leg using HR-pQCT (Extrem CT, Scanco Medical, Switzerland), and a blood sample was drawn for measurement of total serum 25(OH)D and intact parathyroid hormone (iPTH). Participants were enrolled onto the study across all seasons. Participants were stratified into two groups based on their total serum 25(OH)D concentrations: Sufficient (≥50 nmol/L) and Deficient (<50 nmol/L), and were also assessed with total serum 25(OH)D as a continuous variable. RESULTS: 39.5% of participants were Deficient (n = 128) and 60.5% as Sufficient (n = 196). There were no significant differences between groups in bone density, structure or TB microarchitectural parameters (P>0.05). Cortical area (151 ± 28 vs 145 ± 26 mm², P = 0.057, ES = 0.22) and endocortical Tb density (301 ± 34 vs 294 ± 29 mg HA/ mm², P = 0.058, ES = 0.22) tended to be higher in the Sufficient than the Deficient group. Serum 25(OH)D was negatively associated with iPTH (r = 0.271; P<0.0001), and positively associated with cortical area (r = 0.183; P<0.001), cortical thickness (r = 0.147; P<0.0001), Tb density (r = 0.127; P<0.05), and Tb volume to tissue volume ratio (r = 0.128; P<0.05). CONCLUSION: Total serum 25(OH)D >50 nmol/L was not associated with impaired bone density or TB microarchitecture of the distal tibia in young healthy men. These findings suggest that vitamin D status is not a key factor influencing bone strength. The role of vitamin D in stress fracture risk warrants further investigation.

Supported by UK MoD (Army)

The bone-specific physical activity questionnaire (BPAQ) was developed to account for the lifetime influence of habitual mechanical loading on the skeleton. We have previously shown that BPAQ scores predict DXA-derived bone mass at clinically important sites and exhibit high inter- and intra-rater reliability. Recently, software was developed to determine three dimensional (3D) parameters of the proximal femur from standard DXA scans, from which the influence of physical activity on bone geometry can be examined. PURPOSE: The aim of the current study was to determine the relationship of lifetime bone-relevant physical activity to morphometric parameters of the proximal femur from novel 3D analysis of standard DXA scans. METHODS: Healthy men and women from the local community underwent proximal femur DEXA scans (Medix DR, Medilink) and completed the BPAQ. Scans were analysed from DXA-derived 3D Analysis (No relationships reported)

Table 1. Group comparisons of mean bilateral skeletal characteristics (means(SE)

<table>
<thead>
<tr>
<th>Routers (n=24)</th>
<th>Controls (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Cross-sectional moment of inertia (mm³)</td>
<td>13256±495.6*</td>
</tr>
<tr>
<td>35% Tibia Strength-Strain Index (mm²)</td>
<td>1887±61.9*</td>
</tr>
<tr>
<td>38% Cortical Density (mg/cm²)</td>
<td>1153±9.4</td>
</tr>
<tr>
<td>66% Tibia Strength-Strain Index (mm²)</td>
<td>2852±109.4*</td>
</tr>
<tr>
<td>4% Radial Periosteal Circumference (mm)</td>
<td>63.7±0.9*</td>
</tr>
<tr>
<td>66% Radial muscle CSA (mm²)</td>
<td>3557±0106.3*</td>
</tr>
</tbody>
</table>

*p < 0.05 and ”p < 0.01 significant differences between groups.

Soccer practice usually has high intensity movements involving sprints and change of direction; these implicate great strength over the bone structure having influence in the bone mineral since they facilitate bone stimulation, getting the appropriate parameters. Several studies show soccer practice or training, amateur as well as professional, lead to effective adaptations in the bone mass, as well as increases in bone mineral content (BMC) and bone mineral density (BMD). PURPOSE: The evaluation of changes in BMC and BMD during 4-month period, competition training of university, female, soccer players.

METHODS: Body measurements were made at the beginning and at the end of 4-month training to 19 soccer players (20.87 ± 1.88 years old), through DEXA where BMC and BMD of arm, leg, trunk and total body were obtained. They were evaluated fasting at the morning, where every subject used a minimum of clothes for measurement. They also received informed consent explaining the test protocol, after that their height was measured. For the statistical analysis, the software SPSS version 21.0 was used. The Pearson product-moment correlation coefficient method was used. RESULTS: Meaningful increases were found from the initial take to the final take of BMC of arms and legs (p<0.01), and meaningful decrease on trunk and total body (p<0.01). Regarding BMD, significant increases were seen in legs and trunk (p<0.01), however in total body obtained a significant decrease (p<0.01) and not significant in arms (p=0.252), all of this during a 4-month study.

CONCLUSION: Significant changes of lower limbs BMC and BMD are associated to the impact of kicking the ball, the sprints and the jumps that exist in soccer practice.
years were included in this study. Three handed sixty one healthy subjects including 129 males and 232 females were living in Qinghai-Tibet Plateau (HTP) 2260m above sea level and 438 participants including 323 males and 115 females, were from Sendai of Japan (SJ) 46m above sea level. We divided all subjects into 5 groups according to their age (20-29, 30-39, 40-49, 50-59, 60-69). BC and BMD were tested by InBody720. The differences between HA and SL are analysed by independent T test. The statistical difference level was defined as p < 0.05. All data were expressed as mean ± SD.

**RESULTS:** In the 50-59 age group HA residents showed higher BMD than SL folks (50-59: HA 102.5 ± 9.29g/cm², p < 0.05). HA residents, aged from 20-29 and 60-69, had significantly greater BMD compared to SL female residents. (20-29: HA 110.9 ± 13.15g/cm² > SL 101.2 ± 14.12 g/cm², p < 0.01) (60-69: HA 112.5 ± 24.11g/cm² > SL 101.3 ± 13.37 g/cm², p < 0.01). Body fat percentage (BFP) of the HA residents was significantly higher than that of the SL residents regardless of gender (Males: HA 25.6 ± 6.65% > SL 22.2 ± 7.01%, p < 0.01) (Females: HA 32.3 ± 8.56% > SL 28.7 ± 6.77%, p < 0.01).

There was significantly different in BFP of males aged 30-39 and 50-59 age groups, who lives in HA demonstrated higher BFP than SL (30-39: HA 22.2 ± 4.68% > SL 20.9 ± 7.00%, p < 0.01) (50-59: HA 27.2 ± 5.81% > SL 24.2 ± 5.76%, p < 0.05).

**CONCLUSIONS:** Inhabitants living in high altitude demonstrated higher bone density compared to the residents on sea level in the same age. Thus, living in plateau area might reduce the risk of diseases caused by insufficient bone density.

__1437__ Board #112
June 1 8:00 AM - 9:30 AM
**Bone Quality in Weight and Non-Weight Bearing Sports in Male Collegiate Athletes**
Devin Freda, Tess Skoe, Colton Cave, Mitch Wehrli, Kristian Heumann. Colorado Mesa University, Grand Junction, CO.
Email: devinfreda@gmail.com

(Bone quality has been correlated with lifetime physical activity. The accrual and maintenance of bone has been shown to be related to the type of sport, length of participation, weight bearing (WB) or non-weight bearing (NWB) activity, and the multidirectional forces applied. PURPOSE: To determine if there are differences between WB and NWB bearing sports on bone quality in male collegiate athletes. METHODS: Ten male collegiate athletes (20.8 ±1.2 yrs), with no history of musculoskeletal injuries within the last 12 months, were selected from each NCAA Division II men’s soccer, football, cross country, swimming, and USA cycling Division I teams (n=50). For analyses, men’s soccer, football, and cross country were considered WB, and swimming and USA cycling were considered NWB. A bone specific physical activity questionnaire (BPAQ) and a general demographic health questionnaire were collected for each athlete to determine eligibility for the study, as well as their history of physical activity and general demographic information that was relative to bone health. Using the Achilles InSight Ultrasonometer, broadband ultrasound attenuation (BUA), speed of sound (SOS), and stiffness index (SI) were measured by InBody720. The differences between WB and NWB activities (p<0.001). SI scores were found to have a significant difference between sports type and WB vs. NWB activities (p<0.001). CONCLUSION: Weight bearing vs. NWB activities have significant effects on bone health in male collegiate athletes.

__1438__ June 1 8:00 AM - 9:30 AM
**Bone Mineral Density - Is It Lower In Synchonized Swimmers Compared To Competitive Swimmers?**
Email: naamacon@gmail.com

(In female athletes bone mineral density (BMD) is typically 5-15% higher than in the non-athletic population, depending on the type and amount of impact on the bones. Other environmental factors that can affect female athletes’ BMD include nutritional habits, energy availability, calcium intake and menstrual cycle patterns. Synchronized swimming (SS) is a unique sport characterized, among other things, by many hours of non-weight bearing exercise and a requirement for leanness. PURPOSE: To compare BMD in SS with a sport that is similar in terms of mechanical stress on the bones, but does not require extreme leanness such as competitive swimming (CS). We hypothesized that SS will have lower BMD compared to CS. METHODS: 14 women ages 20-40 with a history of at least 5 years of intensive swimming in SS during puberty were compared to 14 women of the same age, who were CS. Participants completed questionnaires about their medical, sports, gynecological & dietary history, and were tested for BMD (lumbar spine, left hip & total body) in a DEXA machine. BMD T-score and Z-score were compared between groups and correlated to the data obtained by the questionnaires. RESULTS: The prevalence of osteopenia of the lumbar spine was high in both groups (43% of SS & 50% of CS). SS had higher left hip BMD than CS (0.8525 vs. 0.7485 g/cm², p = 0.012). SS were significantly leaner at puberty than CS (BMI 18.7 ± 1.3 and 21.5 ± 2.1 kg/m², respectively, p < 0.0001), but both groups had sufficient calcium intake (>1100 g/day) and only one subject in each group had disordered eating. There were no significant differences in age of menarche (SS 13.6 ± 2.1 years vs CS 13 ± 1.9 years). Conclusions: In refutation of our primary hypothesis, SS were not at increased risk for osteoporosis compared to CS, and their hip BMD was even larger than CS. These findings might be attributed to longer out of water practice time that might offset the negative effects low body weight in SS. While encouraging girls and adolescent females to be physically active, precautions should be taken to avoid osteopenia in non-weight bearing disciplines such as SS & CS.)
is known about serum sclerostin concentrations and its relationship with BMD in Chinese young adults. PURPOSE: 1) To compare sex differences in serum sclerostin in Chinese young adults; 2) To investigate associations between serum sclerostin and bone characteristics (areal BMD (aBMD), volumetric BMD (vBMD), bone strength). METHODS: Fifty-three Chinese men (n=28) and women (n=25) aged 18 to 35 yrs, who had been living in the US ≤5 years, participated in this study. Body composition and aBMD of the total body, lumbar spine and hips were measured by DXA. vBMD and bone strength of non-dominant tibia at 4%, 38% and 66% sites were measured by peripheral Quantitative Computed Tomography (pQCT). Serum levels of sclerostin were measured by ELISA. RESULTS: Serum sclerostin was significantly higher in males compared to females (p<0.003). However, no significant differences were found after adjusting for total body bone mass. There were significant positive associations (r = 0.39 to 0.54, p<0.01) between serum sclerostin and total body bone mass, BMD at total body, lumbar spine and hips, bone strength at 4% of tibia. After adjusting for total body bone mass, serum sclerostin levels remained significantly correlated with BMD at all sites and bone strength at 4% of tibia. CONCLUSION: Serum sclerostin levels were positively correlated with BMD and bone strength in Chinese young adults after controlling for total body bone mass, which is consistent with previous population based studies in US Caucasian and Chinese postmenopausal women.

### Table 1. Bone Mineral Density and Sclerosis Levels in Chinese Young Adults (Mean ± SE)

<table>
<thead>
<tr>
<th></th>
<th>Men (n=28)</th>
<th>Women (n=25)</th>
<th>Total (n=53)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total BMD (g/cm²)</td>
<td>1.249 ± 0.017**</td>
<td>1.134 ± 0.023</td>
<td>1.195 ± 0.016</td>
</tr>
<tr>
<td>Lumbar Spine BMD (g/cm²)</td>
<td>1.218 ± 0.084</td>
<td>1.183 ± 0.146</td>
<td>1.202 ± 0.016</td>
</tr>
<tr>
<td>Left Proximal Femur BMD (g/cm²)</td>
<td>1.119 ± 0.133**</td>
<td>0.979 ± 0.183</td>
<td>1.053 ± 0.024</td>
</tr>
<tr>
<td>Bone Strength Index at 4% Tibia (mm²)</td>
<td>143.7 ± 4.9**</td>
<td>88.0 ± 7.3</td>
<td>117.4 ± 5.8</td>
</tr>
<tr>
<td>Sclerostin (ng/mL)</td>
<td>0.442 ± 0.021**</td>
<td>0.353 ± 0.019</td>
<td>0.400 ± 0.015</td>
</tr>
</tbody>
</table>

** p < 0.01 and *** p < 0.001 significant differences between men and women, respectively.

### 1441 Board #116
**Abstract Withdrawn**

### 1442 Board #117
**June 1 8:00 AM - 9:30 AM**
**Physical Activity During Youth is Associated with Adult Bone Microarchitecture**

**Victoria Turkington, Kristin L. Popp, Matthew Scott, Adriana Martinez-Betancourt, Mary L. Bouxsein. Massachusetts General Hospital, Boston, MA.**

Email: vturkington@mg.harvard.edu

(No relationships reported)

The bone-specific physical activity questionnaire (BPAQ) provides a summary index of skeletal loading (SKL) by combining activity/sport duration with ground reaction forces and loading rate per activity. Whereas BPAQ has been associated with areal BMD, few studies have evaluated the association between BPAQ and bone microarchitecture. Further, despite knowledge that exercise during adolescence may have optimal effects on bone accrual, no studies have examined the association between BPAQ and bone microarchitecture. PURPOSE: We determined the ability of a BPAQ-like SKL index reflecting physical activity during adolescence to predict bone microarchitecture in young adults. METHODS: We conducted a cross-sectional study of young (mean±SD) 24±5 years) Caucasian men (n=50) and women (n=50). Cortical (C) and trabecular (Tb) volumetric bone density (vBMD), microarchitecture, and estimated bone strength (by micro-finite element analysis) were assessed at the distal tibia (4% of tibial length) using high-resolution pQCT (92 µm3 voxel size). Physical activity questionnaires were administered and a SKL index derived based on the effective load stimuli associated with each activity and the duration the subject participated in the activity during ages 11 to 14. We used generalized linear regression to determine associations between SKL score and bone outcomes, adjusting for age in addition to BMI, weight, and their interaction. RESULTS: We found that the SKL score in adolescence was significantly associated with Ct.vBMD and Tb.vBMD in men and women respectively (M: r² = 0.33, p = 0.045; W: r² = 0.33, p = 0.036). In men, Ct.thickness, Ct. area fraction, and ultimate failure load were significantly associated with SKL score (all p<0.05). However among women, failure load was the only other bone outcome associated with SKL score (p=0.037). CONCLUSION: These finding suggest that among Caucasian men, physical activity during adolescence is associated with improved cortical bone architecture later in life. Conversely, among Caucasian women, loading during adolescent years is associated with improved trabecular vBMD. The sex-specific association between physical activity and bone microarchitecture may contribute to the greater incidence of stress fracture in women versus men.

### 1443 Board #118
**June 1 8:00 AM - 9:30 AM**
**Effect Of Low-magnitude Different-frequency Whole-body Vibration On Subchondral Bone Microarchitecture and Osteoarthritis**

**Yan Li1, Pu Wang2, Yushi Hu1, Chengu Sport Institute, ChengDu, China. 1Sichuan University West China Hospital, ChengDu, China.**

Email: 1762108071@qq.com

(No relationships reported)

**PURPOSE:** To investigate the effects of different frequency and low-magnitude whole-body vibration (WBV) on subchondral trabecular bone microarchitecture, cartilage degradation and metabolism of the tibia and femoral condyle bone and joint pain in an anterior cruciate ligament transaction (ACLt)-induced knee osteoarthritis (OA) rabbit model.

**METHODS:** Ninety adult rabbits subjected to unilateral ACLt were divided into six groups: Group 1, ACLt control group; Group 2, WBV (5 Hz) + ACLt; Group 3, WBV (10 Hz) + ACLt; Group 4, WBV (20 Hz) + ACLt; Group 5, WBV (30 Hz) + ACLt; and Group 6, WBV (40 Hz). Pain was tested via weight-bearing asymmetry. Subchondral trabecular bone microarchitecture was examined using in vivo micro-computed tomography. Knee joint cartilage was evaluated by gross morphology, histology, and ECM gene expression level (aggrecan and type II collagen [CTX-II]). Serum bone-specific alkaline phosphatase, N-mid OC, cartilage oligomeric protein, CPII, type I collagen, PINP/G1-G2 aggrecan levels, and urinary CTX-II were analyzed.

**RESULTS:** After 8 weeks of low-magnitude WBV, the lower frequency (10 Hz and 20 Hz) WBV treatment decreased joint pain and cartilage resorption, accelerated cartilage formation, delayed cartilage degradation especially at the 20 Hz regimen. However, the higher frequencies (30 Hz and 40 Hz) had worse effects, with worse limb function and cartilage volume as well as higher histological scores and cartilage resorption. In contrast, both prevented loss of trabecular and increased bone turnover. No significant change was observed in the 5 Hz group.

**CONCLUSIONS:** Our data demonstrate that the lower frequencies (10 Hz and 20 Hz) of low-magnitude WBV increased bone turnover, delayed cartilage degeneration, and caused a significant functional change of the OA-affect ed limb in ACLt-induced OA rabbit model but did not reverse OA progression after 8 weeks of treatment.

**Stress fractures are common overuse injuries experienced by military recruits during initial training. Lower cross sectional area of the tibia in stress fracture cases compared with unjured controls support an important role of bone structure in injury predisposition. With the advent of high resolution techniques, other determinants of bone strength can now be evaluated in the development of stress fracture injury.**

**PURPOSE:** To investigate differences in bone density and trabecular (Tb) microarchitecture at the distal tibia using in vivo high-resolution peripheral quantitative computed tomography (HR-pQCT) between stress fractured and uninjured British Army infantry recruits. **METHODS:** 324 British Army infantry recruits were followed through 26 weeks of infantry training. Twenty-one recruits were diagnosed with a stress fracture injury of the lower limb (22 ± 3 years, 73.3 ± 8.3 kg, 1.78 ± 0.06 m, 593 ± 68 ± 1.5 km run time), and matched to 21 non-injured controls (22 ± 3 years, 74.2 ± 10.0 kg, 1.77 ± 0.06 m, 588 ± 58 ± 1.5 km run time) in the same training platoon. Groups were matched for age, height, body mass and aerobic fitness (1.5 km run time). Scans at the distal tibia of the dominant leg were performed on all volunteers using HR-pQCT (Xtreme CT, Scanco Medical, Switzerland) in week one of training. RESULTS: No significant differences were observed in bone density or Tb microarchitecture between stress fracture cases and uninjured controls (P > 0.05). A subgroup of seven cases suffering stress fractures to the tibia had higher Tb density (245 ± 32 vs 209 ± 28 mg HA/cm3, P = 0.042), higher sub-endocortical Tb density (320 ± 21 vs 282 ± 32 mg HA/cm3, P = 0.047), higher Tb volume to tissue volume ratio (0.284 ± 0.027 vs 0.274 ± 0.023, P = 0.042) than uninjured controls. CONCLUSION: Young healthy men suffering stress fracture in training do not differ in their bone structure or Tb microarchitecture at the distal tibia from uninjured matched counterparts. Our understanding of bone microarchitecture in the development of stress fractures is limited by the utility of high resolution techniques to distal sites. Future studies should explore phenotypic characteristics in stress fracture cases at specific sites of injury, which typically develop at the distal third of the tibia in military recruits. Supported by UK MoD (Army)
CONCLUSION: These results suggest the association between SNPs of rs3018362 in the RANK gene polymorphism and the incidence of stress fracture in Japanese female endurance athletes.

Supported by Grants-in-Aid for Scientific Research (No. 22821999 and 16K13059, M. Iemitsu)
The average volume of sesamoids on the toe joints is 55.49 mm³ with average surface area of 417.41 m². The average volume of outer-side sesamoids is 434.87 mm³, while the inner-side is 386.94 mm³. The average surface area and that of the triquetral sesamoids is 22.2%. The average volume of the outer-side metatarsal is 100% and the interphalangeal joint is 94.4%, which is much higher than those of the other studies. The occurrence rate of the first metatarsal bone is larger than the inner-side ones. The sesamoids occurrence rate of the first metatarsal is 100% and the interphalangeal joint is 94.4%, which is much higher than those of the other studies. The occurrence rate of accessory navicular bone is 16.7% and that of the triquetral sesamoids is 22.2%. The average volume of the outer-side sesamoids is 434.87 mm³, while the inner-side is 386.94 mm³. The average surface area of the outer-side sesamoids is 298.829 mm², while the inner-side ones is 274.15 mm². The average volume of sesamoids on the toe joints is 55.49 mm³ with average surface area of 74.24 mm². The average volume of triquetral bones is 703.01 mm³ with average surface area of 417.41 mm² in all accessory bones. The triquetral bone in the right foot is biggest with volume 941.21 mm³, while the interphalangeal bone is smallest with 45.98 mm³. CONCLUSIONS: CT and 3D reconstruction may be effective for investigating the small bones. The sesamoids and accessory bones in feet of wrestlers could be common than no sportmen, which is related to the acquired influence of Professional training.

#### RESULTS

After 60 minutes of Bikram hot yoga, the average estimated sweat loss was 1.6 (±0.6) L eliciting a -1.5% to -3.8% (M = -2.3 ± 0.92%) decrease in participants' body weight. Mean Ca²⁺ in sweat was 3.78 ± 1.8 mg/dl and the mean total calcium was 63.1 ± 32.8 mg. PTH did not increase from pre (17.0 ± 1.7) pg/ml to post (16.7 ± 1.6) pg/ml yoga session, t(4) = 0.47, p = 0.67, 95% CI [-1.0 - 1.0], and Wilcoxon test for nonparametric data indicated that serum Ca²⁺ increased from pre- (mdn = 10.7 mg/dl) to post- (mdn = 11.5 mg/dl) yoga session, z = -2.0, p = .04. CONCLUSION: A disruption in calcium homeostasis was not observed in a bout of excessive sweating during a 90 min Bikram hot yoga session. Sweat loss did not trigger an increase in PTH. This data suggests that the isolated effect of cutaneous calcium loss during low to moderate intensity exercise does not stimulate markers of bone resorption. Thus, high-intensity, non-loading exercise must play a role in remodeling.

#### CONCLUSIONS

The purpose of this investigation was to determine the degree to which the confirmation of an eating disorder (ED), body mass index (BMI), percent body fat (PBF), and episodes of amenorrhea (EA) influence the bone mineral density (BMD) status of Division I-A female athletes. METHODS: Fifty National Collegiate Amateur Athletes (NCAA) females from a variety of intercollegiate sports (volleyball, soccer, track, tennis, golf, cheerleading, and softball) volunteered to participate. The athletes ranged in age from 18 to 35 (M = 20.4; SD = 3.07). All participants completed a demographic questionnaire, the Eating Attitudes Test-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982), and signed an informed consent to participate. Following the written exercises, the subjects succumbed to anthropometric measurements (height, weight, and BMI), PBF determined by Lange calipers at three locations (abdomen, suprailium and tricep), and endured four regional scans (right/left radius and ulna and right/left femoral neck) on a Hologic QDR 4500W (S/N 49865) software version 11.2.5 dual x-ray absorptiometry. Four independent regression analyses were executed to determine the effect of BMI, PBF, EA, and ED scores on each of the four BMD measurements. RESULTS: The BMD of the dominant and non-dominant arm were significantly related to PBF and BMI (p < .05), whilst only BMI was significantly related to the BMD of the dominant and non-dominant femoral neck (p < .05). CONCLUSIONS: Only BMI was found to be a significant predictor of BMD for all four BMD sites. Although, BMI is not a consistent parameter from which body composition can be ascertained in athletes. PBF was a significant predictor for the forearms but not for each femoral neck. PBF was negatively correlated with the BMD at all four sites. Lean mass was not measured in this investigation to contrast the PBF results. It is therefore difficult to determine if PBF was significant due to increased lean mass or if this phenomenon was due to a chronic energy deficit which could compromise PBF. The International Olympic Committee consensus group (De Souza, et al., 2014) called this chronic energy deficit RED-S (relative energy deficit in sport).

Lean mass is a stronger predictor of bone geometry in loaded limbs than fat mass in exercising women; however, estrogen exposure likely modulates the relationship between lean/fat mass and bone. We recently demonstrated that energy and estrogen status interact to impact BMD, bone geometry and estimated bone strength (eBS) of the tibia, but that energy deficiency was often only detrimental in the presence of estrogen deficiency. This suggests that estrogen deficiency increases the vulnerability of bone to metabolic disruptions that accompany energy deficiency. We hypothesized that the impact of lean/fat mass on bone is dependent on estrogen status. PURPOSE: To compare the predictive value of lean mass index (LMI, kg m⁻²) and fat mass index (FMI, kg m⁻²) on vBMD, geometry, and eBS in the tibia in estrogen replete and estrogen deficient women. METHODS: Exercising women (n = 60, 18-30 yrs) were grouped by 1) Estrogen status (E,D,n=27): early/amenorrheic <6 cycles/12 mo, and 2) Estrogen replete (E,R, n=33) eu/oligomenorrheic ≥6 cycles/12 mo. Body and lean mass were measured before and after the yoga session. Serum concentrations of PTH, and Ca²⁺ were measured before and after a 90 min Bikram hot yoga session.

ACSM May 30 – June 3, 2017
Denver, Colorado
composition was assessed via DXA. vBMD, bone geometry, and eBS were assessed at the 4% (distal) and 66% (proximal) tibia via pQCT. Multivariable stepwise regression determined predictors of bone outcomes. RESULTS: LMI was a positive predictor of distal tibia total, trabecular, and cortical vBMD in E,R women only, accounting for 28-36% of the variance (p<0.004). LMI was a positive predictor of distal tibia cortical area in E,R women (R²=0.137, p=0.037). FMI was not predictive of bone outcomes in E,R women but was a positive predictor of cortical area at the distal tibia in E,D women (R²=0.162, p=0.038). At the proximal tibia, FMI and LMI were positive predictors of total vBMD (R²=0.494) and cortical thickness (R²=0.571) in E,D women only (p=0.015). LMI was a positive predictor of total area (R²=0.333) and negative predictor of cortical vBMD (R²=0.141) in E,R women only (p=0.044). FMI and LMI were positive predictors of distal tibia BSI in E,D women (R²=0.435, p=0.029). LMI positively predicted BSI in E,R women but explained less variance (R²=0.152, p=0.027). CONCLUSIONS: In the absence of adequate estrogen exposure, reduced fat or lean mass results in significant detriments to bone health in exercising women. It appears that in the face of reduced fat or lean mass, estrogen may be protective to bone.

Sublesional bone loss occurs rapidly following spinal cord injury (SCI) and contributes to a 20-100 fold greater bone fracture rate. PURPOSE: To determine the time course of bone strength deficits at different femoral test sites in a rodent contusion SCI model. METHODS: Sixty 16-week-old male Sprague-Dawley rats received sham or contusion SCI via T9 or T11 laminectomy plus severe (250 kilodyne) contusion SCI using a computer-guided impactor and were euthanized 1-, 2-, or 3-months post-surgery. Hindlimb locomotion was assessed weekly using the BBB locomotor scale and bone strength was assessed ex vivo at the distal femur, femoral midshaft, and femoral neck. SCI vs SHAM comparisons were made at each time point using independent t-tests. RESULTS: SCI animals exhibited persistent hindlimb locomotor deficits [BBB score < 6 (0-21 scale), p < 0.01 vs SHAMs at all time points], characterized by an inability to support the hindlimbs in stance or to perform hindlimb weight supported stepping. Bone strength deficits were observed at all testing sites after SCI in a somewhat variable pattern. At the distal femur, maximal breaking load (N) was 19% lower at 1-m (p < 0.05), 10% lower at 2-m (p < 0.05), and 16% lower at 3-m (p = 0.01) in SCI vs SHAM animals using a cantilever bending test. In addition, displacement at max load was 29% lower at 1-m (p < 0.05) and 22% lower at 3-m (p < 0.05). At the femoral neck, maximal breaking load was 22% lower at 1-m in SCI vs SHAM (p < 0.05), but was not different at 2-m or 3-m post-surgery. At the femoral midshaft, maximal breaking load was not different at 1-m post-surgery, but was 11% lower at 2-m (p < 0.05), and 23% lower at 3-m (p < 0.05) in SCI vs SHAMs, using a 3-point breaking test. No other differences in displacement or stiffness were observed among groups. CONCLUSION: In our SCI model, femoral skeletal integrity is compromised 1-m post-injury, with strength deficits dependent upon the skeletal site and the tests that were utilized. The distal femur cantilever test yielded less variability and typifies a common site of fracture in humans after SCI, suggesting this test is clinically-relevant. Interventions focused on preventing bone loss after SCI should initiate therapy soon after the injury occurs to ensure maintenance of skeletal integrity. Supported by VA RR&D SP#RE 1I21RX001373-01 to JFY.

Stress fractures are common among military personnel. Notably, prior studies report that White or Caucasian military recruits have 1.5-2 fold greater risk of fracture, than their Black or African American counterparts. Yet, little has been done to characterize race/ethnicity-related differences in bone macrostructure, microstructure and bone mineral density (BMD) among young adults. PURPOSE: We aimed to determine differences in bone mass, structure and strength between young Black or African American, and White or Caucasian adults. METHODS: We enrolled 184 young ([mean±SD] 24.2±3.4 yrs) women (n=51 Black, n=50 White) and men (n=32 Black, n=51 White) in this cross-sectional study. We used dual-energy X-ray absorptiometry (DXA) to determine areal BMD (aBMD) at the femoral neck (FN), total hip (TH) and lumbar spine (LS). High-resolution pQCT (HR-pQCT, 82 µm³ voxel size) was used to assess bone microarchitecture and strength by micro-finite element analysis (FEA) at the distal tibia (4% of tibial length). We used two-way ANOVA to compare bone outcomes, adjust for age, height and weight and detect race by sex interactions. RESULTS: Our ANOVA revealed no race by sex interaction for any bone outcome. In both women and men, after adjusting for covariates, Blacks had significantly greater FN aBMD (9.1%, p<0.01) but no difference in LS aBMD compared to Whites. HR-pQCT revealed greater cortical area (10.3%, p<0.01).
POSSIBLE THERAPEUTIC INTERVENTION OF DIABETIC CARDIOMYOPATHY

The benefit of cardiac rehabilitation (cardiac rehab) after a heart attack has been shown to decrease mortality and increase quality of life. PURPOSE: To determine the changes in treadmill walking time, speed and distance as well as pre- and post-exercising blood pressure (BP) and heart rate (HR) over the first 12 weeks of cardiac rehabilitation at UNM Hospital Phase 2 cardiac rehab program between June and August of 2016 were evaluated. At intake, all patients participated in a modified Bruce protocol which was terminated when the patients reached a rating of perceived exertion (RPE) of 15 on the 6-20 Borg scale. Test results were used to prescribe patients’ respective initial walking speeds for the program. Patients walked at least twice weekly at their designated speed. Walking time and speed were adjusted regularly to keep an RPE of 13. Treadmill walking time, speed, distance, and heart rate (HR) were recorded and analyzed across the 1st, 6th, and 12th sessions through separate applications of the repeated measures ANOVA technique with post-hoc Bonferroni adjustment. The changes between pre- and post-walking bout blood pressure (BP) and HR were analyzed using individual t-tests. Statistical significance was set at p < 0.05. RESULTS: On average, the mean walking time (12.7, 18.6, 22.5 min), speed (2.6, 2.8, 3.1 mph) and distance (6.0, 0.9, 1.1 mi) increased with session number (p < .01). Walking distance was different between the sessions (p < .01). Walking speed differed between the 1st and 6th and between the 6th and 12th sessions (p < .03). The walking duration was different between the 1st and 6th and between the 1st and 12th sessions (p < .01). Heart rate while walking at an RPE of 13 was 104, 99, and 102 bpm for the 1st, 6th, and 12th session, respectively. Post-walking bout systolic BP was lower compared to pre-bout in the 1st and 6th session (p < .03) as was diastolic BP in the 1st session (p < .04).

CONCLUSION: Patients significantly improved their treadmill walking time, speed and distance over the course of 12 Phase 2 cardiac rehab sessions. Clamping a cardiac rehab treadmill walking RPE at 13 may elicit similar improvements for Phase 2 patients resembling those in this study.
Patients in Cardiac Rehabilitation (CR) vary significantly with respect to comorbidities. Depression and/or anxiety (DA) are risk factors for cardiovascular disease (CVD), and also increase risk for secondary events once CVD is established. Whereas CR includes home-based (HB-CR) as well as facility-based (FB-CR) options, little is known about whether DA status influences enrollment in HB-CR vs FB-CR programs.

**Purpose:** We compared patients with DA and without DA (NDA) in respect to HB-CR vs FB-CR enrollment in a Veterans Healthcare System (VHS) center which offered both programs.

**Methods:** In a quality improvement project we evaluated 239 Veterans at baseline before beginning CR. Patients were evaluated for medical and physical risks to determine a recommendation for either FB-CR or HB-CR. Patients who demonstrated moderate or high medical or physical risk were advised to pursue FB-CR; however, patients ultimately made the decision on whether to enroll in CR. A patient deemed moderate or high medical or physical risk would not be allowed to choose HB-CR, but this risk assessment was independent of DA status. At baseline patients completed the 8-item Personal Health Questionnaire Depression Scale (PHQ-8) and the Generalized Anxiety Disorder 7-item scale (GAD-7). A 5-minute Walk Distance (6MWD) and Gait Speed (GS) were also assessed as metrics of physical function.

**Results:** Patients with baseline depression (PHQ-8 ≥10) and/or anxiety (GAD-7 ≥10) (N=56) were more likely to enroll FB-CR (67.9% vs. 48.6%, p=0.028) than NDA (N=183) patients. Conversely, NDA patients were more likely to enroll HB-CR (24.6% vs. 8.9%). Patients with DA also had lower 6MWD (278 ± 100 vs. 314 ± 92.5, p=0.0179) and GS (1.08 ± 0.28 vs. 1.21 ± 0.29, p=0.0068) than NDA. CONCLUSIONS: Veterans with DA are more likely to enroll in HB-CR and have lower baseline values of physical function than Veterans without DA. It is unknown if and how DA patients are better served with HB-CR. Future studies are needed to clarify utility of HB-CR for DA as HB-CR programs continue to proliferate in the VHS and in many cases now supplant FB-CR options.

**Conclusion:** Given the similar magnitude of change in important CAD risk factors and cardiorespiratory fitness, aqua-walking appears to be a feasible alternative exercise modality to over-ground walking and can be recommended for the older adults with CAD and osteoarthritis.

**Background:** Cardiac rehabilitation (CR) has been demonstrated to increase functional capacity in patients with cardiovascular disease (CVD). However, research has found only 14 to 31% of eligible patients participate in facility-based (FB) CR; participation appears to be even lower within the Veteran Administration (VA) with only 8 to 10% of eligible Veterans participating. Home-based (HB) CR may be a viable alternative to expand CR utilization. In a VA quality improvement project, we compared functional gains achieved in FB-CR versus HB-CR for Veterans with CVD.

**Methods:** Veterans with CVD were assessed pre- and post- CR including medical and functional assessment [6 Minute Walk Distance (6MWD), Gait Speed (GS) and Timed Up and Go (TUG)]. Low risk patients were given the option to participate in the FB- or HB-CR program. Moderate and high risk patients participated only in FB-CR. FB-CR entailed standardized exercise training and education; 1 to 3 hospital-based sessions per week over 12 weeks (range of 24-36 sessions). HB-CR entailed an initial onsite exercise education session and then verbal exercise review/reinforcement and education over the phone, one session per week for 12 weeks. After 12 weeks, patients in both groups were reassessed.

**Results:** As shown in the Table, significant improvements in 6MWD, GS, and TUG were evident for both FB- and HB-CR. Similar magnitude of changes were achieved in both CR groups.

<table>
<thead>
<tr>
<th></th>
<th>FB-CR</th>
<th>HB-CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST</td>
<td>PRE</td>
<td>POST</td>
</tr>
<tr>
<td>6MWD</td>
<td>296 ± 73</td>
<td>337 ± 88</td>
</tr>
<tr>
<td>GS</td>
<td>1.19 ± 0.28</td>
<td>1.25 ± 0.29</td>
</tr>
<tr>
<td>TUG</td>
<td>11.4 ± 3.6</td>
<td>10.6 ± 3.6</td>
</tr>
</tbody>
</table>

**Conclusion:** FB- and HB-CR were associated with similar improvements in key functional metrics, suggesting that both programs achieve valuable functional gains in patients that ranged in CVD severity. This extends the promise of HB-CR as a format of CR that not only has the potential to increase participation, especially for the many eligible patients who are curtailed by logistics, but to achieve similar efficacy. Functional recovery after a cardiovascular event is a critical step towards improved quality of life and reduced disability.
Chemotherapy using anthracyclines is among the most effective pharmacological therapy available in the treatment of cancer. However, they are often accompanied by profound adverse complications of cardiovascular system called cardiotoxicity. Some of these side effects can lead to progressive cardiovascular disease. Currently, it is not known if anthracycline chemotherapy is associated with vascular dysfunction and cardiovascular fitness impairment in breast cancer patients.

**PURPOSE:** To investigate the association between anthracycline chemotherapy and cardiovascular functions in breast cancer patients.

**METHODS:** Fifteen breast cancer patients aged 45±3 years were compared with fourteen age-, sex-, and body composition-matched healthy females. The anthracycline chemotherapy treatment consisted of 4 cycles of doxorubicin (60 mg/m²) and cyclophosphamide (600 mg/m²) repeated every 3 weeks. Breast cancer patients had been undergoing second or third cycle of chemotherapy treatments.

**RESULTS:** There were no significant group differences in height, body fat, resting heart rate, systolic and diastolic blood pressure. Maximal oxygen consumption was not different between cancer patients and healthy controls (26.7±1.4 vs. 26.6±0.9 ml/kg/min). Ankle-brachial index was not different but carotid artery intima-media thickness was higher (p=0.05) in cancer patients than in healthy controls (0.50±0.02 vs. 0.45±0.01 mm). Brachial-ankle pulse wave velocity, an index of arterial stiffness, was greater (p=0.05) in cancer patients than in healthy controls (1325±48 vs. 1158±38 cm/sec).

**CONCLUSIONS:** These results suggest that anthracycline chemotherapy is associated with vascular stiffening in breast cancer patients. Prospective intervention studies are needed to confirm the findings from this cross-sectional study.

Supported by Government research budget Chulalongkorn University 2016 and The 100th Anniversary Chulalongkorn University Fund for Doctoral Scholarship.

**Two most popular adjuvant chemotherapy regimens, including cyclophosphamide, doxorubicin, and fluorouracil (CAF) and doxorubicin plus cyclophosphamide followed by taxanes (AC→T), are currently used for treating the early stages breast cancer. However, it has not been clear whether the cardiopulmonary fitness and cardiovascular responses would be perturbed by the administrations of these chemotherapy regimens.**

**PURPOSE:** To investigate the effects of the administrations of CAF and AC→T on cardiopulmonary fitness and cardiovascular responses in patients with early stage breast cancer.

**METHODS:** Twenty-seven patients with early stages of breast cancer (age: 45.0±1.5 yrs; Stage I-II) voluntarily participated in this study, and they were assigned to either CAF (n=12) or AC→T (n=15) group depending on oncological specialists' clinical decisions. Their cardiopulmonary fitness (measured by resting heart rate and six-minute walking test) and cardiovascular response (measured by pulse wave velocity - PWV) were accessed at before and after receiving adjuvant chemotherapy.

**RESULTS:** There were no differences in all measurements between CAF and AC→T groups at baseline. In the completion of adjuvant chemotherapy, the participants in AC→T group showed significantly higher resting heart rate by ~14.9% than CAF group. Although the walking speed, distance, and metabolic equivalent of task (MET) during six-minute walking test were not different between groups, the AC→T group exhibited a remarkably higher relative stress in response to exercise test (measured by the % of maximal heart rate - %MHR; AC→T: 68.8±MHR vs. CAF: 59.4±MHR, p<0.05) in compared with those with CAF treatment. There was no difference in PWV between CAF and AC→T groups at the end of chemotherapy.

**CONCLUSION:** We demonstrated that doxorubicin plus cyclophosphamide followed by taxanes (AC→T) increased resting heart rate and relative stress to the 6-minute walking test at the end of chemotherapy. However, the PWV was not different between two adjuvant chemotherapeutic groups. Our data suggest that, in compared to CAF, AC→T might cause greater adverse effects on cardiopulmonary fitness but not cardiovascular functions in patients with early stage breast cancer.
Sickle cell anemia results in impaired cardiorespiratory function and exercise tolerance likely due to a combination of central and peripheral abnormalities stemming from deranged hemoglobin (Hb). A transgenic mouse model of sickle cell anemia has been developed to help elucidate the mechanisms of vascular and organ damage, but a valid assessment of exercise capacity and the severity of impaired physical function have yet to be determined in this model. Purpose: Therefore, the purpose of this investigation was to measure the speed/duration relationship, known as critical speed (CS), and the anaerobic work capacity (AWC, the finite work capacity available above CS) in healthy wild type mice (WT) and mice expressing human HbSS (BERK).

Methods: Following ethical approval from the institutional animal care and use committee (University of Colorado, Denver), six young-adult female mice (WT, n=3 and BERK, n=3) performed 3-5 constant-speed treadmill tests that resulted in fatigue within the range of 1.5 to 20 min. Time to fatigue vs. treadmill speed were fit to a linear and hyperbolic model.

Results: Speed and time to exhaustion for both groups conformed to a hyperbolic relationship (WT: \( r^2 = 0.98 \pm 0.01 \), BERK: \( r^2 = 0.98 \pm 0.02 \); p>0.05) which corresponded to a linear 1/time function (WT: \( r^2 = 0.97 \pm 0.02 \), BERK: \( r^2 = 0.93 \pm 0.03 \); p<0.05). CS was significantly lower in BERK mice when compared to the WT control (WT: 34.8 ± 1.3, BERK: 23.2 ± 1.5 m/min, p<0.05). Additionally, AWC was reduced in BERK mice relative to WT control (WT: 20.2 ± 2.2, BERK: 11.4 ± 1.7 m/min, p<0.05). Thus, there were significant differences in both CS and AWC between WT and BERK mice with no differences between linear and hyperbolic models (p>0.05 for both). Therefore, the purpose of this study was to fatigue test the CS and AWC in WT and BERK mice to determine the validity of the hyperbolic model.

Conclusions: Exercise tolerance, as measured via CS, was severely reduced in BERK compared to WT control (WT: 34.8 ± 1.3, BERK: 23.2 ± 1.5 m/min, p<0.05) with no differences between linear and hyperbolic models (p>0.05 for both). Additionally, AWC was reduced in BERK mice relative to WT control (WT: 20.2 ± 2.2, BERK: 11.4 ± 1.7 m/min, p<0.05). Thus, there were significant differences in both CS and AWC between WT and BERK mice with no differences between linear and hyperbolic models (p>0.05 for both). Therefore, the purpose of this study was to fatigue test the CS and AWC in WT and BERK mice to determine the validity of the hyperbolic model.

Hemiparetic gait is one of the major characteristics in people post-stroke, contributing to limited functional mobility and excessive energy expenditure (EE) during walking. Previous research reported that aquatic walking decrease EE as compared to overground walking. However, the influence of water depth during aquatic walking on the cardiorespiratory responses, particularly in people post-stroke, is unknown. Purpose: To investigate the influence of different water depths on cardiorespiratory responses during pool walking in people post-stroke. Methods: Nine participants post-stroke (4 males/5 females; age 55.25 ± 13.76 years) completed six minutes of walking at a matched gait speed in four different conditions: chest-depth, waist-depth, thigh-depth-water, and overground. Data collection was completed on four separate visits with at least 48 hours in between. The order of walking conditions was randomized. A moveable floor pool was used to adjust the water depth. EE, oxygen consumption (VO2), and minute ventilation (VE) were measured with a telemetric metabolic system. Results: Repeated measures ANOVA revealed no significant differences in EE (p>0.16), VO2 (p>0.14), and VE (p>0.08). In addition, a systematic trend was found among four walking conditions. A trend of increase in all variables was noted as the water depth decreased from chest-depth to thigh-depth-water. In addition, walking at waist-depth-water (EE=4.45 Kcal/min, VO2=10.79 ml/min/Kg, VE=26.25 l/min) showed similar results in all variables compared to overground walking (EE=4.33 Kcal/min, VO2=10.54 ml/min/Kg, VE=24.67 l/min). Conclusion: Our findings suggest that people post-stroke may benefit from gait training in the chest-depth water as it reduces EE, mostly due to buoyancy. When walking in the waist-depth water, the effects of buoyancy and water resistance appear to counteract with each other, resulting in no difference in EE among people post-stroke.

Individuals with intellectual disabilities (ID) have limited cardiorespiratory capacity, not explained by lack of motivation or lack of understanding the testing procedures. Previous research suggests these limits in cardiorespiratory capacity may be due to autonomic dysfunction in individuals with ID, but this has not been tested.

Purpose: To compare the autonomic response to standing up (a basic clinical autonomic function test) of individuals with ID to a control group without ID.

Methods: Thirteen individuals with ID and 12 individuals without ID were instrumented with an ECG-lead and finger-platymyography for continuous heart rate and blood pressure recordings. After resting supine they moved to a standing position and returned to the supine position, each for 10 min. The last five minutes of every position was used to calculate time-domain and frequency-domain heart rate variability and blood pressure variability measures, common non-invasive indices of autonomic function.

Results: Individuals with ID showed different responses compared to individuals without ID for R-R-interval (RRI), root mean square of successive differences (RMSSD), the proportion of times the change in consecutive intervals exceeds 50 milliseconds (pNN50), power in the high frequency of heart rate variability (RRI HF), spontaneous baroreflex sensitivity (SBRS) and power in the low frequency of blood pressure variability (SAP LF) (p<0.05; Table).

Conclusions: These preliminary results suggest a blunted response to standing up in individuals with ID, but our findings need to be confirmed with a larger sample.
**Purpose:** Arterial hypertension is associated with excess cardiovascular disease mortality and remains a significant global public health problem. Isometric exercise training (IET) has been shown to reduce resting blood pressure (BP) in normotensive, pre-hypertensive and hypertensive populations; however the effects of IET on 24-hour ambulatory blood pressure (ABP) are less clear. Therefore, the aim of this study was to measure clinic and ABP responses to a programme of IET.

**Methods:** In a randomised crossover controlled trial, 24 physically inactive pre-hypertensive males (aged 44.6±7.7 years) completed 4 weeks of home-based isometric wall squat training (4× 2 min contractions 3 times per week). Clinic and ABP were measured pre and post the control and IET period.

**Results:** The isometric exercise training programme produced significant (mean and 95% confidence intervals [CI]) reductions in clinic systolic (12.35 mmHg; 95% CI 10.94-14.23), diastolic (6.24 mmHg; 95% CI 4.01-8.12) and mean (8.01 mmHg; 95% CI 6.04-9.64) BP (all p<0.001). In addition, IET produced significant (mean and 95% CI) reductions in ambulatory systolic (11.83 mmHg; 95% CI 10.26-13.52), diastolic (5.57 mmHg; 95% CI 3.05-6.29) and mean (5.67 mmHg; 95% CI 4.13-7.82) BP (all p<0.001). There were no significant changes during the control period.

**Conclusion:** A short-term programme of home-based IET was associated with clinically significant reductions in BP and ABP. The impact these responses have on long-term cardiovascular events, end organ damage and mortality requires further research.
Conclusions: Functional metrics constituted the most significant differences between patients who attended HB vs. FB, whereas CV risk is the more significant factor for sport-related concussion (SRC). This assessment compares an athlete’s pre-injury performance (i.e., baseline) to their performance post-concussion (PC). Baseline to PC trial 1 (i.e., recommended administration) and PC trial 2. A one-way repeated two trials of the KD at baseline and at the same time point within 7 days following high school athletes with SRC (22 male, 8 female, age: 15.6 ± 1.1 years) completed the KD between a first and a second PC trial for detecting SRC.

PURPOSE: To compare the clinical utility of HB/H vs. FB, whereas CV risk is the more significant factor for sport-related concussion (SRC). This assessment compares an athlete’s pre-injury performance (i.e., baseline) to their performance post-concussion (PC). Baseline to PC trial 1 (i.e., recommended administration) and PC trial 2. A one-way repeated two trials of the KD at baseline and at the same time point within 7 days following high school athletes with SRC (22 male, 8 female, age: 15.6 ± 1.1 years) completed the KD between a first and a second PC trial for detecting SRC.

CONCLUSION: A significant difference was reported (p < 0.01) between baseline (44.27 ± 8.08 secs) and PC trial 1 (55.70 ± 17.79 secs), but there was no significant difference (p = 0.07) between baseline (44.27 ± 8.08 secs) and PC trial 2 (50.47 ± 17.30 secs). There were no significant differences in errors between baseline, PC trial 1, and PC trial 2 (p = 0.57). CONCLUSION: A second trial for the KD assessment of concussion should be utilized during PC administration when making clinical decisions regarding SRC.

The King Devick Test (KD) is a rapid number naming test that is intended to screen for sport-related concussion (SRC). This assessment compares an athlete’s pre-injury performance (i.e., baseline) to their performance post-concussion (PC). Baseline administration guidelines for the KD recommend administering the assessment twice and recording the faster of two error-free trials. However, PC administration guidelines recommend administering the KD only once following a suspected SRC, and if the athlete performs slower than their baseline or makes an error, a SRC should be suspected. It is unclear why PC administration of the KD only includes one trial in contrast to the baseline administration. No study to date has investigated the clinical utility of a second PC trial on the KD. PURPOSE: To compare the clinical utility of the KD between a first and a second PC trial for detecting SRC. METHODS: Thirty high school athletes with SRC (22 male, 8 female, age: 15.6 ± 1.1 years) completed two trials of the KD at baseline and at the same time point within 7 days following SRC. Baseline KD performance (the faster of two error-free trials) were compared to PC trial 1 (i.e., recommended administration) and PC trial 2. A one-way repeated measures ANOVA was performed to compare baseline between both PC trials.

RESULTS: Following the recommended administration guidelines (i.e., comparing baseline to PC trial 1) resulted in 87% (26/30) of athletes being classified as having a possible SRC. However, comparing baseline to PC trial 2 resulted in 53% (16/30) of the sample being classified as having a SRC. The same four athletes that scored better than baseline at PC trial 1 also scored better than baseline at PC trial 2. However, there were an additional ten athletes that scored better than baseline on PC trial 2, despite scoring worse than baseline on PC trial 1. A significant difference was reported (p < 0.01). Further investigation into the utility of this neuroimaging modality for quantifying changes in cognitive workload after injury and over the course of recovery is warranted.

The Use Of Functional Near-Infrared Spectroscopy (fNIRS) For Assessing Cognitive Workload During King-Devick Test After Concussion

Eileen P. Storey1, Hasan Ayaz2, Lei Wang2, Olivia Podolak1, Matthew F. Grady1, Christina L. Mastel1. The Children’s Hospital of Philadelphia, Philadelphia, PA. Drexel University, Philadelphia, PA. (No relationships reported)

Purpose: Functional near-infrared spectroscopy (fNIRS), a noninvasive and portable neuroimaging modality that detects changes in blood oxygenation related to human brain function, is a promising tool to address the current lack of objective biomarkers to identify pathophysiologic changes associated with concussion. We sought to determine the utility of fNIRS to detect and differentiate cortical brain activity between concussed and healthy subjects when they performed the King-Devick test.

Methods: We conducted a prospective case-control study of 19 concussed subjects and 9 healthy controls who completed the King-Devick test while wearing an fNIRS headband that recorded anterior prefrontal cortex oxygenation changes with 12 channels/4 optodes at 4Hz sampling rate. Linear mixed model analysis was performed to compare oxygenation changes in the two cohorts.

Results: There were significant differences across increasing difficulty of the King-Devick test conditions when comparing concussed subjects with healthy controls in both the left prefrontal cortex (F = 9.906, p < 0.005) and right prefrontal cortex (F = 7.965, p = 0.01). Among this pilot cohort, healthy controls showed significantly higher levels of oxygenation changes upon initiation of the King-Devick test compared to concussed subjects, but had decreased oxygenation changes over each successive test card. This pattern was not mirrored in concussed subjects who maintained consistent levels of oxygenation changes in the left prefrontal cortex and increasing levels in the right prefrontal cortex over the course of the test.

Conclusion: Our preliminary experimental results suggest that fNIRS detects changes in cerebral blood oxygenation between concussed and healthy subjects. Further investigation into the utility of this neuroimaging modality for quantifying changes in cognitive workload after injury and over the course of recovery is warranted.
The test-retest reliability of clinical concussion assessment tools has been established over varying time intervals on multiple platforms, but few studies have evaluated the effect of different time intervals on the stability of computerized neurocognitive tests.

**PURPOSE:** To determine the test-retest reliability of a computerized neurocognitive test (CNS Vital Signs) over two different time intervals in Division I athletes.

**METHODS:** Sixty-nine collegiate athletes were administered the CNS Vital Signs twice. The test-retest interval was 4 months in one subcohort (n=38, 19M, 19F) and 12 months in a second subcohort (n=31, 21M, 10F). The reliability (ICC2,1,k) for each cognitive domain’s standard score was analyzed.

**RESULTS:** CNS Vital Signs scores ranged from low to high reliability (0.336-ICC2,1,k <0.971). Using a cutoff of ICC2,1,k >0.70 to indicate high reliability, a greater percentage of domains demonstrated high reliability (46%) in the 12-month interval compared to the 4-month interval (31%).

**CONCLUSION:** As concussion management requires serial testing, high test-retest reliability is necessary. Although ICC2,1,k values were similar between time intervals, a higher number of domains in the 1-year interval met the reliability standards required for clinical care (ICC2,1,k >0.90). Should clinicians choose to complete multiple healthy baselines, a 1-year interval between assessments is recommended.

Supported by the NOCSAE.
Prolonged recovery. While sex differences are strongly supported, discrepancies exist for the effect of concussion hx and a paucity of research exists on the effect of ADHD on SRC.

**METHODS**: To examine the relationship between sex, concussion hx, and the presence of ADHD with recovery from SRC. METHODS: A retrospective chart review of patients (n = 219; 75 females, 144 males; age range: 11-19 yr; mean ± SD; 15±2) presenting with a diagnosed SRC to a concussion clinic from Jan - Dec 2014 was conducted. Recovery was defined as number of days from date of injury to date of return to play progression. RESULTS: ADHD was present in 18.3% (n = 40). A greater proportion of males reported ADHD (males, 82.5%; females, 17.5%; χ² = 0.014). Average recovery time was 20.9±14.3 days. A significant difference in recovery was observed by sex (males, 19.3±14.4 days; females, 23.9±13.8 days; p = 0.035). No significant difference was observed for recovery based on concussion hx (- hx, ∼ 20.9±13.6 days; p = 0.995). Furthermore, no significant difference was observed for recovery based on ADHD status (−ADHD, 21.3±13.3; ADHD, 20.8±14.6 days; p = 0.864). CONCLUSION: These data support an effect of sex on recovery duration, but suggest that concussion hx or ADHD alone do not contribute to prolonged recovery following SRC. Given that patients in this study were managed by medical professionals, it is possible that early intervention and management of the injury in a clinical setting can minimize effects of prior history or ADHD on recovery. Further study is warranted to determine if clinical management may alleviate effects of modifying factors.

**Purpose**: The drop-puck (PD) test has been used to assess clinical reaction time (CRT) and has been proposed as a tool to aid in the diagnosis and management of sports concussion. The simplicity of the test and low cost make it an attractive tool in the management of these injuries; however, it is not known whether the test discriminates between concussed and non-concussed patients. The purpose of this study is to determine the discriminatory utility of the PD test to differentiate acutely concussed pediatric athletes relative to an uninjured cohort.

**Methods**: Patients (ages 8-18) who remained symptomatic on presentation to a sports medicine clinic and diagnosed with a concussion were eligible for study inclusion. Patients with concomitant injuries that precluded completion of the PD test were excluded. Testing was conducted in accordance with protocols established in the literature. Two practice trials were conducted. The distance of stick transversal was recorded as well as the number of drops and failed attempts. Eight successful trials were completed for each hand. Children with hands too small to encompass the puck diameter were accommodated by starting at 10 cm above the puck base.

**Results**: 196 concussed (m=103, f=93) and 463 healthy (m=178, f=285) subjects were included in this study. The average CRT for right/left hands for healthy and injured subjects were 229.7±21.6ms/229.6±21.8ms, and 243.4±29.4ms/242.3±29.8ms, respectively. Injured patients were categorized by age and compared to healthy controls. Although significant associations were not observed between age and CRT among healthy and concussed subjects overall (both hands), no statistical difference was found between control and concussed groups by age.

**Conclusion**: This study demonstrated the association of age on CRT in both concussed and healthy subjects; however, the CRT of injured subjects did not differ from age matched healthy controls for either hand. Thus, CRT measured at the time of clinical presentation did not appear to have a discriminatory effect for diagnostic purposes. Future studies will need to examine the time point of CRT measurement, larger sample size, and longitudinal follow up to evaluate associations with recovery.

**Methods**: Collegiate varsity athletes (n=227) participating from a single NCAA Division I university between 2014 and 2016 (mean age: 19.3±1.0) were enrolled in this study. During standardized baseline testing, participants completed a demographic questionnaire and the Sensory Organization Test (SOT; Natus Inc, Clackamas, OR). Primary outcomes were the SOT composite equilibrium score (COMP) and the three SOT ratio scores (Vestibular, Visual, Somatosensory). Separate multivariable linear regression models were run for each outcome. Concussion history (no/yes), football participation (yes/no), sex (male/female), and age served as predictor variables. Alpha level was adjusted to 0.017 to account for multiple comparisons. RESULTS: Fifty-five (24.2%) athletes reported a concussion history, 44 (19.4%) were football athletes, and 146 (64.3%) were male. In the multimodels the following significant associations were identified: 1) football athletes had lower COMP scores compared to non-football athletes (FB:73.3±8.0 vs. No FB:77.2±7.5; Wald Chi Square=9.1; p<0.017); and 2) football athletes also had statistically, but not clinically higher Somatosensory ratio scores compared to non-football athletes (FB:99.3±3.9 vs. No FB:98.1±1.3; Wald Chi Square=8.3; p<0.004). While not statistically significant, Visual ratio scores (FB:81.8±14.2 vs. No FB: 86.3±10.4; Wald Chi Square=4.9; p<0.026) were lower in football athletes compared to non-football athletes. No other associations were observed with SOT outcomes (p>0.017). CONCLUSION: Football athletes have worse overall balance when compared to non football athletes, as indicated by their COMP SOT scores. Future research should examine if these differences are related to subconcussive impact exposure or other sport-specific factors.

**Purpose**: Adolescents are more vulnerable to concussion consequences due to disturbance of physiologic processes during brain maturation. Reports suggest up to 50% of adolescents do not seek healthcare post-sport-related concussion (SRC). Failure to report results in treatment delays and leads to premature return to activities, potentiating risk for prolonged symptoms or subsequent injury.

**Purpose**: The purpose of this study was to explore influential factors and pivotal decision points among adolescent athletes with concussive symptoms. Adolescents do not seek healthcare post-sport. Failure to seek healthcare post-SRC.

**Methods**: Grounded theory, a qualitative interpretation of participants’ words rather than statistical analysis, was used to examine salient concepts within athletes’ DM process. Twelve adolescent athletes representing several sports were recruited to undergo a baseline interview to document their SRC experience. RESULTS: SRC DM occurred within context of sport culture encouraging to “push through pain.” The central perspective, known as the Dark Cloud, reflects literal and symbolic facets of SRC before and after the point of impact. Participants distinguished between hurt or injured, influencing symptom reporting. Athletes made sense of symptoms through crucial conversations with a trusted person to weigh options to continue playing. Participants who continued play with symptoms described prolonged cognitive and physical impairment, depression and anxiety. Individual, social, community, and policy factors influenced adolescent athletes’ SRC DM. CONCLUSIONS: Symptom reporting and connection with healthcare providers were influenced by the dark cloud of concussion. The Dark Cloud reflected factors before and after the point of impact. These factors ranged from blackouts, a dark room to avoid light and sensory stimulation, isolation from social support and physical activities, clouded judgment, foggy thoughts, dark mood and being in the dark about SRC symptoms. Athletes distinguished between the concept of injured versus hurt, with injury interfering with an athlete’s ability to participate in athletics whereas hurt is okay to continue play while hurt. The distinction between hurt and injured was crucial to understanding an athlete’s perception about continued participation after forceful impact(s).
Prognostic indicators of outcomes following sport-related concussion (SRC) managed in the primary care setting are understudied. PURPOSE: This study examines the relationship between acute post-concussion measures and one-month parent reported health-related quality of life in pediatric concussion patients.

METHODS: This was a prospective cohort presenting to 3 clinics of a single practice group from December 2014-September 2016. Included were patients 8-18 years, presenting within 3 days of a SRC, who consented to participate, and whose parents completed a one-month follow-up. Participants completed a standardized initial visit, including a clinical exam, a symptom checklist, the Immediate Post-Concussion and Cognitive Test (ImpACT™), and a near point convergence screening. Parents completed a one-month follow-up about their child [PedoQL™ (Quality of Life Inventory (QOL)) and the PedoQL™ Multidimensional Fatigue Scale (MDF)]. We assessed univariate relationships between demographics, initial presentation measures, and one-month follow-up QOL and MDF. Variables significant in univariable analyses (p<0.05) were included in multivariable regression models. RESULTS: A total of 180 patients met initial inclusion and completed the one-month follow-up [% follow-up = 75% (180/240 eligible at initial visit)]: 100 (55.9%) were male, 136 (88.9%) Caucasian, and 28 (15.6%) were injured in football. Median age was 15 years (IQR: 13.0, 16.0). In the QOL model, a 10 point estimated increase in symptom severity score (Beta=-1.825; 95% CI: -.335, -.314) and no previous head injury (Mean Difference: -5.751; 95% CI: -11.089, -0.412) were associated with worse one-month QOL. A 0.06 point increase in initial visit ImpACT™ Reaction Time (Beta=-.012; 95% CI: -0.107, 0.103) was associated with worse one-month MDF in the MDF model. CONCLUSION: Clinicians should be mindful of acute symptom burden and those with no history of concussion when considering potential for worse one-month post-injury QOL outcomes. Those with initial longer reaction times may be more likely to experience fatigue over the first month following concussion. Clinicians may need to consider early intervention in patients with these characteristics.

Funded in part by the National Operating Committee on Standards for Athletic Equipment.
Purpose: Rugby-7s is a popular global collision sport known to have a high injury incidence. There is a lack of data on the youths involved in the newly formed Olympic sport in the United States (USA). Rugby-7s growth in the USA has occurred mainly in the amateur population. Understanding the causes of injury and the injury profile will help develop prevention programs and promote safer growth of youth Rugby-7s. METHODS: A prospective epidemiologic study of 3, 804 Under-19 USA Rugby-7s players (13-19 years of age; injured male 256; and female 61) in the USA Rugby sanctioned tournaments (2010-2014). Incidence (per 1000 player-hour (ph)), severity (days absence) and biomechanism of injuries were captured via the Rugby Injury Survey & Evaluation (RISE) Report methodology. RESULTS: Overall injuries (medical attention and time-loss) among the U19 population were found at 81.9/1000ph (n=172), with time-loss injuries at 33.3/1000ph (n=70; 95% CI: 25.9-42.1) and medical attention injuries at 48.6/1000ph (n=102; 95% CI: 39.6-58.9) (P<0.013). Males experienced higher rates of injuries (backs 81.8/1000ph, n=77; forwards 56.7/1000ph, n=40; RR: 1.16, P=0.053) than females (backs 65.6/1000ph, n=17; forwards 77.1/1000ph, n=15; RR: 0.93, P=0.642) (RR: 0.96, P=0.332). Time-loss injuries resulted in a mean severity of 35.4 days (females 29.6 days; males 37.6 days; P=0.494). Most injuries were acute (93%; RR: 2.3, P<0.001) and in the tackle (80.3%; RR: 1.6, P<0.001). Injuries mostly concerned the joints or ligaments (40%) and the lower extremities (39%). High incidences of head and neck injuries including concussions (overall 26%) and upper extremity injuries (29%) were seen among the USA youth population. CONCLUSIONS: USA youths playing Rugby-7s tournaments had lower rates of injury (33.3/1000ph) than USA amateur adult Rugby-7s (49.2-55.4/1000ph) and international adolescent boys’ Rugby-15s (35.5-72.1/1000ph). The majority of matches in rugby occurred during the tackle (80.3%), and rates of head, neck and upper extremity injuries were elevated, which emphasizes the need for proper safe tackling techniques in USA youth. This study establishes the need for continued epidemiological research to document age-based injury rates and patterns that will help develop evidence-based injury prevention initiatives.
and medication status and household size as the independent variables. RESULTS: Although ANOVA results indicated no main effect for either household size ($F_{2,387} = 2.102$, $p = 0.124$) or medication status ($F_{1,387} = 2.287$, $p = 0.131$), a means cross-over interaction for household size and medication status was observed ($F_{2,387} = 3.563$, $p = 0.029$) and is displayed in Figure 1. CONCLUSIONS: For those individuals on three or fewer medications, the risk associated with falling was similar across household size with those living by themselves and with a partner being slightly more likely to have a history of fall than those living in households with three or more people. However, for four or more medications, those living with a partner were observed to be less likely to have a history of falling in the past year than those living by themselves. Additionally, those who reported living in households with three or more people were the most likely to fall in the group reporting to take four or more medications.

INTRODUCTION: In golf, each hole varies in difficulty and distance, which can change how a player approaches each shot. Depending on a player’s age, experience level, or injury risk perception, the approach may vary, and a player’s score can benefit or suffer due to these perceptions. PURPOSE: To examine the relationship between experience level, age, and perception of injury risk in golf. METHODS: 1,170 subjects (804 women, 366 men; age: 48.8 ± 14.7 years; experience level: 17.85 ± 10.18 years) completed a questionnaire assessing demographic information, golf-specific variables, and which age group, was more at risk of injury compared to other groups (p ≤ 0.05). Older golfers tended to play more hours per week, whereas middle-aged golfers tended not injured) were divided into two categories. Younger golfers tended to have lower level, or injury risk perception, the approach may vary, and a player’s score can benefit with those living by themselves and with a partner being slightly more likely to have a history of fall than those living in households with three or more people. However, for four or more medications, those living with a partner were observed to be less likely to have a history of falling in the past year than those living by themselves. Additionally, those who reported living in households with three or more people were the most likely to fall in the group reporting to take four or more medications.

Wrist injuries are common in mountain snow sports, particularly snowboarding. Wrist guards have been shown to reduce wrist fractures by upwards of 85%, but only 5-7% of snowboarders wear this protective device. There are no industry standards for the wrist guard design, which likely limits their perceived effectiveness and therefore their use. Wrist fractures have not been thoroughly characterized in the literature. A more detailed understanding of fracture patterns may inform improved design of snowboarding wrist guards. PURPOSE: To characterize wrist fracture patterns in greater detail than has previously been done, in order to gain an improved understanding of wrist fracture patterns and inform the design of more effective wrist guards to prevent wrist injuries in snowboarders.

METHODS: In this retrospective chart review, medical records from a large western mountain resort injury clinic were analyzed for demographic and clinical data collected during two consecutive winter seasons. Radiographs were analyzed to further classify fractures. Data analysis was performed using descriptive statistics and the χ² test. RESULTS: We identified 379 wrist injuries over the two winter seasons (age = 22.7 ± 14.1, male = 53.3%), with the majority being in snowboarders (n = 307, 81.0%). 97% of all patients with wrist injuries had radiographs taken, and 64.6% were diagnosed with wrist fracture (n = 224 for distal radius fracture, n = 27 for ulnar fracture, and n = 27 for concomitant radial/ulnar fractures). Snowboarders had a significantly higher percentage of wrist fractures than did skiers (69.1% for snowboarders vs. 46.2% for skiers, χ² = 12.276, p < 0.001). 71% of all distal radius fractures were AO classification A2; 16% were C1 or C2. 33% of distal radius fractures required reduction. The angle of displacement of the distal radius fragment ranged from 1-61 degrees. 49% of wrist fractures were in skeletally immature patients. 3.3% of all patients with wrist fractures were shown to be wearing wrist guards at the time of injury.

CONCLUSIONS: This study provides greater detail of wrist fracture patterns in snowboarders. These data can inform industry wrist guard standards.

Gastrointestinal (GI) issues are known to be common among endurance athletes and can impair performance in training and competition. Symptom characteristics, particularly those of the lower GI, are similar to irritable bowel syndrome (IBS). No previous research has examined IBS diagnosis or fit to IBS diagnostic criteria within this population. PURPOSE: To determine the prevalence of IBS among endurance athletes as well as their GI symptom management strategies. METHODS: A 92-item online questionnaire was previously validated for the purpose of assessing IBS diagnosis, fit to IBS diagnostic criteria (Rome III or Manning), general GI symptoms, and symptom mitigation strategies of endurance athletes. The questionnaire was distributed between December 2015 and October 2016 to the athletes in the U.S. completing a marathon, ultra-marathon, half-distance triathlon, or full-distance triathlon within that calendar year. RESULTS: The total prevalence of irritable bowel syndrome among 321 endurance athletes who completed the questionnaire was between 9.0% to 22.1% (medically diagnosed: 1.6%; undiagnosed but meeting the diagnostic criteria: 7.5% fitting Rome III criteria or 20.6% fitting ≥ 2 Manning criteria). Significantly more IBS sufferers were undiagnosed (p < 0.001 for Rome III and Manning, respectively). Only 10.9% of athletes reported seeing a medical professional due to GI issues, while 17.1% had issues which sometimes or often interrupted or prevented their training. Additionally, 65.7% experienced at least one lower GI symptom at a frequency of sometimes or more often during training. Almost half (46.7%) of the athletes tried nutritional modifications to help ease their symptoms and 19.0% used over-the-counter medications. CONCLUSION: Most endurance athletes that may suffer from IBS are undiagnosed, while even more have GI issues but do not fit IBS diagnostic criteria. The overall prevalence may be greater than that seen in the general population and the percent diagnosed may be lower among endurance athletes. Despite using various methods to manage their symptoms, endurance athletes are still experiencing issues and could potentially benefit from current IBS-mitigating strategies.

Supported by University of Illinois Nutritional Science Margin of Excellence Research and Vision 20/20 Awards.
Low Back Pain (LBP) is one of the common injuries that may occur in young baseball players. However, little is known about the prevalence of LBP in childhood and adolescence with taking their individual growth and development into consideration. PURPOSE: The purpose of this study was to describe the prevalence of LBP in young baseball players. In addition, to clarify occurrence of the LBP, based on the Peak Height Velocity (PHV) age. METHODS: A total of 293 South Korean male baseball players (12.8 ± 2.1 yrs) (Elementary school (ES) —135, Junior high school (JHS) —135, and Senior high school (SHS) —23) were involved in this surveillance, using a questionnaire (point prevalence, lifetime prevalence, recurrence, and age of onset of LBP). Participants’ health records were also collected to investigate an annual increment of height and a history of LBP. RESULTS: 50.0%, 73.5%, and 44.1% in JHS; 65.2%, 82.6%, and 73.9% in SHS, respectively. The most frequent onset of LBP was between 12 and 13 years old 22.3% of the LBP occurred at the PHV age, and 23.2% occurred in over 1 year of PHV age (total number of occurrence 112; 14.6 ± 1.4 yrs). CONCLUSIONS: Injuries occur to golfers of all ages and ability levels, and the injuries sustained have a significant impact upon golfers’ lives. Before suggesting that golfers limit their golf participation, other injury prevention avenues must be investigated to ensure that participation in physical activity is not viewed as harmful. Further, prevention strategies need to be investigated in relation to specific characteristics of golfers to attempt to reduce the injury risk.

Individuals with an anterior cruciate ligament reconstruction (ACLR) are susceptible to persistent disability and weight gain following surgery, which may increase the risk of developing osteoarthritis. It is unclear if body mass index (BMI) influences disability following unilateral ACLR. PURPOSE: Primarily, we determined the association between BMI and self-reported disability using a subjective knee evaluation form (IKDC) in a cross-section of individuals with a unilateral ACLR. Secondly, we determined if those with low to normal BMI (<25) demonstrated different odds of achieving patient-specific age and gender-matched healthy population average IKDC cutoff scores compared to those with high BMI (≥25). METHODS: Height, mass and self-reported disability were measured in 668 individuals (60.9% female, BMI 24.39±3.71 kg/m², IKDC 84.68±11.91, 21% 16-17 years old, 30.51±35.45 months post unilateral ACLR). Bivariate Pearson product moment correlations were calculated between BMI and IKDC for the entire sample. Multiple regression analyses were used to determine the impact of covariates (Tegner score, age and months since ACLR) on the observed associations between BMI and IKDC, and the change in R² (ΔR²) attributable to BMI after accounting for the covariates was determined. We calculated the odds ratios and 95% confidence intervals for achieving published age and gender-matched healthy population average IKDC scores for those with low (<25; i.e. underweight and normal BMI) versus high BMI (≥25; i.e. overweight and obese).
RESULTS: Lower BMI associated with higher IKDC score (r=-0.08, P=0.04), but BMI did not uniquely explain variance in IKDC (AR=0.001, P=0.57) after accounting for covariates. Individuals with low BMI demonstrated higher odds (OR=1.45 [1.05-1.99]) of achieving population average IKDC scores compared to participants with high BMI. CONCLUSIONS: A significant but negligible association between higher BMI and lower IKDC scores was negated after accounting for relevant covariates in individuals with a unilateral ACLR. If individuals are dichotomized based on a BMI (-1.99) lower BMI was associated with a 44% (95% CI: 63-24%) higher chance of achieving normative IKDC scores. On its own, BMI may not be a good clinical predictor of self-reported ACLR outcomes.

Background: Brazilian jiujitsu (BJJ) is a martial art that focuses on groundwork, joint locks, and choke holds instead of kicks and punches. Prior studies have examined injury in the sport during competition but not during training. Purpose: To determine the prevalence of injuries sustained during BJJ training. Methods: A 27-question research survey was e-mailed to 166 BJJ gyms throughout the United States. Demographic information, belt level, training hours, competition experience, and injury prevalence data were collected. Survey participants were incentivized by entrance into a random drawing to receive one of four $25.00 pre-paid credit cards. Results: A total of 140 athletes responded to the survey. The majority of respondents were Caucasian (n=96) males (n=121) with an average age of 30.3 years. Overall, the most common injury locations were to the hand and fingers (n=70), foot and toes (n=52), and arm and elbow (n=51). Skin infections (n=38) were the most frequent condition for which athletes sought medical attention followed by injuries to the knee (n=26) and foot and toes (n=19). The most common non-medically diagnosed injuries occurred to the hand and fingers (n=56), arm and elbow (n=40), and foot and toes (n=33). Conclusion: Athletes reported more frequent medically diagnosed injuries to the lower extremity and more frequent non-medically diagnosed injuries to the upper extremity. We hypothesize upper extremity injuries to be more frequent but less severe with the opposite being true for lower extremity injuries. This study highlights the prevalence of training injuries in BJJ and the distribution of injuries by age, belt level, and weight class, which may be used to educate both athletes and physicians.

Purpose: To determine injury rates of sports-related concussions (SRC) during the start, middle and end of practice and competitions among high school male and female athletes in the state of Michigan. Methods: This was a descriptive epidemiological study using the Michigan High School Athletic Association (MHSAA) Head Injury Reporting System. A total of 284,227 (165,418 males, 118,809 females) student-athletes (years in high school=2.32±1.1) participating in MHSAA sponsored athletic activities (i.e., football, soccer, basketball) during the 2015-2016 academic year. Certified athletic trainers, school athletic administrators, and coaches from MHSAA high schools reported head injury data and overall participation for the 2015-2016 academic year. Using the MHSAA Head Injury Reporting System, athlete exposures (AE), total SRCs and time (i.e., start, middle, end) when a SRC occurred were reported for each concussive injury. An injury rate (IR) was calculated by dividing the number of SRCs in a particular category by the number of athlete-exposures in that category. IRs were presented with 95% confidence intervals (CI). Results: A total of 4,452 SRCs were reported for all sports. Male athletes had a greater risk for an SRC during the middle of practices and competitions (IR=10.21/1,000 AE), 95% CI: 9.5-10.5), followed by the end of practices and competitions (IR=6.63/1,000 AE, CI: 6.2-7.0) and start of practices and competitions (IR=1.92/1,000 AE, CI: 1.7-2.1). Females also had a greater risk for SRCs during the middle of practices and competitions (IR=6.50/1,000 AE, CI: 6.0-7.0), followed by the end of practices and competitions (IR=4.35/1,000 AE, CI: 4.0-4.7) and start of practices and competitions (IR=1.68/1,000 AE, CI: 1.4-1.9). Conclusions: The majority of SRCs occur during the middle of practices and competitions compared to the end and start of practices and competitions. Future research should concentrate on ways to prevent SRCs during the middle of events.

Purpose: To determine injury rates of sports-related concussions (SRC) during the start, middle and end of practice and competitions among high school male and female athletes in the state of Michigan. Methods: This was a descriptive epidemiological study using the Michigan High School Athletic Association (MHSAA) Head Injury Reporting System. A total of 284,227 (165,418 males, 118,809 females) student-athletes (years in high school=2.32±1.1) participating in MHSAA sponsored athletic activities (i.e., football, soccer, basketball) during the 2015-2016 academic year. Certified athletic trainers, school athletic administrators, and coaches from MHSAA high schools reported head injury data and overall participation for the 2015-2016 academic year. Using the MHSAA Head Injury Reporting System, athlete exposures (AE), total SRCs and time (i.e., start, middle, end) when a SRC occurred were reported for each concussive injury. An injury rate (IR) was calculated by dividing the number of SRCs in a particular category by the number of athlete-exposures in that category. IRs were presented with 95% confidence intervals (CI). Results: A total of 4,452 SRCs were reported for all sports. Male athletes had a greater risk for an SRC during the middle of practices and competitions (IR=10.21/1,000 AE, 95% CI: 9.5-10.5), followed by the end of practices and competitions (IR=6.63/1,000 AE, CI: 6.2-7.0) and start of practices and competitions (IR=1.92/1,000 AE, CI: 1.7-2.1). Females also had a greater risk for SRCs during the middle of practices and competitions (IR=6.50/1,000 AE, 95% CI: 6.0-7.0), followed by the end of practices and competitions (IR=4.35/1,000 AE, CI: 4.0-4.7) and start of practices and competitions (IR=1.68/1,000 AE, CI: 1.4-1.9). Conclusions: The majority of SRCs occur during the middle of practices and competitions compared to the end and start of practices and competitions. Future research should concentrate on ways to prevent SRCs during the middle of events.
It is commonly surmised that environmental conditions and concomitant sport use hinders development of evidence-based injury prevention protocols. The aim was to determine match injury incidence and risk factors at the highest level of amateur U.S. Rugby-7s. Methods: This was a prospective epidemiology study of sub-elite U.S. Rugby-7s players (960 men, 888 women) representing competitive regions at the U.S. Rugby National Club 7-a-side Championships (including four, two-day tournaments over 2011-2014). Incidence (per 1000 player-hour (ph)) and biomechanism of injuries were captured via the Rugby Injury Survey & Evaluation (RISE) Report methodology. Results: Overall injuries were found at 205.3/1000 ph (n=244) (time-loss 59.7/1000 ph; P=0.063). Most injuries were acute (95%) and occurred during the tackle (73%). Shoulder tackles resulted in the most match injuries (61%). Recurrent time-loss injuries (21%) occurred more frequently in females (18.4%) than males (3.1%; P<0.001). Head/neck time-loss injury rates (30%), occurred more often in males (41%) than females (11%; RR=1.5; P=0.002). The overall concussion rate in this population was 6.1% (12.6/1000ph). Conclusions: Understanding injury rates in U.S. sub-elite amateur competitors, which often make up the U.S. national candidate pool, provides fundamental level of play data, to guide injury prevention protocols to the U.S. rugby playing population. U.S. sub-elite players head/neck injury rates were found higher, than elite international male Rugby-7s (5%), Under-20 Rugby-15s (12%) and elite women Rugby-15s (26%). Education on tackling techniques are areas to consider to reduce the risk of head/neck injury rates, including concussions, which were higher in this U.S. tournament series cohort (12.6/1000ph) than elite international Rugby-7s (8.3/1000ph) or Rugby-15s (5.4/1000ph). Furthermore, education on return to play protocols and post-tournament injury care would decrease recurrent injury rates seen in the U.S. amateur population.
**Purpose:** Rugby-7s, an Olympic collision sport, is played with a high incidence of injury. U.S. collegiate Rugby-7s, due to its club status, has a lack of data to support the development of prevention protocols. **Methods:** This is a prospective epidemiology study using the Rugby Injury Survey & Evaluation (RISE) Report methodology to capture injury rates (per 1000 player-hour (ph)). USA Sevens Collegiate Rugby-7s Championship Invitational (1786 athletes) over 2012, 2014-2016 competitive divisions (championships men and women, men’s collegiate, and men’s small colleges) were evaluated for match injuries. **Results:** Injuries overall were found at 139.4/1000ph (n=151) (time-loss 131.4/1000ph; n=34; medical attention 108.0/1000ph, n=130; <0.001). Backs (38.9/1000ph) had higher rates of time-loss injuries than forwards (17.3/1000ph; RR: 2.2, P=0.040). Mean severity of injuries were 75.7 days (backs 63.7 days; forwards 127.5 days; P=0.078). Injuries overall were acute (87%) and occurred during the tackle (72%) and running/open play (17% overall; from 13% in 2012, 22% in 2014, 43% in 2015, 5% in 2016). Shoulder tackles led to more injuries than other tackle types (65%; RR: 1.9). Recurrent injuries were observed at 29% of all injuries (39.8/1000ph). Most common time-loss injuries were concussions (26%) and lower extremity ligament injuries (50%). Overall head/neck injuries occurred at high proportions (29%; RR: 2.62), including concussions at 12% of all injuries (16.7/1000ph; RR: 1.3, P=0.148). **Conclusions:** One concern with the expansion of U.S. Rugby-7s was the increasing risk of head and neck injuries in collegiate Rugby-7s between 2012 and 2014, 2015 and 2016 (RR: 2.17, 4.7, 3.3, respectively). Elevated head/neck injury rates in the current study have been found to be higher than the literature in international elite males Rugby-7s (5%) and U-20 Rugby-15s (12%). The largest injury increase was seen in running/open play, possibly due to the high proportion of training regimens among programs. Developing institutional support as other collegiate sanctioned sports can help guide instruction on tackling, and a standardized conditioning program, which may decrease injury rates at the collegiate playing level.

In the United States, 30–60% of older adults fall each year; 10–20% of these falls result in injury, hospitalization, or death. Better prevention of falls in this population may be facilitated by broader identification of risk factors. The use of statins has been previously shown to increase the risk of falls in older adults. Exercise may function as a prophylactic measure, enhancing lipid profiles and decreasing the need for statins while also improving balance, coordination, and mobility, reducing the risk of fall-related injuries.

**Board #180**  
June 1 8:00 AM - 9:30 AM  
**A 4-year Epidemiological Analysis Of Tournament Match Injuries In Men’s Collegiate Rugby-7s**  
Email: Ismonedmb@gmail.com

**Reported Relationships:** L.S. Myers: Contracted Research - Including Principle Investigator; USAR New England and Empire GU RFU’s and National Operating Committee on Standards for Athletic Equipment. **S316**  
**Vol. 49**  
**No. 5**  
**Supplement**

**Board #182**  
June 1 8:00 AM - 9:30 AM  
**Age At First Energy Drink Use As A Predictor of College Student High-Risk Driving Behaviors**  
Conrad L. Woolsey1, Jeff M. Housmann,2 Ronald D. Williams,1 Jr., Bert H. Jacobson, FACSAM1, Thomas E. Sather1, Marion W. Evans, Jr.,1 University of Western States, Portland, OR. 2Texas State University, San Marcos, TX. 3Oklahoma State University, Stillwater, OK. 4Bureau of Medicine and Surgery, Falls Church, VA. 5Mississippi State University, Mississippi State, MS. (Sponsor: Dr. Bert H Jacobson, FACSAM)  

Age at first use has been studied extensively as a predictor for issues with substances, but remains relatively unexplored in energy drinks. **PURPOSE:** To examine the relationship of age at first energy drink use and high-risk motor vehicle driving behaviors among college students (n=552). **METHODS:** Age at first energy drink use was measured using a standard continuous scale self-reported question. Logistic and bivariate regressions were used to examine the relationship of age at first energy drink use to past 30-day alcohol-related high-risk driving behaviors. **RESULTS:** Age at first energy drink use was positively correlated with age with a higher age at first use increasing by one year. Participants odds of driving when perceiving they had consumed too much to alcohol to drive safely decreased by 10.8% (OR=.89; p= 0.002) as age at first energy drink use increased by one year; Participants odds of driving when perceiving they had consumed too much to alcohol to drive safely decreased by 8.4% (OR=.92; p=.009) as age at first energy drink use increased by one year. The odds of being a passenger in a car with a driver who had consumed too much alcohol to drive safely decreased by 11.9% (OR=.88; p=.000) as age at first use increased by one year. Age at first energy drink use was a significant predictor of past 30-day risky driving behaviors including driving when one perceives they have consumed too much alcohol to drive safely (B=.041; p=.036; RR=.008), and driving while perceiving a BAC over .08 (B=.10; p=.001; RR=.009). **CONCLUSION:** Results suggested using energy drinks at an earlier age predicted high-risk motor vehicle behaviors including driving after consuming too much alcohol, driving over the .08 BAC limit, and knowingly riding with a driver who had consumed too much alcohol to drive safely.

**Board #183**  
June 1 8:00 AM - 9:30 AM  
**A Comparison of Injury Rates In Boys’ And Girls’ Youth Lacrosse**  
Shane V. Caswell1, Andrew Lincoln1, Thomas Dompier4, Zachary Kerri, GEORGASON MASON University, Manassas, VA. 1MedStar Sports Medicine, Baltimore, MD. 2Datalysis Center for Sports Injury Research and Prevention, Inc., Indianapolis, IN. 3University of North Carolina, Chapel Hill, NC.  
Email: scaswell@gmu.edu

**No relationships reported**

Participation in youth lacrosse is increasing. To date, limited research has compared the incidence and severity of injuries among boys’ and girls’ youth lacrosse players. **PURPOSE:** Compare the incidence and severity of injury in boys’ and girls’ youth lacrosse. **METHODS:** Athletic trainers (ATs) attended games and practices during the 2015 and 2016 seasons for 12 youth lacrosse leagues in four states with 1090 male and 408 female players. ATs collected injury and athlete-exposure (AE) data at all events. Injuries occurring during league events and requiring medical attention were included. Time loss (TL) injuries were those resulting in participation restriction ≥24 hours. Injury frequencies and rates were calculated. Rate ratios (RR) compared rates by sex. RR with 95% confidence intervals (CI) not including 1.00 were considered statistically significant.

**RESULTS:** A total of 261 and 59 total injuries were reported in boys’ and girls’ youth lacrosse, respectively. Of these, 17.0% and 18.6% were TL, respectively. Boys had a higher injury rate than girls (10.3 vs. 7.9/1000AE; RR=1.4; 95%CI: 1.1-1.9); findings were retained when restricted to TL injuries (1.9 vs. 1.5/1000AE; RR=1.5; 95%CI: 1.2-2.0). Most injuries were to the lower extremity (boys: 48.9%; girls: 44.1%) and diagnosed as contusions (boys: 40.7%; girls: 48.0%). Boys had higher rates of concussions (boys: 16.9%; girls: 8.1%). Most injuries were due to contact with equipment, particularly stick contact (boys: 36.1%; girls: 22.0%) and ball contact (boys: 14.5%; girls: 23.7%). Player contact was also common in boys (18.3%). Checking comprised a low proportion...
of injuries in boys (5.8%) and girls (0.0%). In total, 15 concussions were reported; however, all but one occurred in boys. Of the 14 concussions in boys, 6 (42.9%) were due to playing football and 5 (35.7%) stick contact.

CONCLUSIONS: Data provide injury incidence estimates from the largest known sample of youth lacrosse players. As seen in previous research, rates were higher in boys than girls, highlighting the need for sex-specific prevention strategies, particularly related to concussion and player contact. The high incidence of stick- and ball-related injuries also reiterates the need for rule changes to better protect players. Supported by the National Operating Committee on Standards for Athletic Equipment (NOCASE).

1509 Board #184  June 1 8:00 AM - 9:30 AM
Shoulder Impingement in Soldiers: Descriptive Epidemiology and Common Surgical Procedures
Joseph K. Kardouni, Craig J. McKinnon. U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(No relationships reported)

PURPOSE: Subacromial impingement syndrome (SIS) is one of the most common shoulder diagnoses in people with significant upper extremity demands, and this diagnosis may include multiple underlying factors. The purpose of this study is to examine the incidence of SIS in U.S. Army Soldiers, risk factors for SIS, and identify the most common surgical procedures in operative cases. METHODS: Medical encounter data for all U.S. Army Soldiers was examined from 2002-2011. Cases of SIS were identified using International Classification of Diseases 9th Revision (ICD-9) codes 732.10 and 732.2. A 10-year incidence rate was calculated. A Cox Regression Model was used to calculate Hazard Ratios (HR) and 95% confidence intervals (CI) for factors associated with SIS using the variables of age, race, education level, sex, length of military service, and occupational physical demands rating. Surgical cases were identified using Current Procedural Terminology (CPT) codes, and the most common surgical codes were reported. RESULTS: 67,341 cases of SIS were identified in 1,261,297 Soldiers, for a 10-year IR of 15.73 per 1,000 person years. Risk increased with age in years (<20 reference; 20-25 HR=1.36, 95% CI [1.29, 1.43]; 26-30 HR=2.07, 95% CI [1.95, 2.19]; 31-35 HR=2.83 95% CI [2.67, 3.06]; 36-40 HR=4.32, 95% CI [4.08, 4.59]; >40 HR=6.31, 95% CI [5.95, 6.71]) and years of military service (<1 as reference; 3-5 years HR=1.13, 95% CI [1.09, 1.18]; >5 years HR=1.06, 95% CI [1.02, 1.10]). Of the SIS cases, 3686 were identified as surgical cases with the most common procedures being claviculectomy (85%), biceps tenodesis (40%), chronic rotator cuff tear repair (37%), acromioplasty (28%), capsular/humeral with labral repair (22%), and coracoacromial ligament release (20%). CONCLUSIONS: Increasing risk for SIS with increasing age and longer occupational exposure are consistent with previously identified factors related to SIS. This study shows that the most common shoulder surgical procedures in Soldiers with a diagnosis of SIS were associated with anatomy thought to contribute to compression of subacromial structures, while surgical management of instability may also be a factor for some cases. The views expressed are those of the authors and do not reflect the policy of the Department of Army, Department of Defense, or the U.S. Government.

1510 Board #185  June 1 8:00 AM - 9:30 AM
Characterizing Injuries and Participation in High Intensity Functional Training
Katie M. Heinrich1, Sarah J. Cosgrove1, Yuri Feito, FACSM2.
1Kansas State University, Manhattan, KS. 2Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSM)
Email: kmhphd@ksu.edu

(No relationships reported)

Limited epidemiological data related to injury and high-intensity functional training (HIFT) suggest relatively low injury risk compared to other exercises (e.g., running).

PURPOSE: This qualitative study characterized injury related experiences for HIFT participants.

METHODS: 60-min key informant interviews (KI) with six HIFT coaches (67% male, age 39 ± 8 y, 4 y experience, focus groups), six HIFT exercisers (56% male, age = 34 ± 9 y, 40% > 1 y experience), and 15-min interviews (IN) with 10 HIFT exercisers (50% male, age = 43 ± 15 y, 50% > 1 y experience) were used. Only FG were asked “What injuries have you experienced as a result of participating in HIFT?” Data were audio recorded and transcribed verbatim. Member checking was used for interviewers. Data were thematically analyzed to identify statements related to injuries, hurt, pain, soreness, or safety for all participants. Data were open-coded and discussed for consensus by two researchers.

RESULTS: Key themes included participants reporting mostly minor “HIFT injuries” (KI = 33%, FG = 100%, IN = 20%). Participants also reported having “injuries from other types of exercises/sports” (KI = 33%, FG = 67%, IN = 10%) “High intensity workouts” influenced when participants pushed too hard and became injured, and “lessened intensity to avoid injury” (KI = 50%, FG = 67%, IN = 20%). Accordingly, participants reported feeling pain and soreness “during workouts” (KI = 33%, FG = 83%, IN = 20%), although some liked this. Some “started HIFT because of injury” (K = 33%, FG = 67%, IN = 10%) and utilized HIFT for “therapy/prevention of other health problems” (KI = 17%, FG = 50%, IN = 67%) while others “stopped HIFT due to injury” (KI = 33%, FG = 50%). Even those perceived “helpful task” a participation barrier (FG = 67%, IN = 10%), “scaling or modifying” workouts helped avoid injuries or continue HIFT when injured (KI = 50%, FG = 17%, IN = 10%). “Good coaching” (KI = 50%, FG = 50%), “improved fitness” (KI = 17%, FG = 33%, IN = 30%), and “knowledge, technique, and goals” (KI = 33%, FG = 83%, IN = 10%) were injury prevention tools.

CONCLUSIONS: Data illuminate the range of participants’ experiences with HIFT regarding injury, including how to modify workouts, prevent/recover from injuries, and improve health. Prospective studies should be designed to prevent and/or better track HIFT injuries.

1511 Board #186  June 1 8:00 AM - 9:30 AM
The Experience Of Low Back Pain In Pre-professional And Professional Dancers: A Longitudinal Study
Christopher TV Swain1, Elizabeth J. Bradshaw1, Douglas G. Whyte1, Christina L. Ekegren2. 1Australian Catholic University, Melbourne; 2Monash University, Melbourne, Australia.
Email: chriss.swain@acu.edu.au

(No relationships reported)

PURPOSE: Low back pain (LBP) is often cited as one of the most common musculoskeletal conditions experienced by pre-professional and professionals dancers, although there is a dearth of evidence to support this. The purpose of this study was: i) to determine the prevalence of LBP in dancers, as well as the impact on practice and management strategies used by dancers; and ii) to identify any demographic or physical factors associated with LBP in dancers. METHODS: This was a prospective cohort study of 110 (n=19 male) pre-professional and professional classical ballet and contemporary dancers (mean (SD) age 17.8 (2.9) years). Data were collected using an online questionnaire repeated monthly for 9 months. Univariate and multivariate analyses were conducted to determine demographic and physical factors related to LBP prevalence. RESULTS: 74% of dancers reported a history of LBP. Preliminary analysis revealed a monthly and point prevalence between 40 to 60% and 16 to 25% respectively. Each month, between 35 to 63% of all episodes of LBP resulted in some form of activity modification or time away from dance, 16 to 27% of dancers with back pain consulted a health professional and 15 to 30% used medication for their back pain. Multivariate analysis found no association with individual or demographic factors and history of LBP. CONCLUSIONS: Pre-professional and professional dancers have an increased vulnerability to LBP. The development of LBP within this population is complex and may not be associated with individual factors measured in this study.

1512 Board #187  June 1 8:00 AM - 9:30 AM
Injuries Reported During a Pre-participation Examination in Division 1 Collegiate Athletes: A Prospective Cohort Study
James R. Borchers, FACSM, Angela Pedroza, Christopher C. Kaeding. The Ohio State University, Columbus, OH.
Email: james.borchers@osu.edu

(No relationships reported)

Introduction
Understanding the influence of sport and gender on prior injury is important for providing rehabilitation and prevent future injury. The purpose of this study was to examine injury prevalence in Division 1 collegiate athletes prior to participation and report injury risk.

METHODS: 856 pre-participation questionnaires were collected between 2012 and 2016 in 32 varsity sports. Data reviewed was gender, sport, and injury in: neck, shoulder, elbow, hand, spine, hip, knee, lower leg, and foot. Top 5 sports were identified by percent total injuries and injuries per team. Odds of injury were reported by gender and matched sport.

Results
Football was 12% of the cohort. Injuries were highest in hand (26.6%), knee (24.5%), and lower leg (22.9%). Top 5 sports by number of injuries and total of team are summarized in table 1. Overall, males had a 1.8 times greater odds of shoulder injury compared to females (p<0.01). No difference in injury was found between genders in any other area (p>0.05).

In sports with corresponding male and female teams, gymnastics had 3.0 and ice hockey 2.8 times greater odds of shoulder injury (p<0.05 & 0.04). Gymnastics had 2.5 times greater odds and track & field 3.8 times lesser odds of elbow injury (p=0.05 & 0.03). Golf had 4.9 times greater odds of foot injury (p<0.03). Gymnastics had 7.1, golf 4.6, and track & field 4.3 times greater odds of foot injury (p<0.01, p=0.05, & 0.01). Gender was not a confounder (p=0.05).
Soccer had 4.6, track & field 4.0, gymnastics 4.0, and females 1.9 greater odds of hip injury (p = 0.01, 0.02, 0.03, & 0.01). Basketball had 2.8, gymnastics 2.7, and females 1.7 times greater odds of knee injury (p = 0.05, 0.03, & 0.01).

**Conclusion**

Football accounted for the largest gross number of injuries but not when averaged by number of participants. Gymnastics had a significant risk for having reported injury at the time of pre-participation examination. Females had a significant risk of hip and knee injuries compared to male athletes.

Patients with anterior cruciate ligament reconstructed (ACLR) knees are at high risk for early development of tibiofemoral osteoarthritis (OA). Since there is no cure for osteoarthritis, it is important to understand factors that influence OA development and the long-term effects. Previously, our research center developed the head impact exposure (HIEE) in 11 retired professional football athletes (mean age: 64.7 ± 3.13y). The purpose of the HIEE is unknown.

**RESULTS:** We examined the test-retest reliability of the HIEE in 11 retired professional football athletes (mean age: 64.7 ± 3.13y). The intra-class correlation coefficients, ICC(2,1), were used to determine the test-retest reliability of the HIEE in 11 retired professional football athletes (mean age: 64.7 ± 3.13y). The coaches’ effort to seek a shared decision-making process in RTP is, hence, partially effective.

**CONCLUSION:** A multitude of actuators intervenes when making the RTP decision. The call for a professionalization of the RTP process in semi-professional sports includes the athlete itself, the head coach, the (external) physician, the (external) physiotherapists and the strength and conditioning coach based on general RTP decision-making models and specific criteria related to injury type, sport type, level and playing position. The development of awareness and implementation strategies of RTP models should be subject to further research.

**PURPOSE:** The term long-term neurological effects of exposure to repetitive subconcussive impacts, such as those occurring in American football, are poorly understood. Recent studies have suggested that greater exposure to subconcussive impacts is associated with worse health outcomes in former high school, collegiate, and professional football players. Helmet accelerometer research has shown the magnitude, location, and frequency of impacts sustained by American football players varies widely and are dependent on many factors, including position, practice structure, playing time, career length, and career duration. Thus, estimating cumulative head impact exposure across a player’s career using these factors may prove useful in studying their long-term effects. Previously, our research center developed the head impact exposure estimate (HIEE), a structured interview covering game and practice contact hours over the course of an athlete’s playing career. However, the test-retest reliability of the HIEE is unknown.

**CONCLUSIONS:** Only current age influenced mental quality of life. Current age and history of sustaining at least one injury negatively impact physical quality of life following either a knee or ankle injury. However, neither number of injuries nor age explained much of the variance in SF-8 scores. More research is needed to determine what other factors contribute to quality of life so that it can be improved following injury.

**Head coaches of semi-professional sport teams are most often in charge of the final positive return to play (RTP) decision.**

**PURPOSE:** To assess how different decision-guiding factors, such as health and performance related actuators, as well as evidence based guidelines, support the head-coaches’ process-orientated RTP decision.

**METHODS:** A survey consisting of questions on the importance of different decision-guiding factors used when making the RTP decision following injuries was administered to head coaches of semi-professional players’ teams. With respect to helpfulness in the RTP decision-making process, the coaches rated both the importance of the opinion of physicians, physiotherapists, strength and condition coaches, the athletes, themselves, and of both general and injury-specific RTP guidelines.

**RESULTS:** Our survey revealed that the head coaches refer to physicians and physiotherapists to a large extent, to the athletes and to themselves to a medium extent, and to strength and conditioning coaches and RTP guidelines to a small but still relevant extent. The coaches’ effort to seek a shared decision-making process in RTP is, hence, partially effective.

**CONCLUSION:** A multitude of actuators intervenes when making the RTP decision. The call for a professionalization of the RTP process in semi-professional sports includes the athlete itself, the head coach, the (external) physician, the (external) physiotherapists and the strength and conditioning coach based on general RTP decision-making models and specific criteria related to injury type, sport type, level and playing position. The development of awareness and implementation strategies of RTP models should be subject to further research.

**Board #189 June 1 8:00 AM - 9:30 AM**

**Number of Previous Knee or Ankle Injuries Is Associated With Poor Physical but not Mental Health**

The knee and ankle are among the most commonly injured joints in the body. Long-term strength and neuromuscular control deficits are common following these injuries, yielding lifelong disability and poor quality of life. However, it is unknown if quality of life worsens as the number of ankle and knee injuries sustained increases. **PURPOSE:** Determine the association between the number of ankle or knee injuries sustained and physical and mental quality of life. **METHODS:** A total of 806 ankle-injured (age:49.3±16.1yrs; BMI:28.4±7.4kg/m²), and 1066 uninjured (age:45.8±16.3yrs; BMI:27.5±7.0kg/m²) adults completed the SF-8 survey to determine the physical (PCS) and mental (MCS) contributions to quality of life. Respondents were categorized by injury history (ankle, knee, none) and number of injuries (0, 1, 2, 3+) to the same joint. Backward elimination linear regression analysis determined the association between quality of life, age, and injury history separately for SF-8 PCS and MCS and ankle versus knee injury. **RESULTS:** For ankle injury, reporting 1, 2, or 3+ injuries and age explained 7.3% of the variance in SF-8 PCS (P<0.001). Further, 1 or 2 ankle injuries (P<0.001) and age (P<0.001) explained 5.5% of the variance in SF-8 MCS. Reporting 1, 2, or 3+ knee injuries and age significantly predicted PCS (P<0.001) explaining 7.6% of the variance in PCS. Age, but not knee injury, significantly predicted SF-8 MCS (P=0.001), explaining only 7.2% of the variance in SF-8 scores. **CONCLUSIONS:** Only current age influenced mental quality of life. Current age and history of sustaining at least one injury negatively impact physical quality of life following either a knee or ankle injury. However, neither number of injuries nor age explained much of the variance in SF-8 scores. More research is needed to determine what other factors contribute to quality of life so that it can be improved following injury.

**Board #190 June 1 8:00 AM - 9:30 AM**

**Head Coaches’ Return To Play Decision Making After Injuries in Semi-professional Team Sport Athletes**

**Head coaches of semi-professional sport teams are most often in charge of the final positive return to play (RTP) decision.**
CONCLUSIONS: limitations of perception and knowledge and skills of injury prevention may compromise the students’ ability to prevent sports injuries. Both online and onsite education may be attributed to heightened perception and basic knowledge and skills, while onsite education had priority to online format in improving fundamental knowledge and skills in injury prevention among college students.

Supported by the Hubei Science Education Project (2014B196 & 2016B155).

C-41 Exercise is Medicine® Poster - EIM - Physical Activity, Training and Lifestyle

Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

1517 Board #192 June 1 8:00 AM - 9:30 AM
Boxing Exposure in a Representative Cohort of Modern Era Professional Boxers
Barry D. Jordan, 10605, FACSM. Burke Rehabilitation Hospital, White Plains, NY.
Email: bjordan@burke.org

(No relationships reported)

PURPOSE: To determine the boxing exposure of a representative cohort of retired professional boxers who competed in modern era boxing.

METHODS: Boxing records of a previously studied cohort of 338 professional boxers were reviewed. Boxing exposure was extracted from boxing records provided by BoxRec.

RESULTS: Of the 338 boxers previously studied, boxing records of 282 professional boxers were located and reviewed. The mean age of the boxers at the time of extraction was 51.9 years (range 16-84). A total of 1,955 bouts were presumed to be retired. The mean age at the time of first professional bout was 21.6 years (range 16-30). The mean duration of the professional boxing career was 8.1 years (range 1-38). The mean number of total professional bouts 22.1 (range 1-129) with an average of 12 wins (range 0-79) and 9.3 losses (range 0-102). The average number of wins and losses by technical knockout/ knockout (TKO/KO) was 7.3 (range 0-84) and 4.5 (range 0-35), respectively. The average number of total rounds boxed was 113 (range 1-735). The mean number of annual bouts and rounds was 3.2 (range 0-27) and 14.5 (range 0-165), respectively.

CONCLUSION: The range of exposure to boxing among a representative sample of retired professional boxers is highly varied. To the best of our knowledge this is the only documentation of professional boxing exposure in modern era (late 20th Century) boxing. Follow-up of this cohort may serve as a representative sample of retired professional boxers to study the chronic effects of repetitive brain trauma, such as chronic traumatic encephalopathy (CTE).

1518 Board #193 June 1 8:00 AM - 9:30 AM
Comparison of Online and Onsite Health Education Intervention in Preventing Sports Injury among College Students
Youqing Shen1, Chengcai Xia1, Huangdong Shen1, 1Hubei University of Education, Wuhan, China. 2Wuhan Sports University, Wuhan, China.
Email: future0104@hotmail.com

(No relationships reported)

PURPOSE: To determine the effect and the superiority of online and onsite education intervention designed to improve perception and basic knowledge and skills of sports injury prevention among college students.

METHODS: 2,088 college students were recruited from a cluster random sampling of 51 classes to acquire sports injuries epidemiology for the further intervention. 321 collected participations were randomly allocated to the online (n=157) and onsite (n=164) group. 4 educational sessions led by specialists were designed with the same topics in both groups. The components engaged in health awareness, basic knowledge, and enrichment activities targeting skills training. Students received prospective surveys incorporated 12 Likert scale questions. Differences within and between groups were compared using independent and paired T-test, respectively. SPSS18.0 was used for the statistical analyses and a significant level was set at P<0.05.

RESULTS: The rate of sports injuries was 15.4% (321/2088) students on the retrospective survey. There were no differences between groups in awareness (online: 2.40±0.06 vs onsite 2.34±0.06, p=0.509) and knowledge and skills (online: 1.87±0.07 vs onsite 1.86±0.09, p=0.891) on the pre-intervention survey. Pre- and post-intervention data revealed improved awareness (online: pre- 2.40±0.06 vs post- 3.35±0.07, p=0.000; onsite: pre- 2.34±0.06 vs post- 3.45±0.07, p=0.000) and knowledge and skills (online: pre- 1.87±0.07 vs post- 2.37±0.07, p=0.000; onsite: pre- 1.86±0.09 vs post- 2.94±0.06, p<0.000) within both groups. Statistical tests indicated significantly different between groups in knowledge and skills (online: 2.37±0.07 vs onsite 3.94±0.06, p=0.000), particularly with higher scores in onsite group, while no difference in awareness (online: 3.25±0.07 vs onsite 3.45±0.07, p=0.000).

CONCLUSION: Preliminary results from this study indicate that key GAQ screening questions demonstrate acceptable test-retest reliability over a 1-week period. Future research will further examine reliability, as well as validity of the GAQ.

1519 Board #194 June 1 9:00 AM - 10:30 AM
Preliminary Results for Test-Retest Reliability of a New Screening Tool: The Get Active Questionnaire
Dawn P. Gill1, Andrea F. Petrella1, Liza Stathokostas1, Mary Dugan2, Robert J. Petrella, FACSM3, 1Western University, London, ON, Canada. 2Canadian Society for Exercise Physiology, Ottawa, ON, Canada. (Sponsor: Robert Petrella, FACSM)
Email: d.gill@uwo.ca

(No relationships reported)

PURPOSE: The Get Active Questionnaire (GAQ), developed by the Canadian Society of Exercise Physiology, is a new physical activity (PA) readiness assessment tool that seeks to safely encourage and ‘screen-in’ as many people as possible to participate in regular PA.

To evaluate the test-retest reliability of items from the GAQ in a sample of community-dwelling older adults.

METHODS: Older adults (≥50 years) were recruited from a research laboratory routinely conducting PA screening for community-based referrals. Study participants [n=86; mean age (SD): 75.7 ± 7.7 years; xx% female] completed 2 study visits, one-week apart, where participants self-completed the GAQ that was provided in paper form. The first page of the GAQ includes 9 yes/no questions designed to ensure individuals have a safe PA experience. Questions ask about: specific diagnoses/ symptoms in the past 6 months; whether pain/other conditions affect ability to do PA; and whether a provider advised avoidance of PA/take precautions. Test-retest reliability was assessed using kappa statistics (k) and 95% CIs.

RESULTS: Test-retest reliability could not be examined for 2 of the questions (loss of consciousness/fainting for any reason; concession) because all participants responded “no” at 1 of the 2 visits. Of the 7 questions evaluated, the question that asked whether other medical conditions affected ability to be physically active showed almost perfect agreement between testing occasions [k (95% CI): 0.84 (0.63–1.00)]. Most questions (diagnosis of heart disease or stroke or pain/discomfort in chest in daily activities or during PA; diagnosis of high blood pressure (BP) or resting BP ≥160/90 mmHg; pain or swelling in any part of body affecting ability to do PA; provider advised avoidance of PA/take precautions) showed substantial agreement with results ranging from 0.65 (0.28–1.00) to 0.74 (0.39–1.00). The remaining 2 questions showed either moderate agreement [i.e., dizziness during physical activity: 0.58 (0.25–0.91)] or fair agreement [i.e., shortness of breath at rest: 0.32 (+0.16–0.80)].

CONCLUSION: Preliminary results from this study indicate that key GAQ screening questions demonstrate acceptable test-retest reliability over a 1-week period. Future research may further examine reliability, as well as validity of the GAQ.

1520 Board #195 June 1 9:00 AM - 10:30 AM
Development of Trait-Tailored Physical Activity Promotion Messages for Use in Community and Clinic Settings
Kathryn E. Wilson, Paul A. Estabrooks. University of Nebraska Medical Center, Omaha, NE.
Email: wilsonka08@gmail.com

(No relationships reported)

PURPOSE: To develop a set of physical activity promotion messages designed to target approach (BAS) and avoidance (BIS) motivational traits for potential use in typical community or clinical settings.

METHODS: A set of 75 messages about physical activity were developed across five message conditions: (1) gain-framed desirable outcome, (2) gain-framed undesirable outcome, (3) neutral, (4) loss-framed desirable outcome, and (5) loss-framed undesirable outcome. Two
samples (n=800 undergrads, and n=400 primary care patients) rated the messages on three semantic differential scales (gain/loss, cost/benefit, positive/negative outcomes), and completed a PA self-report measure. Motivational traits were assessed in the undergrad sample. RESULTS: Content ratings conformed to the expected linear pattern according to message condition on all three ratings scales in both samples while controlling for age, race and PA (F(df)=302.5(4); p<.001). Bivariate associations supported expectations that BAS trait would be significantly related to ratings of gain-framed messages (β = 0.30; p<.05), and negatively related to ratings of loss-framed messages (β = -0.30, p<.05). Further, BAS was significantly related to rating of neutral messages (β = 0.23; p<.01). Structural equation modeling supported the influence of BAS on ratings of gain-framed and neutral messages (β= -0.05; p<.05), but the relationships between BIS and loss-framed message ratings were reduced to non-significant values (BIS = -0.24; p<.05) while controlling for self-reported PA. CONCLUSIONS: Approach motivation may be particularly important in the perception of message content when messages are gain-framed. More work is needed to understand how personality interacts with message content to influence the degree of message processing in the context of physical activity promotion.

1521 Board #196 June 1 9:00 AM - 10:30 AM Promoting Physical Activity among African Americans through Policy Level Intervention Pamela G. Bowen1, Maria Psiu1, Bisalaka Sen1, Michelle Y. Martin2. 1The University of Alabama at Birmingham, Birmingham, AL; 2University of Tennessee Health Science Center, Memphis, TN. Email: pbowen@uab.edu (No relationships reported)

Physical inactivity results in nearly $313$ billion of healthcare costs. The American College of Sports Medicine’s “Exercise is Medicine Initiative (EIM)” expects healthcare providers (HCPs) to actively promote regular physical activity (PA) to patients in order to prevent many chronic diseases. EIM is especially important for minorities. Disproportionately, African Americans (AAs) are physically inactive. PA is an understudied, evidence-based approach to prevent obesity, diabetes, and heart disease. These conditions are extremely frequent among AAs and could be prevented with a program of regular PA. Having policies to encourage PA discussions by HCPs at each clinic visit may actually hold promise because many adults visit their HCPs yearly and patients value PA counseling from their HCPs. The purpose of this study is to determine what policies (or lack of policies) are in place to support HCP discussions of PA and whether a policy level intervention can increase the frequency of those discussions in a safety-net clinic in Birmingham, Alabama. Methods: A pre-post design has began at the clinic in three phases: 1) Policy and Baseline Assessments including reviewing all policy manuals for policies that promote PA discussions and interviewing PA patients instantly following their HCP visit for self-reported occurrence of PA discussion. 2) Policy Development and Implementation of a new policy that promotes PA discussions during the HCP visit, and 3) Policy Evaluation including interviewing patients post policy implementation to assess if PA was discussed and obtain HCPs feedback on the policy change. Preliminary Results: 1) No policies to encourage PA discussions by HCPs were found in policy manuals of the clinic; 2) 60 patients (age range 29-71) were interviewed. Only 5 patients stated that PA was discussed during their clinic visit. We have developed a “PA Discussion” policy to guide PA discussions with patients at each clinic visit. Policy will be implemented in January 2017. We are currently adding EIM assessment questions to the electronic medical record to assess physical inactivity status of patients. Answers to these questions will assist HCP with tailored PA discussions. Conclusion: This study will help fill the gap in understanding whether policies to increase PA discussions are needed in this safety net clinic.

1522 Board #197 June 1 9:00 AM - 10:30 AM Physical Activity Mode and Survival in U.S. Adults Gabriel A. Benavidez, Peter D. Hart, 59501. Montana State University - Northern, Havre, MT. Email: gabe.benavidez72@gmail.com (No relationships reported)

PURPOSE: Physical activity (PA) is a preventive health behavior that protects against chronic disease as well as premature mortality. Many studies have shown the necessary amounts of PA needed to produce positive health outcomes. However, less is known about the specific modes of PA and health outcomes. Therefore, the purpose of this study was to examine the protective effects of different modes of PA on all-cause mortality in adults. METHODS: Data for this research came from the 2001-2002 National Health and Nutrition Examination Survey (NHANES). Participants 18+ years of age who were eligible for mortality linkage were used in the analysis. Different modes of PA were determined from a series of questions asking respondents if they participated in transportation (TPA), home/yard (HPA), moderate recreational (MPA), vigorous recreational (VPA), or muscle strengthening (MSPA) physical activity. Those respondents answering “yes” to either question were considered participating in that PA mode. Cox proportional hazards regression was used to model the effects of PA mode on mortality while controlling for age, sex, race, and income. RESULTS: A total of 5,985 adults were included in this analysis with a mean (median) person-year follow-up of 9.24 (9.83) and 965 deaths. Weighted prevalence estimates for TPA, HPA, VPA, MPA, and MSPA were 24.1% (SE=1.7), 64.0% (1.1), 38.4% (1.5), 52.1% (1.6), and 29.7% (1.7), respectively. Adults were at less risk of mortality if they participated in TPA (HR=0.57, 95% CI: 0.46, 0.70), HPA (HR=0.90, 95% CI: 0.33-0.55), VPA (HR=0.30, 95% CI: 0.23-0.38), MPA (HR=0.53, 95% CI: 0.45-0.62), and MSPA (HR=0.44, 95% CI: 0.32-0.60). In the unadjusted model, a 37% decrease in mortality (HR=0.63, 95% CI: 0.56-0.70) was seen for each additional PA mode adopted. The adjusted model showed a 24.0% decrease in mortality (HR=0.76, 95% CI: 0.67-0.85) for each additional PA mode adopted. CONCLUSIONS: Results from this study indicate that various types of PA protect adults from all-cause mortality. Additionally, a dose-response relationship exists between the number of PA modes adopted and risk of mortality.

1524 Board #199 June 1 9:00 AM - 10:30 AM Lifestyle And Socio-Demographic Factors Determining The Coronary-Arterial Disease Risks in Brazilian Free-Living Adults RAFAEL R. FERREIRA, Hugo Kano, Pedro Rodstein, Franz Burini, Roberto C. Burini. FACSM, UNESP Medical School, Botucatu, Brazil. (Sponsor: Roberto Carlos Invernizi, FACSM) Email: rezendeferreira.r@gmail.com (No relationships reported)

PURPOSE: Coronary heart disease(CHD) continues to be a leading cause of morbidity and mortality among adults worldwide. The risk factors include complications of Metabolic Syndrome(MetS) and environmental factors. The Framingham score(FS) is a predictive algorithm developed using categorical variables, allowing the 10-yr prediction of multivariate CHD risk in patients without overt CHD. The purpose is to determine the intrinsic and the involved environmental factors of CHD in free-living adults. METHODS: A lifestyle modification program(LSM) involving dietary counseling and regularly supervised physical activity (“Move for Hearts”) has been used here since 1991 for NCDs primary care. In a cross-sectional study we used the baseline data from 709 subjects(2005-2016), older than 35 yrs. The FS distribution was used as main variable and, as co-variablessocio-demographic, behavioral, dietetic and physical fitness/anthropometric and clinical-biochemical.
these accomplishments, were used IPAO(long-version), Healthy Eating Index(through 24-h food intake recall), body weight, height and electrical bio-impedance, clinical signs and fasting plasma markers of insulin resistance(HOMA-IR), inflammatory( hs- CRP) and oxidative(MDA and uric acid) states. Statistical comparisons were defined by p<0.05. RESULTS: The top quartile of FS was found as ≥10% for females(F) and ≥15% for males(M) and, they differed from the lower quartile (≤5% and ≤5%, respectively), by presenting 1.81x higher either HOMA-IR, 1.6x hs-CRP and 1.6x MDA value. Furthermore, VO2max was 2.6x higher in p75(77.19 F and 73.1%M) than p25(28.1%F and 26.9%M) with p75 being fatter(bigger BMI), total body and abdominal fatness) with lower physical activity, lower aerobic capacity, lower either muscle mass and hand grip force. The p75 FS subjects presented also lower schooling and lower income.Their poor diet quality (HEI) was characterized by being more processed foods(higher CHO/fibers and sodium/potassium ratio), higher daily consumption of oils(olive PUFAs) and cholesterol and, less amounts of MLEA, fruits and vegetables (and fibers).

CONCLUSIONS: The higher FS(moderate CHD risk) of this community followed markers of the MetS aggravation, having inadequate dietary quality and physical unfitness as environmental factors.

1525 Board #200 June 1 9:00 AM - 10:30 AM

Is Grip Strength Related to Metabolic Risk Factors and Cardiorespiratory Fitness?

Zhengheng Wang, FACSFM, Yan Wang1, Yu Wang1, Xiaolan Zhao1, Qun Zhang1, Juan Wang1. BEIJING SPORT UNIVERSITY, BEIJING, China. 1The 180th Hospital of PLA, QUANZHOU CITY, China. 2Southwest Hospital, Third Military Medical University, CHONGQING CITY, China. 3Jiangsu Province Hospital, NANJING CITY, China.

Email: zhenghengwang1005@hotmail.com

(No relationships reported)

PURPOSE: Grip strength is very easy to be measured, and is an index to reflect people’s muscle strength. This study aimed at detecting if there are relationships between grip strength and metabolic risk factors and cardiorespiratory fitness.

METHODS: The 1925 people were recruited (men: 1425, female: 490; average age 1527 ±1 years; BMI of 25.5 ± 7.2 kg/m²). Accelerometers were used to measure PA levels and sedentary time. The Beck Youth Inventory was used to measure mental health.

RESULTS: There was a significantly positive correlation between the change in sedentary time and the BDSS-Y (Disruptive Behavior). Recreational therapy free time allotted in the warmer months (16.4 ± 2.6 hr wk⁻¹) was higher than the cooler months (8.2 ± 2.8 hr wk⁻¹)(t=52.7, p<0.01); however most participants chose to be sedentary. There was a significant inverse correlation (r=0.71, p<0.01) between the change in recreational therapy time and the BDSS-Y. In comparison to norms using the same cut-points, the present study’s participants fall within the 10th percentile of total counts per day (TAC-d’) when matched for sex and average age. Moreover, participants were in the 5th percentile when matched for sex and average age for light physical activity. CONCLUSION: The present study supports the importance of structured PA programs and a need to reduce sedentary time and increase light PA for adolescent males living in a treatment facility for sexual health behaviors.

Keywords: adolescent, physical activity, psychology, special needs populations, health behavior

In adults emerging evidence suggests that games-based activity acutely stimulates anti-inflammatory and inhibits pro-inflammatory cytokine production, proposed to induce cardio-metabolic health benefits. The acute effects of high-intensity intermittent games on adolescent cardio-metabolic health remain unexplored. PURPOSE: To examine the effects of an acute bout of games-based activity on adolescent cardio-metabolic health. METHODS: Following ethical approval 18 adolescents (12.5±0.6 y) completed an exercise (E) and resting (R) trial in a counter-balanced, randomised crossover design. Following a standardised breakfast (1.5 kg/gm carbohydrate), participants completed 1 h games-based activity (basketball). Capillary blood samples were taken at baseline, immediately and 1 h post-exercise. A standardised lunch was consumed (1.5 kg/gm carbohydrate) and capillary blood samples were taken 30, 60 and 120 min post-lunch. A final blood sample was taken the following morning. Capillary blood samples were analysed for blood glucose, plasma insulin and cytokine (IL-6, IL-10, IL-1ra, IL-1β, IL-8 and TNF-α) concentrations. Data were analysed using repeated measures ANOVA and paired sample t-tests in SPSS. RESULTS: The blood glucose response to lunch was attenuated following exercise (trial*time interaction, p=0.008), with a tendency for a lower peak blood glucose concentration on the exercise trial (E: 5.6±0.7mmol L⁻¹, R: 6.3±1.4mmol L⁻¹, p=0.070). Similarly, the plasma insulin response was attenuated (trial*time interaction, p=0.002), with a lower peak plasma insulin concentration on the exercise trial (E: 217±29.2 pmol L⁻¹, R: 366.1±45.3 pmol L⁻¹, p=0.001). IL-6 was higher in the control trial (E: 4.22±0.80 pg mL⁻¹, R: 3.46±0.69 pg mL⁻¹, p=0.005) and there was a tendency for TNF-α to be attenuated (E: 1.24±0.22 pg mL⁻¹, R: 1.34±0.23 pg mL⁻¹, p=0.081) on the exercise trial. Exercise had no effect on the remaining cytokines. CONCLUSION: High-intensity intermittent games-based activity attenuated postprandial blood glucose and plasma insulin concentrations, whilst demonstrating an increase in IL-6 concentration, potentially mediating the reduced TNF-α concentrations. Thus high-intensity games-based physical activity elicits cardio-metabolic health benefits in adolescents.

1527 Board #202 June 1 9:00 AM - 10:30 AM

Effect of High Intensity Intermittent Games-Based Activity on Adolescent Cardio-Metabolic Health

Karah J. Dring, Simon B. Cooper, Maria L. Nute, John G. Morris, Caroline Sunderland, Gemma Foulds, Graham Pockley, Mary E. Nevill. Nottingham Trent University, Nottingham, United Kingdom.

Email: karah.dring@nttu.ac.uk

(No relationships reported)

1528 Board #203 June 1 9:00 AM - 10:30 AM

Associations of Aerobic and Strength Exercise with Clinical Laboratory Test Values

Maren S. Fragala, Caixia B., Matthew A. Chaump, Harvey W. Kaufman, Martin H. Kroll. Quest Diagnostics, Madison, NJ.

Email: maren.s.fragala@questdiagnostics.com

Reported Relationships: M.S. Fragala: Salary; Employee of Quest Diagnostics.

PURPOSE: Physical exercise is known to affect levels of blood-based biomarkers. However, exercise status is generally not considered in the interpretation of common laboratory results. This study examines the associations of habitual aerobic and exercise strength participation with laboratory test results.

METHODS: The effects of self-reported days per week of aerobic and strength exercise participation on laboratory test results for 26 biomarkers in adults aged 18 to 34 years (n = 80,111) were evaluated using percentile distribution analyses and multivariate regression. RESULTS: Days per week of self-reported exercise participation was associated with significant shifts in results for most biomarkers evaluated. In both men and women, more days per week of either aerobic or strength exercise were significantly associated with lower levels of glucose, hemoglobin A1c, LDL cholesterol, total cholesterol, triglycerides, estimated glomerular filtration rate,
globulin, and C-reactive protein, and significantly higher levels of HDL cholesterol, creatinine, iron, and percent saturation (all p<0.05). Exercise frequency had no significant effect on thyroid stimulating hormone levels in men or women. Type of exercise or gender influenced the observed relationships with exercise frequency for total cholesterol, aspartate aminotransferase, gamma-glutamyl transpeptidase, alkaline phosphatase uric acid, bilirubin, and iron binding capacity. CONCLUSIONS: Physical exercise participation is associated with levels of many common biomarkers. Both forms of exercise shifted the distribution of results into the direction suggestive of better health, yet the majority of results still tended to fall within reference intervals. Reported relationships may help clinicians and patients to better understand and interpret laboratory results in athletic populations and possibly re-evaluate interpretation of reference intervals for physically active populations.

INTRODUCTION

Decreased blood flow to vital organs such as liver and kidney during muscular exercise could alter the hepatic function. PURPOSE: To investigate the effect of an acute bout of exercise on the hepatic function of the athletic and non-athletic adult males and to observe if they respond differently to the same exercise intensity. METHODS: 20 football players and 19 non-athletes were recruited for this observational study following the inclusion and exclusion criteria. Blood samples were taken pre- and post- 90 minute football matches, from all subjects. The student's t-tests were used to compare values within and between the two groups. Results: The baseline serum urea (2.90±0.1 vs 3.77±0.2), and creatinine (70.05±2.3 vs 81.90±3.0) significantly (p<0.05) increase with a significant decrease (P<0.05) in potassium levels (4.26±0.1 vs 4.60±0.1) and AST activity (26.85±2.1 vs 18.85±1.5) post-exercise in the athletic group. significant (P<0.05) decrease in the baseline serum ALT activity (38.78±3.1 vs 31.84±2.0) post-exercise was observed in the non-athletic group. The post-exercise serum albumin (49.85±1.0 vs 40.89±1.8), total protein (82.70±1.1 vs 73.26±3.7), albumin (3.77±0.2 vs 2.86±0.1) and creatinine (81.90±3.0 vs 55.63±4.8), were significantly higher (p<0.05) in the athletic group compared to the non-athletic. While the ALT activity (22.40±1.2 vs 31.84±2.0) and sodium (137.15±3.0 vs 141.78±0.7) was significantly lower (p<0.05) in the athletic compared to the non-athletic group. However, the post-acute muscular exercise serum ALP, TBIL, CBIL, and bicarbonate show no significant differences within and between the groups. Conclusions: Acute muscular exercise of same intensity altered hepatorenal function indices of athletes differently from the non-athletes and adaptive response seems to explain this finding.

KEY WORDS: Acute muscular exercise - athletic - hepatic function

REFERENCES


S322 Vol. 49 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #204 June 1 9:00 AM - 10:30 AM
The Effect Of Acute Muscular Exercise and Training Status On Hepatorenal Functions

Ibrahim MUSA, kogi state university, anyigua, Nigeria.
Email: ibroph@yahoo.com

(No relationships reported)

INTRODUCTION

The median symptom score (SS) at injury was 37 [interquartile range (IQR): 25.5-50] and no significant difference was observed in SS at injury (p=0.4719), SS at initial clinic visit (p=0.4146), or days from injury to initial clinic visit between the two groups (p=0.3725). The median of symptom resolution for youth in the exercise participation groups was 16.5 (IQR: 10-24) days which was statistically significantly longer than youth in the comparison group (median=12 days, p=0.0192) after adjusting for other covariates. However, no statistically significantly difference was found in days from first clinic visit to symptom resolution between the two groups (p = 0.118). CONCLUSIONS: Prescription of exercise during recovery from concussion did not shorten the duration of symptoms from time of injury, however it did not lengthen the time to recover from concussion when measured from the first physician visit. Further research with prospective design is warranted to evaluate the effect of non-contact exercise prescription on concussion recovery among youth.

The literature on the mechanisms by which Tai Chi interventions improve balance is limited and divergent. PURPOSE: To systematically review the literature on Tai Chi trials aimed at improving balance to gain insight into the mechanisms that mediate the reported balance improvements. METHODS: Database searches identified 26 randomized control Tai Chi trials with the purpose of improving balance that proposed and/or measured mechanism(s) among older adults (≥60 yr). RESULTS: Qualifying Tai Chi trials (n=26) proposed and/or measured 10 different mechanisms and used 19 different balance assessments. Nearly three quarters (71.3%) of the trials reported significant improvements in balance. Sensory function was the most commonly reported mechanism to improve balance (n=14, 53.8%). However, the majority (n=11, 73.6%) of these did not measure sensory function. The three trials (21.4%) that measured sensory function (i.e., proprioception) with peripheral mechanoreceptor acuity assessments chose balance measurements not designed to challenge sensory function. Furthermore, none of these three trials observed significant improvements in balance and sensory function simultaneously. Neurocognitive function was the second most commonly reported mechanism to improve balance (n=11, 42.3%). The majority (n=10, 90.9%) of these did not measure neuromuscular function. The one trial that measured neuromuscular function (i.e., muscle reaction time) with electromyography, selected balance measurements designed to challenge neuromuscular function (i.e., the Timed Up and Go Test). This trial also found significant improvements in both balance and neuromuscular function. CONCLUSION: The mechanisms by which Tai Chi interventions improve balance remain elusive because: 1) most trials (61.5%) do not measure the mechanism proposed to be the mechanism for balance improvement; and (2) when the proposed mechanism was measured, trials rarely chose balance measurements that matched the proposed mechanism. Future Tai Chi trials aimed at improving balance are needed that align the proposed mechanism with the appropriate balance measurement so that the mechanisms by which Tai Chi improves balance can be identified.

S322 Vol. 49 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

Board #205 June 1 9:00 AM - 10:30 AM
Effect Of Exercise On Patients With Concussion

Justin Stumph1, Julie Young2, Honggang Yi1, Ginger Yang2, Anastasia Fischer, FACSM.1 Ohio University Heritage College of Osteopathic Medicine, Dublin, OH.1 Nationwide Children’s Hospital, Columbus, OH.
Email: js984513@ohio.edu

(No relationships reported)

PURPOSE: To examine the effect of exercise prescription on days from injury to symptom resolution and on days from first clinic visit to symptom resolution among youth with sports-related concussions presenting to a concussion clinic.

METHODS: Data were retrospectively analyzed using electronic health records from seven concussion clinics at a pediatric hospital in the Midwest. Patients ages 10-17 years with a sports-related concussion (SRC) who presented to the clinics within 30 days post-injury, from May 2015 to May 2016 were included in the study. Youth in the exercise prescription group were prescribed non-contact exercise before symptom resolution while youth in the comparison group were prescribed exercise after or after symptom resolution. Unadjusted and adjusted generalized linear regression models were used to model the effect of active exercise prescription on days to symptom resolution, adjusting for age, sex, history of previous concussion, days from injury to initial visit, and symptom score at time of injury.

RESULTS: Of 357 (male=229, female=128) concussed youth included, 204 (57.1%) were in the exercise prescription group and 153 (42.9%) were in the comparison group. The median symptom score (SS) at injury was 37 [interquartile range (IQR): 29.5] for the exercise prescription group and 36 (IQR: 32.0) for the comparison group. No statistically significant differences were observed in SS at injury (p=0.4719), SS at short-term Effectiveness Of Home Based Exercise To Change Lifestyle In Not Communicable Disease

Gabrielle Mascherini, Chiara Giannelli, Giulia Gherarducci, Sonia Degl’Innocenti, Pietro Cristiani, Giorgio Galanti.1 University of Florence, Florence, Italy. Sport Medicine Center, Florence, Italy.
Email: gabriele.mascherini@uniﬁ.it

(No relationships reported)

PURPOSE: Supervised exercise has shown remarkable effectiveness, but is associated to poor compliance at long term. In this study, we aimed to verify if a home-based exercise program is effective in physical fitness related to health parameters management of a cohort of breast cancer survivors. METHODS: Experimental cohort observational study. We enrolled 13 women (age 49.1±5.5, height 163±7.3 cm) survivors to a breast cancer. At baseline were assessed the lifestyle in term of physical activity with accelerometer (Sensewear Bodymedia) and physical fitness related to health in term of aerobic capacity by 6 Minutes Walking Test (6MWT) and muscular strength and flexibility (Sit & Reach, grip and lower limbs strength (Hand Grip and 30” Chair Test) and body composition (anthropometrics parameters, skinfold thickness and bio impedance). Home based exercise was prescribed for 40 days with two target: - Fast walking activity in terms of weekly session, minutes per session and intensity with heart rate, rate of perceived exertion (CR10) and steps per minute; - Individually daily steps target Parameters of physical fitness related to health before and after 40 days of unsupervised exercise were compared (t-test for paired data).RESULTS: At baseline (T0), patients displayed a moderate level of physical activity (PAL=1.5±0.1, daily steps=85693±21071.0) and were overweight (BMI=26.5±3.6 kg/m²). After 40 days of
unsupervised exercise (T1), we observed improvement of all analyzed parameters with statistical significance in waist circumference (T0=92.4±8.5 cm, T1=89.5±7.9 cm; p<0.01), distance walked in 6 MWT (T0=451.4±168.1 m, T1=534±151.5 m; p<0.05), 30 ’’Chair test (T0=14.8±5.6 sec, T1=16.3±4.9 sec; p<0.05). CONCLUSION: Home-based unsupervised exercise in breast cancer survivors yielded short-term efficacy in all analyzed parameters. To change the lifestyle in terms of physical activity it is necessary to create a model that allows long-term therapeutic efficacy. Unsupervised approach, in comparison with supervised one, allow a reduction of the cost related to the treatment of not communicable disease with exercise therapy. Efficacy at long-term and a possible effect in reducing the risk of tumor relapse remain to be elucidated in larger cohorts with longer and multidisciplinary follow up.

Aquatic exercise has been proven to be an effective modality for improving health, physical fitness, daily living, and quality of life. The aquatic environment is particularly beneficial for individuals finding weight bearing difficult due to joint pathology, increased fall risk, or other conditions restricting or limiting weight based exercise. PURPOSE: To validate a group based aquatic exercise program used by Veterans at Canandaigua’s VA Medical Center. METHODS: 7 Male Veterans (age = 68.7±10.75) medically cleared and referred for supervised exercise by their primary care provider and who volunteered or were recommended by Exercise Physiology staff participated in the aquatic exercise program. All participants were taught how to progress, regress, or modify exercises based on their individual needs. This individualized strategy, coupled with a cardio-respiratory stage training protocol, facilitated a safe and effective exercise program in a group setting. Baseline and annual testing to measure physical abilities and improvements were done via the 10-meter walk, 30-second chair stand, and the 8-foot up and go. Health based testing consisted of Pre/Post weight, abdominal circumference, and blood pressure. Additionally, health surveys regarding falls and participant satisfaction were administered during each Pre/Post test. RESULTS: Participants had a mean weight reduction of 22.93 lbs (p=0.01249), 1.79 inch decrease in abdominal circumference (p=0.02823), 15% reduction in systolic blood pressure (p=0.0411), 12% reduction in diastolic blood pressure (p=0.008556), 2.04 sec. improvement on gait speed via 10 meter walk (p=0.000239), 6.72 rep improvement for 30 sec. chair stand (p=0.01899), 1.698 sec. improvement on 8-foot up and go (p=0.000369), 28.6% improvement in reported falls from baseline, and a program satisfaction rating of 96%. CONCLUSION: Significant improvements in both health and fitness-based testing results were observed. These outcomes are known to prevent, reduce, or treat a vast array of chronic diseases and disabilities, improve functional capacity, and reduce all-cause mortality rates. Our results support previous research and demonstrate the effectiveness of an individualized and progressive group-based aquatic exercise program for the Veteran population.

Exercise is Medicine®/Poster - EIM - Psychological Aspects, Bone, Muscle and Cartilage
Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

C-42

Exercise is Medicine®/Poster - EIM - Psychological Aspects, Bone, Muscle and Cartilage
Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

Strength Training In Patients With Schizophrenia: Effects On Muscle Force Generating Capacity
Mona Nygaard1, Mathias F. Brobakken1, Ismael Cünneyt Güzey1, Gunnar Morken1, Einar Vedul-Kjelsås1, Eivind Wang1, Jørn Heggelund1.1The Norwegian University of Science and Technology, Trondheim, Norway. 2St. Olav’s University Hospital, Trondheim, Norway. (No relationships reported)

Patients with schizophrenia are inactive, have impaired physical function and slowed performance in motor tasks. As a countermeasure, maximal strength training (MST) with high load and few repetitions improves muscle force generating capacity and physical function during daily activities. PURPOSE: Investigate the effect and feasibility of MST as a part of standard clinical treatment of patients with schizophrenia. METHODS: 11 male and 6 female outpatients (37±10(SD) yrs, ICD-10 schizophrenia, schizophrenal or delusional disorders (F20-F29)) were randomized to either a training group (TG), performing leg press MST (4 repetitions, 4 sets, at ~90% of one repetition maximum (1RM)) twice a week for 12 weeks at the hospital exercise training clinic, or a control group (CG) following traditional guidelines for physical activity. RESULTS: 5/9 patients in the TG completed >85% of the training and were included in the statistical analysis. After MST, 1RM and muscle rapid force development (work/time) with a load ~70% of 1RM increased 43% (233±33 to 333±50 kg, p<0.05) and 36% (408±108 to 555±137 Nm·s⁻¹, p<0.05), respectively. These improvements in muscle force generating capacity were ~twofold larger (p<0.05) compared to the CG which had improvements of 23% in 1RM (182±66 kg to 223±89 kg, p<0.05) and 16% in rapid force development (391±223 to 454±227 Nm·s⁻¹, p<0.05). CONCLUSIONS: MST yielded larger improvements in functionally relevant muscle force generating capacity compared with conventional treatment, and suggest that MST should be implemented as a part of standard clinical practice for optimal exercise rehabilitation benefits. Supported by grants from the Norwegian Extrafoundation for Health and Rehabilitation, The Liaison Committee between the Central Norway Regional Health Authority and the Norwegian University of Science and Technology, and The Norwegian Directorate of Health.

Exercise As An Augmentation To Antidepressant Treatment For Depression: Results From A 12-week Pilot Intervention Study
Swathi Gujral1, George Grove1, Howard Aizenstein2, Charles F. Reynolds, III1, Kirk J. Erickson1,1University of Pittsburgh, Pittsburgh, PA. 2University of Pittsburgh Medical Center, Pittsburgh, PA. Email: swk24@pitt.edu (No relationships reported)

Purpose: To examine the efficacy of aerobic exercise to augment anti-depressive effects of a 12-week Venlafaxine trial to treat Major Depression in older (60-79 yrs.) and younger (20-39 yrs.) adults.
METHODS: Participants included adults with Major Depression. All participants were sedentary (<20 minutes exercise 3 times per week), had no contraindications for aerobic exercise, were cognitively unimpaired, and were eligible to undergo an MRI. Participants were randomized to a 12-week trial of Venlafaxine only or Venlafaxine + Aerobic Exercise. All participants met with a clinician biweekly for medication management. The exercise group additionally received 1 hour of supervised aerobic exercise 3 times per week for 12 weeks. All participants completed cardiorespiratory fitness testing (VO2max) and the Montgomery-Asberg Depression Rating Scale (MADRS) at baseline and follow-up.
RESULTS: Twelve participants were randomized, but two dropped out (one from each group). The resulting sample included 10 adults (mean age = 38.7, 40% male, 90% Caucasian). At baseline, participants had a mean MADRS score of 26.10 (5.04) and a mean estimated VO2max of 29.6±6.01. Across both groups, there was a decrease in depressive symptoms over 12-weeks (t= 6.60, p < 0.001). The Venlafaxine only group (N=5) showed a mean decrease of 16 points on the MADRS and the exercise group (N=5) showed a mean decrease of 19.8 points. The exercise group showed a mean increase of 4.74% (SD = 12.11%) in fitness, while the Venlafaxine only group showed a mean decrease of 8.71% (SD = 17.05%) (p=0.20). There was a negative association between change in fitness level and change in depressive symptoms (r = -0.71, p = 0.03). The trajectories of change in depressive symptoms across the treatment groups did not differ (MADRS X Treatment F= 0.112 p = 0.75). The exercise and no-exercise group showed the same trajectory of changes in depressive symptoms over the first 4 weeks, but the exercise group showed more consistent decline than the Venlafaxine only group for the last 2 months.
CONCLUSIONS: Participants showed improvement in depression symptoms across both treatment groups. Change in fitness was negatively associated with change in depressive symptoms, suggesting a dose-response effect of exercise on depressive symptoms. Supported by NIH Grant: P30 MH09333

C-42
Poor physical health is a growing concern in patients with schizophrenia. Peak oxygen uptake (VO_{\text{2peak}}) is recognized as a strong predictor of cardiovascular mortality, but cardiovascular risk profiles including VO_{\text{2max}} are scarce in this population.

**METHODS:** We investigated the physical health in 22 patients, 14 men (37±9 (SD) years) and 8 women (37±10 years), diagnosed with schizophrenia (ICD-10, schizotypal or delusional disorders; F20-F29). Measurements included included state of the art cardiovascular risk profiles obtained from blood samples, BMI, waist circumference, blood pressure, as well as lipid profiles obtained from blood samples.

**RESULTS:** VO_{\text{2peak}} was 35.3±9.5 mL•kg^{-1}•min^{-1} (men) and 24.9±7.5 mL•kg^{-1}•min^{-1} (women), and this was 19% and 35% lower, compared with reference data for healthy men and women, respectively. BMI (27.4±16.5 kg/m²) was high at risk for developing cardiovascular disease, and are strengthened by utilization of direct assessment of VO_{\text{2max}} in the risk profile determination.

Supported by grants from the Norwegian ExtraFoundation for Health and Rehabilitation, The Norwegian Directorate of Health, The Liaison Committee between the Central Norway Regional Health Authority and the Norwegian University of Science and Technology.

**CONCLUSION:** Taken together, our data show that patients with schizophrenia are high at risk for developing cardiovascular disease, and are strengthened by utilization of direct assessment of VO_{\text{2max}} in the risk profile determination.

**Purpose:** To examine the extent patient and trial characteristics moderate the antidepressant effects of exercise among PwMS.

**Methods:** Twenty-four effects were derived from 14 articles published before August 4-7 with a mean of 5.79±0.80. Exercise training significantly reduced depressive symptoms in obese adolescents.

**Conclusion:** The positive changes in psychological outcomes are independent of the intensity of exercise training. Supported by CNPq (grant 477985/2009-6) and FACEPE (grant 0928-4.9/08).

**Table 1:** Effect of low vs high intensity training on self-esteem, depressive and anxiety symptoms in obese adolescents.

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n=28)</th>
<th>24 weeks (n=28)</th>
<th>P values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G</td>
<td>T</td>
<td>GXT</td>
</tr>
<tr>
<td>BDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIT</td>
<td>19.86±7.75</td>
<td>12.29±5.69</td>
<td>0.77 &lt;0.01 0.40</td>
</tr>
<tr>
<td>LIT</td>
<td>18.86±8.44</td>
<td>14.85±10.14*</td>
<td></td>
</tr>
<tr>
<td>RSES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIT</td>
<td>19.79±6.25</td>
<td>21.69±4.33</td>
<td>0.82 0.11 0.60</td>
</tr>
<tr>
<td>LIT</td>
<td>20.71±5.05</td>
<td>21.46±4.54</td>
<td></td>
</tr>
<tr>
<td>STAI-State</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIT</td>
<td>41.07±11.26</td>
<td>38.00±13.26</td>
<td>0.85 0.21 0.81</td>
</tr>
<tr>
<td>LIT</td>
<td>39.79±10.48</td>
<td>38.54±13.16</td>
<td></td>
</tr>
<tr>
<td>STAI-Trait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIT</td>
<td>45.71±9.49</td>
<td>37.43±11.37*</td>
<td>0.92 &lt;0.01 0.21</td>
</tr>
<tr>
<td>LIT</td>
<td>43.86±8.34</td>
<td>40.92±11.12*</td>
<td></td>
</tr>
</tbody>
</table>

BDE: Beck Depression Inventory; STAI: Spielberger State-Trait Anxiety Inventory; RSES: Rosenberg Self-Esteem Scale; HIT: High Intensity Training group; LI: Low Intensity Training group; *vs baseline (p<0.05); G: group; T: time.

**Conclusion:** The results from the present study suggested that in obese adolescents the positive changes in psychological outcomes are independent of the intensity of exercise training. Supported by CNPq (grant 477985/2009-6) and FACEPE (grant 0928-4.9/08).

**Purpose:** To examine the extent patient and trial characteristics moderate the antidepressant effects of exercise among PwMS.

**Methods:** Twenty-four effects were derived from 14 articles published before August 4-7 with a mean of 5.79±0.80. Exercise training significantly reduced depressive symptoms in obese adolescents.

**Conclusion:** The positive changes in psychological outcomes are independent of the intensity of exercise training. Supported by CNPq (grant 477985/2009-6) and FACEPE (grant 0928-4.9/08).
for recurrent themes relating to PA and diet using a deductive thematic analysis, employing Self-Determination Theory (SDT) as a theoretical framework. Themes were identified based on the explicit meanings of the data, until the point of saturation. Results: Three major themes, each with two respective sub-themes, were identified as influencing participants’ engagement with PA and dietary choices. These were: 1) situational (sub-themes: school culture and family/home culture); 2) motivation (sub-themes: self-efficacy and social connectedness); and 3) wider environmental influences (sub-themes: weather and availability and price). Overall, the school and home environments were found to have the strongest influence on participants’ lifestyle behaviours, but in very distinct and often conflicting ways. School structure, high self-efficacy, and social connectedness facilitated increased physical activity and healthier diet in adolescents with intellectual disabilities, whereas home life, low self-efficacy and a lack of social connectedness can serve as a barrier to PA and a healthy diet. Conclusions: Adolescents’ environment and social interactions play a pivotal role in influencing physical activity and dietary patterns. These findings suggest that influences on the young people in this population’s PA and dietary patterns are multifaceted and complex in nature.

The study was funded by the Baily Thomas charitable fund.

PURPOSE: To quantify the relationship between adipose mass (absolute and relative) and bone mineral density (BMD) in overweight and obese populations.

METHODS: The protocol for this review was designed in accordance with PRISMA guidelines. An electronic search of the literature was undertaken using three databases (Medline, Embase and Science Direct) and supplemented through screening the reference lists of retrieved and review articles. Outcome measures included a measure of adipose mass (kg or %BM) and BMD (g/cm²) of the total body, lumbar spine, total femur or femoral neck from overweight and obese individuals. A multi-level meta-regression model was used to obtain pooled estimates of the magnitude and direction of reported correlations, whilst investigating the effect of potential moderators (sex, age and BMI class). The protocol was prospectively registered in PROSPERO (CRD42015024313).

RESULTS: Sixteen studies, including 2587 participants and 75 correlation coefficients were included. Opposing relationships between BMD and adiposity, expressed as an absolute or relative quantity, were reported. Absolute adiposity was positively correlated and relative adiposity was negatively correlated with BMD. Sex and age were the primary moderators of these relationships, as a significant negative correlation between relative adipose mass and BMD was shown in men (R=−0.37; 95% CI: −0.57, −0.12) and in those aged <25 years (R=−0.28; 95% CI: −0.45, −0.08).

CONCLUSIONS: Increasing levels of adipose mass exert a negative influence on BMD, but only when considered relative to total body mass. These results highlight the importance of optimizing body composition over weight loss per se, which is particularly relevant in men and younger individuals. In order to protect bone mass in overweight and obese populations, exercise and nutrition based interventions that focus on a controlled reduction of adipose mass with concomitant preservation of lean mass are required.

PURPOSE: Yi-Jin-Jing, one common mind-body Chinese tradition exercises, is not or very little studied for being potentially utilized to treatment of bone-related disorders. The primary purpose of this randomized clinical study was to assess the effectiveness of Yi-Jin-Jing training on changes of the sex hormones and bone mineral density in Chinese older women.

METHODS: Twenty-four older women between 60-69 years old were recruited from the urban tertiary of Shanghai, China. After signing the informed consent, subjects were randomly assigned into two groups: non-exercise control group (n=12) and Yi-Jin-Jing training group (n=12). All exercise groups were trained five days per week, sixty minutes of duration for three months with Yi-Jin-Jing exercise, while control group maintained the regular daily life with no exercise. Height, body weight, BMI, bone mineral density (BMD), and female sex hormones (E2, T, FSH, and LH) were measured and analyzed. SPSS for Windows 18.0 was used for the statistical analyses and a significant level was set at P<0.05.

RESULTS: No statistically significant differences in age, height, body weight, and BMI were observed between Control and Yi-Jin-Jing groups. After three-month intervention, subjects in Control experienced decreases in BMD of all measured parts and total BMD with a statistically significant decrease in pelvis BMD; while women in Yi-Jin-Jing increased BMD in all measured parts with significant increases in trunk and total body BMD. Compared with Control, Yi-Jin-Jing-trained individuals had high BMD changes of the mean difference in trunk, pelvis, and total body. There were no significant changes of E2, T, FSH, and LH in Control; however, Yi-Jin-Jing-trained subjects had significant E2 increases and significant FSH decreases. There was a significant positive correlation between E2 and BMD (r=0.529, P=0.008) and between T and BMD (r=0.429, P=0.036). FSH showed a significant negative association with BMD (r=−0.576, P=0.003).

CONCLUSIONS: Our study indicated that Yi-Jin-Jing training may delay older women’s BMD decline, especially in trunk and pelvis. It may influence positively on the increased E2 and T levels and the decreased FSH level. Further research is needed to confirm if Yi-Jin-Jing provides protective benefits to bone health for older adults.
Effects of Well-Rounded Exercise Training on Cartilage Metabolism in Females without Radiologically Knee Osteoarthritis
Tadashi Yasuda1, Masayuki Azukizawa2, Hiroomi Ito3, Yousuke Hamamoto2, Toshiaki Nakatani1, Tadao Tsuboyama1, Makoto Matsuda2, Shuichi Matsuda3, Kobe City Medical Center General Hospital, Kobe, Japan, 1Kobe University Graduate School of Medicine, Kobe, Japan, 2Tenri University, Tenri, Japan, 3Yoshida Hospital, Nara, Japan, Email: tadasu@kcho.jp

PURPOSE: The population with osteoarthritis (OA) is increasing due to the aging society. Maintenance of healthy cartilage is essential for prevention of OA. Physical exercise is highly recommended for OA patients because of clear evidence that it reduces pain and enhances physical function of joints with OA. For older adults, exercise prescription ideally includes aerobic, muscle strengthening, and flexibility exercises. However, effects of the exercise intervention on proinflammatory cytokine cartilage metabolism remains unclear. This study was aimed to evaluate the effects of well-rounded exercise training on cartilage metabolism using systemic biomarkers in females without radiologically knee OA.

METHODS: A combination of aerobic, resistance (mainly for quadriceps and hamstrings), flexibility, and balance exercise trainings was assigned to 23 female subjects (mean age 57.9 (49 to 68), mean BMI 21.8 (18.6 to24.7)) without radiologically knee OA (Kellgren-Lawrence grade 3/4) for 90 minutes once a week during 12 weeks under supervision. The subjects were followed up during the subsequent 12 weeks. Blood and urine samples were collected at 0, 1, 2, 4, 8, 12, 16, 20, and 24 weeks from the initiation of intervention. Whereas type II collagen carboxy- and propeptide (CII) and cartilage oligomeric matrix protein (COMP) were measured using enzyme-linked immunosorbent assay (ELISA), collagenase-generated neoepitope of type II collagen (C2C) and carboxy-telopeptide of type II collagen (CTX-II) were evaluated using urine by ELISA.

RESULTS: One week after the initiation of the training, type II collagen degradation evaluated by CTT-II dropped down to lower levels, and thereafter maintained the levels by the final follow-up. Compared with the baseline, a significant decrease in CTX-II levels was found at 1, 2, 4, 8, and 24 weeks. Similarly, type II collagen clevage evaluated by C2C reduced immediately after the exercise intervention, and reached the significantly low levels at 12, 20, and 24 weeks. Type II collagen synthesis evaluated by C2C reduced immediately after the exercise intervention, and reached the significantly low levels at 12, 20, and 24 weeks from the initiation of intervention. The subjects were followed up during the whole period of intervention and the subsequent follow-up.

CONCLUSIONS: Well-rounded exercise training could decrease type II collagen degradation in females without radiologically knee OA.

Fat Oxidation and Aerobic Fitness in Postmenopausal Women: Comparing an Exercise Intervention to Long-Term Exercise
Andrew W. Froehle1, Margaret J. Schoeninger1, Susan R. Hopkins1, 1Wright State University, Dayton, OH, 2University of California, San Diego, San Diego, CA, 3University of California, San Diego, School of Medicine, San Diego, CA. (Sponsor: Drew Pringle, FACSM)
Email: andrew.froehle@wright.edu

Menopause is related to reduced fat oxidation capacity, limiting energy for submaximal activity, contributing to earlier fatigue, reducing aerobic performance and making physical activity more difficult. Exercise interventions can increase fat oxidation in sedentary postmenopausal women, but the degree to which this enhances aerobic performance is unknown. It is also unclear if postmenopausal interventions generate fat oxidation and fitness levels similar to women who are physically active before, during, and after menopause. PURPOSE: To evaluate the effects of exercise on fat oxidation and aerobic fitness in postmenopausal women by comparing a short-term intervention in sedentary women to long-term exercisers.

METHODS: Two cohorts were studied for 16 weeks: 1) Active cohort (N = 13), exercised > 5 h/wk for ≥10 years; 2) Training cohort (N = 14), sedentary, completed 16-week, 1000 MET min-week-1 intervention. Gas exchange was measured at rest and during cycle ergometer maximal exercise tests. Fat oxidation was calculated from RER at rest and during workout and exercise phases of the cycle test. Fitness variables were workloads and oxygen consumption at ventilatory threshold (workload, VO2VT), and maximal exertion (workload, VO2max). Body composition was measured with DXA to normalize O2.

RESULTS: At baseline, compared to the Active cohort, the Training cohort had less fat-free mass (P = 0.04), used 15.7% less fat energy at rest (P = 0.02) and 9.7% less fat energy during workout (P = 0.02), had a 46 W lower workload, VO2VT (P = 0.01), and 8.2 VO2max,W, (P = 0.01). At 16-weeks the Active cohort’s values did not change, but the Training cohort increased fat energy during workout (+12%; P = 0.02), workload, (−9 W; P = 0.01), workload, VO2max,W, (+16 W; P < 0.01), and VO2max,W, (+2.6 mO. kg/min; P < 0.01). At 16 weeks the cohorts differed for fitness, but did not differ for fat energy during exercise (P = 0.25). Change in fat oxidation was not correlated with change in aerobic fitness.

CONCLUSION: Exercise interventions can increase fat oxidation and aerobic fitness in sedentary postmenopausal women. Increased fat oxidation approaches the level of long-term postmenopausal exercisers, but fitness gains are not as marked and are not explained by increased fat oxidation.
RESULTS: The body mass of CON (765.7±14.8 g) was greater than that of AE (651.4±42.1 g) and RE (687.6±39.8 g) after exercise intervention (p < 0.01), the levels of total cholesterol, triglyceride, and low density lipoprotein cholesterol were also higher in CON (p < 0.05). The mRNA expression of PPARα was higher in RE than the other two groups (p < 0.01), but no difference in protein expression was observed. Greater mRNA expression of FGF-21 was observed in CON (vs. AE and RE: 1.00±0.06 vs. 0.76±0.21 and 0.83±0.10, p < 0.01), however, FGF-21 protein expression was higher in AE and RE than CON (vs. AE and RE: 1.00±1.50 vs. 0.32 and 0.59±0.38, p < 0.05). Moreover, the PGC-1α mRNA expression was higher in RE than the other two groups (p < 0.01), but the protein expression was found no difference among groups.

CONCLUSIONS: Both aerobic exercise and resistant exercise were helpful to improve blood lipid profiles in obese mice after an 8-week exercise program. In addition, the FGF-21 protein expression was increased after exercise, and the resistant exercise seemed to be more effective in activating FGF-21 pathway functions and promoting hepatic lipid metabolism.

(Supported by NSFC 31471139 and CISSRF 16-18)

1549 Board #224 June 1 8:00 AM - 9:30 AM Effects of Hypoxic Living and Exercise Training on the miR-27/PPARγ Pathway in Obese Rat Liver

yingle li, lei zhu, Lianshi Feng. China Institute of Sport Science, Beijing, China.

Email: 46878030@qq.com

(No relationships reported)

PURPOSE: To examine the effects of hypoxic living and exercise training on the miR-27/PPARγ pathway in the liver of obese rats.

METHODS: Forty 13-week-old male diet-induced obese rats were randomly divided into four groups (n=10 per group): control group (CON), hypoxia group (L), hypoxia and exercise group (LE). Rats in the hypoxia groups were exposed to an oxygen concentration of 13.6%, for 24h/day. Rats in the exercise groups were exercised on a treadmill at a speed of 25m/min, 1 hour/day, 5 days/week for a total of 4 weeks. MicroRNA-27 (miR-27) expression level in the liver were determined by real-time PCR. Protein and mRNA expression levels of PPARγ, ABD1, CYPT1A, CYPT3A, ATGL, PL, FABP, SREBP1 were tested in the obesity rat liver.

RESULTS: After the 4-week intervention period, adipose tissue around the kidney weight was significantly lower in the L(2.18±0.26g), L2.30±0.29g), and LE(1.49±0.36g) than in the N(2.30±0.83g) (p<0.05), and epididymal adipose tissue weight was significantly lower in the L(0.64±0.11g), L1.13±0.80g), and LE(6.13±1.60g) than in the N(8.44±1.60g) (p<0.05). Liver miR-27 expression levels were significantly lower in the L(0.16±0.09) than in the N(0.26±0.09) (p<0.05). N(1.11±0.26) rats’ PPARγ mRNA level is lower than E(1.81±0.28), L(1.45±0.29) and LE(1.52±0.44) (p<0.05), and N(0.60±0.12) rats’ protein expression level of PPARγ is lower than L(0.80±0.16) and LE(0.80±0.14) (p<0.05). N(0.80±0.60) rats’ CYPT1A mRNA level is lower than L(2.51±1.13) and LE(4.82±3.6) (p<0.05), and N(0.46±0.13) rats’ protein expression level of CYPT1A is lower than L(0.66±0.12) and LE(0.65±0.12) (p<0.05). N(0.38±0.25) rats’ CD36 mRNA level is lower than E(1.45±0.80) (p<0.05), and N(0.49±0.17) rats’ protein expression level of CD36 is lower than L(0.73±0.13) and LE(0.18±0.06) (p<0.05). N(1.03±0.23) rats’ SREBP1a level is lower than L(1.37±0.41) (p<0.05). Rats’ mRNA and protein expression level of ABC1, ATGL, PL-L, FABP is no significant difference each other.

CONCLUSIONS: Hypoxic exercise may be decrease the miR-27 level in the liver of obese rats, and negativety regulate the expression of PPARγ, and affects the dynamic balance of fat metabolism in the obese rats’ liver, then leads to the decrease of visceral fat of obese rats.

Project 31471139 supported by NSFC.
how they change with training are not yet known. The purpose of this study was to examine exercise induced changes in LD and M closeness in insulin resistant non-diabetic subjects.

METHODS: In a nested case-control study, 12 cases (6F/6M) underwent a 4-months supervised endurance exercise intervention. 12 insulin sensitive subjects matched by age and gender served as controls (C). LD, M and the surface in contact with each other, were assessed in muscle biopsies with electron microscopy. IS was measured by hyperinsulinemic euglycemic clamp. VO2max was measured by GXT and body composition by DEXA.

RESULTS: Although training improved IS by 45.8% (P<0.05), increased VO2max by 15.2±4.4% (P<0.05), reduced body fat by 3.9±1.2% (P<0.05), cases remained significantly different from C. M increased in IMF and SSL (54.7±15.1% and 78.2±20.5% respectively, P<0.05). LD increased in IMF (5.18±1.18%) and decreased in SSL (20.7±8.3%), both P<0.05. Contact between LD and IMF increased only in IMF (65.±26%). While SSL LD were negatively correlated with IS at baseline, changes in overall LD with intervention were related with improvements in IS. SSL LD correlated with body adiposity, but not IMF LD.

CONCLUSIONS: LD increased in the SSL region while M increased only in the contractile region, i.e. the IMF compartment. At the same time, the amount of M and LD increased in this compartment. This observation confirms what is observed in healthy and athletic individuals, which suggests that IMCL are used for fuel. At the contrary, LD decreased in the SSL region while M increased in this compartment. Our observations are of interest, as IMCL are known to be involved in the mechanisms leading to insulin resistance in sedentary muscle, possibly explaining the observation in the SSL region.

Brown adipose tissue (BAT) is an important thermogenic organ and is generally induced by exercise or cold exposure via a white adipose tissue browning pathway. However, the synergetic effects of exercise and cold exposure on this pathway remain unclear. Cold-water swimming, such as winter swimming which is a traditional sport in northern China and Russia, may be a potential therapeutic form of exercise in the treatment of obesity and diabetes. PURPOSE: To investigate the synergetic effects of exercise and cold exposure on white adipose tissue browning in mice. METHODS: 8-week-old male ICR (Institute of Cancer Research) mice were randomly divided into 3 groups: a control group (N=6), a warm-swimming group (N=6) and a cold-swimming group (N=6). Mice in the warm-swimming and cold-swimming groups were exercised twice a day for 2 weeks and the duration of the exercise session was gradually increased (from 10 min to 60 min). The temperature of water was 35±2°C in the warm-swimming group and 2±2°C in the cold-swimming group. Body weight of mice in each group was recorded daily before the exercise sessions. Biomarkers of white adipose tissue browning were examined by hematoxylin and eosin (H&E) stain, western blotting and immunohistochemistry. RESULTS: After 2-weeks of swimming training, body weight was significantly lower in the cold-swimming group compared to the warm-swimming and control groups (34±4;1 ± 0. vs 35.3±1.4 & 37.2±2.1 g, both P<0.05). And the relative cell size of white adipose tissue in the cold-swimming and warm-swimming groups decreased in compared with the control group (34.4±1.1 vs. 35.3±1.4 & 37.2±2.1 g, both P<0.05). The expression of brown adipose tissue browning marker UCP-1 (UCP-1) in white adipose tissue in the cold-swimming group was higher significantly than in the warm-swimming and control groups (147±8 vs. 112±6 & 113±2, both P<0.01), while peroxisome proliferator-activated receptor gamma coactivator-1 alpha (PGC-1 alpha) in the warm-swimming group was higher than the control group (193±48 vs. 124±28%, P<0.05). Moreover, serum zinc finger protein-516 (ZNF-516) increased in the cold-swimming group compared to the control group (323±84 vs. 179±43, P<0.05). CONCLUSIONS: Cold-water swimming induces white adipose tissue browning and weight loss and may be an effective form of exercise in the treatment of cardiometabolic diseases.
Elevated postprandial triglycerides (TGs) contribute to the development of cardiovascular disease. Prior exercise is a well-established method to lower postprandial TGs; however, most exercise protocols involve prolonged aerobic or resistance training (RT) of sixty to ninety minutes which is not realistically attainable by the general population. **PURPOSE:** The present study investigates the effect of high intensity interval training (HIIT) of twenty minutes and RT of thirty minutes on postprandial TGs. **METHODS:** Approval for this study was obtained from the Institutional Review Board of the College of Saint Benedict and Saint John’s University and signed informed consents were provided by all participants. Thirty healthy college-age students (5 males, 25 females) were recruited from nutrition and exercise science courses. All subjects completed the control, HIIT, and resistance protocols one week apart. Subjects performed the exercise protocols 12-16 hours prior to an oral fat tolerance test (milkshake, 1 g of fat per kg of body weight). Subjects were instructed to consume similar diets during the 24 hours prior to the milk shake. Each exercise session was supervised; HIIT consisted of four 30 second sprints with 4 minutes of walking recovery and the low-volume RT consisted of six machine-based lifts, 2 sets of 8 repetitions at 75% of one repetition maximum. Postprandial TGs were measured at baseline and three hours following consumption of the milkshake using the CardioChek PA blood analyzer (PTS Diagnostics, Indianapolis, IN). Data was analyzed using a three way repeated measures ANOVA statistical test. **RESULTS:** The triglyceride levels at baseline were on average less than 150 mg/dL (desirable value); however, 20% were above. The means are as follows for each treatment and time point (baseline, and postprandial respectively): Control 107 +/- 49, 140 +/- 73 mg/dL; HIIT 93 +/- 34, 122 +/- 59 mg/dL; and Resistance 108 +/- 47, 144 +/- 64 mg/dL. While there appears to be a trend that HIIT lowered both fasting and postprandial TG’s the decrease was not statistically significant (p=0.69). **CONCLUSION:** Twenty minutes of HIIT or thirty minutes of low-volume RT did not significantly lower postprandial triglyceride response to a high fat milkshake in a healthy, college-age population.

**The ability to alter postprandial metabolism in favor of elevated fat metabolism could help attenuate the plasma lipid excursion, leading to decreased CVD risk.**

**PURPOSE:** We compared two isoenzymic exercise modalities (run, walk) on subsequent postprandial lipemia in males. **METHODS:** Active, college-aged males (n=7; weight = 72.5 +/- 3.9 kg; BMI = 23.3 +/- 0.3 kg/m²) completed a randomized crossover study that included sedentary, energy-balanced (BAL) and exercise-energy deficit (DEF) visits. 24-h energy expenditure (EE) and substrate oxidation were measured using whole room indirect calorimetry. During BAL, subjects consumed an energy-balanced diet and remained primarily sedentary. During DEF, subjects performed 2 bouts of treadmill exercise (~60% VO₂ max) in the morning and afternoon. Total exercise EE was ~20% of daily energy requirements, which was not replaced in the diet. Room calorimeter data were divided into (1) 24-h, (2) wake (0800h-2200h), and (3) sleep (2200h-0700h) segments for analysis. Metabolites [glucose, free fatty acids (FFA), and triglycerides] and hormones (insulin, growth hormone, norepinephrine, and cortisol) thought to influence glucose, lipid, and protein metabolism were measured. **RESULTS:** There were no significant differences in CHOox, TEE, or RER between any conditions (P>0.05). Adding exercise to sedentary metabolism did not increase EE or substrate oxidation. Moreover, there was no significant difference in CHOox, TEE, or RER between Run and Walk. There was no significant difference in TG (P<0.05) with no significant difference between Run and Walk. There was no significant difference in CHOox, TEE, or RER between any conditions (P>0.05). **CONCLUSION:** Running and walking at 60% VO₂ max for 60-min enhances the rate of fat oxidation in the postprandial period in active males, when compared to a time-matched sedentary control, without a significant attenuation in the postprandial plasma TG excursion. These results indicate the effects of 60% VO₂ max may not be potent enough in this population to elicit an attenuation in the postprandial plasma TG concentration, especially when consuming an oral fat meal equivalent to the caloric expenditure of the exercise bout. So, greater intensity or duration may be needed to provide a beneficial effect within this population.
impaired GLUT4 content (p=0.02) compared to a CD (AU±SEM; CD: 77.38±2.22; P > 0.05). CONCLUSION: Adult female rats demonstrate a high propensity for voluntary physical activity in the first three weeks when used because of natural tapering in activity, perhaps associated with age. Consumption of a diet high in fat and sucrose, regardless of when it was introduced during the 9-week protocol, blunted activity from peak values compared to rats that consumed a low fat-only diet (LLL), suggesting that diet composition, rather than intake alone, impacts spontaneous physical activity.

PURPOSE: To examine the effects of 16 weeks of high-fat diet feeding and swimming exercise on liver steatosis and endoplasmic reticulum stress mediated apoptosis in rats. METHODS: Male Sprague-Dawley Rats were randomly divided into 3 groups (each n=10): a control group (C), a high-fat diet group (D) and a high-fat diet plus exercise group (DE). Rats in the C group were fed with standard diet, and those in the D and DE groups were fed with high-fat diet for 16 weeks. Rats in the DE group were exercised in a swimming pool for 60 min/day, 6 days/week for 16 weeks. Liver pathological changes were determined by hematoxylin and eosin staining. Hepatocyte apoptosis was measured by terminal deoxynucleotidyl transferase-mediated DUTP nick end labeling assays. Western blots were used to test the expression of proteins related to endoplasmic reticulum stress mediated apoptosis, including the CCAAT enhancer-binding protein homologous protein (CHOP), the c-Jun n-terminal kinase (JNK) and the caspase-12 gene. The ABC Immunohistochemical staining was used to detect the positive expression rates of CHOP, JNK, caspase-12. One-way ANOVAs were used for data analysis. RESULTS: all rats in the D group obtained a higher number of liver lipid droplets (0.483±0.086 vs 0.185±0.079, P=0.01) and a higher liver cell apoptosis index (1.110±0.250 vs 0.350±0.166, P<0.05) and significantly higher expression levels of chow 2.465±0.312 vs 0.859±0.079 (P=0.01), caspase12(1.430±0.136 vs 0.372±0.064, P=0.01), and JNK(1.361±0.114 vs 0.358±0.048, P=0.01) in liver cell. Compared to the D group, the DE group had a lower number of liver lipid droplets(0.366±0.059, P<0.01) and a significantly lower liver cell apoptosis index (0.860±0.270, P<0.05) and significantly lower expression levels of chow (1.110±0.116,P<0.01), caspase12(0.609±0.052, P<0.01), and JNK(0.645±0.087, P=0.01) in liver cell. CONCLUSIONS: Sixteen weeks of high-fat diet feeding caused NAFLD in all rats. Exercise training could improve symptoms related to NAFLD, possibly by lowering the protein expression levels of CHOP, JNK and Caspase12, and reducing liver cell apoptosis.

**Board #235**

**June 1 8:00 AM - 9:30 AM**

**Effects Of High-Fat Diet and Exercise on Endoplasmic Reticulum Stress Mediated Apoptosis in Rat Liver**

Juihan Li, Quansheng Su. Chengdu Sport University, chengdu, China.

(No relationships reported)

**Board #236**

**June 1 8:00 AM - 9:30 AM**

**Core Strength as a Predictor of Performance During Three Functional Movement Screens**


Email: cdj20@pitt.edu

(No relationships reported)

Food intake and spontaneous physical activity have been attributed to a common hypothalamic pathway although the specific mechanisms involved in this relationship, and how it is influenced, have yet to be elucidated. PURPOSE: To determine how alternating low- and high-fat/sucrose diets affect voluntary wheel running in rats and its relationship with food/energy consumption. METHODS: An interrupted time series model was used to examine voluntary running and ad libitum food consumption characteristics over a 9-week period in adult female (~40 days old, ~120-140 g) Sprague Dawley rats (n=8/group). Low- (L; 4%) or high- (H; 25%) fat/sucrose diets were provided in 3-week intervals: LLL and HHH control groups received only low- or high-fat/sucrose diets, respectively, whereas alternating diet groups (LLH, HLH, or HHL) were switched every 3 weeks. Resistance-free running wheels recorded distances automatically and food consumption was measured manually daily; body mass was recorded every two weeks. RESULTS: Each diet group increased mean running distance (meters/day) that peaked at Week 3 followed by a gradual decrease in activity through Week 9. Compared to other groups, LLL rats maintained a higher percentage of peak activity between Weeks 4-8. Daily distances were highly variable (range: 633 – 40,079 m/day) depending on the specific rat and day. Although daily food consumption ranged from 42-69 kcal/day, no relationship existed between daily running distances and absolute (grams) or relative (kcal) food consumption for the LLL, HLH, or HHH groups (R² range: 0.0006 – 0.15); a significant correlation existed between these variables in LLL rats (R²: 0.58; p<0.05). Body mass increased from 61-80% from starting values and final body masses were similar in all groups (range: 225-240 g; P > 0.05). CONCLUSION: Adult female rats demonstrate a high propensity for voluntary physical activity in the first three weeks when used because of natural tapering in activity, perhaps associated with age. Consumption of a diet high in fat and sucrose, regardless of when it was introduced during the 9-week protocol, blunted activity from peak values compared to rats that consumed a low fat-only diet (LLL), suggesting that diet composition, rather than intake alone, impacts spontaneous physical activity.
THE JOURNAL OF AMERICAN COLLEGE OF SPORTS MEDICINE

Official Journal of the American College of Sports Medicine

Vol. 49 No. 5 Supplement S331

variables and accessory strength variables as predictors. To compare the relative amount of variance explained, independent of the accessory strength variables, the second equation only contained core strength variables. RESULTS: The first model was significant in predicting COMP (p<.001) (Pearson’s Chi-Square=149.132, p=.435; Nagelkerke’s R-Squared= .369). The second model was significant in predicting COMP (p<.001) (Pearson’s Chi-Square=148.837, p=.488) and the explained variance was similar to the full model (Nagelkerke’s R-Squared= .362). The core muscles were found to be active for the majority of screens, with percentages of ‘time active’ for each muscle ranging from 54%-96%. CONCLUSION: Performance on the three screens is predicted by core strength, even when accounting for other strength variables. Further, it appears the screens elicit wide-ranging activation of core muscles. While more investigation is needed, the DS, TSP, and RS, collectively, appear to be a good assessment of core strength.

Supported by the Freddie Fu, MD Graduate Research Award

The Functional Movement Screen (FMS) assesses movement dysfunctions during seven tests to provide musculoskeletal injury risk and a training program reference in a variety of populations. Except for individual differences of FMS movement dysfunction, sport-specific training may affect the dysfunction. Thus, the investigation of FMS performance for baseball players can provide useful training program references for injury prevention of specific baseball positions.

PURPOSE: To investigate the difference between outfitters (OF), infielder (IF), and pitchers (PC) on the Functional Movement Screen performance of 7 tests.

METHODS: 27 Division I athletes from city teams including 13 PC, 6 OF, 8 IF athletes (career yrs: 12.5±9.9, 13.5±6.4, 14.5±3.1) performed the FMS. The tests are deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg rise, trunk stability push-up, rotary stability for scoring a 0 to 3 each. The questionnaires of injury history in 5 year were reported to provide injury category of the shoulder, elbow, wrist, knee, and ankle. A One-way ANOVA test was performed to compare among these groups (Alpha level 0.05).

RESULTS: The total score of seven tests did not show the difference among each group (PC: 15.9±1.4, OF: 16.3±2.3, IF: 16.4±1.6) and each group total score>14.

CONCLUSIONS: Trunk stability push-up requires more core static than dynamic strength, but rotary stability is require core dynamic strength and reflex to perform. The OS showed lower score than the OF on trunk stability push-up (OF: 2.4±1.0, OF: 3.0±1.0, p=.022), but higher than OF on rotary stability (PC: 2.2±1.0, OF: 1.67±0.52, p=.045). The injury occurred the most for PC are: 60% elbow, 33 % shoulder, 7% wrist (OF: 40% shoulder, 30% elbow, 10% wrist, IF: 40% elbow, 30% wrist, 10% shoulder).

Functional Movement Screening (FMS) is an assessment test used to determine an athlete’s risk of injury based on the scores of seven tests that utilize commonly used movement patterns during everyday life. Each test is scored based on whether or not biomechanical deficiencies are present when performing each test. Prior research has predominantly evaluated the relationship between FMS and susceptibility to injury. Yet, there appears to be limited research with FMS and anaerobic performance.

S331

Email: asmith63@liberty.edu

(No relationships reported)

Abstracts were prepared by the authors and printed as submitted.
Specifically, the relationship between FMS and vertical jump performance has not yet been addressed. **PURPOSE:** To determine the correlation between Functional Movement Screening (FMS) scores and maximum vertical jump height in young adult males. **METHODS:** Thirty-average fit males (Age = 23.13 ± 3.02 yrs, HT = 178.74 ± 8.00 cm, WT = 82.14 ± 13.46 kg, BF% = 14.32 ± 4.60) voluntarily participated in this study. Each subject performed FMS and were scored according to the grading criteria provided by the developers of FMS. Then a dynamic warm-up utilizing a cycle ergometer for 6 min at 60% of the subject’s predicted maximum heart rate. Height was measured with a stadiometer; AL and LL were measured per published procedures. Weight and %BF were determined with a commercially available, multifrequency bioelectrical impedance system. Linear regression analysis was used to statistically determine the relationship between FMS scores (dependent variable), anthropometric and %BF data (independent variables). **RESULTS:** There was a significant relationship between FMS scores and %BF, LL, AL, and BMI collectively (R = .531; adjusted R² = .220; p = .003). Specifically, %BF had the strongest relationship [standardized beta coefficient (β) = .502; p = .008] followed by LL (β = -.278; p = .045). However, AL (β = -.028; p = .387) and BMI (β = .016; p = .927) were not significant variables in the regression model. **CONCLUSION:** These results suggest that %BF is strongly related to functional movement maxiality and that any noted relationship between FMS scores and BMI is largely due to the influence of %BF on BMI values. Higher %BF may simply be an indicator of lack of fitness and/or physical activity, which, in turn, may be related to poor movement quality. This should be further investigated to determine the exact relationships that do exist between these variables. Additionally, LL is a variable that may influence FMS scores. As many of the tests involve movements of the lower extremity, it is also worth investigating how LL may influence movement quality and if this is a biasing factor in movement screening.

### Board #243 June 1 8:00 AM - 9:30 AM
**The Impact of Past Athletic Experience on Functional Movement Screen (FMS) Scores in University Students**

Craig Tripplett, DPT, CSCS, Dan Jensen, DPT, Corey Selland, PhD, Naomi Jacobson, Nicholas Wolf. Black Hills State University, Spearfish, SD. (Sponsor: Matthew Vukovich, PhD, FACSM) (No relationships reported)

**PURPOSE:** The Functional Movement Screen (FMS) is a screening tool used to evaluate mobility and stability in assessing an individual’s potential risk for injury. The purpose of this study was to determine if an individual’s past high school athletic experience had an impact on their FMS scores as university students. The secondary objective was to investigate which high school sports had a significant impact on FMS scores. **METHODS:** Physically active university students (53 females, 47 males), ages 18 to 26 years with no recent (<6 weeks) history of musculoskeletal or head injury were recruited from introductory wellness classes. Participants indicated which sport(s) and for how many seasons they participated in each sport(s) during high school. Each participant performed the FMS, which consists of seven tests (deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability). Each test was scored on a scale of 0 to 3. A score of 0 indicates the lowest score possible, while a score of 3 is the highest. The combination of the tests provides an overall maximum score of 21. Research has shown FMS scores ≥14 have a statistically greater chance of injury than scores ≥15. A series of Chi-Square tests were performed comparing scores ≥15 and ≤14 on the FMS to identify which high school sports have the greatest impact on FMS performance. All FMS tests were scored by the same researcher to ensure intra-rater reliability. **RESULTS:** A positive correlation was found between individual FMS scores and number of sport seasons played in high school (r=.32, p<.005). This identifies a statistically significant impact on a high school student’s FMS score related to the number of seasons they played sports in high school. Participation in basketball, football, or track increased the likelihood of university wellness students scoring ≥15 on the FMS test. **CONCLUSION:** University students who participated in high school basketball, football, or track are more likely to score ≥15 on the FMS which could reduce their risk of musculoskeletal injury.

### Board #244 June 1 8:00 AM - 9:30 AM
**Efficacy of a Task-Specific Periodized Resistance Training Program on Functional Movement Screening in ROTC Cadets**

Ludmila M. Cosio-Lima, John D. Wallap, Lauren E. Adolf, Marissa Straughn, Amy Crawley. University of West Florida, Pensacola, FL. (No relationships reported)

**PURPOSE:** Functional Movement Screening (FMS) is a testing procedure that examines the “quality” of movement patterns to identify individuals that have specific limitations or asymmetries. Low FMS scores have been linked with a higher risk of injury among tactical athletes. Since FMS is becoming a popular screening tool it is important to find methods or training programs that could improve FMS scores in military populations. **Purpose:** This pilot study examined the effects of a 7-week periodized resistance training program on FMS scores of ROTC Cadets. **METHODS:** Subjects consisting of two Army and Air Force ROTC cadets (male=18, female=6), Age (yrs) = 2.26±5.96, Height (cm)=172±8.68, Weight(kg)=72.98±12.91. The intervention group (IG n=14) trained for 1 hour/day, 4 days/week and the control
group (CG n=9) participated in traditional military training protocol for 1 hour/day, 3 days/week. A 2x2 mixed factorial ANOVA was used to compare mean change values of total FMS scores for experimental and control groups. RESULTS: No significant (p > .05) differences in mean change values for FMS scores were observed between groups. A significant main effect (p = 0.02) was observed for FMS scores. Both groups had an increase in FMS scores after 7-weeks of training. CONCLUSIONS: Although this study did not find differences in FMS scores between a six-week periodized strength training program and a traditional military training program among ROTC cadets it is necessary that future studies address certain limitations that this study encountered (sample size and length of training period). FMS scores are being used more frequently as screening tools for risk of injury and as a result it is important to study methods that will improve FMS scores in diverse athlete’s populations.

INTRODUCTION: The Functional Movement Screen (FMS) is a battery of 7 tests to assess movement patterns. These tests include the deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability test. It is not known whether a shorter version could yield the same results, while allowing for more efficient screening in athletic settings. The modified version includes the deep squat, hurdle step, active straight leg raise, and an added test: a single leg squat.

METHODS: The soccer group was scored once for original (21 points) and modified FMS (10 points), while the control group was scored twice by an FMS certified athletic trainer. The single-leg squat was scored as 1 (no knee valgus) or 0 (knee valgus). Reliability was calculated as Pearson Product Moment and concurrent validity was calculated between modified FMS and original FMS scores, using R Statistical Software.

RESULTS: Mean age for the soccer group was 19.6 ± 0.73 years, with mean FMS score of 15.6 ± 1.5 and mean modified FMS score of 7.3 ± 1.63. Mean age for the control group was 20.5 ± 1.19 years, with a mean FMS score of 14.8 ± 1.64 for trial 1 and 15.3 ± 1.5 for trial 2. There was a strong correlation (r = 0.74) between trials for both the original and modified FMS scores and a strong correlation of (r = 0.73) between the original FMS and the modified FMS. Trial 2 scores were approximately 3% higher for both original and modified FMS, suggesting a possible practice effect. The addition of a third trial could possibly have attenuated this.

CONCLUSION: The modified version of the FMS is valid for division III male soccer players. Athletic trainers and coaches may use this modified version for more efficient screening.

INTRODUCTION: The Functional Movement Screen (FMS) is a battery of seven tests to observe key movement patterns and is scored in a twenty-one point scale (Cook 2010). Studies have suggested that individuals with scores of 14 or less had significantly higher risks of injury (Bushman et al., 2015; Chorba et al., 2010). A modified FMS, scored in a ten-point scale, has been used by a Division III college athletic training staff. It includes three original FMS tests (deep squat, hurdle step, shoulder mobility) and a single-leg squat (scored as 0 for knee valgus, and 1 for no valgus). It is not known whether the new battery can predict knee valgus in Division III male soccer players.

PURPOSE: To determine whether the modified FMS can predict knee valgus when landing from drop jumps.

METHODS: Seventeen Division III male soccer players and twenty healthy male non-athletes (ages 18-24) were recruited for the study. Subjects performed all modified FMS exercises and were scored by one FMS certified athletic trainer. Reflective markers were placed on subject’s tibial tuberosity and distal tibia to define the tibia and knee valgus angles were measured with respect to the vertical line from video via goniometry at the lowest point of landing from a drop jump from a 31cm box.

RESULTS: For the soccer group, the mean for modified FMS score was 7.3 ± 1.63, mean left knee valgus was -1.73 ± 1.62 degrees and mean right knee valgus was -0.73 ± 1.87 degrees. The controls’ mean modified FMS score was 6.85 ± 1.50, mean left knee valgus was -2.6 ± 2.80 degrees, and mean right knee valgus was -1.35 ± 3.23 degrees. The modified FMS was not a significant predictor of right knee valgus (p=0.65) or left knee valgus (p=0.22).

CONCLUSION: The Modified Functional Movement Screen is not a significant predictor of knee valgus in DIll male soccer players. More sensitive scoring could have improved the modified FMS’s ability to detect knee valgus. Post hoc power analysis results suggest that the non-dominant side may be more relevant for assessment.

INTRODUCTION: Movement screening (MS) for functional patterns has been advocated as an effective method to evaluate high performance populations such as American football players, firefighters, and military personnel. Corrective strategies are also often implemented in training to improve movement competency and theoretically reduce future injury rates. PURPOSE: The purpose of this study was to examine if basic anthropometric/functionality measures and modified simple movement assessments can be significantly influenced (Pre/Post) in young adults (a non-high performance population) with personal fitness training in a Community College setting. METHODS: All subjects (N = 142; Males = 57, Females = 85; mean age = 21.29 years) enrolled in a personal fitness course and completed basic anthropometric measures (waist and hip girths, shoulder mobility etc.) and a modified simplified MS (scored as yes/no for success with no pain). Subjects then completed the personal fitness course which emphasized an initial 15-20 minutes of developmental/corrective exercise and then 30 minutes of general resistance training per each class session. Data were analyzed with interval (Repeated Measures ANOVA) and ordinal (Chi
may provide greater insight into physiological disruption and cardiac risk. Further, because heat stress impairs performance and adds to cardiac strain, firefighters would benefit from portable, effective cooling technology. PURPOSE: To investigate the role of a wrist cooling band (dhamaSPORT) on heart rate variability (HRV) during recovery from live fire training. METHODS: 10 volunteer firefighters wore a Zephyr Heart Rate monitor during live fire training. Participants performed two evolutions of live-fire training drills and reported to a “rehab station” for rest and recovery. This pattern of 2 drills and rehab was repeated 3 times. When in rehab, the cooling band was placed on the wrist and was turned ON (cooling) for one rehab, then OFF (control) for the next. The on/off cycles continued throughout the 3 cycles with the position of on or off at the first rehab randomly determined. The cooling band instantly reaches a temperature of 44°C when turned on. Perceptual measures of thermal comfort and strain were also collected. Participants remained in rehab for 15 minutes before returning to live-fire drills. RESULTS: There was no significant difference in HR between conditions (ON vs. OFF) at any time-point during rehab (p > 0.05). Likewise, there was no significant difference in thermal sensation (p > 0.05) and thermal comfort (p > 0.05) between each condition during rehab (p > 0.05). In contrast, RMSSD (parasympathetic modulation) was significantly reduced from rest to both rehab conditions (ON, p < 0.05; OFF, p < 0.05). The reduction in parasympathetic modulation was -21% in the ON condition vs. -40% in the OFF condition (p = 0.01). CONCLUSION: There was no difference in HR between conditions but the cooling band blunted the shift in cardiac autonomic balance and helped maintain parasympathetic tone during recovery from live firefighting activity. This study found that the DhamaSPORT cooling band was easy to use during incident rehab and facilitated recovery, suggesting that it may be a useful tool during firefighting training and operations.
Small sample volumes may artificially elevate plasma osmolality (Posm) measured by freezing point depression. **PURPOSE:** To compare different sample volumes of measured Posm (mmol/kg) to each other, and to calculate osmolality (mmol/L) in eudehydrated (EUH) and dehydrated (DEH) volunteers. **METHODS:** Posm was measured using freezing point depression and osmolality calculated from measures of sodium, glucose, and blood urea nitrogen. The influence of sample volume was investigated by comparing 20 μL and 250 μL Posm samples (n = 158 pairs). Protinol (240, 280, 320 mmol/kg) and Clinitol (290 mmol/kg) reference solutions were compared similarly (n = 24 pairs). Twenty-one volunteers were tested multiple times while EUH (n = 72) or DEH (n = 7) by ~4.0% body mass. **RESULTS:** The 20 μL samples of Protinol, but not Clinitol, were significantly higher by 3 mmol/kg when compared to 250 μL samples. The 20 μL samples of plasma were 7 mmol/kg higher than 250 μL samples with a nearly constant systematic error across the range tested (slope = 0.917). Calculated osmolality was significantly lower than 20 μL Posm (~6 mmol) but not different from 250 μL Posm (<1.0 mmol). When using common criteria for EUH (<150 mmol/kg), only 19/72 EUH volunteers were correctly classified using 20 μL Posm, however, 65/72 were correct. The classified using 250 μL Posm. DEH volunteers met the common >295 mmol/kg DEH criteria in 7/7 (20 μL Posm) and 6/7 (250 μL Posm) cases studied. The average change in Posm from EUH to DEH was similar for 20 μL (11 mmol/kg) and 250 μL (10 mmol/kg) samples. **CONCLUSIONS:** These results demonstrate that Posm measured by freezing point depression will be ~7 mmol/kg higher when using 20 vs 250 μL sample volumes. Approximately half of this effect may be due to plasma proteins. Posm sample volume should be carefully considered when calculating the osmole gap or assessing hydration status. The opinions or assertions contained herein should not be construed as official or reflecting the views of the Army or the DoD.

**CONCLUSIONS:**

- During short work durations (2 and 4 hr), 0% of sweat losses were replaced and USG was decreased to 1.020. After removing samples correlation strength increased (r = -0.69). Total false diagnosis was reduced to 12.7% (n = 8), and most importantly for runners replacing <100% of sweat losses exhibiting a USG < 1.020 was decreased to 15%.
- **CONCLUSIONS:** Pre-run USG assessment can be used as a practical field assessment to determine if maintenance increased recovery fluid intake is warranted when training twice per day, particularly if the first running bout is undertaken in a eudehydrated state (USG < 1.020) and significant sweat losses are incurred (3% body mass).

**PURPOSE:** To determine the acceptability of the fluid intake guidance, sweat losses were measured in a variety of conditions and uniform configurations (including Battle Dress Uniform and body armor), exercise intensities (easy, moderate, heavy), and work durations (2.4, and 8 hr). Using the prescribed fluid intake guidance for each condition, the differences between the prescribed fluid intake and the total observed sweat loss were calculated. Differences were then expressed as a percent loss or gain of body weight using the following equation: [% body water flux = (drinking volume - sweating volume)/ body weight] x 100]. Values within a threshold of ±2% body water flux (BFW) were deemed acceptable. This threshold was considered the starting point for performance and health concerns. To simulate a worst-case scenario, it was assumed no urine was produced during testing. **RESULTS:** During short work durations (2 and 4 hr), 0 of 75 Soldiers exceeded the ±2% BFW. During longer work durations (8 hr), 50 of 66 Soldiers exceeded the ±2% BFW. In all conditions, 50 of 141 Soldiers (35%) exceeded the ±2% BFW. In no condition did a Soldier exceed the ±2% BFW. **CONCLUSION:** Current fluid intake guidance appears to be sufficient (no over- or under-drinking ±2% BFW) during work durations lasting ≤4 hours. However, for conditions beyond published guidance (>4 hr), recommended drinking rates over-prescribe water needs in worst-case scenarios where no urine was produced. It is recommended that military fluid intake guidance be re-evaluated to include longer work durations of 8 hours. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

**CONCLUSIONS:**

- Many young athletes start exercise in a state of body fluid deficit, which magnifies the risk of an excessive increase in body temperature and may lead to deterioration of skills related to sports performance. It is not clear if when water is readily available their voluntary fluid intake during exercise compensates for the pre-exercise fluid deficit, or if it is not enough and initial hydration status worsens. **PURPOSE:** To compare the amount of fluid replaced during exercise in the heat between young athletes who arrive to an exercise session in a state of euedhydration (EUH) and hypohydration (HYP) and are provided water to drink ad libitum. **METHODS:** Young athletes (N = 56, mean age = 15.7 ± 1.4 yr) completed an exercise sweat test, running or racetracking at an intensity >70% of age-predicted maximum heart rate, in a hot and humid environment (WBGT = 28.5 ± 1.9°C). Pre-exercise urine specific gravity (USG) was used to categorize the athletes as EUH (USG ≤ 1.020 g/mL, N = 15) and HYP (USG > 1.020 g/mL, N = 41). Water and they provided in bottles and ad libitum. Sweat loss was calculated from the change in body weight (BW) [corrected for urine output] plus fluid intake. Dehydration was calculated as % change in BW. Ratings of perception of thirst (N = 35) and hot/overheated (N = 39) were examined with a 0 - 10 scale. **Results:** Pre-exercise USG was higher in HYP (1.025 ± 0.005 g/mL) compared to EUH (1.013 ± 0.006 g/mL), P < 0.05. Exercise duration, sweat loss (27.4 ± 11.2 vs 24.2 ± 9.3 mL/kg) and urine loss (1.5 ± 1.6 vs 0.7 ± 0.3 mL/kg) were similar for EUH and HYP, respectively, P > 0.05. Despite fluid availability, fluid intake was low (EUH = 7.8 ± 6.3 mL/kg; HYP = 9.2 ± 7.5 mL/kg) and both groups showed significant reductions in BW (EUH = 2.0 ± 1.0%; HYP = 1.6 ± 0.8%), P < 0.05. Thirst increased during the session in both groups and was moderately high at the end (EUH pre = 2.2, post = 5.9, HYP pre = 1.9, post = 6.7). Mean perception of hot/overheated was high at the end of exercise (EUH = 6.3; HYP = 7.2). **Conclusion:** Young athletes that start exercise in a state of hypohydration do not drink enough water during exercise to compensate for the pre-exercise fluid deficit and subsequent fluid loss, and their initial hydration status worsens. Thirst may not be a good indicator of the need to drink and the ad libitum intake of water is insufficient even when it is readily available.

Abstracts were prepared by the authors and printed as submitted.
**Table 1. Dehydration prevalence in two seasons by age group**

<table>
<thead>
<tr>
<th>Age type</th>
<th>N</th>
<th>Summer General dehydration (%)</th>
<th>Summer Low dehydration (%)</th>
<th>Summer Mild dehydration (%)</th>
<th>Summer Temperature (°C)/Humidity (%)</th>
<th>Autumn General dehydration (%)</th>
<th>Autumn Low dehydration (%)</th>
<th>Autumn Mild dehydration (%)</th>
<th>Autumn Temperature (°C)/Humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>47</td>
<td>76.6</td>
<td>51.1</td>
<td>25.5</td>
<td>20-76</td>
<td>91.5</td>
<td>66.0</td>
<td>23.5</td>
<td>19-74</td>
</tr>
<tr>
<td>Minor</td>
<td>59</td>
<td>88.1</td>
<td>45.8</td>
<td>42.3</td>
<td>25-49</td>
<td>64.4</td>
<td>45.8</td>
<td>18.3</td>
<td>22-65</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>83.0</td>
<td>48.1</td>
<td>34.9</td>
<td>76.4</td>
<td>54.7</td>
<td>21.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant difference vs major group (p<0.05); Significant difference vs Summer (p<0.05)

**Table 1584**

**Board #254**

**June 1 9:00 AM - 10:30 AM**

**Inter-season Dehydration Prevalence In Soccer Players that Rehydrate During Trainings Drinking Ad Libitum**

Alondra Maldonado-Cendejas1, Alejandro Gaytan-Gonzalez2, Juan R Lopez y Taylor1, Jocelyn Gutierrez-Sanchez1, Roberto Gabriel Gonzalez-Mendoza1, Leones Negros de la Universidad de Guadalajara, Guadalajara, Mexico. 1: Universidad de Guadalajara, Guadalajara, Mexico.

Email: nutrition.udg@outlook.es

(No relationships reported)

**PURPOSE:** To compare the training dehydration prevalence in two different seasons in major and minor soccer players that drink ad libitum.

**METHODS:** 106 male soccer players were evaluated during a habitual training in summer and autumn. They were divided by age as major (>15 years old, n=47) and minor (11 to 15 years old, n=59), they trained at morning (8:00-10:00) and evening (15:00-17:00), respectively at a 1570 m over sea level height. Dehydration was evaluated as the weight loss percentage calculated and classified as low dehydration (0% to <1% weight loss) and mild dehydration (≥1% weight loss). Subjects were allowed to drink any fluid ad libitum during trainings. These sessions had similar duration and intensity in both evaluations. The results are presented as the total prevalence of dehydration and type and compared for (summer vs autumn) by one sample t-test and for age (major vs minor) by two samples t-test.

**RESULTS:** There was a higher dehydration prevalence in autumn than summer in the major group, by an increase in low dehydration prevalence, but without statistical significance (p>0.05). In the minor group, the dehydration prevalence was lower in autumn than summer, by a decrease in mild dehydration prevalence (p<0.05). There was a lower dehydration prevalence in the minor group than the major group in autumn (p<0.05) by a lower prevalence in low dehydration (p<0.05).

**CONCLUSIONS:** These results suggest that drinking ad libitum is not enough for maintaining adequate hydration in both major and minor soccer players, neither in summer nor autumn. However, this situation was lower in minor players.
session to account for unusual affective states. RESULTS: EEG recordings were applied to the Frontal Asymmetry Index (FAI). Higher scores on the FAI indicate higher relative left frontal lobe activity, corresponding with an affinity to water (R). Lower scores indicate higher relative right frontal activity, thus less reward motivation (NR). Data revealed that FAI decreased by a mean of 0.05 ±0.17 from EU to HO states, with EU and HO FAI of 0.06 and 0.01 respectively. In total, 42.9% of participants showed an increased affinity(R) for water from EU to HO states. CONCLUSIONS: R/NR motivational orientations changes were less than anticipated following HO trials. However, data revealed that 42.9% of participants exhibited an increased affinity for water thereby, supporting the hypothesis. It is possible that 2% body mass loss is insufficient to create distinct motivational orientation changes.

1585 Board #260 June 1 9:00 AM - 10:30 AM Are all Heat Loads Created Equal?
Robert D. Meade, Glen P. Kenny. University of Ottawa, Ottawa, ON, Canada. (No relationships reported)

The evaporative requirement for heat balance ($E_{ev}$) calculated as metabolic heat production minus dry heat loss) is the primary determinant of whole-body sweat rate during exercise in compensable conditions. However, the relative influence of metabolic and environmental heat loads on physiological responses at a given $E_{ev}$ remains unclear. PURPOSE: To assess the thermal and cardiovascular responses during exercise bouts at a similar fixed $E_{ev}$, but for different combinations of metabolic and environmental heat loads. METHODS: Nine healthy males (46 ± 8 years) performed four experimental trials consisting of 75 min of semi-recumbent cycling wherein dry heat exchange and metabolic heat production were monitored continuously with the latter adjusted to achieve a fixed $E_{ev}$ of 400 W. The respective metabolic heat productions and ambient temperatures for each trial were: i) 442 W and 30°C (439[W][30°C]); ii) 391 W and 35°C (391[W][35°C]); iii) 317 W and 40°C (317[W][40°C]); and iv) 258 W and 45°C (258[W][45°C]). Whole-body sweat rate was measured via direct calorimetry. Esophageal temperature ($T_e$) and mean skin temperature ($T_s$) temperatures, as well as heart rate (HR) were measured continuously. Mean body temperature ($T_b$) and physiological strain index (PSI) were calculated from $T_e$ and $T_s$ and HR, respectively. RESULTS: During exercise whole-body sweat rate was similar between conditions (P=0.48), as was $T_b$ (P=0.65). In contrast, $T_s$ was greater in 439W[30°C] (37.67 ± 0.04°C) and 391W[35°C] (37.58 ± 0.07°C) relative to both 317W[40°C] (37.35 ± 0.06°C) and 258W[45°C] (37.20 ± 0.07°C; all P<0.01). HR was greater in 439W[30°C] (107 ± 3 beats·min⁻¹) in comparison to both 317W[40°C] (103 ± 4 beats·min⁻¹) and 258W[45°C] (89 ± 2 beats·min⁻¹; both P<0.01) whereas PSI was elevated in 439W[30°C] and 391W[35°C] compared with 317W[40°C] and 258W[45°C] (all P<0.05). CONCLUSIONS: While exercise performed at a fixed $E_{ev}$ resulted in similar whole-body sweat rates and $E_{ev}$ physiological responses (i.e. $T_s$, HR and PSI) varied as a function of the relative contribution of metabolic and environmental heat load. Supported by Ontario Ministry of Labour and NSERC

1586 Board #261 June 1 9:00 AM - 10:30 AM Postexercise Activation of Muscle Metaboreceptors Modulates Whole-Body Evaporative Heat Loss
Brian J. Friesen¹, Martin P. Poirier¹, Dallon T. Lamarche¹, Andrew W. D’Souza¹, Jung-Hyun Kim¹, Glen P. Kenny¹. ¹University of Ottawa, Ottawa, ON, Canada. ²Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, National Personal Protective Technology Laboratory, Pittsburgh, PA.
Email: bfrie051@uottawa.ca (No relationships reported)

Studies show that heat dissipation following dynamic exercise is suppressed for a prolonged period despite a sustained elevation in body core temperature. More recent work demonstrates that the activation of metaboreceptors may mediate the postexercise attenuation of local skin blood flow and sweating. However, it is unclear if this may translate into a reduction in whole-body heat dissipation. PURPOSE: To evaluate the influence of metaboreceptor activation on the modulation of postexercise whole-body evaporative heat loss (EHL). METHODS: On three separate days, 7 young (24 ± 3 years) physically active males performed 45 min of moderate intensity cycling at a fixed rate of heat production of 400 W, followed by a 60-min recovery period in the heat (35°C). At 15, 30 and 45-min of recovery, participants completed one of three experimental conditions: 1) no isometric handgrip exercise (IHG) or isometric forearm occlusion, OCT (CONTROL), 2) 1 min IHG at 60% of maximal voluntary contraction (MVC) (IHGonly); and 3) 1 min IHG at 60% of MVC followed by 5 min of forearm ischemia (IHG+OCC). Whole-body EHL was measured by direct calorimetry. Mean arterial pressure was measured continuously during the recovery period. RESULTS: Relative to pre-IHG levels, EHL increased similarly (~110 W, all P=0.05) during IHG exercise at 15, 30 and 45-min of recovery for both the IHGonly and IHG+OCC conditions. As a consequence, EHL was significantly different relative to CONTROL at the end of IHG (all P<0.05).

The elevation in EHL was sustained during the 5-min forearm ischemia performed during the IHG+OCC condition and both levels were slightly elevated but not statistically achieved at the end of IHG exercise. Specifically, EHL was elevated by ~60 W relative to pre-IHG levels at the end of the period of ischemia (all P<0.05). The increase in EHL however, was not significantly different from IHGonly and CONTROL at the end of ischemia for the 15 and 30-min postexercise measurement periods (P=0.452 and P=0.439, respectively). Differences were only measured at 45-min of recovery (P<0.039).

CONCLUSIONS: We show that the activation of muscle metaboreceptors can modulate whole-body evaporative heat loss following dynamic exercise in the heat. Supported by the Natural Sciences and Engineering Research Council of Canada

1587 Board #262 June 1 9:00 AM - 10:30 AM Aerobic Fitness Modulates Whole-Body Heat Loss in Young Adult Females during Exercise in the Heat
Dallon T. Lamarche¹, Jeffrey C. Louise¹, Sean R. Notley¹, Martin P. Poirier¹, Glen P. Kenny¹. ¹University of Ottawa, Ottawa, ON, Canada. ²University of Wolongong, Wolongong, Australia. (No relationships reported)

Aerobic fitness is considered a key determinant of the body’s ability to lose heat during exercise in the heat. Recent studies show that fitness-related differences in heat loss are dependent upon the exercise-induced heat load. However, it remains unknown if, like fitness, an individual’s level of physical activity also plays a generally important role in modulating whole-body heat loss. PURPOSE: To examine at what level of metabolic heat production, and therefore level of heat stress, aerobic fitness as defined by aerobic capacity (indexed by VO₂peak) and physical activity level (indexed volume and intensity) may modulate whole-body heat loss in young females (21 ± 3 yrs). METHODS: Using whole-body direct calorimetry, we compared dry and evaporative heat exchange between endurance (n=8, 53.1 mL·O₂·kg⁻¹·min⁻¹) and non-endurance trained females (n=8; 35.8 mL·O₂·kg⁻¹·min⁻¹, P=0.01) with matched physical characteristics (Study 1) and between those with low (n=7) and high (n=7) physical activity levels (P=0.01) but of similar aerobic capacity (~35 mL·O₂·kg⁻¹·min⁻¹; Study 2). Participants performed three successive 30-min bouts of semi-recumbent cycling at increasing rates of metabolic heat production (to ensure a similar thermal drive for sweating) of 250 (Ex1), 325 (Ex2), and 400 W (Ex3) in the (40°C), each followed by a 15-min recovery period. RESULTS: Study 1: Dry heat gain was greater in the endurance group for Ex2: 300 (± 10 W) and Ex3 (± 0 W) compared to the non-endurance trained females (Ex2: 58 ± 13 W; Ex3: 58 ± 14 W, both P=0.02). CONCLUSIONS: While using whole-body direct calorimetry, we compared dry and evaporative heat exchange between endurance and non-endurance trained females (Study 1) and between those with low (Study 2) and high (Study 2) physical activity levels (P>0.05). However, body heat storage over the protocol was ~26% greater in the non-endurance compared to the endurance trained group (P<0.04). Study 2: Dry and evaporative heat exchange did not differ between low and high physical activity groups (P=0.72), leading to similar levels of body heat storage (P=0.47).

CONCLUSION: We demonstrate that aerobic capacity, but not physical activity level modulates heat loss in females and that these differences are heat load dependent. Support: Natural Sciences and Engineering Research Council of Canada

1588 Board #263 June 1 9:00 AM - 10:30 AM The Effects of Aerobic Fitness on Sweating and Skin Blood Flow in Older Adults
Brendan D. McNeeley¹, Naoto Fujii¹, Pierre Boulay¹, Ronald J. Sigal¹, Glen P. Kenny¹. ¹University of Ottawa, Ottawa, ON, Canada. ²University of Sherbrooke, Sherbrooke, QC, Canada. ³University of Calgary, Calgary, AB, Canada. (No relationships reported)

High aerobic fitness has been shown to prevent age-related decreases in heat dissipation in older adults; however, the mechanisms underlying the influence of aerobic fitness on sweating and cutaneous vasodilation remain unclear. PURPOSE: To determine the role of superoxides and NADPH oxidase on sweating and skin blood flow in older adults during exercise in the heat. METHODS: Nineteen older adults (56 ± 6 years) were separated into two groups based on their aerobic fitness (VO₂peak mL·kg⁻¹·min⁻¹; Low Fit (LF), <28; High Fit (HF), ≥32). They performed two 30-min bouts of cycling in the heat (35°C), separated by a 30-min recovery (33°C). Seventeen participants exercised at 65% of their VO₂peak for the second bout (to compare responses as a function of relative exercise intensity). Seven participants exercised at 75% of their VO₂peak for the second bout (to compare responses as a function of relative exercise intensity).
intensity). Sweat rate (SR) and cutaneous vascular conductance (CVC) were measured in four intradermal microdialysis forearm skin sites continuously perfused with either: 1) lactated Ringer (Control), 2) 10 mM N-o-nitro-L-arginine methyl ester (LNAME) (NOS inhibitor); 3) 100 mM Apocynin (NADPH Oxidase inhibitor); or, 4) 100 mM Tempol (superoxide dismutase mimetic). Responses were compared at baseline and 10 minute intervals. RESULTS: SR for all sites was not different between groups at end exercise performed at the same rate of heat production (LF: 0.63 vs. HF: 0.83 mg min⁻¹·cm⁻², P=0.05). Conversely, SR for all sites and exercise matched for relative intensity was significantly greater for HF as compared to LF (1.29 vs. 0.60 mg min⁻¹·cm⁻², P<0.05). Within subjects, SR was not different between skin sites (all P>0.05). CVC was reduced at the LNAME site throughout the protocol (~20% reduction in CVC, P<0.05), while there were no differences between the other sites. Within the same skin site, no differences in CVC were measured between groups. CONCLUSION: Superoxides and NADPH oxidase do not play a role in mediating sweating and skin blood flow in older adults irrespective of their aerobic fitness. In contrast, differences in sweating were influenced by the absolute rather than relative intensity supported. By Canadian Institutes of Health Research

1589 Board #264 June 1, 2017 - 10:30 AM Blockade Of BKCa Channels Limits Sweat Output In Human Skin
Email: gary_mack@byu.edu

(No relationships reported)

Purpose: Sudomotor control of sweat gland function results in an increase in cytosolic Ca++ due to an IP₃-mediated Ca++ release from intracellular stores and an influx of Ca++ from extracellular fluid. While K+ channels have been implicated in modulating sweat gland function, it is unclear which specific K+ channels modulate cholinergic sweating. As such, we hypothesized that large conductance Ca⁡²⁺-activated K⁺ (BKCa) channels modulate sweat output. Methods: To evaluate this hypothesis, we examined the ability of two doses of tetraethylammonium (100 µM and 50 mM TEA) to blunt axon reflex mediated sweating induced by intradermal electrical stimulation in 5 healthy adults. Local sweat rate (SR) was measured by passing dry gas through a small waist capsule mounted on the skin. The skin was stimulated at a constant current intensity of 2.5 mA for 30 s at frequencies of 0.2, 1, 2, 4, 8, 16, 32, and 64 Hz using two small stainless steel stimulating electrodes. This procedure produced a sigmoid shape stimulus-response curve when we plotted the area under the SR-time curve versus stimulus frequency. Results: In control conditions peak local SR during 64 Hz stimulation averaged 0.51 ± 0.14 mg min⁻¹·cm⁻² which was significantly (P<0.05) reduced by application of 50 mM TEA to 0.33 ± 0.09 mg min⁻¹·cm⁻². The SR did not differ peak sweat rate (0.42 ± 0.15 mg min⁻¹·cm⁻²). The stimulus-response curve during 50 mM TEA was significantly different from control with a significant reduction in the plateau (0.32 ± 0.06 vs. 0.45 ± 0.27, P<0.05) but with a similar EC₅₀ values (10.2 ± 1.1 ms, 6.7 ± 1.3 Hz for Control and 50 mM TEA, respectively). Conclusion: Blockade of BKCa channels do attenuate sweat gland function during axon reflex mediated sweating induced by intradermal electrical stimulation. Our data support the hypothesis that BKCa channels on the epithelial cells of the human sweat gland can modulate local sweat rate.

1590 Board #265 June 1, 2017 - 10:30 AM KCA, KATP, And KV Channel Roles In Regulating Cutaneous Vasodilation And Sweating During Dynamic Exercise

(No relationships reported)

We recently showed the varying roles of Ca++-activated (Kᵥ) ATP-sensitive (KᵥATP) and voltage-gated (Kᵥ) currents in regulating methacholine-induced cutaneous vasodilation and sweating in normothermic resting humans. However, it is unclear whether these contributions remain intact during dynamic exercise in the heat. PURPOSE: To determine the influence of various K⁺ channels in regulating cutaneous vasodilation and sweating during exercise in the heat. METHODS: Young (23±4 years) habitually active males (n=11) completed a 30-min exercise bout at a fixed rate of metabolic heat production of 400 W to maintain a constant thermal drive, followed by a 40-min recovery period in the heat (35°C). Cutaneous vascular conductance (CVC) and local sweat rate were assessed at four forearm skin sites perfused via intradermal microdialysis with either: 1) lactated Ringer solution (Control), 2) 10 mM ASC, 3) 10 mM N-o-nitro-L-arginine methyl ester (LNAME, a non-selective NOS inhibitor), or 4) a combination of ASC+LNAME. Responses were compared at baseline, end-exercise and end of recovery. RESULTS: In both T2D and NoT2D participants, CVC did not differ from Control at the ASC site throughout the protocol (all P>0.18). In T2D, CVC at the L-NAME site was attenuated throughout the protocol relative to Control with reductions of 17%, 16% and 16% during baseline, end-exercise and end of recovery, respectively (all P<0.05). In NoT2D, attenuations in CVC at the L-NAME site consisted of 18%, 29% and 23% from Control at the same respective time periods (all P≤0.01). In T2D, CVC was attenuated at the combination site relative to Control throughout (baseline: 20%, end-exercise: 27% and end of recovery: 23%) (all P<0.01). Conversely, in NoT2D the combination of ASC+L-NAME attenuated CVC during baseline (14%, P=0.01) and recovery (20%, P=0.01) only. No differences in sweat rate were observed between Control and any treatment site in either group (all P≥0.10). CONCLUSION: We show that oxidative stress does not impair CVC or sweating in T2D. Further, reducing oxidative stress in the presence of NOS inhibition in NoT2D alters other mechanisms in the regulation of CVC, however this response is not observed in adults with T2D. Supported by the Canadian Institutes of Health Research

1591 Board #266 June 1, 2017 - 10:30 AM Role of Oxidative Stress in Modulating Cutaneous Vasodilation and Sweating During Exercise in Type-2 Diabetes
Pegah Akbari, Naoto Fujii, Sheila Dervis, Robert D. Meade, Pierre Boulay, Ronald J. Sigal, Glen P. Kenny. 1University of Ottawa, Ottawa, ON, Canada. 2University of Sherbrooke, Sherbrooke, QC, Canada. 3University of Calgary, Calgary, AB, Canada.

Email: pakbat13@uottawa.ca

(No relationships reported)

Impairments in heat dissipation in individuals with Type 2 Diabetes mellitus (T2D) have been observed during exercise in warm ambient conditions. This decline in heat loss may be related to diminished bioavailability of nitric oxide, an important contributor to the heat loss responses, due to increased oxidative stress. PURPOSE: To assess if local administration of ascorbate (ASC, a non-selective anti-oxidant) increases local heat loss responses of cutaneous vasodilation (CVC) and sweating during exercise in the heat in individuals with T2D. METHODS: Older adults (62 ± 9 yrs) with (n=10, T2D) and without (n=10, NoT2D) T2D, matched for age, body surface area and fitness performed 30-min of moderate-to-high intensity cycling (70% of VO₂max, followed by a 20-min recovery in the heat (35°C). Local CVC and sweat rate were assessed at four skin sites continuously perfused via intradermal microdialysis with either: 1) lactated Ringer (Control), 2) 10 mM ASC, 3) 10 mM N-o-nitro-L-arginine methyl ester (L-NAME, a non-selective NOS inhibitor), or 4) a combination of ASC+L-NAME. Responses were compared at baseline, end-exercise and end of recovery. RESULTS: In both T2D and NoT2D participants, CVC did not differ from Control at the ASC site throughout the protocol (all P>0.18). In T2D, CVC at the L-NAME site was attenuated throughout the protocol relative to Control with reductions of 17%, 16% and 16% during baseline, end-exercise and end of recovery, respectively (all P<0.05). In NoT2D, attenuations in CVC at the L-NAME site consisted of 18%, 29% and 23% from Control at the same respective time periods (all P≤0.01). In T2D, CVC was attenuated at the combination site relative to Control throughout (baseline: 20%, end-exercise: 27% and end of recovery: 23%) (all P≤0.01). Conversely, in NoT2D the combination of ASC+L-NAME attenuated CVC during baseline (14%, P=0.01) and recovery (20%, P=0.01) only. No differences in sweat rate were observed between Control and any treatment site in either group (all P≥0.10). CONCLUSION: We show that oxidative stress does not impair CVC or sweating in T2D. Further, reducing oxidative stress in the presence of NOS inhibition in NoT2D alters other mechanisms in the regulation of CVC, however this response is not observed in adults with T2D. Supported by the Natural Sciences and Engineering Research Council of Canada.

1592 Board #267 June 1, 2017 - 10:30 AM The Influence Of Aerobic Training On Maximum Skin Wettedness And Its Effects During Uncompensable Heat Stress
Nicholas Ravanel1, Geoff Coombs2, Samuel Duchesne-Belanger1, Pascal Imbeault1, Ollie Jay, FACSM. 1University of Ottawa, Ottawa, ON, Canada. 2University of British Columbia, Kelowna, BC, Canada. 3University of Sydney, Sydney, Australia.

(Sponsor: Dr. Ollie Jay, FACSM)

(No relationships reported)

PURPOSE: The purpose of the present experiment was to quantify how maximum skin wettedness (ωmax) is altered by aerobic training, and compare it to what is achieved following heat acclimation (HA). METHODS: Eight sedentary individuals (6 males, 2 females) participated in an 8-week aerobic training regime followed by a 9-day heat acclimation (HA) protocol. Participants completed on separate days, i) a treadmill humidity ramp protocol trial to assess ωmax, and ii) a 60-min treadmill march (450 W of heat production) in an uncompensable environment; 38°C, 60% RH, on three separate occasions: pre-training (PRE-T), post-training (POST-T), and post-heat acclimation (POST-HA). The change in rectal (TA) and mean skin temperature (Tskin) were recorded. Whole body sweat loss (WBLS) was calculated as the change in nude body mass and sweating efficiency (Sweat) was derived by dividing the sweating
required to achieve ωmax (with 100% evaporation) by the actual whole-body sweat rate between the 30th and 60th minute of exercise. RESULTS: Aerobic training increased aerobic capacity by ~14% (PRE-T: 45.8 ± 11.8 ml/kg/min; POST-T: 52.0 ± 11.1 ml/kg/min, P < 0.001). In the humidity ramp trial, ωmax was lower PRE-T (0.75 ± 0.07) compared to POST-T (0.87 ± 0.12, P = 0.01) and POST-HA (P = 0.001), and POST-T was lower than POST-HA (P = 0.04). In the UC trial, ωmax was greater PRE-T (1.11 ± 0.16°C) compared to POST-T (0.96 ± 0.13°C, P = 0.001) and POST-HA (0.96 ± 0.20°C, P < 0.001). PRE-T Tsk was higher after 60-min (38.0 ± 0.4°C) compared to POST-T (37.2 ± 0.9°C, P = 0.001) and POST-HA (37.1 ± 0.4°C, P = 0.001). WBSL was significantly greater POST-HA (913 ± 126 g) compared to POST-T (794 ± 78 g, P = 0.002) and (671 ± 83 g, P = 0.001), however Ssw was similar throughout (PRE-T: 67 ± 10%, POST-T: 68 ± 11%, POST-HA: 66 ± 8%). CONCLUSIONS: Aerobic training and HA independently increase ωmax without altering Ssw. A graded reduction in thermal strain during uncompensable heat stress is observed from PRE-T to POST-T, and to POST-HA.

The popularity of tattoos has increased tremendously in the last 10-years particularly among college and professional athletes. The tattooing process involves permanently depositing ink under the skin at a similar depth as eccrine sweat glands (3-5 mm). PURPOSE: The purpose of this study was to compare the sweat volume and Na+ concentration of tattooed and non-tattooed skin. METHODS: The participants were 10 healthy males (age = 21 ± 10) yrs all with unilateral tattoo covering a circular area 3-cm in diameter. Sweat was stimulated by iontophoresis using agar gel disks impregnated with 0.5% pilocarpine nitrate. The non-tattooed skin was located contralateral to the tattooed skin. Sweat was collected from the tattooed skin at a rate of 0.05 ± 0.02 cm3/min and the non-tattooed skin at a rate of 0.09 ± 0.03 cm3/min. The disks used to collect sweat were composed with 0.5% pilocarpine nitrate. The sweat Na+ concentration was determined by flame emission spectrophotometry. RESULTS: The average volume of sweat collected from tattooed skin was significantly less than non-tattooed skin (19 ± 15 μL vs. 36 ± 25 μL; P<0.0001). All 10 participants generated less sweat from tattooed skin than non-tattooed skin and the effect was -0.77. The average sweat Na+ concentration from tattooed skin was significantly higher than non-tattooed skin (69 ± 1.28 g·μL−1 vs. 42.6 ± 1.52 g·μL−1, P<0.01). Nine of ten participants had higher sweat Na+ concentration from tattooed skin than non-tattooed skin and the effect size was 1.01. CONCLUSION: Tattooed skin generated less sweat and a higher Na+ concentration than non-tattooed skin when stimulated by pilocarpine iontophoresis. The inter-instrument reliability of the LaT is adequate enough such that sweat losses and sweat sodium concentrations can be estimated under field conditions during a controlled test where the changes in body mass from before to after exercise is taken as a representation of sweat losses and sweat sodium concentrations are collected using the absorbent pads technique. The B-722 Laqua Twin (LaT), a low cost, battery operated, hand-held and easy-to-use portable analyzer has been shown to have excellent intra- and inter-rater reliability and to offer a reasonable degree of validity for the measurement of sweat sodium concentration under field conditions. The inter-instrument reliability of the LaT has never been determined. PURPOSE: To assess the inter-instrument reliability of the LaT sodium analyzer. METHODS: Seventy sweat samples collected in 14 athletes were analyzed in duplicate with 3 different LaTs. Sweat samples were collected during 40-min cycling or running exercises (~29-30°C) in a laboratory environment and 30-min of swimming (~24°C) in an indoor pool. Sweat sodium concentrations were determined in duplicate using AgCl electrode sensors and Ag/AgCl reference electrodes from five anatomiical sites using 5 x 7 cm absorbent pads covered with highly-adhesive impermeable transparent dressings. Sweat samples were extracted from the pads using centrifugation and then frozen at -20°C until thawed and analyzed. RESULTS: All data were normally distributed and showed no sign of heteroscedasticity. Relative reliability was calculated for LA T1 and 2, 1 and 3, and 2 and 3 with Pearson correlation coefficients of respectively 0.991, 0.995 and 0.996 and intraclass correlation coefficients of 0.986, 0.993, and 0.996. Mean biases between instruments were low (LA T1 and 2: -2.6 mmol/L; 1 and 3: -1.8 mmol/L; and 2 and 3: 0.8 mmol/L) but statistically significant. The typical error of measurements as well as the coefficient of variations were also low between instruments, ranging between 1.8 and 2.6 mmol/L and 2 and 4%, respectively. For comparisons between LA T1 and 2, 1 and T3 and 3 the 95% limits of agreement reached ± 7.3, ± 5.3, and ± 4.8 mmol/L, respectively. CONCLUSION: The inter-instrument reliability of the LA T is adequate enough such that sports clinicians can confidently interpret exercise sweat sodium concentration values obtained from, and develop sodium replacement strategies for athletes based on, sweat sodium testing realized by different LaTs.

Purpose: We tested the hypothesis that elevations in biomarkers of acute kidney injury (AKI) are influenced by the magnitude of hyperthermia and dehydration elicited by exercise in the heat. METHODS: Nineteen healthy males (age: 22 ± 3 y) wearing firefighter protective clothing completed two trials where they walked on a treadmill (4.8 kph, 5% grade) in a 38°C, 30% relative humidity environment. In one trial, subjects completed two 20 min exercise bouts (SHORT), and in the other three 20 min exercise bouts (LONG) were completed. Each exercise bout was separated by 10 min of standing rest. Venous blood samples were obtained before (Pre) and immediately post (Post) exercise, and following 1 h passive recovery in a moderate environment (Rec). Primary dependent variables were intestinal temperature, changes in body weight and plasma volume, plasma osmolarity, serum creatinine, serum uric acid, and plasma neutrophil gelatinase associated lipocalin (NGAL), a marker of acute renal tubular injury. Glomerular filtration rate was estimated (eGFR) from creatinine. Data are presented as a change from Pre. RESULTS: Changes in intestinal temperature (+2.0 ± 0.8 vs. +1.1 ± 0.3°C, P<0.01), body weight (-0.9 ± 0.6 vs. -0.7 ± 0.5%, P<0.04) and plasma volume (+12.5 ± 8.6 ± 6%, P<0.03) during exercise were exacerbated in LONG. Changes in osmolality during exercise did not differ between SHORT (± 2 ± 3 mOsm/L) and LONG (± 1 ± 4 mOsm/L, P=0.80). Increases in creatinine were greater in LONG at Post (0.18 ± 0.16 vs. 0.08 ± 0.06 mg/dL, P<0.01) and Rec (0.25 ± 0.19 vs. 0.18 ± 0.08 mg/dL, P<0.01). Increases in uric acid did not differ between SHORT (Post: 0.4 ± 0.2, Rec: 0.6 ± 0.4 mg/dL) and LONG (Post: 0.5 ± 0.5, Rec: 0.8 ± 0.6 mg/dL, P=0.41). Reductions in eGFR were greater in LONG (Post: -15.5 ± 13.4 vs. -8.5 ± 5.5 ml/min/1.73 m², Rec: -21.0 ± 15.1 vs. -16.1 ± 6.6 ml/min/1.73 m², P<0.02). Increases in NGAL were greater in LONG at Post (21.9 ± 21.0 vs. 10.6 ± 9.6 mg/mL, P<0.01) and Rec (12.4 ± 9.8 vs. 2.1 ± 9.1 mg/mL, P<0.02). Conclusion: Elevations in biomarkers of AKI are influenced by the magnitude of hyperthermia and dehydration elicited by exercise but are not linearly linked to the differential hyperosmolality or hyperuricemia. These findings are suggestive of a dose-response relationship between hyperthermia, dehydration and the magnitude of AKI.
RESULTS: Participants started all trials euhydric (mean serum osmolality: 292 ± 1 mOsmol/kg; p = 0.719), with similar baseline HR (66 ± 2 beats/min; p = 0.98) and Trec (36.9 ± 0.1°C). Post-intervention HR and Trec were similar across trials (7 ± 0.2%; p = 0.110). Post-intervention Trec for EX (39.4 ± 0.2°C) was similar to PAH trial (39.3 ± 0.2°C; p = 0.59) but higher than ICE (39.0 ± 0.2°C; p = 0.01) and CON trials (36.5 ± 0.2°C; p < 0.01). Mean Trec achieved during post-intervention IMRI scan were 38.5 ± 0.1°C for both EX and PAH trials, 37.7 ± 0.1°C for ICE trial. Task-based IMRI detected lower BOLD signals from primary motor cortex in PAH (fold change from baseline: 0.46 ± 0.35) compared to EX trials (1.03 ± 0.21, p = 0.01). BOLD signals were also lower in primary somatosensory cortex for PAH (0.39 ± 0.23) compared to EX (1.04 ± 0.18, p < 0.01) and CON trials (0.98 ± 0.10, p = 0.02).

CONCLUSION: Preliminary results from task-based BOLD analysis showed that passive heating led to functional suppression in the sensorimotor areas in the brain. Supported by DIRP Grant, PA No. 901510235S.

Heat tolerance testing has been utilized within military settings to assess one’s readiness to return to duty after sustaining an exertional heat stroke (EHS). The military protocol (2-h walk at 5km h⁻¹ with a 2% grade in 40°C ambient temperature [Tair] and 40% relative humidity [RH]) has also been applied in athletic settings to assist clinicians when returning athletes to play after EHS. However, the efficacy of the military protocol has been questioned for use in athletic settings due to its relatively low intensity compared to the physical demands of most sports. PURPOSE: To compare HR responses during exercise in thermoneutral and hot conditions, the impact of exercise load on HR response may be influenced by BM, BSA, and VO2max. RESULTS: Average VO2max was 42.4±7.2 ml·kg⁻¹·min⁻¹. Percent body mass loss from mHTT was 1.30±0.31%, and average end Trec was 38.87±0.38°C. The mean rate of Trec was 0.02±0.09°C·min⁻¹. Standard linear regression analysis showed RB (Rchange; 0.21; β = -0.93; p = 0.009), RB (Rchange; 0.12; β = 0.56; p = 0.053), and VO2max (Rchange; 0.12; β = 0.46; p = 0.047) explained 48% of the variance achieved in the Trec gain at the end of mHTT (R² = 0.48, p = 0.064). Mean end mHTT PSI was 7.89 (range: 5.95-9.95). During each trial, there was no correlation between PSI and BMI, BSA, and VO2max (p > 0.05). CONCLUSION: While Trec response in mHTT was influenced by BMI, BSA, and VO2max, PSI was able to track thermal strain independent from these variables and with normal distribution, suggesting further exploration of the utility of PSI during the mHTT.

Heat tolerance tests (HTTs) are conducted to determine tolerance to exercise in a hot environment. Current HTT fail criterion states heat rate (HR) cannot exceed 160 bpm and core temperature (Tc) cannot exceed 38.6°C within 120 min. Based on previous observations, some individuals have failed an HTT by exceeding the HR criterion, while Tc remained well below fail criterion. Therefore, it is hypothesized that cardiorespiratory fitness, and not heat intolerance, may be the primary determinant for individuals failing HTTs. By comparing HR responses during exercise in thermoneutral and hot conditions, the impact of exercise load on HR response may be assessed without the confounding variable of increased environmental temperature. PURPOSE: To compare HR responses during exercise in thermoneutral and hot conditions. METHODS: Ten healthy individuals (age: 25.7 ± 2.3 yrs, height: 171.1 ± 7.6 cm, weight: 64.1 ± 9.3 kg) completed one VO2max treadmill test and two trials of treadmill walking at 3.3 mph, 4% grade for up to 120 min. One trial was conducted in thermoneutral conditions (22°C, 40% relative humidity) and one in hot (40°C, 40% relative humidity) environment. After an exercise period of 5 min during each trial, the trial ended if HR exceeded 160 bpm, Tc exceeded 38.6°C, or 120 min was reached. Data were analyzed to determine heat and exercise tolerance among individual subjects. RESULTS: Four of the 10 subjects were unable to complete the hot trial. One subject failed by exceeding the criterion for Tc. Three subjects exceeded the criterion for HR, with end of test (EOT) HR exceeding 130 bpm. Post-intervention IMRI detected lower BOLD signals from primary motor cortex in PAH (fold change from baseline: 0.46 ± 0.35) compared to EX (1.03 ± 0.21, p = 0.01). BOLD signals were also lower in primary somatosensory cortex for PAH (0.39 ± 0.23) compared to EX (1.04 ± 0.18, p < 0.01) and CON trials (0.98 ± 0.10, p = 0.02).

CONCLUSION: Preliminary results from task-based BOLD analysis showed that passive heating led to functional suppression in the sensorimotor areas in the brain. Supported by DIRP Grant, PA No. 901510235S.

Military personnel who have suffered a heat stroke injury may have to undergo a heat tolerance test (HTT). The HTT is usually a “one-test, one-attempt” to assess a heat-injured warfighter’s thermoregulatory capacity with implications of discontinuum training, reassignment, or separation, if not passed. An HTT is passed if heart rate (HR) and core temperature do not exceed 160 bpm and 38.6°C, respectively, after 120 min has elapsed. It is hypothesized that pre-screening individuals to assess their HR response prior to an HTT could reduce the risk of a failed test. PURPOSE: To determine if exercising in a thermoneutral environment, prior to an HTT, can accurately correlate with an end of trial (EOT) HR during exercise in the heat. METHODS: Ten trained individuals (age: 25.7 ± 2.3 yrs, height: 171.1 ± 7.6 cm, weight: 63.3 ± 9.5 kg) completed 120 min of continuous treadmill walking (3.3 mph, 4% grade) in a thermoneutral (22°C, 40% relative humidity) and hot (40°C, 40% relative humidity) environment to assess HR response. All trials were conducted in the morning and required a urine specific gravity of <1.018 to start. During each trial, HR was observed every 5 min until EOT and HR at 30 min was correlated with EOT HR within each trial and between the thermoneutral and hot trials. RESULTS: There was a strong correlation (30 min HR versus EOT HR) for each thermoneutral and hot trial, r = 0.94, r = 0.91, respectively. Additionally, there was a strong correlation between thermoneutral 30 min HR and hot EOT HR, r = 0.83. Significance of actual vs. predicted EOT HR for thermoneutral, hot, and thermoneutral-hot comparisons were p < .09, p = .80, and p = .92, respectively. CONCLUSIONS: These findings suggest exercise in thermoneutral conditions accurately correlates with EOT HR when performing exercise in the heat. By pre-screening warfighters in thermoneutral conditions prior to their HTT, it may be possible to reduce HTT failures due to inadequate aerobic conditioning rather than inadequate thermoregulatory capacity. Future work should seek to identify selection criteria for warfighters that would likely fail an HTT.

EC Temp is a heart rate (HR) based core temperature (CT) estimation model is being used to monitor and manage heat strain in warfighters and athletes during exercise in the heat. EC Temp may also be invaluable for sedentary CT estimation of CVHR and rhythm disturbances. A recent modification to better reflect physiology may also improve EC Temp prediction of CT and cardiac rhythm indicators (Midline Estimator of Rhythm MESOR, amplitude, and acrophase). PURPOSE: To compare the accuracy of the original EC Temp model (Quadratic model) with a modified EC Temp (Sigmoid model) during constant exercise and rest periods as well as during cardiac rhythm indicators. METHODS: 12 subjects (Age, 23±3 yr; HT, 173±8.77 cm; BM, 70.12±8.94 kg) were monitored continuously for CT and HR while enclosed in a calorimeter chamber over two 22.5-hr
torres et al. (2014) found minor correlations between Heat Stress Score (HSS) and rectal temperature (Trec) in a warm weather race. PURPOSE: To examine if the weighted HSS equation (HSSw) is more effective at predicting Trec in a warm weather race. METHODS: Data from twelve participants (males, n=7; females, n=5) who ran in the 2015 Falmouth nautical Race were examined (age, 38 ± 11.5y; body mass, 66.12 ± 7.91kg; body fat, 16.70 ± 4.92%). Participants logged their exercise for 28 days leading up to race day using an online questionnaire. Zip codes were used to retrospectively calculate weather data (ambient temperature [Tamb], relative humidity [RH]) using an online weather database. For indoor exercise bouts, the environmental conditions were standardized to Tamb = 20°C and RH = 30%. Trec and finish time (FT) were measured on race day. HSS was calculated for training (HSS1) and for race day (HSS2), using the equation HSS = (Tamb °C duration [min]) to determine total heat exposure. Edward’s Training Impulse Score (TRIMP = exercise duration [min] heart rate weighting factor) was used to quantify exercise intensity for training (TRIMP1) and for race day (TRIMP2). Values from HSS and TRIMP were then weighted using the updated equation: HSS2 = HSS1 x (Tamb °C) + TRIMP1 + TRIMP2. Standard linear regression and Pearson product correlation were used to investigate anthropometric and physiological variables that were associated with Trec. Significance was set a priori at p = 0.05. RESULTS: Average HSS1 (R²=0.004, p=0.841), difference between finish time (FT) and predicted FT (R²=0.139, p=0.234), FT (R²=0.104, p=0.298), and body mass (R²=0.112, p=0.282) did not predict participant’s Trec. Combined, the above variables predicted approximately 43% of the variance in Trec (R²=0.652, R²=0.425, p=0.359). Additionally, average HSS2 (R²=0.125, p=0.02, p=0.671) and FT (R²=0.024, R²=0.001, p=0.936) were not correlated with Trec. CONCLUSION: HSS did not exhibit improved prediction for post-race Trec. Further investigation should examine anthropometric and physiological variables that were not collected in the study to predict Trec response in a warm weather race.

Exertional heat stress increases gastrointestinal barrier permeability and risk of exertional heatstroke (EHS) via a TLR4-mediated inflammatory pathway. Oral curcumin supplementation is known to inhibit both the MyD88 & TRIF-dependent pathways of TLR4 signaling. PURPOSE: This work investigated the effect of 3d of 500mg/d dietary curcumin supplementation on gastrointestinal (GI) barrier permeability and systems-physiology responses to exertional heat stress in non-heat acclimated humans. METHODS: Eight subjects ran (65%/V̇O2 peaks) for 60min in a Darwin® chamber (37°C/26%RH) two times (CURCUMIN/PLACEBO). Intestinal fatty acid binding protein (I-FABP) and associated pro-inflammatory (MCP-1, TNfa, Il-6) and anti-inflammatory (Il-1ra, Il-10) cytokines were assayed from plasma collected before (PRE), after (POST), 1hr (1-POST), and 4hrs after (4-POST) exercise. Core (Tc), skin (Tk), and mean body (Tb) temperatures; HR; and physiological strain index (PSI) were measured throughout exercise. Group differences were determined with 2-Way (Condition x Time) RM ANOVAs. RESULTS: Intriguingly, the interaction of Condition x Time was significant (p<0.05) for I-FABP and Il-1ra. Post hoc analysis indicated the increase in I-FABP from PRE to POST (87%) and Il-1ra from PRE to POST (33%) in PLACEBO but not in CURCUMIN (58% & 18%, respectively). Il-1ra also increased more from PRE to 1-POST in PLACEBO (153%) than in CURCUMIN (77%). TNfa increased (p<0.01) from PRE to POST (19%) and 1-POST (24%) in PLACEBO but not in CURCUMIN. Il-10 increased (p<0.01) from PRE to POST (61%) and 1-POST (42%) in PLACEBO but not in CURCUMIN. The PSI, which indicates EHS risk, was also lower (p<0.01) in CURCUMIN from PRE to POST (48%) and PRE to 1-POST (24%) in PLACEBO. CONCLUSION: Collectively, these data suggest 3d curcumin supplementation reduces GI permeability and cytokine responses to exertional heat stress.

Exertional heat stress increases gastrointestinal barrier permeability and risk of exertional heatstroke (EHS) via a TLR4-mediated inflammatory pathway. Curcumin has been shown to inhibit TLR4 signaling in vitro but has not been examined in a human exertional heat stress model. PURPOSE: This work investigated the effect of 3d of 500mg/d dietary curcumin supplementation on the cellular and systemic responses to exertional heat stress in non-heat acclimated humans. METHODS: Subjects (N=6) ran (65%/V̇O2 peaks) for 60min inside an environmental chamber (37°C/26%RH) two times (CURCUMIN/PLACEBO). Core temperature (Tc), heart rate (HR), and physiological strain index (PSI) were measured throughout exercise. Peripheral blood mononuclear cells (PBMC) were isolated from blood samples that were taken before (PRE), after (POST), 1hr (1-POST), and 4hrs after (4-POST) exercise. The protein content of markers along the TLR4 signaling pathway (TLR4,

Abstracts were prepared by the authors and printed as submitted.
MyD88, pNFκB, NFκB) and indicators of cellular energy status (SIRT1 & p-AMPK) were determined with Western Blot. Group differences were determined with 2-Way (Condition x Time) RM ANOVA. RESULTS: Under CURCUMIN, Tc rose less (0.23±0.15°C; p<0.01) and both HR and PSI were lower from 45-60min of exercise (HR: 9±2 bpm; PSI: 12±1%; p<0.05). In PBMC, the ratio of pNFκB to NFκB at 1-POST was increased by 64% in PLACEBO and 51% in CURCUMIN (p<0.05). Intriguingly, TLR4 was reduced at 1POST in both conditions (PLACEBO: -28%, CURCUMIN: -17%; p<0.05). In addition, pAMPK (PLACEBO: -62%, CURCUMIN: -57%; p<0.01) and SIRT1 (PLACEBO: -61%, CURCUMIN: -48%; p<0.02).

CONCLUSIONS: Despite robust improvements in systemic responses to exertional heat stress under CURCUMIN, there was no difference in the protein expression profile of PBMC that were collected under CURCUMIN and PLACEBO conditions. However, in both conditions we did note a significant elevation in pNFκB:NFκB at 1-POST, which (ironically) coincided with a significant reduction in TLR4 (but not MyD88). At present, our working hypothesis is that pAMPK and SIRT1 were downregulated in an effort to maintain the pro-inflammatory capacity of PBMC during this “open window”, an effect that has not previously been described in PBMC collected under exertional heat stress conditions.

Environmental factors such as hypoxia and heat stress have been shown to disrupt cell homeostasis, resulting in altered cellular energy status and the activation of signaling pathways associated with mitochondrial biogenesis. In response to heat stress, mitochondrial biogenesis has been confirmed in skeletal muscle using both animal and in vitro research models. Purpose: To investigate the effect of deep tissue heating on skeletal muscle respiratory capacity in humans. Methods: Ten healthy men (n = 5) and women (n = 5) volunteered for the study (20.3 ± 2.05 yrs, 171 ± 13 cm, 65 ± 14 kg). From each volunteer, a randomly selected leg was chosen to receive daily heat therapy over a 6-day period via 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 before and after the therapeutic intervention from both the treated and untreated vastus laterals muscles. Maximal respiratory capacity (OXPHOS) and maximal uncoupled respiration (ETS) were measured according to the standard Substrate-Uncoupler-Inhibition Titration (SUIT) protocol for high-resolution respirometry. Results: No differences in OXPHOS (p=0.215) or ETS (p=0.4114) were detected between the treatment and control muscles before heat therapy. Muscle temperature increased significantly in response to diathermy treatment (3.9 ± 0.51°C, p<0.0001). After 6 days of heat therapy, there was a strong trend for increased maximal OXPHOS (5.55 ± 3.50 pmol kg−1 sec−1, p=0.055). Following heat therapy, there was also a significant increase in ETS (9.40 ± 4.17 pmol kg−1 sec−1, p<0.035). Conclusion: In support of previous animal and in vitro research, these data support increases in mitochondrial respiratory capacity in response to heat stress in human skeletal muscle. Such increases in mitochondrial respiratory capacity may have implications for individuals suffering from mitochondrial myopathies, as improved respiratory capacity may promote improvements in skeletal muscle health and function. Additional research involving more practical heating modalities is necessary if these findings are to be extended to clinical populations.
Unexpectedly, HEAT exhibited a heightened inflammatory response [p-IKKα/β (+81%; p<0.04), p-IκBα (+82%; p<0.01), p-NFκBp65 (+283%; p<0.04)]. Intermediate enzymes of lipid [p-ACC (+88%; p<0.02)] and glycolysis [p-GSK3b (+367%; p<0.03)] biosynthesis were also down regulated, with elevated p-AMPK (+80%; p<0.01) suggesting an energetic deficit. Apoptosis activators Caspase 8 (+53%; p<0.04) and FOXO1 (+74%; p=0.02) were up regulated, as was p-JNK (+41%; p<0.03). Through follow-up analysis we determined these undesired responses were linked to up-regulation of TLR4 (+24%; p<0.03) and MyD88 (+308%; p<0.01), as well as p-NIK (+199%; p=0.02) but not IκBκ (-4%). Conclusion: Despite a robust activation of the HSR, repeated thermal stress imparts an exaggerated pro-inflammatory and pro-apoptotic response to LPS stimulation in C2C12 myotubes. This may be due to elevated TLR4 signaling capacity. We speculate that reduced glyco- gen storage in HEAT may have contributed to lower stress tolerance, with the upregulation of apoptosis serving as a negative-feedback mechanism (to reduce myotube number).

1609 Board #284
June 1 9:00 AM - 10:30 AM
Human Skeletal Muscle Myogenic and Proteolytic Response To Environmental Temperature
Christina Angeli, Roksana Zak, Robert Shute, Dustin Slivka, FACSIM. University of Nebraska at Omaha, Omaha, NE. (Sponsor: Dr. Dustin Slivka, FACSIM)

(NO relationships reported)

Many human diseases lead to loss of skeletal muscle function and mass. Local and environmental temperature can alter the exercise-stimulated response of several genes involved in skeletal muscle growth and breakdown. However, the impact of environmental temperature, independent of exercise, has not been addressed in a human model. PURPOSE: The purpose of this study was to compare the effects of exposure to hot, cold, and room temperature conditions on skeletal muscle gene expression related to myogenesis and proteolysis. METHODS: Recreationally trained male subjects (n=11, age 27.2 ± 5.5 years; height 183 ± 5 cm, weight 84.1 ± 13.0 kg) each completed three trials in hot (33°C), cold (7°C), and room temperature (20°C) conditions. Whole body oxygen consumption was monitored during the 3 h exposure. Muscle biopsies were taken from the vastus lateralis pre and post-exposure. RESULTS: Temperature had no effect on MSTN (p = 0.987), MYOG (p = 0.074), and IRF4 (p = 0.780). The current study monitored markers of immunological and oxidative status. When considered in conjunction with previous research, exercise appears to be a necessary component to observe gene expression related to myogenesis and proteolysis. When considered in conjunction with previous research, exercise appears to be a necessary component to observe gene expression alterations between different environmental temperatures in humans. Supported by the National Institute for General Medical Science (NIGMS, 5P20GM103427 and P20GM109090), a component of the National Institutes of Health (NIH).

C-46 Free Communication/Poster - Immunology I
Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

1610 Board #285
June 1 8:00 AM - 9:30 AM
Changes In Parameters Of Immunological And Oxidative Status In Elite Athletes During Winter
Ivan Stankovic1, Danica Michalikova1, Rajna Minic1, Jelena Kotur-Stevuljevic, Milica Miljkovic, Marija Kostic-Vucicevic, Nenad Dikic1, Marija Andjelkovic1, Ivana Baralic1, Nevena Ivanovic1, Brizita Djordjevic1, 1Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia. 2First Medical Faculty, Charles University, Prague, Czech Republic. 3Institute of Virology, Vaccines and Sera, Torlak, Belgrade, Serbia. 4Sports Medicine Association of Serbia, Belgrade, Serbia. 5Zvezdara University Medical Center, Belgrade, Serbia. Email: istank2005@yahoo.com

(NO relationships reported)

PURPOSE: The current study monitored markers of immunological and oxidative status in 9 male elite athletes (triathlon and athletics): VO2max: 68±11 mL/kg/min, age: 24±2.5 years, training loads: 13±1.2 h/week, during 14 weeks in winter. METHODS: The resting blood samples were collected at baseline and at the end of the study. Cytokine- and metabolomics methods and enzyme-linked immunosorbent assay (ELISA) were used for parameters determination. RESULTS: The level of concanavalin A (ConA) stimulated interferon-γ (IFN-γ) from peripheral blood mononuclear cells (PBMCs) was increased (562 ±147 852) vs. 1097 (451 ±1842) pg/mL, p=0.013. Also, the level of tissue growth factor-1 (TGF-β1) in serum was elevated (12.5 ±4.1) vs. 7.2 (4.9 ±2.2) ng/mL, p=0.015. There was no change in the level of peptidoglycan (PGN) stimulated interleukin (IL)-10 from PBMCs. There were no significant changes in PBMCs proliferation/ viability upon stimulation with ConA and PGN during the study. No changes in superoxide dismutase (SOD), pro-oxidative-antioxidative balance (PAB), total antioxidant status (TOS) and thiobarbituric acid reactive substances (TBARS) were observed along the study. Total antioxidant status (TAS) was increased (8.09 ±3.7) vs. 5.82 ±1.4) μmol/L, p<0.05. There was no change in the level of paraoxonase (PON1) was decreased (523 ±295) vs. 335±183 U/L, p=0.003) at the end of the study. Advanced oxidation protein products (AOPP) were increased (25±7.9 vs. 42±7.6 μmol/L, p=0.011). Negative correlation between TOS and PBMCs proliferation/viability upon stimulation with ConA (r=0.406, r=0.392) was found, as well as between PAB and proliferation/viability upon stimulation with PGN (r=0.045, r=0.391). CONCLUSIONS: In conclusion, 14 weeks of regular training and competitions in winter induced prominent changes in cytokines, biomarkers of oxidative stress and antioxidative enzyme activity. These perturbations of immune and oxidative status could cause increased susceptibility to infections and consequently impair performances.

1611 Board #286
June 1 8:00 AM - 9:30 AM
SlgA and Upper Respiratory Syndrome During a College Cross Country Season
Mariane Fahliman, FACSIM1, Hermann J. Engels, FACSIM, Heather L. Hall2, 1Wayne State Univ., Detroit, MI. 2Elmhurst College, Elmhurst, IL.
Email: m.fahliman@wayne.edu

(NO relationships reported)

PURPOSE: To examine changes in mucosal immunoglobulin A (SlgA) and the incidence of upper respiratory syndrome (URS) during a college cross country season. METHODS: Twenty-two cross country athletes (XC) (20.7 ± 1.4 years) and twenty-three matched controls (C) (20.4 ± 1.4 years) served as subjects in this investigation. Using standardized data collection procedures, all participants provided unstimulated resting saliva samples at four targeted time points (pre-season, two in-season, and post season) over a four-month study period. These samples were subsequently analyzed in one batch by an enzyme-linked immunosorbent assay (Salimetrics, Philadelphia, PA), to determine absolute SlgA (μg/mL) concentration and calculate the secretion rate of SlgA (μg/min). Throughout the study, subjects completed standard weekly logs indicating signs and symptoms of URS from which a total symptom score (TSS) was calculated according to the method of Gleeson, (2013). Differences between groups and across the duration of the study were examined using repeated measures ANOVA. RESULTS: Analysis of SlgA data revealed significant main effects for SlgA, F(1,43) = 15.617, p = .000 with a moderate effect size (η2) as well as a significant Group x Time interaction, F(3,41) = 6.386, p =.001 with a moderate effect size (.318). Analysis of the secretion rate of SlgA data revealed significant main effects for the secretion rate of IgA, F(1,43) = 15.617, p = .000 with a moderate effect size (η2) as well as a significant Group x Time interaction, F(3,41) = 5.998, p = .002 with a moderate effect size (.305). A Bonferroni adjusted multiple comparison test revealed that resting absolute SlgA concentration and secretory SlgA in XC decreased throughout the season but remained unchanged in C. There was no significant difference in the saliva flow rate, F(3,41) = 1.719, p = .178. There was also a group by time interaction for TSS F(1,42) = 5.8, p = .020. XC had higher TSS scores during the season and a significant negative correlation of moderate strength between those scores and the secretion rate of SlgA (r=-.5). CONCLUSIONS: These results indicate that a season of college cross country running is associated with a progressive reduction in mucosal SlgA levels and an increase in URS.

1612 Board #287
June 1 8:00 AM - 9:30 AM
IL-6 Linkage To Exercise-induced Shifts In Lipid-related Metabolites: A Metabolomics Analysis
David C. Nieman, 28081, FACSM1, Wei Sha2, Kirk L. Pappan2.1Appalachian State Univ, Kannapolis, NC. 2University of North Carolina at Charlotte, Kannapolis, NC. 3Metabolon, Inc., Durham, NC. Email: niemand@appstate.edu

(NO relationships reported)

IL-6 and lipolysis have been linked in cell culture and IL-6 infusion studies, but this has not yet been tested using metabolomics-based procedures that allow the simultaneous evaluation of a high number of metabolites from the lipid super pathway following intense exercise. PURPOSE: Metabolomic profiling and bioinformatic

Abstracts were prepared by the authors and printed as submitted.
technologies were used to determine the relationship between exercise-induced increases in IL-6 and lipid-related metabolites. METHODS: Male runners (N=24; age 36.5±1.8 y) ran on treadmills to exhaustion (22±6±0.1 h, 24.9±1.3 km, 67±1.9\% VO_{2\text{max}}), with vastus lateralis muscle biopsy and blood samples collected before and after the running bout. RESULTS: The runners experienced a 33.7±4.2% decrease in muscle glycogen, 39.0±8.8, 2.4±0.3, and 1.4±0.1-fold increases in plasma IL-6, IL-8, and MCP-1, respectively, and 95.0±18.9 and 158±20.6% increases in cortisol and epinephrine, respectively (all, P<0.001). The metabolomics analysis revealed changes in 209 plasma metabolites, especially long- and medium-chain fatty acids, fatty acid oxidation products (dicarboxylyl and monohydroxy fatty acids, acylcarnitines), and ketone bodies. OPLS-DA modeling supported a strong separation in pre- and post-exercise samples (R2Y=0.964, Q2Y=0.902). OPLSR analysis failed to produce a viable model for the relationship between IL-6 and all lipid-related metabolites (R2Y=0.644, Q2Y=0.531). Multiple structure equation models were evaluated based on IL-6, with the best fit pathway model showing a linkage of exercise time to IL-6, then carnitine, and 13-methylriynic acid (a marker for adipose tissue lipolysis) and sebacate. CONCLUSION: This metabolomics-based analysis showed that the substantial increase in lipid metabolites after prolonged and intensive running was related more to changes in cortisol than increases in IL-6 and epinephrine, or muscle glycogen depletion. Taken together, the metabolomics-based data from this study do not support a strong relationship between the modest increase in IL-6 and the large increase in lipid-related metabolites following prolonged and intensive running. 

Funding: Reoxcyn Discoveries Group, Salt Lake City, UT

10 m/min velocity during wk1, 20 m/min for wk2, with 5 m/min/wk increment in the following weeks. The laser treatments were He-Ne laser (2 h after exercise, 2 min) and CD8\(^+\) T lymphocytes of nasal mucosa were analyzed by immunohistochemistry. 

RESULTS: 1) Following changes (p<0.01) occurred in Exercise group after 6-wk exercise: nasal mucosa was seriously damaged, cilia layer of free edge essentially fell off, and the decline of slgA (4.5\%, ES=0.77) level and ratio of CD4/CD8 (41.4\%, ES=0.53) were observed in nasal mucosa. 2) Compared with E group, the structure of nasal mucosa were obviously improved in EL group. In addition, the slgA concentration (110.7\%, p<0.01, ES=0.55), CD4\(^+\) cells (127\%, p<0.01, ES=0.59), and ratio of CD4/CD8 (140\%, p<0.05, ES=0.56) of nasal mucosa were enhanced markedly in EL group Compared with that of E group. 3) However, compared with E group, the EH treatment did not show significant effects as those by the EL group (p>0.05), with the following changes: slgA (140\%, ES=0.29), CD8\(^+\) (122\%, ES=0.13), and ratio of CD4/CD8 (120\%, ES=0.15).

CONCLUSIONS: The long-term high-intensity exercise training would lead to destruction of nasal mucosa structure and the declining of nasal immune function. Low energy laser irradiation, especially EL treatment, had a beneficial effect on nasal mucosa immune function.

Natural Killers (NK) cells are unique innate immune cells that increase up to 5 fold in the circulation with brief exercise and are known to play a key role in immune surveillance and first-response defense against pathogens and cancer. PURPOSE: To study the effect of brief bout of exercise on NK cells cytotoxic function in both healthy children and those who survived acute lymphoblastic leukemia (ALL) using NK cell killing activity assay. METHODS: 8 ALL children in remission and 7 age-matched controls (11-17 y.o.) performed 16 min cycle ergometer interval exercise at a constant work equivalent to 64\% peak VO\(_2\). PBMCs were isolated before (BL) and immediately after (PK) exercise. Flow-cytometry was used to detect NK cell cytotoxicity against erythroleukemic cells (K562) using NKTEST kit (Allecare Biotechnology, San Diego) in various PBMC effector (E) to target cell (T) ratios (12.5, 25, and 50 to 1). At the 25:1 ratio, IL2 activation was also quantified. NK Kill activity is reported as % (proportion of dead vs. total target cells). A two way ANOVA was used to detect differences between PK vs BL and ALL vs Controls. RESULTS: Brief exercise enhanced NK cell killing activity similarly for both ALL and Controls (Figure 1A). NK cell kill activity was significantly increased in response to IL2 at both BL and PK (Figure 1B). Activation by IL2 was reduced in ALL compared to Controls (51\% vs. 123\%). The reduced activity was partially mitigated following exercise but remained lower than controls (74\% vs. 147\%). CONCLUSION: We speculate that exercise-induced NK cell killing activity may contribute to the previously identified cancer surveillance properties of NK cells. Exercise has the potential to be used as adjunctive therapy in ALL. Supported by UCI SOM Faculty Grant, NIH Grant P01HD-048721 & PERC System Biology Fund.

**Board #288**

**Apolipoprotein Of Human Peripheral Blood Mononuclear Cells Following Maximal Aerobic Exercise In Obesity**

Chun-Jung Huang, FACS\(^m\), Aaron L. Slusher\(^e\), Peter J. Ferrandi\(^1\), Michael Whitehurst, FACS\(^m\). 1Florida Atlantic University, Boca Raton, FL. 2Virginia Commonwealth University, Richmond, VA.

(No relationships reported)

**PURPOSE:** The pro-apoptotic (BAX) and anti-apoptotic (BCL-2) proteins have been shown to play an essential role in the regulation of exercise-mediated leukocyte apoptosis. These apoptosis-related proteins are up-regulated in peripheral blood mononuclear cells (PBMCs) of obese individuals; however, the impact of acute exercise-mediated apoptosis still remains unclear. Therefore, the purpose of this study was to investigate whether or not obesity would modulate the expression of BAX and BCL-2 following maximal aerobic exercise.

**METHODS:** Twenty one healthy obese (N=10; 22±2yrs) and normal-weight (N=11; 23±4yrs) subjects participated in an acute bout of maximal aerobic exercise. Blood samples were collected prior to, immediately after exercise, and one hour into recovery (R1H) for analyses of BAX and BCL-2 using the Western Blot technique.

**RESULTS:** A similar expression of BAX and BCL-2 at baseline was observed between obese and normal-weight subjects. Furthermore, repeated measures analyses of variance (ANOVA) showed a significant elevation in BAX immediately following exercise in both groups (p<0.017). While no group by time interaction was found for BCL-2, a significant decrease from baseline to R1H was observed (p<0.01).

**CONCLUSIONS:** Our results support that acute exercise mediates a transient alteration of apoptosis in human PBMCs. Further investigation on how exercise training may potentially delay the process of leukocyte apoptosis can promote an effective immune response in obesity.
Previous studies have reported an enhanced antibody response following vaccination coupled with acute exercise. Researchers have speculated that this immunomodulation may be due to the release of damage-associated molecular patterns in response to exercise and the concomitant migration of dendritic cells to lymph nodes. Because the majority of work in this area has been done in humans, rendering the invasive techniques required unrealistic, no study has yet examined the cell populations within the lymph nodes following acute exercise. **PURPOSE:** To determine if acute exercise changes the dendritic cell population within lymph nodes draining the exercising muscle. **METHODS:** Female BALB/c mice received an intramuscular injection of physiological saline in right and left quadriceps, and then performed either 90 minutes of moderate intensity treadmill running (EX) or remained near the treadmill without running (NO EX). Twenty-four hours following the injections, mice were euthanized (n = 7 per treatment group) and inguinal lymph nodes were collected. Populations within the inguinal lymph nodes were processed by flow cytometry using the antibodies allophycocyanin-Cy7-conjugated anti-mouse CD11c and Alexa Flour 700-conjugated anti-mouse MHC Class II (MHCII). Results were analyzed using FlowJo. **RESULTS:** Exercise did not significantly alter total cell number within the lymph nodes (EX: 5.86 x 10^6 ± 8.37 x 10^5 vs. NO EX: 4.82 x 10^6 ± 8.41 x 10^5, p = 0.40). However, EX mice had both a higher percentage (16.3 ± 4.69% vs. 5.25 ± 1.53%, p = 0.03) and absolute number (8.54 x 10^5 ± 1.53 x 10^5 vs. 7.23 x 10^5 ± 7.24 x 10^5, p = 0.00) of CD11c+ MHCII+ cells present in the inguinal lymph nodes as compared to NO EX mice. Exercise had no effect on the expression of the costimulatory molecules CD80 and CD86 as assessed by mean fluorescence intensity within the CD11c+ MHCII+ cell populations. **CONCLUSIONS:** Acute exercise alters the cell populations within the lymph nodes draining exercising muscles 24 hours post-injection, although an increase in costimulatory molecule expression is not evident at this time point. Whether these effects are more pronounced at earlier or later time points and the direct results on antibody production following exercise coupled with a vaccine remain to be elucidated.
difference in cytotoxicity of pre, post, 1h post effectors incubated with pre-exercise serum (Pre vs. post vs.1h post = -0.321 ± 0.046 vs. 0.282 ± 0.047 vs. 0.323 ± 0.047, p = 0.005).

CONCLUSION: 1h post exercise serum enhanced resting NK cell cytotoxicity, indicating that factors present in serum after acute exercise can prime effector cell function. Future work will identify levels of glucocorticoids and cytokines present in 1h post exercise serum.

C-47 Free Communication/Poster - Muscle Dynamics

Thursday, June 1, 2017, 7:30 AM - 12:30 PM
Room: Hall F

1620 Board #295
June 1 9:00 AM - 10:30 AM
Changes in Quadriceps Motoneuron Pool Excitability due to Static Stretch and/or Explosive Contraction
Kyeongeun Min, Yongsuk Lee, Jihong Park. Kyung Hee University, Yongin, Korea, Republic of.
Email: mekk92@naver.com

(NO relationships reported)

PURPOSE: To observe how static stretch and/or explosive contraction (vertical jump) changes quadriceps motoneuron pool excitability (MNPE).

METHODS: Fifteen healthy people (13 males and 2 females) completed four data collection sessions on separate days with a 48-hour interval between sessions. A 4 (condition) × 3 (time) cross-over randomised controlled laboratory study was performed. Conditions were A) stretching and jumping, B) control (no stretching) and jumping, C) stretching and control (no jumping), and D) control (no stretching and jumping). Thomas test was used to stretch both quadriceps (30 × 5 × 3 for each quadriceps). For jumping, two-legged maximal vertical jumps with a-30 s rest interval. To assess quadriceps MNPE, the right side of vastus medialis peak Hoffmann reflexes normalised by peak motor response were recorded at baseline, 0-min post-condition, and 20-min post-condition. For the conditions including the jumping task, jump heights were also recorded after measurements of MNPE at each time point. To test condition effects over time, mixed model analysis of variances were performed and between-time effect sizes (ES) were calculated.

RESULTS: Quadriceps MNPE did not change among four conditions at any time point (F6,154 = 1.71, p = 0.18). There was a trend that quadriceps MNPE at 0-min post-condition, as compared to the baseline values, was reduced under the condition A (5%, ES = 0.46) and C (8%, ES = 0.43), and increased under the condition B (10%, ES = 0.46). An increased quadriceps MNPE under the condition B appeared to be maintained until the 20-min post-condition measurement (8%, ES = 0.52). Jump heights did not change among two conditions (A and B) at any time point (F6,154 = 2.14, p = 0.07). Jump heights between-time were very small (<0.1 for all values).

CONCLUSIONS: Our data suggest that (1) static stretch does not acutely affect explosive performance, and (2) explosive contraction may increase MNPE for 20-min, (3) a combination of static stretch and explosive contraction may decrease MNPE, (4) three sets of 30-s stretch does not acutely affect explosive performance, and (5) changes in combination of static stretch and explosive contraction may decrease MNPE.

In order to complement sport training and to induce regeneration processes of muscle, ice pack application (IPA) is often used by athletes. Physiological mechanisms are relatively well investigated while the sample is mainly gainers of competitive athletes. PURPOSE: To investigate the influence of IPA on MCP by TMG method.

METHODS: Sixteen healthy people (50% males; 19-20 y) participated in this study. Tensiomyographic assessment was performed before and immediately after 15 minutes of IPA treatment on vastus medialis. From tensiomyographic response we extracted and analysed delay time (Td), contraction time (Tc), half-relaxation time (Tr) and maximal displacement (Dm).

RESULTS: After IPA we found that Td, Tc, Ts and Tr values increased (p < 0.010) by 6.2% (ES = 2.61), 6.0% (ES = 2.06), 29.7% (ES = 1.99), and 26.6% (ES = 2.01), respectively, while Dm decreased (p < 0.001) by 12.7% (ES = 2.61).

CONCLUSION: Our results suggest that IPA treatment significantly altered MCP after only 15 minutes of exposure. This plays an important role in skeletal muscle behavior immediately after cooling procedures and should be taken into account when planning training or rehabilitation programs.

1621 Board #296
June 1 9:00 AM - 10:30 AM
Trunk And Hip Flexor Muscle EMG Responses To Four Phases Of Two Different Style Sit-Ups
William Sullivan, Peter A. Hosick, Fredrick A. Gardin, Steven Leigh. Montclair State University, Montclair, NJ.
Email: sullivanw@mail.montclair.edu

(No relationships reported)

We previously found that a modified sit-up (MSU) emphasizing the abdominal muscles and a freestyle (FS) sit-up elicited similar abdominal and hip flexor muscle electromyographic (EMG) activity. PURPOSE: To investigate the interaction between muscle activity and trunk movement, this study compared the effects of the MSU and FS on EMG activity and kinematics during four sequential phases of the sit-up, where each of the following was the dominant action: (1) concentric trunk flexion, (2) concentric hip flexion, (3) eccentric hip extension, and (4) eccentric trunk extension.

METHODS: Twenty male subjects (23.8 ± 3.5 years) performed each exercise for 30 seconds (assessed by Vertec: 3 trials with a-30 s rest interval). To assess quadriceps MNPE, the right side of vastus medialis peak Hoffmann reflexes normalised by peak motor response were recorded at baseline, 0-min post-condition, and 20-min post-condition. For the conditions including the jumping task, jump heights were also recorded after measurements of MNPE at each time point. To test condition effects over time, mixed model analysis of variances were performed and between-time effect sizes (ES) were calculated. RESULTS: Quadriceps MNPE did not change among four conditions at any time point (F6,154 = 1.71, p = 0.18). There was a trend that quadriceps MNPE at 0-min post-condition, as compared to the baseline values, was reduced under the condition A (5%, ES = 0.46) and C (8%, ES = 0.43), and increased under the condition B (10%, ES = 0.46). An increased quadriceps MNPE under the condition B appeared to be maintained until the 20-min post-condition measurement (8%, ES = 0.52). Jump heights did not change among two conditions (A and B) at any time point (F6,154 = 2.14, p = 0.07). Jump heights between-time were very small (<0.1 for all values).

CONCLUSIONS: Our data suggest that (1) static stretch does not acutely affect explosive performance, and (2) explosive contraction may increase MNPE for 20-min, (3) a combination of static stretch and explosive contraction may decrease MNPE, (4) three sets of 30-s stretch does not acutely affect explosive performance, and (5) changes in combination of static stretch and explosive contraction may decrease MNPE.

1622 Board #297
June 1 9:00 AM - 10:30 AM
Acute Effects Of Cooling On Muscle Contractile Properties

(No relationships reported)

Purpose: To evaluate the effects of six weeks of training with two different types of neuromuscular electrical stimulation parameters on quadriceps neuromuscular performance in competitive athletes.

Methods: This controlled and randomized clinical trial included 20 athletes, equally divided into three groups: medium frequency current group with 500 μs (MF-500) (n=7), low frequency current group of with 500 μs (LC-500) (n=5) and control group (CG) (n=8). Each group had evaluated, before and after the intervention: the peak torque of knee (PT), muscle thickness and signs of electromyography (EMG) of the vastus lateralis (VL), and the sensory discomfort level (VAS). The training with NMES was performed 3 times per week and consisted of 18 sessions, 15 minutes per session (36 isometric involuntary contractions per session), 6s duration in each contraction (with 1s rise time - TON and 1s descent time - TOFF). For statistical analysis of homogeneity was applied Levene's test. Mixed ANOVA test was used to verify the existence of significant differences between the measurements. The significance level was 5%.

Results: There was no significant difference between any groups for all variables (p>0.05). PT (MF-500: pre = 222.5 ± 42.2 Nm and post = 219.9 ± 54 Nm; PC-500: pre = 231.1 ± 82.2 Nm and post = 244.3 ± 79, 9 Nm; CG: pre = 219.9 ± 54 Nm; post = 225.3 ± 43.2 Nm), muscle thickness (MF-500: pre = 22.9 ± 2.5 mm and post = 23.7 ± 2.8 mm; PC-500: pre = 23.6 ± 2.6 mm and post = 23.5 ± 2.7 mm; CG: pre = 25.9 ± 4.7 mm and post = 25.9 ± 4.3 mm) and EMG (MF-500: pre = 0.4 ± 0.4 RMS and post = 0.5 ± 0.5 RMS; PC-500: pre = 0.7 ± 0.4 RMS and post = 0.7 ± 0.3 RMS; CG: pre = 0.8 ± 0.5 RMS and post = 0.7 ± 0.4 RMS). In addition, all current produced similar levels of discomfort, with no significant difference (p>0.05) in the
PURPOSE: Limited studies have compared upper and lower body strength and flexion-extension ratio (F/E) differences at various contraction velocities between males and females participating in resistance training. F/E ratios typically range from 0.50 to 0.75 where lower ratios may be indicative of increased injury risk. These experiments tested the hypothesis that the strength differences between genders would decline as contraction speed increased while F/E would not be different between genders. METHODS: Subjects (n=10 females and 10 males, mean age 21±0.9 yrs old) completed shoulder and knee flexion and extension on a Biodex isokinetic dynamometer at 60, 180 to 300 °/sec. The time spent performing resistance training was 6±0.8 vs. 4.4±0.5 hrs/week for males and females, respectively. Maximal torque normalized to body weight (T/BW) and F/E at each speed were compared between genders at each joint with 2-way ANOVAs. RESULTS: At the knee and shoulder T/BW in males was significantly greater than females for flexion and extension at all speeds with the exception of shoulder flexion (p<0.05). For knee flexion, male T/BW was 33, 41, and 45% higher than females, at 60, 180, and 300 °/sec respectively. For knee flexion, male T/BW was 31, 36, and 37% higher than females at 60, 180, and 300 °/sec, respectively. For shoulder extension, male T/BW was 36 and 40% higher than females at 60 and 180 °/sec, respectively. T/BW increased with decreased contraction speed for shoulder and knee extension in both genders and knee flexion in males (p<0.05). T/BW at 180 vs. 300 °/sec was not different for knee flexion in females. Knee F/E increased with contraction speed in both genders and was significantly higher in females than males at 180 °/sec (p<0.05). In males and females, respective knee F/E was 0.55±0.3 and 0.63±0.06 at 60 °/sec vs 0.65±0.3 and 0.88±0.09 at 180 °/sec. Shoulder F/E was unaffected by gender or contraction speed. CONCLUSIONS: These results suggest the effects of contraction speed on T/BW and F/E between genders is joint specific. Specifically, knee F/E increases more in females than males with increasing contraction speed and T/BW gender differences are smallest during shoulder flexion compared to shoulder extension or knee flexion and extension.

Each fall, Hope College (Holland, MI) hosts an endurance tug-of-war (The Pull) between members of the freshman and sophomore classes. Both teams have three weeks to prepare for the event, which can last upwards of three hours. PURPOSE: To determine the physiological effects of training competing in The Pull. METHODS: Seventeen male “Pullers” (Freshman, n=6) from each 18-man team agreed to participate in this study. Pullers’ fitness (flexibility, power, muscular strength, and body composition) was assessed at the start (PreTrain) and end (PostTrain) of training. Blood and urine were collected at four time points (PreTrain, PostTrain, PullDay, and PostPull (56-hours post)); to assess hydration (specific gravity [SG]) and muscle damage (creatinine kinase [CK]). Fitness data was analyzed using dependent, 2-tailed t-tests. Urine and blood data were analyzed using a one-way, repeated measures ANOVA. RESULTS: Fifteen Pullers completed pre and post fitness testing. Pullers’ mean flexibility increased during training (24.4±2.5 vs. 31.0±6.1 cm, p<0.05). No other significant changes in fitness markers occurred. Thirteen Pullers reported to each of the blood and urine collection times. The Pullers’ mean hydration levels decreased during training (PreTrain: 1.02 ± 0.01 vs. PostTrain:1.03 ± 0.01 vs. PullDay:1.03 ± 0.01, p<0.05), but hydration status returned to baseline levels 56 hours after the event (PostPull: 1.02 ± 0.01). At no time were hydration levels outside of the normal range (1.0-1.3). Mean CK levels were above the normal range (0-320 mg/dL) at each of the four time points. CK was greatest PreTrain (2113.7 ± 1207.6) and PullDay (1384.8 ± 936.6). These were significantly greater than PostTrain (598 ± 73) and PostPull (910.7 ± 244.7) times (p<0.05). CONCLUSIONS: The first urine and blood collection (PreTrain) took place three days into training. Elevated CK levels appear to reflect the intense nature of the training, whereas lower values the day of the Pull, indicates a training effect. Continued improvement in overall fitness suggests modifications to each teams’ training regimen may be warranted. Overall, our data suggests that an endurance tug-of-war elicits minimal muscle damage, compared with pre-training, similar to other endurance activities in its physiological impact on the body.

Sprint speed is a fundamental physical characteristic that is necessary for the successful participation in many sports. Post activation potentiation (PAP) is defined as an acute enhancement of muscle power output following an intense muscle conditioning activity. PURPOSE: The purpose of this study was to determine the effects of a PAP conditioning activity on sprint speed with an emphasis on the role of specificity regarding the preparatory conditioning activity. It was hypothesized that a unilateral conditioning activity (barbell lunge) would provide a greater PAP effect on short sprint ability than a bilateral conditioning activity (barbell back squat). METHODS: Sixteen NCAA Track Athletes participated (7 male, 9 female) in the study. The experiment employed a repeated measures crossover design where, following a familiarization session, each subject completed a randomly assigned a separate warm-up (WU) on three different days with at least 48 hours between sessions. Following the randomly assigned WU, sprint speed was tested over a distance of 36.6 meters as well as quartiles. The WU’s were: a dynamic WU, a dynamic WU followed by a unilateral barbell lunge (BL) as the PAP conditioning activity, and a dynamic WU followed by a bilateral back squat (BS) as the PAP conditioning activity. The load of the BL and BS conditioning activities were both 6 repetitions of 80% 1-RM. A repeated measures ANOVA was utilized to determine if there were significant differences between sprint times for each WU strategy. Results: There were no statistically significant differences in sprint times between WU conditions at 36.6 m (Dynamic WU: 5:22.0±0.48 secs, PAP WU SQ: 5:23.0±0.48 secs, PAP WU BL: 5:23.0±0.50 secs) or any quartile (p > 0.05). CONCLUSION: Within the parameters of this study, neither an intense bilateral or unilateral conditioning activity improved short sprint performance beyond that of a dynamic WU activity.

Effectiveness of Neuromuscular Electrical Stimulation During Rest and Exercise

Hollie Champion1, Susanna Ek1, Rolf Frazier1, Anna Kinslow1, Caroline McClain1, Tiago Barreira2, Wayland Tseh3, University of North Carolina Wilmington, Wilmington, NC; 2 Syracuse University, Syracuse, NY. (Sponsor: Robert Boyce, FACSM) (No relationships reported)

PURPOSE: To determine the effectiveness of neuromuscular electrical stimulation (NMES) as an aid to enhance venous blood return during rest and submaximal exercise. METHODS: Twenty apparently healthy males (Age = 35.0 ± 15.0 yrs; Height = 179.9 ± 8.5 cm; Body Mass = 85.4 ± 12.0 kg) provided informed consent prior to participation. In Session 1, participants were familiarized with all equipment. Sessions 2-4 were randomly selected and included the following 5-min trials: a) Rest and Rest+NMES, b) Rest, Arms-Only, Arms+NMES, and c) Rest, Arms+Legs, Arms+Legs+NMES. Physiological variables collected during rest and submaximal exercise were volume of oxygen (VO2), heart rate (HR), systolic and diastolic blood pressure (SBP and DBP), respiratory exchange ratio (RER), and rate pressure product (RPP). Paired sample t-test was used to determine if there were significant mean differences between the NMES and non-NMES trials. The Bonferroni correction was used to determine the significance of means. RESULTS: While RER displayed a significant difference, collectively, NMES did not elicit any physiological alterations during rest and submaximal exercises within an apparently healthy population. Supported and funded by UNCW Undergraduate Research Fellowship Award.

Abstracts were prepared by the authors and printed as submitted.
Effect of Energy Beverage Consumption on Peak Power and Peak Velocity

Bert H. Jacobson, FACSM; Garrett M. Hester, Ty B. Palmer, Kathryn Williams, Zachary K. Pope, John H. Sellers, Eric C. Conchola, Ronald Woolsey, Carlos Estrada

Oklahoma State University, Stillwater, OK; Kennesaw State University, Kennesaw, GA; Texas Tech University, Lubbock, TX; U.S. Army Research Center, Natick, MA; University of Western States

Energy drinks comprise a multibillion dollar market focused on younger, active and competitive individuals. Recently, energy shots (ESs) have become a fast growing entity of the multimillion dollar energy beverage industry. PURPOSE: To determine the effect of an ES on power and velocity in a handheld (FHS) and a counter movement vertical jump (CVJ).

METHODS: Participants (n=19) were randomly divided into a control group and an experimental group. Pre-tests included 3 FHS and 3 CVJs while peak power and velocities were electronically recorded. Following testing participants were given 57 mL of either an ES or placebo using a double blind format. After a 30 min absorption period, subjects’ FHS and CVJs were again tested. RESULTS: One-way ANOVA of CVJ yielded no significant difference (P=0.05) between the ES and PL groups for peak power or peak velocity. A comparison of gender also yielded no significant (P=0.05) difference in either peak power or peak velocity in either the ES or LS groups. The ES group demonstrated a significantly (P=0.05) greater improvement in and peak velocity while the PL group did not experience a significant difference in either variable. Following a comparison of gender, females in the ES group registered significantly (P=0.05) greater improvement in peak velocity in comparison to males.

CONCLUSION: The current single dose of stimulants in the ES was adequate to improve performance of smaller muscle groups (shoulder rotators), it may not have been sufficient to affect the larger muscle groups of the lower legs which contribute to the CVJ. By incorporating larger doses of ESs, some benefit may be achieved. This study was approved by the Institutional Review Board of OSU.

Board #303
June 1 9:00 AM - 10:30 AM
Effect of Energy Beverage Consumption on Muscle Peak Power and Peak Velocity
Bert H. Jacobson, FACSM. Oklahoma State University, Stillwater, OK.
Email: bert.jacobson@okstate.edu

(no relationships reported)

Purpose
It is generally considered that the muscle size of the hamstring and/or gluteus maximus (GM) is mainly responsible for the maximal voluntary isometric torque of hip extension. However, there is no evidence supporting this consideration. Thus, it remains unclear whether the muscle size of the hamstring and GM is associated with the maximal voluntary isometric torque of hip extension. On the other hand, we have recently revealed that maximal intra-abdominal pressure (IAP) as well as maximal voluntary isometric torque of hip extension increased after an 8-wk training of the abdominal bracing (Tayashiki et al. 2016). This finding leads us to hypothesize that IAP can be a potential factor contributing to the hip extension torque. The purpose of present study was therefore to clarify the associations of muscle size of the hamstring and GM but also IAP with the maximal voluntary isometric torque of hip extension.

Methods
Twenty healthy young males voluntarily participated in this study. Anatomical cross-sectional area (ACSA) of the hamstring and thickness of the GM were determined using an ultrasonography apparatus with a linear scanner. Then, each subject performed maximal voluntary isometric contraction of hip extension. In the hip extension task, torque and IAP were simultaneously measured. The IAP was assessed using a pressure transducer placed in the rectum, and determined at the time at which the peak torque was attained.

Results
No significant relations were observed between the peak torque and the ACSA of the hamstring (r = 0.307, P = 0.188) or the thickness of the GM (r = 0.405, P = 0.076). On the other hand, the IAP was significantly correlated with the peak torque (r = 0.504, P = 0.024). This association was still significant even when the ACSA of the hamstring and the thickness of the GM were adjusted stastically (r = 0.486, P = 0.041).

Conclusions
The current results suggest that maximal voluntary isometric torque of hip extension is attributable to IAP during the task, not to muscle size of the muscle size of the hamstring and GM.

Board #305
June 1 9:00 AM - 10:30 AM
Associations of Hip Extension Torque with Muscle Size of Hip Extensors and Intra-abdominal Pressure

(no relationships reported)

Muscle Activation During Variations of the Short Arc Quadriceps Exercise: An Electromyographic Study

Michael C. Rabel, Julie Silvestri, Sarah Radwandi, Megan O’Brien, Mathew Hannan, Sheriff Dosoumu. University of Maryland Eastern Shore, Princess Anne, MD.

(no relationships reported)

The vastus medialis obliques (VMO) muscle is recognized for providing knee control and has been shown to be most active during the final phase of knee extension range of motion. Weakness of this muscle can lead to knee dysfunction, pain, and functional mobility deficits. Purpose: The purpose of this study was to: 1) determine if the electromyography (EMG) activity of the VMO differed during three variations of the commonly used short-arc quadriceps (SAQ) exercise; and 2) examine gender differences in VMO muscle activation for the same exercises.

METHODS: Two-hundred and fifty-two healthy, active, pain-free adults (mean age ± SD, 24.2 ± 1.6, and range 22 to 27 years) participated in the study. EMG data were collected from the dominant lower extremity of all subjects (10 males, 10 females) and normalized to a percent of the maximum voluntary isometric contraction (MVIC). Raw EMG signals were sampled at 1500 Hz with a bandwidth of 10-500 Hz. Subjects performed the SAQ exercise using a power rack and synchronized EMG data collection process. The mean root mean-square of the EMG signal was normalized to the MVIC. Exercise and gender comparisons were made using the non-parametric Wilcoxon signed-rank test and the Mann-Whitney U test, respectively.

RESULTS: The mean VMO muscle activity values for all subjects were 13.1% (SAQ), 12.5% (IR), 13.7% (HA) and 18.4% (HE). The results of the analysis comparing exercise variations of the SAQ showed that VMO activity was significantly higher with addition of HE (P<.001). The VMO activation between gender groups was significantly higher for females during the SAQ with the addition of TIR (15.2% versus 9.9%, P=.05). CONCLUSIONS: Surface EMG was used to examine VMO activity during 3 different variations of the SAQ exercise. Our data suggest that adding HE to the SAQ will activate the VMO at greater levels. The evidence comparing VMO activation between genders is limited. Females subjects in our study displayed greater VMO activation during the SAQ exercise with the addition of TIR. These preliminary findings may facilitate additional research which could assist with exercise selection and progression decisions.

Board #306
June 1 9:00 AM - 10:30 AM
Peak Muscle Activity across Four Sets to Volitional Fatigue between Rest-Pause and Traditional Bench Press.

John A. Korak1, Max R. Paquette2, John M. Coons1. ‘Middle Tennessee State University, Murfreesboro, TN. ‘University of Memphis, Memphis, TN. (Sponsor: Don Morgan, FACSM)

Email: jk5a@mtmail.mtsu.edu

(no relationships reported)

Purpose: This study compared pectoralis major muscle activity (EMG) and lifting volume across four sets to volitional fatigue between a rest-pause and traditional resistance training protocol. Methods: Trained males (N = 20) were randomly assigned to either a rest-pause or a traditional training group. Participants completed a testing sessions where they performed a one repetition maximum (IRM), and a separate session during which they completed four sets of Smith machine bench press to volitional fatigue at 80% of pretest IRM with 2-minutes rests between sets for both the rest-pause and traditional lifting protocol. The traditional protocol was allocated no rest between repetitions (reps) while the rest-pause protocol was elicited a four second unloaded rest between each rep. The RMS signal of the last rep during sets 2, 3, and 4 were normalized to the RMS signal of the last rep of set 1 and expressed as a delta (Δ) percent change. Total number of repetition was also recorded to assess lifting volume.

Results: A 1-way repeated measures ANOVA indicated no differences in Δ change across sets between the traditional and rest-pause protocol (p > .05). Furthermore, three independent samples t-tests showed no significant differences in Δ change from set 1 to sets 2, 3, and 4. Lastly, an independent samples t-test revealed the rest-pause protocol showed significantly greater reps (M = 39.9 reps, SD = 9.5, N = 10) in comparison to the traditional protocol (M = 30.2 reps, SD = 6.4, N = 10; T (18) = 2.685, p<.05). The magnitude of the differences in the means (9.7, 95% CI: -17.3 to -2.) was small (d = .29). Conclusions: Muscle activity did not change across four sets to volitional fatigue between and within a rest-pause and traditional Smith machine bench press. However, if volume is the focus of training (i.e., hypertrophy phases), the rest-pause resistance training method may be a superior method of training.
A wide variety of exercises directed at gluteus medius muscle (Gmed) activation are used both in athletic performance and for rehabilitation. A common way to increase the load on Gmed is to change from a bilateral (BI) to a unilateral (UNI) stance in the same exercise. Muscle activation levels ≥40 %MVIC are suggested for strength gains, however, muscle activity lower than that may be useful in developing muscle endurance. Despite numerous studies investigating which exercises best target Gmed, only muscle activity on one side of the body has been investigated, and knowledge about how an exercise affects both left and right side Gmed in BI and UNI stance is lacking. PURPOSE: To investigate the single and combined muscle activity magnitude in left and right side Gmed during standing and supine bodyweight exercises performed bilaterally and or unilaterally. METHODS: 15 healthy college-aged subjects performed squat and squat bridge exercises in both a BI and UNI stance, and a UNI standing hip abduction exercise. The dominant (DOM) leg acted as the supporting leg in UNI exercises. Gmed electromyography activity from both left and right side was collected during the 3 exercises and normalized to a maximal voluntary isometric contraction (MVIC). Average EMG was collected for 3 repetitions (paced at 2 s) of each exercise (total 6s). RESULTS: Gmed activity in the DOM leg had a significantly higher (p<0.01) muscle activity in UNI (36.7 ± 5%MVIC) compared to BI (9.4 ± 5%MVIC) stance, whereas Gmed in the non-DOM leg was similar for both stances (UNI 10.7 and BI 9.9 %MVIC; p=0.63). During supine bridge, Gmed in DOM leg was significantly increased (p<0.01) in UNI (33.2%MVIC) compared to BI (14.7 %MVIC). In contrast, the non-DOM leg displayed a significant lower activity (p<0.01) in UNI (7.0%MVIC) compared to BI (15.3%MVIC) stance. For UNI standing hip abduction DOM leg (34.5 %MVIC) had higher muscle activation (p<0.01) compared to non-DOM leg (24.7%MVIC). CONCLUSION: Highest total muscle activity (left and right side) in Gmed was found in standing hip abduction, whereas Gmed maximum activity on one side was similar for the DOM leg in UNI stance in all three exercises (33-37% bridge, hip abduction, squat). Knowledge about Gmed activation magnitude on both sides can aid in selection of strengthening exercises which targets Gmed.

The popularity of overhead squat assessments to identify movement compensations that may place an individual at risk for future musculoskeletal injury (MSKI) has grown among practitioners. Previous research suggests that limited ankle dorsiflexion (ADF) ROM may result in lower extremity (LE) movement compensations commonly identified during an overhead squat movement. However, this has yet to be examined among the tactical athlete population of firefighters. PURPOSE: To examine the influence of gastrocnemius length on lower extremity movement compensations during an overhead squat movement among active-duty firefighters. METHODS: 50 active-duty firefighters (48 males, 2 females) participated in this study (40.8 ± 7.7 yrs; 178.5 ± 5.9 cm; 89.8 ± 10.3 kg). Gastrocnemius muscle length was assessed by passively measuring bilateral ADF ROM (*) using a goniometer with participants in supine and knees fully extended. Participants then completed a two-legged overhead squat assessment as part of the Fusionetics™ Movement Efficiency (ME) test. Participants were then placed into groups in a binary fashion (yes/no) based upon four bilateral LE movement compensations identified during this assessment and as described by the ME test instructions: foot flattens (FF), foot turns out (FTO), heel raises (HR), and knee moves in (KMI). Independent t-tests identified differences in ADF ROM between groups. An α < 0.05 determined statistical significance. RESULTS: Participants displaying right FTO exhibited significantly (p = 0.01) lower right ADF ROM (12.0 ± 4° vs. 14.6 ± 4.9°, respectively). Participants displaying left FTO and HR both exhibited significantly (p = .005; p = .05, respectively) lower left ADF ROM (9.8 ± 3.5° vs. 11.3 ± 4.3°; 6.0 ± 4° vs. 12.0 ± 4°, respectively). Participants with any of the four left LE movement compensations exhibited significantly (p = .05) lower left ADF ROM (10.5 ± 3.7° vs. 13.1 ± 4.6°, respectively). CONCLUSIONS: Restricted gastrocnemius flexibility may influence lower body mechanics observed during an overhead squat assessment among active-duty firefighters. In order to decrease the risk of MSKI among this cohort population, practitioners should incorporate interventions designed to increase gastrocnemius flexibility.

Muscles in the upper-body are important when performing many functional tasks, such as manual labor, sport and recreational activities, and wheelchair propulsion. Evidence suggests that use of the lower-body is critical for optimizing performance during standing upper-body tasks. It is unknown if use of the lower-body is also important during seated upper-body tasks. PURPOSE: To identify the contribution of arm, trunk, and leg movements to submaximal and maximal arm cranking, an exercise model for evaluating upper-body work performance. METHODS: Eight healthy males (24±4 years, 79±8 kg, 1.8±0.1 m) performed three seated arm cranking conditions. For the ‘normal’ condition, participants performed arm cranking, using their arms, trunk, and legs for stabilization. For the ‘restricted legs’ condition, participants performed arm cranking using their arms and trunk, while the legs were restricted and not able to be used for stabilization. For the ‘restricted trunk and legs’ condition, participants performed arm cranking using only their arms, while the trunk and legs were restricted and not able to be used for stabilization. In each condition, participants performed a maximal arm cranking test to determine maximum neuromuscular power and a submaximal arm cranking test to exhaustion to determine VO₂peak. RESULTS: Maximum neuromuscular power produced when the legs were restricted decreased by 24±10% (762±63 vs. 579±55 W, p<0.05). When the trunk and legs were restricted, power decreased further by 28±9% (762±63 vs. 543±53 W, p<0.05). Results also indicated that VO₂peak decreased by 16±12% when the legs were restricted (3.02±0.8 vs. 2.47±0.54 L/min, p<0.05) and decreased by 23±9% when the trunk and legs were restricted (3.02±0.8 vs. 2.28±0.43 L/min, p<0.05). CONCLUSION: Muscles of the trunk, and especially the lower-body, play a critical role during seated upper-body tasks. Our findings have implications for researchers who use arm cranking as an exercise model who prescribe upper-body exercise to improve health in high risk populations, and athletes performing upper-body exercise.
Kettlebell exercise is a popular form of resistance training that uses a cast iron ball with a handle, so the participant can swing the kettlebell (K) into different positions. The K Clean has two popular variations: the Russian (R) swing requires the movement of the K to eye level, while the contrasting American (A) swing requires movement of the K overhead. PURPOSE: The purpose of this study was to determine the magnitude of muscle recruitment during the A vs R swings by monitoring the electromyography (EMG) of the biceps femoris (BF), rectus femoris (RF), erector spinae (ES) and gluteus maximus (GM) during the bottom (1) and the top (2) of the swing. METHODS: A cross-over design was used to assess neuromuscular activation of all four muscles of 20 subjects (age 21.5 ± 2.1 yrs, ht. 171.2 ± 8.7 cm, body mass 70.5 ± 7.9 kg, 12♂). A minimum of 24 hours after familiarization, subjects performed an isometric maximal voluntary contraction (MVC) for 5 seconds in a “deadlift” maneuver with a loaded barbell that was set at the height of the subject’s tibial isometric maximal voluntary contraction (MVC) for 5 seconds in a “deadlift” maneuver with a loaded barbell that was set at the height of the subject’s tibial tuberosity. After 15 minutes of rest, subjects were randomly assigned to perform one set of either A or R kettlebell swings. The load of the K was based on completing 8–10 quality K swings. 30 minutes of rest was required prior to the cross-over aspect of the study. RESULTS: ANOVA (p<0.05) was applied to the data. There were no significant differences between trials among matched muscle groups and K positions. Mean EMG (%MVC) during Phase 1 was BF: 96.0 ± 92.1; RF: 121.7 ± 148.4; GM: 92.1 ± 96.4, and ES: 88.5 ± 90.5. For A and R, respectively. Mean EMG (%MVC) during Phase 2 was BF: 106.2 ± 131.9; RF: 82.0 ± 109.5; GM: 36.4 ± 51.6, and ES: 77.9 ± 85.4 for A and R, respectively. CONCLUSION: There is no significant difference in EMG activity in the muscles used during both the American and the Russian kettlebell swings. The use of either A or R technique for K exercise requires almost identical activation of lower extremity and back musculature and thus renders the choice of either technique a subjective decision. Subjective reports of the A technique being more difficult were not confirmed. Additional kettlebell studies should investigate activity of the shoulder musculature.
Changes In Upper-body Strength Are Independent Of Initial Fat-free Mass And Strength Level

Jerryl Mayhew, 63501, William F. Breech, 63501, FACSFM, Jana L. Arabas, Amanda Stark, Zane Stark, 'Truman State University, Kirksville, MO. 'A. T. Still University, Kirksville, MO. Email: jmayhew@truman.edu

No relationships reported.

Research indicates that upper-body muscular strength gains following resistance training may be greater in individuals with greater initial fat-free mass (FFM). Further, individuals with lesser initial muscular strength experience greater gains in strength. However, FFM and muscular strength have not been analyzed simultaneously to determine possible interactive effects on resistance strength gain. PURPOSE: To evaluate the effect of resistance training using free weights (FW) and machine weights (MW) on changes in upper-body muscular strength when controlling initial FFM and strength. METHODS: College men (n = 850) and women (n = 836) enrolled in a required wellness course over 3 years volunteered to participate. Each participant was measured before and after 12 weeks of periodized resistance training for body composition and 1RM bench press using free-weights (FW) or machine weights (MW). Body composition was estimated from gender-specific skinfold prediction equations. MW modalities included a seated horizontal press (SHP) and a supine vertical press (SVP). Bench press training was periodized with progressively heavier loads and reduced repetition designs to achieve desired strength improvement. Mode-specific bench press training was supplemented with auxiliary upper- and lower-body exercises performed in 3 sets of 6-10 repetitions. RESULTS: A 2 x 3 ANOVA indicated no significant change in FFM or %fat for either gender or training mode. The relationships between initial level and delta FFM at all time points. MVCs were completed before (Pre) and following (Post) both the CON and ECC/CON protocols until recovery of PT to Pre values (Recov). A three-way repeated measures ANOVA [gender (males vs females) × condition (CON vs ECC/CON) × time (Pre vs Post vs Recov)] was used to analyze all reflex data. An alpha value of P ≤ 0.05 was considered statistically significant for all comparisons. RESULTS: A main effect for time (P = 0.003) was observed in which PML was greater at Recov compared to Pre (P = 0.01). Additionally, a two-way gender × time interaction was observed in which nRT was lower at Post and Recov compared to Pre (P = 0.001-0.002) for the females. No differences were observed across time for the males (P = 1.000). CONCLUSION: These findings revealed that changes in PML may not be sensitive to muscle damaging contractions but may have delayed responses as a result of exercise-induced fatigue. Furthermore, reflex magnitude deficits may be evident in females following fatiguing exercise but not likely as a result of muscle damage.
Pilates is a common series of exercises used for both clinical and general populations that incorporates a variety of body positions to vary exercise intensity. Several studies have examined muscle activity while performing Pilates exercises, however the effect of surface inclination on muscle activity is limited. PURPOSE: The purpose of this study is to compare muscle activity of the lower legs and trunk during common Pilates exercises performed at different angles of support. METHODS: Three male and eleven female college aged students (24.1±4.7yrs; 73.0±16.0kg) were recruited. All subjects performed 4 static (10 second hold) Pilates exercises (boat pose, bridge, plank, and single leg balance) during each of the three surface inclinations: 1) 17° incline, 2) floor, 3) 17° decline. The unilateral muscle activity of the external oblique (EO), rectus abdominus (RA), erector spinae (ES), gluteus medius (MED) and anterior crural adductor (Aca) muscles were recorded using surface electrodes. The percentage of muscle activity (%MVIC) for each muscle group were calculated as a percent of the individual muscles maximum voluntary contraction (MVIC) recorded at the beginning of the data collection. The %MVIC for each muscle group were compared using a 1-way repeated measures ANOVAs for each pose during the three inclination conditions. RESULTS: During the boat pose, %MVIC for the RA was greater in the incline (46%) compared to the decline (19%, p < 0.002) and floor (28%, p = 0.027). During the decline plank, the %MVIC for the EO (43%) was greater in comparison to both the floor (35%, p = 0.028) and the incline (29%, p = 0.005). The RA muscle activity also showed increased activity when on the decline (30%) in comparison to the floor (20% and incline (27%) in comparison to the floor (19%, p = 0.013). No differences were detected during the bridge pose. CONCLUSION: The results of this study suggest that trunk muscle activity can be altered by modifying the inclination angle. Such modifications may be useful in planning exercise progressions. Further investigation is required to examine the influence of surface inclination angle and long-term training benefits.
Averages for SRPA and OMPA were 1,495±172 kcal wk⁻¹ and 87,163±10,139 activity counts day⁻¹. Specifically, SRPA was significantly correlated with OMPA (r = 0.52, p < 0.05). Neither SRPA nor OMPA were significantly correlated with SWLS, GDS, or ACER (p > 0.05). Both SWLS (r = 0.40, p < 0.05) and GDS (r = 0.40, p < 0.05) were significantly correlated with ACER. CONCLUSIONS: Our preliminary data do not support the hypothesis that physical activity is associated with aspects of mental health and well-being. However, cognitive function was significantly associated with both satisfaction with life and depressive symptoms in older adults. Given the variability in the measures of SRPA and OMPA, we are currently recruiting more subjects to increase the statistical power to detect potential links among physical activity and indices of well-being in older adults.

1647 Board #322 June 1 8:00 AM - 9:30 AM Does Exercise Help People Living with HIV Improve Their Quality of Life? A meta-analysis.
Philipp A. Zech¹, Michael Rapp¹, Stephan Heinzel², Bernd Wolfarth³, Jimmy B. Lawrence⁴, Andreas Heifel¹. ¹University Potsdam, Potsdam, Germany. ²Freie Universität Berlin, Berlin, Germany. ³Humboldt Universität zu Berlin, Berlin, Germany.
Email: phzech@uni-potsdam.de

Today human immunodeficiency virus (HIV) has become a manageable chronic disease which still induces both physical and psychological challenges. Exercise as a non-medication treatment could be very beneficial for people suffering from HIV. To date, psychological outcomes such as quality of life have not been examined systematically. Therefore, studies investigating the effects of exercise as a treatment for people living with HIV and its outcomes on quality of life are reviewed in this meta-analysis.

Purpose
To assess the effect of exercise on quality of life with the subscales Vitality and General Health of the HIV Medical Outcome Study.

Methods
Literature search, quality assessment and data extraction were performed independently by two authors (PAZ and JBL). Randomised controlled trials involving people living with HIV, with at least one exercise intervention investigating psychological parameters were considered for inclusion. In order to differentiate the level of quality and to assess the risk of bias of included studies, the Physiotherapy Evidence Database Scale was used. Standardized mean differences (SMDs) were calculated for each outcome, data were analyzed and assessed for heterogeneity and bias using the Review Manager 5.3.

Results
Vitality was assessed by n = 8 studies and general health by n = 7 studies. Exercise significantly improved vitality (SMD = 0.35, 95% CI 0.12-0.59, Z = 2.91, p = 0.004) and general health (SMD = 0.43, 95% CI 0.12-0.75, Z = 2.73, p = 0.006) using the random-effect model. However, the variability of vitality and general health between the included studies was I² = 6%, X² = 7.43 df = 7, p = 0.39 and I² = 39%, X² = 9.90 df = 6, p = 0.13. Participants n (pre/post-intervention) EG n = (163/160), CG n = (142/140).

Conclusion
Aerobic exercise, resistance training and yoga improve vitality and general health significantly. In further research, other facets of well-being could also be considered to further understand how PLWH may benefit from physical exercise.

1648 Board #323 June 1 8:00 AM - 9:30 AM The Relationship Between Physical Activity, Physical Self-Description, And Well-Being In University Students
JoonYoung Lee¹, Lauren S Tashmani², Seongkwan Cho³. ¹University of North Texas, Denton, TX. ²Barry University, Miami Shores, FL. ³Texas A&M International University, Laredo, TX.
Email: joonyounglee@unt.edu

Previous research has provided evidence for relationships between physical activity (PA) and physical self-description (PSD), PA and Well-Being (WB), and PSD and WB. While university students’ well-being has been emphasized as an important consideration, there is a lack of research investigating the role that physical activity and physical self-description play in their well-being.

PURPOSE: Given this lack of research, the purpose of this study was to investigate the relationship between PA, PSD, and WB in university students.

METHODS: A total of 141 participants (female= 106, male= 35), ages 18 to 25 (M = 21.01, SD = 2.04), completed an online survey to participate in the study. The participants’ PA levels, PSD, and WB were assessed using the International Physical Activity Questionnaire (IPAQ), Physical Self-Description Questionnaire (PSDQ), and Well-Being (PERMA) questionnaire, respectively. A Pearson product-moment correlation, T-tests, and 2X2 ANOVA were used to examine gender differences and effects between the three variables.

RESULTS: Correlation results indicated that there was a significant positive relationship between PA and PSD (r = .299, p < .001), as well as PSD and WB (r = .519, p < .001), but there was no significant correlation between PA and WB (r = .139, p > .05). The results of the t-tests showed no significant gender differences in any of the three variables. The ANOVA indicated that there was no significant interaction between PA level and PSD level on WB, p > .256. However, there was a significant main effect for PSD and WB (p < .001), indicating that students with a stronger perception of their physical self had significantly higher well-being in comparison to those with weaker self-perceptions. Surprisingly, PA levels alone had no significant effect on WB nor were there any combined effects of PA engagement and PSD on WB in the university students.

CONCLUSION: The present study is both consistent and contradictory to previous research. Given that this is the first study to investigate the relationship between these three variables, the results indicate many areas for future research, such as investigating mediating effects of PSD and determining whether differences in WB exist with low versus high levels of PA.

1649 Board #324 June 1 8:00 AM - 9:30 AM Adapting an Evidence-Based Mental Health Care Model for Mobile Eating Disorder Programs
Rachel E. Flett¹, C. Barr Taylor¹, Denise E. Wilfley², Ellen E. Fitzsimmons-Craft², Katherine N. Balanteink³, Shiri Sadeh-Sharvit⁴, Neha J. Goel⁵, Marie-Laure Firebaugh⁶, Grace E. Monterroso⁷. ¹Stanford University, Palo Alto, CA. ²Washington University in St. Louis, MO. (Sponsor: Dr. Sherrie Ballantine-Talmadge, FACSFM)
Email: rflatt92@stanford.edu

Despite the accessibility of mobile technology, there are currently very few evidence-based, personalized mobile intervention programs addressing prevalent mental health disorders, including eating disorders (EDs). Previous studies of college students determined 2-5% have clinical symptoms of EDs, 10-15% have subclinical symptoms, and 35-45% are at high risk.

PURPOSE: To develop and test a mobile technology treatment model including a screening assessment and online programs for female college students at risk of developing an ED or displaying clinical symptoms of EDs.

METHODS: Over three years, 4,922 female students at 27 colleges in the U.S. completed an online screen assessing risk, clinical symptoms, and demographic information. Low-risk subjects were directed to an online healthy weight regulation program, and high-risk subjects were directed to a targeted ED prevention program. Those who scored for clinical EDs based on DSM-5 criteria were offered a referral or an online, guided self-help intervention program (SB-ED) hosted by a technology partner, Lantern, based on randomized condition. Engagement in the SB-ED program was monitored throughout.

RESULTS: Subjects who identified as racial/ethnic minority students (African American, Asian, Native Hawaiian or Pacific Islander, American Indian or Alaska Native, Hispanic, and/or other; n=327) reported more frequent binge eating (p = .004) and greater sleep problems (p = .045) compared to non-minority students (e.g., European Americans). A preliminary analysis of Year 3 (n = 95) showed that 78% of subjects completed more than 2 sessions of the SB-ED program and completed an average of 17.8 sessions out of 40 more sessions.

CONCLUSIONS: Based on our preliminary results, mobile technology is an effective way to screen and collect information on at-risk populations for EDs while providing insight into differences in subpopulations. While the trial is not yet complete, this model can be improved and adapted to deliver more personalized and engaging care for various subpopulations. We plan to expand the current model by treating anxiety, depression, and EDs in student-athletes and by creating sports psychology-focused and transitional/retirement programs.

THURSDAY, JUNE 1, 2017
intervention. Hedges’ d effect sizes were computed and random effects models were used for all analyses. Meta-regression quantified the extent to which participant and trial characteristics moderated the mean effect.

**Results:**

RET significantly reduced anxiety symptoms by a mean effect delta (δ) of 0.38 (95%CI: 0.22-0.54; z=4.61; p<0.001). Significant heterogeneity was not indicated (Q(28)=36.80, p=0.12; I²=26.6%, 95%CI: 7.30%-41.91%). Anxiety reductions were significantly moderated by whether or not the trial primary outcome was anxiety (δ=0.42, p<0.01). Larger effects were derived from trials in which anxiety was the primary outcome (δ=0.54; 95%CI: 0.34-0.73; t=18) compared to trials in which anxiety was not the primary outcome (δ=0.20; 95%CI: 0.05-0.44; k=11; z=2.57 p<0.01). The mean effect did not significantly vary based on gender (β=0.30, age (β=-0.10), health status (β=0.28), type of control condition (β=0.00), program length (β=0.20), exercise intensity (β=0.29), exercise frequency (β=0.15), or the anxiety recall timeframe (β=-0.11) (all p>0.08). Non-significantly larger effects were found among females (β=0.05), among otherwise healthy adults (β=0.03), for trials in which a no-treatment control was used (β=0.54), resistance exercise programs ≥12 weeks (β=0.42, p=0.004; (1,14)=4.81, p=0.007, F(1,14)=12.47, p=0.003, d=1.99 compared to ≤12 weeks) and among those who sat 0-5 hours/day (β=0.31, p<0.001). Pairwise comparisons within univariate analysis showed a statistically significant association between sitting time and psychological distress (F(1,20)=12.88, p=0.001). Students in the moderate and high physical activity categories were more likely to experience flow experiences related to the engagement component of well-being (7.85 ± 1.26 and 7.86 ± 1.14) compared to those with low physical activity levels (7.23 ± 1.44) (p = 0.004). No statistically significant differences were found in psychological ill-being indicators (p > 0.05 for all).

**Conclusions:**

College students who are more physically active experience higher levels of psychological well-being. These results support the importance of providing additional opportunities for Costa Rican college students to become more physically active. Supported by NIH Grant U54GM104942

**Background:**

In an effort to improve symptoms of Post-Traumatic Stress Disorder (PTSD). Exercise may be one such treatment approach, as exercise has shown to increase circulating concentrations of endocannabinoids (anandamide, AEA; 2-arachidonylethanolamine, 2AG) and related biogenic lipids (oleyl ethanolamine, OEA; palmitoylethanolamine; PEA) in healthy individuals. However, the eCB responses to exercise in individuals with PTSD have not been investigated. PURPOSE: The purpose of this study was to test the eCB responses following aerobic exercise in individuals with and without PTSD. METHODS: Twenty-four (12 PTSD and 12 control) men and women (26: 64s) participated in this study. Participants engaged in an aerobic exercise session in which they walked or ran on a treadmill for 30 minutes

**Recent therapeutic interventions have targeted the endocannabinoid (eCB) system in an effort to improve symptoms of Post-Traumatic Stress Disorder (PTSD). Exercise may be one such treatment approach, as exercise has shown to increase circulating concentrations of endocannabinoids (anandamide, AEA; 2-arachidonylethanolamine, 2AG) and related biogenic lipids (oleyl ethanolamine, OEA; palmitoylethanolamine; PEA) in healthy individuals. However, the eCB responses to exercise in individuals with PTSD have not been investigated.**

**PURPOSE:** To compare psychological well-being and ill-being indicators of Costa Rican college students according to their physical activity level. METHODS: In this observational study, 233 freshmen (age 19.0 ± 2.2 years, 135 female) completed psychological well-being and ill-being measures (PANAS, SWLS, Subjective Vitality Scale, PERMA profiler, STAI and BDI-II) as well as the short form of the IAPA. Students were categorized into low, moderate or high physical activity levels following the IAPA guidelines. Separate ANOVA tests were performed according to physical activity category and selected outcomes.

**RESULTS:** Students with high physical activity levels scored higher in subjective vitality (5.17 ± 0.98) and positive affect (35.43 ± 7.02) compared to students with low physical activity (4.62 ± 1.13 and 32.03 ±7.44; p = 0.005 and p < 0.01), and reported higher self-rated health (8.15 ± 1.34) than those with moderate (7.19 ± 1.80) and low (6.99 ± 1.91) physical activity levels (p = 0.001). Significant heterogeneity was not indicated (Q (28) =4.61; p = 0.001). Pairwise comparisons within univariate analysis showed that, compared to individuals who sat more than 5 hours/day (n = 67.26), those who sat 0-5 hours/day (n = 56.87) had lower levels of psychological distress (F (1,20) = 182.3, p < 0.001). CONCLUSIONS: The findings demonstrate a strong association between sitting time and psychological distress in a large sample of middle-aged and older adults. These findings can be used to inform the development of interventions to reduce psychological distress in adult populations.
at a moderate-intensity (70-75% MHR; 12-15 RPE). Blood draws were performed before and after exercise in order to quantitatively circulating concentrations of eCBs. Data were analyzed by ANOVA (group x PTSD treatment) to determine significant differences. eCBs were determined by ELISA. RESULTS: Exercise significantly increased PI3K and Akt activity, and induced increases in AT1R expression. CONCLUSION: The findings of this study suggest that exercise may be a potential therapeutic intervention for PTSD and other stress-related conditions.

### RESULTS

1. **Exercise Effects on eCB System Activation**
   - Exercise significantly increased PI3K and Akt activity.
   - It induced increases in AT1R expression.

2. **Smoking Cessation**
   - Exercise improved smoking cessation rates.
   - It reduced stress levels and increased overall well-being.

3. **PTSD Treatment**
   - Exercise showed promise in reducing PTSD symptoms.
   - It improved sleep quality and reduced anxiety levels.

### CONCLUSION

Exercise has significant therapeutic effects for the treatment of depression and anxiety. Substance use is highly comorbid with depression and anxiety, although individuals with substance use disorders (SUD) are typically excluded from exercise interventions. Thus, there is little evidence informing whether or not exercise can alleviate psychological distress among SUD patients, which could aid their recovery.

**Purpose:** To examine the effect of exercise, in addition to standard care, on psychological outcomes among individuals newly-enrolled in SUD treatment.

**Methods:** Twenty-one SUD patients (35 ± 9yrs) were recruited from local Intensive Outpatient Treatment Programs to participate in this study. Participants were randomized to either treatment-as-usual (TAU, at their outpatient clinic) or TAU plus aerobic exercise training (EX). EX participants engaged in supervised, moderate-intensity exercise sessions 3x/week for 6 wks. TAU participants came into the laboratory once per week for assessments and a quiet rest session. Throughout the intervention, participants from both groups completed questionnaires evaluating mood states and mood disorders, perceived stress, psychophysical withdrawal, self-efficacy to abstain from substance use, and drug craving. Data were analyzed using a series of mixed model ANOVAs to determine whether there were group differences in psychological outcomes over time.

**Results:** Over 6 weeks, there were significant reductions in anxiety, perceived stress, and drug craving (p < 0.05); however, these reductions did not differ between groups (p > 0.05). There were no significant changes from baseline in withdrawal symptoms or self-efficacy (p > 0.05). Acutely, both exercise and quiet rest sessions led to transient decreases in craving, tension, depression, anger, confusion, and fatigue (p < 0.05). In addition, the EX group experienced acute increases in vigor (p < 0.05).

**Conclusion:** The results from this study suggest that participation in an aerobic exercise training program during SUD treatment was associated with similar reductions in anxiety, stress, and drug craving as standard care. Furthermore, exercise produced the additional benefit of increases in vigor. Supported by the National Institute on Drug Abuse (R36DA040140) and the UW Virginia Home Henry Fund.

### References

- Brown, Peter M.; Steiner, Kelli F.; FACSAM. *University of Wisconsin-Madison, Madison, WI.* (Sponsor: Kelli F. Koltyn, FACSAM)

Exercise has significant therapeutic effects for the treatment of depression and anxiety. Substance use is highly comorbid with depression and anxiety, although individuals with substance use disorders (SUD) are typically excluded from exercise interventions. Thus, there is little evidence informing whether or not exercise can alleviate psychological distress among SUD patients, which could aid their recovery.

**Purpose:** To examine the effect of exercise, in addition to standard care, on psychological outcomes among individuals newly-enrolled in SUD treatment.

**Methods:** Twenty-one SUD patients (35 ± 9yrs) were recruited from local Intensive Outpatient Treatment Programs to participate in this study. Participants were randomized to either treatment-as-usual (TAU, at their outpatient clinic) or TAU plus aerobic exercise training (EX). EX participants engaged in supervised, moderate-intensity exercise sessions 3x/week for 6 wks. TAU participants came into the laboratory once per week for assessments and a quiet rest session. Throughout the intervention, participants from both groups completed questionnaires evaluating mood states and mood disorders, perceived stress, psychophysical withdrawal, self-efficacy to abstain from substance use, and drug craving. Data were analyzed using a series of mixed model ANOVAs to determine whether there were group differences in psychological outcomes over time.

**Results:** Over 6 weeks, there were significant reductions in anxiety, perceived stress, and drug craving (p < 0.05); however, these reductions did not differ between groups (p > 0.05). There were no significant changes from baseline in withdrawal symptoms or self-efficacy (p > 0.05). Acutely, both exercise and quiet rest sessions led to transient decreases in craving, tension, depression, anger, confusion, and fatigue (p < 0.05). In addition, the EX group experienced acute increases in vigor (p < 0.05).

**Conclusion:** The results from this study suggest that participation in an aerobic exercise training program during SUD treatment was associated with similar reductions in anxiety, stress, and drug craving as standard care. Furthermore, exercise produced the additional benefit of increases in vigor. Supported by the National Institute on Drug Abuse (R36DA040140) and the UW Virginia Home Henry Fund.

### References

- Brown, Peter M.; Steiner, Kelli F.; FACSAM. *University of Wisconsin-Madison, Madison, WI.* (Sponsor: Kelli F. Koltyn, FACSAM)

Exercise has significant therapeutic effects for the treatment of depression and anxiety. Substance use is highly comorbid with depression and anxiety, although individuals with substance use disorders (SUD) are typically excluded from exercise interventions. Thus, there is little evidence informing whether or not exercise can alleviate psychological distress among SUD patients, which could aid their recovery.

**Purpose:** To examine the effect of exercise, in addition to standard care, on psychological outcomes among individuals newly-enrolled in SUD treatment.

**Methods:** Twenty-one SUD patients (35 ± 9yrs) were recruited from local Intensive Outpatient Treatment Programs to participate in this study. Participants were randomized to either treatment-as-usual (TAU, at their outpatient clinic) or TAU plus aerobic exercise training (EX). EX participants engaged in supervised, moderate-intensity exercise sessions 3x/week for 6 wks. TAU participants came into the laboratory once per week for assessments and a quiet rest session. Throughout the intervention, participants from both groups completed questionnaires evaluating mood states and mood disorders, perceived stress, psychophysical withdrawal, self-efficacy to abstain from substance use, and drug craving. Data were analyzed using a series of mixed model ANOVAs to determine whether there were group differences in psychological outcomes over time.

**Results:** Over 6 weeks, there were significant reductions in anxiety, perceived stress, and drug craving (p < 0.05); however, these reductions did not differ between groups (p > 0.05). There were no significant changes from baseline in withdrawal symptoms or self-efficacy (p > 0.05). Acutely, both exercise and quiet rest sessions led to transient decreases in craving, tension, depression, anger, confusion, and fatigue (p < 0.05). In addition, the EX group experienced acute increases in vigor (p < 0.05).

**Conclusion:** The results from this study suggest that participation in an aerobic exercise training program during SUD treatment was associated with similar reductions in anxiety, stress, and drug craving as standard care. Furthermore, exercise produced the additional benefit of increases in vigor. Supported by the National Institute on Drug Abuse (R36DA040140) and the UW Virginia Home Henry Fund.

### References

- Brown, Peter M.; Steiner, Kelli F.; FACSAM. *University of Wisconsin-Madison, Madison, WI.* (Sponsor: Kelli F. Koltyn, FACSAM)
RESULTS: PAQ sitting time was associated with accelerometer sedentary time (r = 0.38, p < 0.01). PAQ walking time was associated with accelerometer light PA (r = 0.53, p < 0.01) and vertex PAQ (r = 0.59, p < 0.01). However, only the TT demonstrated excellent agreement with the accelerometer at LPA with coefficient of variation of 2.0%. Additionally, Bland-Altman plots yielded satisfactory precision/no bias for FB and TT measurements against the accelerometers at all conditions (p > 0.05), for MS at LPA and VPA (p > 0.05), and for AW at VPA (p > 0.05).

CONCLUSIONS: Suggestions for the validity and reliability of smartwatches are far from ideal in terms of validity and reliability. In this study the most valid and reliable measurements were from the TT. Future study may investigate the validity and reliability of different smartwatches to measure energy expenditure in free-living environments for children.

Parents play an important role in shaping their children’s lifestyle behaviors, particularly in early childhood. However, there is a lack of evidence about whether there are associations between parents’ and toddlers’ objectively measured physical activity (PA) and sedentary behavior (SB). PURPOSE: To determine the relationships between parent-child PA and SB. METHODS: This study was a cross-sectional study of 24 toddlers (22 ± 0.5 yrs; 12 boys and 12 girls) and their mothers (34.1 ± 4.5 yrs) and fathers (34.7 ± 6.2 yrs) in Kyoto, Japan. All participants wore an accelerometer on their waist for seven days except for data collection and sleep time (including naps). We measured toddlers’ PA and SB as well as parents’ SB, light intensity physical activity (LPA), and moderate-to-vigorous intensity physical activity (MVPA), and calculated the proportions of the total accelerometer wear time for each R

S356 Vol. 49 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

METHODS: Participants were 25 college students (12 males; M = 23.52, SD = 1.04) from Southcentral region in China. They completed three separate 10-minute exercise sessions at light-physical activity (LPA, walking at 3.0 km/h), moderate PA (MPA, running at 5.0 km/h), and vigorous PA (VPA, running at 7.0 km/h) conditions on the Hcosmos treadmill at a highly controlled laboratory. In this study, the AW and TT were placed on the right wrist while the FB and MS were worn on the left wrist. All demographic information (i.e., height, weight, age, gender) was loaded onto each smartwatch prior to testing. Three smartwatches were then validated against EE data from a Actigraph wGT3X accelerometer worn on the right side of waist.

RESULTS: ANOVAs with repeated measures revealed significant differences between smartwatches for EE, F(9, 16) = 45.73, p < 0.01, n² = 0.98. When validated against accelerometer, post-hoc comparisons suggested significantly different EE assessments for the FB at LPA and MPA conditions (p < 0.01), and for MS and FB at the VPA (p < 0.01). Interclass correlations between the accelerometer and smartwatches revealed reliability for EE for the TT at (r = 0.65, p < 0.01), for the FB, TT and AW at (mp = 0.53, 0.59, p < 0.01), and for MS, FB and TT at VPA (r = 0.59, 0.65, p < 0.01). However, only the TT demonstrated excellent agreement with the accelerometer at LPA with coefficient of variation of 2.0%. Additionally, Bland-Altman plots yielded satisfactory precision/no bias for FB and TT measurements against the accelerometers at all conditions (p > 0.05), for MS at LPA and VPA (p > 0.05), and for AW at VPA (p > 0.05).

CONCLUSIONS: Suggestions for the validity and reliability of different smartwatches to measure energy expenditure in free-living environments for children.

ACSM May 30 – June 3, 2017 Denver, Colorado
Actigraph GT3X+ accelerometer (AG) on their right hip simultaneously while they were participating in variety of activities of daily living. The activity protocol was 33 minutes in total, and consisted of watching TV while laying/sitting, playing with toys, walking/exploring, soccer/running and basketball/throwing. Breath-by-breath measures from OM were averaged into minute-by-minute VO2 (ml kg−1 min−1) and AEE (kcal kg−1 min−1). Additionally, accelerometer-based VO2 and AEE were estimated using Pate’s (PT) and Puyau’s (PY) equations, respectively. The accuracy of each equation was examined against AEE and VO2 measures from OM using Pearson correlations, dependent t-tests and mean absolute percent error (MAPE).

**Results:** Overall, the estimates of AEE and VO2, from accelerometer-based equations were highly correlated with those from OM (VO2: r = 0.78, p < .05, AEE: r = 0.80, p < .05). When compared with measures from OM, the PT and PY equations significantly underestimated VO2 (mean difference (MD) = −1.93 ml kg−1 min−1, p < .05) and AEE (MD = −0.04 kcal kg−1 min−1, p < .05) respectively. The overall MAPEs were 9.2% for PT and 52.1% for PY. For moderate-to-vigorous physical activity (MVPA), the correlation was moderate for the PT and PY equations (VO2: r = 0.54, p < .05, AEE: r = −0.58, p < .05). The PT and PY equations underestimated VO2 (MD = −4.75 ml kg−1 min−1, p < .05) and AEE (MD = −0.07 kcal kg−1 min−1, p < .05) for MVPA respectively.

**Conclusions:** Relatively high correlations support the validity of accelerometer-based AEE prediction equations. However, researchers should be aware that accelerometer based prediction equations may underestimate AEE and VO2, especially for MVPA in 3-6-year-old children.

### Table 1

<table>
<thead>
<tr>
<th>Method</th>
<th>% Accuracy</th>
<th>Kappa</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>71.70%</td>
<td>0.44</td>
<td>0.75</td>
<td>0.95</td>
</tr>
<tr>
<td>Light</td>
<td>65.10%</td>
<td>0.46</td>
<td>0.49</td>
<td>0.89</td>
</tr>
<tr>
<td>Moderate</td>
<td>61.00%</td>
<td>0.49</td>
<td>0.78</td>
<td>0.90</td>
</tr>
<tr>
<td>Vigorous</td>
<td>61.00%</td>
<td>0.40</td>
<td>0.82</td>
<td>0.84</td>
</tr>
<tr>
<td>Sleep</td>
<td>68.40%</td>
<td>0.28</td>
<td>0.28</td>
<td>0.81</td>
</tr>
<tr>
<td>Hip RA</td>
<td>64.00%</td>
<td>0.60</td>
<td>0.72</td>
<td>0.87</td>
</tr>
<tr>
<td>Wrist RA</td>
<td>53.20%</td>
<td>0.53</td>
<td>0.57</td>
<td>0.78</td>
</tr>
</tbody>
</table>

**Purpose:** To validate the International Physical Activity Questionnaire-Short Form (IPAQ-SF) in Chinese college students using health-related fitness tests.

**Methods:** 2513 (1698 males & 815 females; Aged 18.8 ± 0.8 yr.; Height = 170.1 ± 8.0 cm) Chinese college students using health-related fitness tests. The new suite of methods emerging, they are often difficult to compare, due to differences in the intended wear location and data format. Within the last few years, new guidelines have been issued from independent expert panels in the United States, Australia, and United Kingdom: Guideline A) ≥15 min/hr of total PA (TPA) every day and Guideline B) ≥ 180 min/day (≥2 hrs/day of TPA) every day. PURPOSE: The purpose of this study was to compare compliance between Guidelines A and B in a cross-sectional sample of preschool children. METHODS: PA was assessed for 7 days in 241 preschool-age children via accelerometer (ActiGraph GT3X+). A total of 197 children (4±1 yrs; 100 boys, 97 girls) met PA wear time standards and were utilized for data analysis using age appropriate cut-points. The main outcome of interest was TPA (sum of light, moderate, and vigorous intensity PA). TPA was used to determine the number of subjects meeting Guidelines A and B. Differences in the frequency of preschool children meeting Guidelines A and B were compared via chi-square with statistical significance set at p<0.05. Data are presented as mean ± SD. RESULTS: Descriptive characteristics of the samples are as follows: height: 103.6 ± 6.54 cm, weight: 17.27 ± 2.68 kg, BMI percentile: 57.25±27.65. Mean TPA was 11.76±2.84 min/hr and 164.5±39.79 min/day. A greater number of children met Guideline B (r=71%; 36%) than Guideline A (n=23; 11%), p<0.001. None of the subjects met Guideline A during all waking hours every day. On average, subjects met Guideline A 4 hr/day. Only n=10; 5% of subjects met Guideline B every day. CONCLUSION: There is a high degree of variability between the frequencies of subjects meeting Guidelines A and B. Considering that on average, subjects met Guideline A only 4 hours/day, showcase the children that are engaged in long bouts of activity as well as long bouts of sedentary time throughout the day. A majority of children are not meeting these new guidelines and further efforts aimed at increasing PA among preschool-age children should focus on breaking-up long sedentary bouts with activity.

### Table 2

| Test | BMI | VC | Step Test | SLT | Pull-ups | Sit-ups | Full pull-ups | 50-M dash | 800-M run | 1000-M run | Total-METs | Vigorous-METs | Moderate-METs | Light-METs | Sedentary-METs | 50-M | 800-M | 1000-M |
|------|-----|----|-----------|-----|----------|--------|-------------|---------|---------|----------|------------|------------|-------------|------------|-------------|-------------|--------|-----------|--------|--------|
| Mean | 1407.0 | 627.2 | 566.8 | 2513.0 | 21.6 | 3727.4 | 23.7 | 27.6 | 10.4 | 15.4 | 7.4 | 240.8 | 242.4 | 2000-M | 1000-M (MO) |
| SD   | 194.0 | 140.7 | 141.0 | 140.7 | 1.4 | 183.4 | 1.4 | 1.4 | 0.6 | 0.6 | 0.6 | 11.4 | 11.4 | 1000-M | 1000-M |

**Conclusion:** Consist with the findings of other validation studies, only low correlations between physical activity time measured by IPAQ-SF and physical fitness were found, which provide some valid evidence to support the Chinese version of IPAQ-SF.
Researchers use portable metabolic units (PMUs) to assess the energy expenditure of children in free-living settings, with the assumption that physical activity level and participation are not affected due to the PMU’s light weight and small size. However, any effect would potentially impact research on energy expenditure, monitor validation, or active intervention or prescription. PURPOSE: The purpose of this study was to assess differences in accelerometer-derived activity level and enjoyment while wearing a PMU versus not wearing the PMU during a variety of common children’s games (e.g., tag).

METHODS: Youth (N=26; 8-12 y; 15 males, 8 overweight) played a combination of 29 games (mean 4.8 min each) while 1) wearing and 2) not wearing a PMU. During both conditions, children wore a triaxial accelerometer on their right hip to determine total vertical axis counts and counts/min, steps, and vector magnitude counts. After every game, participants responded to questions about their enjoyment on a 9-item affective scale. Because children participated in different numbers of games, each child’s data for each condition were averaged across all games played. Paired t-tests determined if activity level and enjoyment were different while wearing the PMU.

RESULTS: The PMU weighed 1.2-1.3 kg depending on whether the small or large backpack size was worn. The average relative weight of the PMU was 3.5% of the participant’s weight. When comparing wearing the PMU to not wearing the PMU, enjoyment (7.2 ± 1.4 vs. 7.4 ± 1.5; p=0.369), counts (1412 ± 3527 vs. 1491 ± 3902; p=0.329), counts/min (2932 ± 749 vs. 3107 ± 843; p=0.311), steps (295 ± 70 vs. 302 ± 71; p=0.526), and vector magnitude (23309 ± 4318 vs. 24188 ± 4949; p=0.371) were lower, but not significantly different.

CONCLUSIONS: In this sample, wearing the PMU did not affect accelerometer-derived activity level or enjoyment, but more research is justified because of the small sample size. Additionally, future research should examine if the effect of the PMU varies by physical activity intensity. Different age groups should also be explored, since the effect may be more noticeable in younger populations, for which the relative weight of the PMU is greater.
unknown intensity. Chi-square analyses were utilized to examine differences between proportions of intensity levels offered by semester. Kruskal-Wallace tests were utilized to examine differences in proportion of CBPA intensity offered by grade level. **RESULTS:** Most CBPA opportunities were MPA (58.7%), followed by VPA (17.6%) and LPA (11.5%). Few responses were SED (0.5%), and 11.6% were of indeterminate intensity. There was a significant difference in the intensity of CBPA opportunities by semester, with a greater proportion of more physically intense activities reported during the fall versus spring semesters (p < 0.0001). There was also a significant difference in the intensity levels of CBPA offered by grade, with a general trend of decreasing intensity as grade level increased (p < 0.0001). **CONCLUSIONS:** This study provides insight into the physical activity actually occurring in classrooms; however, additional research should be conducted on the CBPA opportunities offered in public schools.

1670 Board #345 June 1 8:00 AM - 9:30 AM The Impact Of Epoch Length On Intensity Of Physical Activity Among Fourth Grade Children Vanessa L. Errisuri, Jon E. Clutton, Esbelle M. Jowers, John B. Bartholomew, FACSM. The University of Texas at Austin, Austin, TX. (Sponsor: John B. Bartholomew, FACSM)

Email: vlerrisuri@utexas.edu

(No relationships reported)

**Purpose:** Research examining the impact of epoch length and cut point (CP) selection on estimates of physical activity (PA) intensity is limited to provide children's PA intensity fills a void by examining the influence of epoch length on estimates of time spent in sedentary, light PA (LPA), and MVPA across different published CP for elementary school children.

**Methods:** Participants were 265 4th graders (M = 9.4 years; 52% female) from 3 elementary schools in the control of the Texas I-CAN! project. Students wore accelerometers over one school week. Data were collected in 5 sec epochs and reintegrated into 10s, 15s, 30s, and 60s epochs. Five children’s CP (Freedson, Evenson, Mattocks, Puyau, Pulsford) classified PA intensity. One-way, RM ANOVAs explored impact of epoch length on PA estimates across CP.

**Results:** Epoch length significantly impacted estimates of time spent in each category of PA. These differences held across each CP used. For sedentary behavior, Post hoc Bonferroni tests showed that all epoch lengths differed from each other within all CP (p < .001), except Puyau between 15s and 60s (p = 0.1; d < 0.01 to d = 1.51). For LPA, post hoc Bonferroni tests showed that all epoch lengths differed from each other within all CP (p < .001), except Puyau between 30s and 60s (p = 0.4; d = 0.01 to d = 1.13). For MVPA, post hoc Bonferroni tests showed that all epoch lengths differed from each other (p < .001; d < 0.09 to d = 1.17). Longer epoch length was associated with less time in sedentary and more time in LPA for all CP. Longer epoch length was related to less time spent in MVPA for all CP except Freedson, which led to greater time spent in MVPA. This resulted in differences in the proportion of children classified as meeting recommendations for daily PA (60 min of MVPA). No children met daily PA recommendations, except when Freedson CPs were used. With Freedson CP, longer epoch lengths resulted in larger percentages of children meeting daily PA recommendations (75.8% at 5 to 87.5% at 60s).

**Conclusion:** Epoch length and CP selection exert substantial influence on estimates of PA intensity among children. Since results from school-based, PA intervention inform public health and policy decisions, future research should use a criterion reference PA intensity among children. Since results from school-based, PA intervention inform public health and policy decisions, future research should use a criterion reference PA intensity among children.

1671 Board #346 June 1 8:00 AM - 9:30 AM Validity of a Sedentary Behavior Guideline for Youth Seungho Ryu, Heonat Kim, Junbze Mun, Minsoo Kang, FACSM. Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM)

Email: sr4@mtmail.mtsu.edu

(No relationships reported)

Sedentary behavior (SB) has been identified as an independent risk factor for many health outcomes such as metabolism, cardiovascular and obesity. The Canada research group provided SB guideline that is no more than 2 hours of SB per day. The SB guideline also indicated lower levels of SB are associated with higher level of fitness. Little is known about the validity of the SB guideline.

**Purpose:** The purpose of this study is to examine the validity of Canada sedentary behavior guideline for Youth.

**Methods:** Data from NHANES National Youth Fitness Survey (NNYFS) 2012 were analyzed for this study. A total of 432 participants (221 males aged 12-15 years completed the survey and a physical fitness examination. The NNYFS questionnaire included two questions regarding recreational SB; in the past 30 days how many hours of TV or videos were watched and how many hours of computer use. Recreation SB was categorized in two levels: (1) 2 hours and less per day; (2) more than 2 hours per day. Health related fitness consisted of body composition, muscular strength and cardiovascular fitness. Body composition was measured by BMI, muscular strength was measured by plank, and cardiovascular fitness was measured by VO2max in NNYFS examination. To validate SB activity, the general linear model was used to examine the association between the recreational SB and health related fitness after controlling the covariates (age, gender, and physical activity).

**Results:** After adjusting the covariates, recreational SB was related to plank, F (1, 427) = 4.14, p = .043. Recreational SB, however, was not related to VO2max and BMI, F (1, 427) = 1.62, p = .20 and F (1, 427) = 0.67, p = .413, respectively. The recreational SB was only associated with muscular strength. The lack of validity for the SB guideline may be due to surrogate measure of SB used in the current study. Further validity research is needed using more accurate measures of SB.
person has not been fully understood. The purpose of this study was to evaluate RHAs of a thrown judo expert and to compare them with the values previously obtained by an anthropomorphic test device (ATD) experiment without akemi.

METHODS: Three male judo expert (thrower) repeatedly threw another male judo expert (follower) for 4 times with Osoto-gari (Osoto) and with Ouchi-gari (Ouchi) techniques respectively, because most ASDHs in judo have occurred with these two throwing techniques. The follower took akemi adequately without head collision against the mat in all trials. A three-dimensional angular rate sensor was mounted on the center of the follower’s forehead and the angular velocities of the head were measured. In order to evaluate the magnitude of follower’s impact of the head, we calculated the RHA from the angular velocities. Kinematic data of the follower’s head were also recorded during trials using digital video cameras. The RHAs of ATD thrown by the same judo expert were obtained from our previous study (Murayama et al., 2016).

RESULTS: Kinematic data showed that the follower fell backwards without any head collisions against the mat in both throwing techniques. In all trials, a large acceleration appeared at the body contact phase to the mat. The peak resultants RHAs of follower (Osoto, 740.7 ± 139.2 рад/с²; Ouchi, 581.5 ± 69.5 рад/с²) were significantly lower than those observed in ATD (Osoto, 4576.2 ± 3574.7 рад/с²; Ouchi, 2716.0 ± 826.6 рад/с², p<0.05 in both techniques).

CONCLUSIONS: These results suggested that an acquisition of adequate akemi technique could substantially reduce the RHA on head impact and the risk of severe head injuries in judo.

1674 Board #349 June 1 9:00 AM - 10:30 AM Influence Of Proprioceptive Intervention On Joint Configuration During Sprint Starts In Elite Collegiate Sprinters

Gabriel Gil, Rumeshi Balendran, Will Wu, Mimi Nakajima, James Becker. California State University: Long Beach, Long Beach, CA.

Email: gil.gabe@live.com

No relationships reported

Purpose: An effective block clearance (BC) is crucial to the success of competitive sprinters. To have success a sprinter must exert an impulse to change his/her momentum while also staying low to the ground, in order to maximize the amount of forward force. The purpose of this experiment was to investigate the influence of proprioceptive priming on the kinetics and kinematics of the sprint start. Methods: Three female (age: 20yrs±1.73, height: 1.64m±0.07, weight: 58.78kg±9.11) and three male collegiate sprinters (age: 23yrs±3.46, height: 1.84m±0.08, weight: 75.3kg±4.6) participated in the study. Participants performed two baseline (BL) trials and two proprioceptive (PR) trials involving a resistance band. Participants were fitted with a full body 55-marker set, 3D kinematics were recorded with a 12-camera motion capture system sampling at 250Hz. Kinetic analysis included assessments of Impulse, Angle of GRF (Sagittal plane), and Average Force. Kinematic analysis included stride rate (SR) and stride length (SL), ground time (GT) and air time (AT), peak toe height during swing phase of sprinting gait, and segment angles. Segment angles were measured for the rear lower leg (RLL) at ankle cross along with the RLL at take-off during the first two steps (SIAC, STO, SZAC, SZTO). Results: There were no significant changes in impulse or average force between interventions. There was, however, a significant difference between the force angle produced during proprieceptive trials (28.5°) and baseline (30.7°) for VR; respectively, (p<0.05). Average Force was significantly greater in proprieceptive trials than baseline for all conditions. Between pairs of variables there were statistically significant differences. Conclusion: Proprioceptive training resulted in an improvement in ground time values during the sprint start and reduced peak toe height for all phases, but showed mixed results for air time. These results suggest that proprioceptive priming has the potential to improve sprint start mechanics and performance.

1675 Board #350 June 1 9:00 AM - 10:30 AM Observing First Time Use Of The Backstroke Starting Device In Competitive Swimmers

Brian V. Wright1, James McDonnell1, James P. Babington1, Wes Manz2, Joel M. Stager, FACSM3. 1DePauw University, Greencastle, IN. 2Indiana University, Bloomington, IN. (Sponsor: Joel Stager, FACSM)

No relationships reported

INTRODUCTION Since FINA’s initial approval for use of the backstroke starting device (ledge) in competition, these devices are now readily available in the marketplace. However, the use of these devices in collegiate, high school, and age-group competitions has yet to be legislated or implemented. Most importantly, no data exist for novice or inexperienced swimmers from the perspective of racing start safety. PURPOSE: To determine whether or not maximum head depth (MHD), velocity at max head depth (VMHD), distance at max head depth (DMHD) and entry angle (Ea) attained when executing backstroke starts vary as a function of using the backstroke starting device in less experienced swimmers (i.e. novice backstroke starting device users). METHODS: 26 swimmers (8 collegiate, age: 21.5 ± 1.2 yr and 18 high school, age: 16.2 ± 1.5 yr) were filmed in a water depth of 1.59 m performing two backstroke starts (1st trial no device; N 2nd trial with the device; W) in the sagittal plane at a sampling frequency of 120 Hz with cameras positioned at three points: 1m (above water), 1m (below water), and 3m (below water) from the starting end wall. Data for MHD, VMHD, DMHD, entry angle were tracked using Simi Reality Motion Systems software. Independent t-tests were used to compare between ability level and within each starting condition. Paired t-tests were used to compare between starting conditions within each ability level. RESULTS: MHD, VMHD, DMHD, and entry angle were significantly (p<0.05) greater in collegiate swimmers when compared to high school swimmers in both starting conditions (N: MHD, 1.14 ± 0.29 vs. 0.48 ± 0.17 m, VMHD: 1.98 ± 0.75 vs. 1.04 ± 0.41 m·sec⁻¹, DMHD: 5.14 ± 0.34 vs. 4.06 ± 0.50 m, Ea: 3.78 ± 6.1° vs. 30.7 ± 6.4° respectively, and W: MHD, 1.02 ± 0.18 vs. 0.53 ± 0.20 m, VMHD: 1.63 ± 0.46 vs. 1.04 ± 0.38 m·sec⁻¹, DMHD: 5.04 ± 0.31 vs. 4.28 ± 0.55 m, Ea: 9.9 ± 10.2° vs. 31.2 ± 7.0° College vs Novice respectively). Only Ea significantly (p<0.05) increased in high school swimmers when using the backstroke starting device (3.78 ± 6.1° vs. 9.9 ± 10.2°). CONCLUSION: It appears that the recently introduced backstroke device tested causes few changes in common parameters that allow stratification of risk for swimmers executing racing starts. This appears true for the expert as well as the novice swimmer.

1676 Board #351 June 1 9:00 AM - 10:30 AM A Common Drill Exercise In A World Champion Breaststroker - Does It Offer What It Promises?

Bjørn Harald Olstad, Jan Cabri, Per-Ludvik Kjendli. Norwegian School of Sport Sciences, Oslo, Norway.

Email: b.h.olstad@nih.no

No relationships reported

Breaststroke swimmers at all levels perform the common drill exercise of two leg kicks to one arm pull at submaximal effort for improving competitive performance through optimizing the timing between the arms and legs. PURPOSE: The aim of this study was to investigate whether this exercise can lead to a more beneficial timing and muscle activation patterns in a world champion when performed at different effort levels. METHODS: Muscle activation of one male world champion (28 yrs, 28 BMI kg/m²) was collected during 25 m of normal breaststroke at maximal effort and during 25 m of two leg kicks to one arm pull at 60% (medium) and 80% (high) of maximal effort using electromyography. Electrodes were placed on triceps brachi, biceps brachii, trapezius, pectoralis major, gastrocnemius, tibialis anterior, biceps femoris and rectus femoris and sampled at 1000 Hz. The signals were amplitude normalized to the individual maximal voluntary contraction. Muscular on- and offset had a threshold level of 20% of the peak. Each stroke phase (leg propulsion, leg glide and leg recovery) was identified through 3D kinematics and was interpolated to 50 time points. Descriptive statistics were used for the average muscle activation and each phase equals 100%.

RESULTS: During leg glide, biceps brachii and pectoralis major activated 2% earlier in the exercise at high effort, but 8% later at medium effort compared to swimming at maximal effort. The exercise showed that biceps femoris was activated during the entire leg recovery at medium and high effort, but at normal swimming at maximal effort it was activated for the last 80%. Tibialis anterior activated 28% later during leg recovery for the exercise at medium and high effort compared to swimming at maximal effort. At high effort the exercise showed a longer activation for triceps brachii during leg propulsion (38%), compared to 6% at medium effort and 10% at swimming with maximal effort. CONCLUSION: The exercise needs to be performed at high effort and not medium effort in order to practice an earlier timing between the arms and legs. The drill exercise at both effort levels are suitable to optimize the muscle activation during leg recovery, as the earlier activation in biceps femoris combined with the later activation in tibialis anterior can reduce the time spent in this non-propulsive high resistance phase.
Board #353
June 1 9:00 AM - 10:30 AM
The Mechanomyographic Activity of the Upper Trapezius Muscle is Heterogeneous in Response to Eccentric Exercise
Pascal Madeleine. Aalborg University, Aalborg, Denmark. Email: pm@lht.aau.dk

The mechanomyography (MMG) signal provides information on the intrinsic muscle mechanical activity. Heterogeneous MMG activity has been reported during endurance contraction but no studies have investigated the effects of high intensity eccentric exercise on the spatio-temporal MMG activity of the upper trapezius muscle.

PURPOSE: To investigate changes in spatio-temporal MMG activity of the upper trapezius muscle before and after eccentric exercise in healthy subjects.

METHODS: Sixteen volunteers performed high intensity eccentric exercise (5 bouts of 10 eccentric contractions at 100% max) involving the upper trapezius muscle on the dominant side. MMG signals were detected by means of 12 accelerometers forming a pentagon over the upper trapezius muscle. MMG recordings were made during submaximal exercise consisting of static arm flexion and abduction at 90° for 30 sec before and 24 hours after the eccentric exercise. Average rectified value (ARV) and percentage of determinism (%DET) of the MMG signals were computed to estimate the level of muscular activation and the amount of regularity of the MMG signals.

RESULTS: During static abduction, there were significant increases in ARV and %DET from before to 24 hours after eccentric exercise, respectively from 0.028±0.011 to 0.036±0.009 m/s² and from 56.3±12.3 to 59.3±11.3% (P < 0.001 for both). The ARV and %DET depended also on the accelerometer locations during static flexion and abduction with higher values in the cranial and lateral part of the upper trapezius (P < 0.001).

CONCLUSION: Inhomogeneous MMG activity in the upper trapezius muscle following high intensity eccentric exercise was found underlining the importance of using multiple recording sites when assessing MMG activity. Changes in the intrinsic properties of the upper trapezius delineated by intrinsic MMG activity and regularity were revealed after high intensity eccentric exercise. Supported by GigForføringen R77-A1202.

Board #354
June 1 9:00 AM - 10:30 AM
Effects of a 4-Week Intrinsic Foot Muscle Exercise Program on Motor Function
John Fraser, Jay Hertel, FACSM. University of Virginia, Charlottesville, VA. (Sponsor: Jay Hertel, FACSM)

PURPOSE: The purpose of this single-blinded randomized control trial was to study the effects of a 4-week intrinsic foot muscle (IFM) exercise program on motor function, perceived difficulty, and IFM motor activation measured using ultrasound imaging (USI) during three IFM exercises. METHODS: 24 healthy, recreationally active young adults with no history of ankle or foot injury who have never performed IFM exercises participated (12 males, 12 females; mean age=21.5±4.8 years; BMI=23.5±2.9 kg/m²). Following randomization, participants allocated to the intervention group received a progressive home IFM exercise program performed daily. Participants in the control group did not receive an IFM intervention and were asked not to alter their physical activity during the trial. Clinician-assessed motor performance (4-point scale: 0=does not initiate movement, 3=performs exercise in standard pattern), patient perceived difficulty (5 point Likert scale: 1=very easy, 5=very difficult), and USI motor activation measures (active thickness/resting) of the abductor hallucis (AbdH), flexor digitorum brevis (FDB), quadratus plantae (QP), and flexor hallucis brevis (FHB) were assessed during a toe spread out, hallux extension, and lesser toe extension exercise. The Wilcoxon signed rank test was used to assess the pre to post intervention motor performance and perceived difficulty measures. Repeated measures ANOVAs were used to analyze the USI measures.

RESULTS: The intervention group demonstrated significant improvement in motor performance in the toe spread out exercise (pre=1.0±0.5, post=2.6±0.5, p<0.008) and less perceived difficulty in the toe spread out (pre=3.1±1.3, post=2.3±1.2, p<0.01), isolated hallux extension (pre=5.2±1.5, post=2.0±1.2, p<0.005), and lesser toe extension (pre=1.9±0.7, post=1.2±0.4, p<0.03) exercises. Both groups demonstrated increased USI motor activation in the AbdH during the toe spread out exercise (intervention: pre=1.07±0.6, post=1.11±0.8; control: pre=1.08±0.6, post=1.11±0.6, p<0.05). No other significant main effects or group by time interactions were observed. CONCLUSION: A 4-week IFM exercise intervention resulted in improved motor performance and decreased perceived difficulty when performing the exercises, but not changes in USI measures of IFM activation.

Previous research has shown that adopting an external focus (i.e., movement of the handle), rather than an internal focus (i.e., muscle contraction) increases force output and decreases muscle activation during an elbow flexion movement in men and women with strength training experience. However, little is known about the influence of attentional focus in novice populations. PURPOSE: To determine the influence of attentional focus on muscle activation and force output among experienced and inexperienced males performing a unilateral isokinetic elbow flexion. METHODS: Fourteen male participants with 3 years of strength training experience (EX group mean age 20.6±0.9) and 9 novice participants with <6 months of resistance training experience (NOV group mean age 19.5±1.0) performed 10 repetitions of a unilateral elbow flexion using a Biodex System 4 dynamometer. Repetitions were performed under 3 conditions (a control followed by randomly assigned internal and external focuses) at a speed of 60°/s. Peak torque (N m) was measured by the Biodex, and peak muscle activation (mV) of the biceps brachi was measured using surface EMG. RESULTS: Within-group differences were analyzed using a repeated measures MANOVA. In the EX group, an external focus showed significantly higher peak torque (65.3±3.2 N m) than both the control (60.0±3.2 N m) and internal (30.1±4.2 N m) focus (all p<0.05). For the NOV group, there were no significant differences in peak torque conditions. Further, there were significant group differences in peak muscle activation for either group. CONCLUSION: Supporting previous research, our results show that adopting an external focus yields greater force output than an internal focus for experienced populations. However, no difference in force output is observed in novices with an external or internal focus. Thus, instructing experienced individuals to adopt an external focus may be beneficial for exercises where maximum force output is the goal, but additional research is needed to better understand the influence of attentional focus for similar exercises among novices. Supported by University of St. Thomas Collaborative Inquiry Grant.

Board #355
June 1 9:00 AM - 10:30 AM
Influence of Experience and Attentional Focus in a Single Arm Isokinetic Elbow Flexion
Blake Loxtorercamp, Marcus R. Moore, Lucy Kelleher, Lesley M. Scibora. University of St. Thomas, St. Paul, MN. Email: Loxt0002@stthomases.edu

No relationships reported.

Board #356
June 1 9:00 AM - 10:30 AM
Core Muscle Function and Endurance in Patients with Patellofemoral Pain following Impairment-Based Rehabilitation
L. Colby Mangum, Ashley Marshall, Neal Glaviano, Susan Saliba, Susan Saliba. University of Virginia, Charlottesville, VA. (Sponsor: Jay Hertel, FACSM)

No relationships reported.

Patellofemoral pain (PFP) is a common knee injury suffered among active individuals and rehabilitation programs for PFP have attempted to target hip muscle dysfunction. However, the role of core musculature in this pathology is not as prevalent in current literature. PURPOSE: To examine the effects of a 4-week impairment-based rehabilitation program with a core-focused component. Muscle activity during a single leg squat (TrA thickness) and endurance (forward and side plank times) were compared before and after rehabilitation. METHODS: 19 PFP patients (23.7±4.8 years, 14F, 5M) completed 12 clinician-supervised rehabilitation sessions over a 4-week
The Single Leg Squat (SLS) is a commonly performed clinical screening tool used to identify faulty lower extremity biomechanics, specifically dynamic knee valgus. Despite this use, few studies have investigated its reliability or examined if sex-differences exist in SLS performance in athletic populations. PURPOSE: Determine interrater reliability of the SLS and investigate whether occurrence of medial knee displacement (MKD) differed between male and female collegiate athletes. METHODS: Ninety-two injury-free Division I collegiate athletes completed SLS testing as part of their preparticipation exam, including 46 men (age=18.6±1.6y, height=183.5±7.9cm, mass=91.0±18.9kg) and 46 women (age=18.6±1.6y, height=169.1±9.5cm, mass=65.4±10.4kg). Participants completed 5 consecutive SLSs on each leg while being recorded with a standard video camera from the frontal plane view. Videos were slowed and paused for scoring purposes. Participants were assigned a positive (+) SLS score if the midpoint of the patella moved to the great toe during the SLS in at least 3 of the 5 trials. Trials were scored by 2 members of the research team (GM, RM). Frequency counts were calculated and agreement of the SLS was analyzed using a kappa statistic to assess the magnitude of occurrence. RESULTS: The interrater reliability for the right and left-leg SLS scores was 0.762 and 0.634, respectively, which indicated a substantial level of agreement. The overall percent agreement was 85%. More than half (50 of 92; 54.3%) of all athletes had a (+) SLS test result in at least 3 of the 5 trials (29.3±6.2°; 27 of 92) had a (+) SLS in both legs. No interrater agreement was 85%. More than half (50 of 92; 54.3%) of all athletes had a (+) SLS in at least 1 leg; 29.3% (27 of 92) had a (+) SLS in both legs. No percent agreement was 85%. More than half (50 of 92; 54.3%) of all athletes had a (+) SLS in at least 3 of the 5 trials. Trials were scored by 2 members of the research team (GM, RM). Frequency counts were calculated and agreement of the SLS was analyzed using a kappa statistic to assess the magnitude of occurrence. Core stability does play a role in PPP and the contribution of task-specific (SLS) and endurance demands should be considered in impairment evaluation while designing a rehabilitation plan.

ACSM May 30 – June 3, 2017
Denver, Colorado

THURSDAY, JUNE 1, 2017
Collisions in sport occur with the head and neck in various positions. While research has shown that the response of the head differs between front and side impacts, the current understanding of how relatively small changes in head position influence head accelerations and the forces on the neck during impacts remains unclear. PURPOSE: To determine the influence of head position on the accelerations of a biofidelic headform as well as the loads at the atlanto-occipital joint in all 6 degrees of freedom during frontal impacts.

METHODS: A Hybrid III male 50% head-neck assembly instrumented with accelerometers, angular rate sensors and force transducers (sampling rate = 30,000 Hz) was impacted in the frontal quadrant 6 cm above the reference plane with a cylindrical pneumatic impactor (mass = 13.78 kg) at 5.5 m/s. The head-neck assembly was placed tethered to a robotic resistance. During the first sprint (S1), the minimal resistance (1-kg) necessary to detect peak (PK) and average (AVG) sprinting power (P), velocity (V) and force (F); peak rate of force production (RFD) was also collected. Following a 5-min rest period, the athletes completed another sprint (S2) at a resistance that equated to approximately 5% of their body mass. The athletes then rested for approximately 4 – 7 minutes before completing their final sprint (S3) with minimal resistance (1-kg). An analysis of variance with repeated measures was used to assess differences between each sprinting condition. RESULTS: Significant (p < 0.05) main effects were observed for all sprinting kinetic measures except VPK (p = 0.067). Compared to S1, a reduction (p < 0.006) in 20-m sprint time (S1: 3.76 ± 0.23 sec; S2: 3.9 ± 0.34 sec), stride length (S1: 1.39 ± 0.16 m; S2: 1.09 ± 0.18 m), Pmax (S1: 140 ± 18 Watts; S2: 302 ± 66 Watts), Pavg (S1: 375 ± 41 Watts; S2: 617 ± 82 Watts), Vavg (S1: 5.70 ± 0.51 m · s⁻¹; S2: 5.32 ± 0.50 m · s⁻¹), Fmax (S1: 23.8 ± 1.2 N; S2: 55.7 ± 8.8 N), Favg (S1: 49.7 ± 1.3 N; S2: 82.1 ± 7.8 N), and RFD (S1: 5855 ± 436 N · sec; S2: 9981 ± 813 N · sec) was observed. However, only RFD was greater at S3 (6139 ± 389 N · sec; p < 0.001) compared to S1. CONCLUSION: Completing a short, resisted-sprint with a load equating to 5% of body mass within 4 – 7 minutes of a short sprint (~20-meters) does not appear to affect sprinting time or kinetics. However, it does appear to enhance rate of force production.
### D-07 Thematic Poster - Body Composition and Health

**Chair:** Peter W. Grandjean, FACSM. Baylor University, Waco, TX.

(No relationships reported)

**Board #1**

**June 1 1:00 PM - 3:00 PM**

**Age Related Decline in VO2max and Lean Body Mass in Masters Athletes**

Manal A. Naseeb1, Sinclair A. Smith1, Emily N. Werner, 19102, Jacqui Van Grouw1, Rachel C. Kelley1, Francesco Alessio1, Stella L. Volpe1, FACSM1. Drexel University, Philadelphia, PA. University of Florida, Gainesville, FL. (Sponsor: Stella Lucia Volpe, FACSM)

Email: man84@drexel.edu

(No relationships reported)

Improving physical performance of athletes is an important goal to success in sports achievements. Aging influences both body composition and results in a decline in maximal oxygen consumption (VO2max). This decline results from several factors, including increased body fat and reduced maximal cardiac output. Sex differences in age-related decline in VO2max and lean body mass (LBM) in Masters Athletes is still not fully understood.

**PURPOSE:** To examine the sex differences in the age-related decline in VO2max and LBM in Masters Athletes.

**METHODS:** A total of 26 master athletes (females: n=14, males: n=12), 26 to 60 years of age, participated in this cross-sectional study. VO2max was determined via Vmax Encore metabolic system. Lean body mass was evaluated by dual energy X-ray absorptiometry (DXA).

**RESULTS:** There were no significant differences in VO2max (40.1±8.7 and 38.2±12.1 mL/kg/min) (r (24) = 1.29, p=0.208) and age (36.5±5.4 and 41.9±9.1 years) (t (24) = -0.784, p=0.441) between males and females, respectively. Males had a significantly greater LBM than females (t (24) = 5.59, p=0.000 (61.7±4.1 kg and 44.2±6.9, respectively). For males, there was no significant correlation between age and VO2max (r = -0.31, p=0.32), age and LBM (r = -0.23, p=0.47), or VO2max and LBM (r = 0.04, p=0.89). For females, there was a significant negative correlation between age and VO2max (r = -0.603, p=0.02), but no significant correlations were found between age and LBM (r = -0.244, p=0.40) and VO2max and LBM (r = -0.121, p=0.68). There was not a significant age-related decline in VO2max in males and females (r² = 0.09, r² = 0.36, respectively) or in LBM (r² = 0.05, p=0.06, respectively). **CONCLUSION:** Although there were declines in VO2max in both men and women, these age-related declines were not significant. In addition, age-related declines in LBM were not significant in this sample of Masters Athletes. These represent data from an unfunded research project.

**Board #2**

**June 1 1:00 PM - 3:00 PM**

**Development And Validation Of Body Fat Prediction Equation In 20-69 Adults**

JIEXIU ZHAO1, Chuanye Huang1, Ping Hong1, Zihong He1, Mei Wang1, Hui Tian1, Ran Li1, Jinlin Zhou1, Chunya Xu1, Ye Tian1, 1China Institute of Sport Science, Beijing, China. 2Shandong University of Sport, Jinan, China. 3Beijing Sport University, Beijing, China. 4Chinese Mountaineering Association, Beijing, China. Email: zhaojiexiu@ciss.cn

(No relationships reported)

**PURPOSE:** Skinfold thickness is commonly measured in clinical and field settings for the assessment of body fat percentage (BF%) because this method is low cost. A study was conducted to develop prediction equation for total body fat using surface anthropometric measurements in adults aged 20-69 years old.

**METHODS:** Data from 1225 healthy, yellow adults were used. The cohort was then divided into validation and cross-validation groups. Prediction equation was developed by using regression analyses in 1141 Chinese adults aged 20-69 years old. These adults were recruited from a larger randomly sampled population-based study. The independent variables included sex, age, height, mass, body mass index, chest girth, waist girth, hip girth, and skinfold thickness at nine sites. The dependent variable was total body fat percentage and was measured using dual-energy X-ray absorptiometry (DXA). Multiple linear regression was used to determine the best prediction equation for fat percentage. A total of 84 additional samples were included to verify the validity of the equation. Tests for accuracy included Bland-Altman analysis was completed to assess the bias and limits of agreement of the two methods.

**RESULTS:** Twenty-two pairs of DXA and MRI scans were obtained from obese participants with metabolic syndrome. All matched DXA and MRI scans were completed within 72-hours of each other. VAT was measured using both 3T MRI scanner and DXA. MRI VAT calculation was estimated via a novel program which automatically segments and measures VAT as well as subcutaneous adipose tissue. Pearson product moment correlations were assessed to determine the strength of association between the MRI and criterion DXA. Bland-Altman analysis was completed to assess the bias and limits of agreement of the two methods. **Results:** Mean MRI VAT and DXA VAT were 4784.48 cm³ ±1366.59 cm³ and 2693.10 ±920.07 cm³, respectively. A strong correlation was observed between MRI and DXA (r=0.891; p<0.05). Bland-Altman analysis demonstrated bias, upper and lower limits of agreement were 2226.16 cm³, 3548.73 cm³ and 903.583 cm³, respectively. **Conclusion:** Large differences in means were expected due to the MRI imaging a larger anatomical region (1.5T to 7T compared to DXA (20% distance from iliac crest to base of skull)). Our results indicate that quantification of VAT determined from DXA and a novel multi-slice MRI protocol are highly correlated, suggesting that either method could be used to provide important insight into disease risk status and effectiveness of therapeutic interventions.

**Board #3**

**June 1 1:00 PM - 3:00 PM**

**Analysis Of Visceral Fat Tissue Via Dual-energy X-ray Absorptiometry And Magnetic Resonance Imaging**

Parker N. Hyde, Nathan Lamba, Christopher Crabtree, Debbie Scandling, Jay A. Short, Richard A. LaFountain, Teryl N. Sapper, Madison L. Bowling, Vincent J. Miller, Fionn T. McSwiney, Ryan M. Dickerson, Orlando P. Simonetti, Jeff S. Volek. The Ohio State University, Columbus, OH. Email: hyde.110@osu.edu

(No relationships reported)

Increased visceral adipose tissue (VAT) is strongly associated with insulin resistance and cardiometabolic diseases. It is difficult to separate subcutaneous from visceral adipose tissue using standard body composition techniques, but recently dual energy X-ray absorptiometry (DXA) has emerged as a method to quantify VAT. **Purpose:** The objective of this study was to assess the correlation between VAT derived from DXA and multi-slice magnetic resonance imaging. **Methods:** Twenty-two pairs of DXA and MRI scans were obtained from obese participants with metabolic syndrome. All matched DXA and MRI scans were completed within 72-hours of each other. VAT was imaged using both 3T MRI scanner and DXA. MRI VAT calculation was estimated via a novel program which automatically segments and measures VAT as well as subcutaneous adipose tissue. Pearson product moment correlations were assessed to determine the strength of association between the MRI and criterion DXA. Bland-Altman analysis was completed to assess the bias and limits of agreement of the two methods. **Results:** Mean MRI VAT and DXA VAT were 4784.48 cm³ ±1366.59 cm³ and 2693.10 ±920.07 cm³, respectively. A strong correlation was observed between MRI and DXA (r=0.891; p<0.05). Bland-Altman analysis demonstrated bias, upper and lower limits of agreement were 2226.16 cm³, 3548.73 cm³ and 903.583 cm³, respectively. **Conclusion:** Large differences in means were expected due to the MRI imaging a larger anatomical region (1.5T to 7T compared to DXA (20% distance from iliac crest to base of skull)). Our results indicate that quantification of VAT determined from DXA and a novel multi-slice MRI protocol are highly correlated, suggesting that either method could be used to provide important insight into disease risk status and effectiveness of therapeutic interventions.

**Board #4**

**June 1 1:00 PM - 3:00 PM**

**Is Unhealthy Fat Mass Disguised By A Healthy BMI In Females With Eating Disorders?**

Kethe M.E. Engen, Therese F. Mathiesen, Jorunn Sundgot-Borgen, FACSM. Norwegian school of sport sciences, oslo, Norway. (Sponsor: Tim Skinner, FACSM)

Email: kmengen@nih.no

(No relationships reported)

The chaotic eating behavior, with or without periods with restrictive eating and compensatory behavior, in bulimia nervosa (BN) and binge eating disorder (BED) can cause metabolic health challenges, with negative implications for regulation of body weight and composition. Despite the knowledge on how body composition and specifically abdominal fat mass relates to various health variables, body mass index (BMI) is still widely used as a health indicator for individuals and populations. Few studies have investigated the fat distribution and the prevalence of abdominal adiposity among women with BN and BED. **PURPOSE:** To investigate the prevalence of abdominal fat adiposity and examine the ability of BMI to identify women with increased abdominal adiposity in a group of treatment seeking women with BN and BED. **METHODS:** Baseline data from an ongoing RCT treatment study for females meeting the DSM-5 criteria for BN or BED (BN n = 62 and BED n=26, aged 28 ± 5 years) were used. Height (cm) and weight (kg) were measured. Abdominal adiposity was measured with dual-energy X-ray absorptiometry (DXA) (Lunar iDXA, GE Healthcare, enCORE Software, Version 34.10.022) by performing a whole-body scan. Android gynoid fat mass ratio (AG ratio) was calculated by the DXA software (AG ratio = % android fat mass / % gynoid fat mass). Abdominal adiposity was defined as an AG Ratio ≥0.7. **RESULTS:** The prevalence of abdominal adiposity was 63 % in the BN and 73 % in the BED group. In all, 54 % and 81 % of cases with abdominal adiposity in the BN and BED group, respectively, were identified by BMI. **CONCLUSIONS:** The results indicate that unhealthy fat mass is being disguised by a healthy BMI in females with eating disorders. Furthermore, our findings highlights the importance of 1) assessing body composition and abdominal obesity rather than only body weight.
and/or BMI in females with BN and BED and 2) the need for utilizing interdisciplinary treatment (including physical exercise and dietary therapy) to properly address this physiological and metabolic challenge.

1724  Board #5  June 1 1:00 PM - 3:00 PM Bias Between DXA And BIA Varies Based On Quantity Of Fat Mass And Fat-free Mass
Grant M. Tinsley¹, Jeffrey S. Forse², Elisa Morales², Peter W. Grandjean, FACSM¹. ¹Texas Tech University, Lubbock, TX; ²Baylor University, Waco, TX. (Sponsors: Peter Grandjean, FACSM)

Email: grant.tinsley@ttu.edu

(No relationships reported)

PURPOSE: Dual-energy x-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) are common methods of body composition assessment, but the agreement between these methods varies. The present analysis sought to identify both fixed and proportional biases between DXA and BIA in young active adults under strictly standardized conditions.

METHODS: Bias between DXA and single-frequency BIA was evaluated at six different time points in 48 young, active male and female adults consuming standardized diets. Bland Altman plots were generated to assess the agreement between devices for fat mass (FM), fat-free mass (FFM), and body fat percentage (BF%). Fixed bias was evaluated via mean differences (DXA value - BIA value) and 95% confidence intervals, and proportional bias was evaluated via linear regression analysis.

RESULTS: Substantial fixed bias was present for body composition estimates. Mean differences for DXA and BIA were present in males and females for BF% (5%; 6%), FM (2.6 kg; 3.9 kg), and FFM (-3 kg; -4.6 kg). Both genders also exhibited proportional bias for FM and FFM, but the magnitude of bias was greater in females, as indicated by regression coefficients (FM: r = -.34 in F; r = -.25 in M; FFM: r = .63 in F, r = -.25 in M). In individuals with less FM, the mean difference between DXA and BIA was high, indicating that BIA underestimated FM relative to DXA. However, in individuals with greater FM, better agreement was seen. Similarly, the mean difference in FFM estimates was greater in individuals with less FFM. In some individuals with high quantities of FM or FFM, the relationship between devices was reversed such that BIA overestimated FM and underestimated FFM.

CONCLUSIONS: Fixed and proportional biases exist between DXA and BIA when used in young predominantly normal weight adults. Although this limits the ability to compare body composition information obtained by these technologies, the degree of disagreement varies substantially based on quantity of fat mass and fat-free mass such that all-encompassing statements regarding the comparability of these technologies cannot presently be made. While BIA commonly overestimated fat-free mass and underestimated fat mass relative to DXA, this relationship was reversed in some individuals.

1725  Board #6  June 1 1:00 PM - 3:00 PM Effects Of Aerobic Exercise Training Intensity On Inflammatory Cytokines In Obese Hispanic Females
Kyung-Shin Park¹, Brett Nickerson¹, Jason Norris¹, Leslie Solis², Boang Jin Kang¹. ¹Texas A&M International University, Laredo, TX; ²Elizabeth City State University, Elizabeth City, NC.

Email: kpark@tamu.edu

(No relationships reported)

Inflammatory cytokines are useful biomarkers in predicting development of metabolic and cardiovascular diseases and may be positively affected by physical activity and weight loss. Despite much interest in chronic low-level inflammation in obese population, effect of aerobic training intensity on inflammatory cytokines remains elusive. PURPOSE: The purpose of this study was to investigate effects of 12-week aerobic exercise training at high and low intensities on changes in pro-/anti-inflammatory cytokines.

METHODS: Forty-one inactive obese Hispanic females (mean BMI = 34.5 kg/m², aged 21-39 years) were divided into one of three groups: high intensity training group (HI: 144 min), low intensity training group (LT: walking at 50% VO₂max, n=14), and control group (CON, n=13). Exercise volume was similar for both training groups [initial energy expenditure (EE): 13.5 METs h/w and EE was increased by 4.5 METs h/w every four weeks in both training groups. Two-way repeated measures ANCOVA and Tukey post hoc tests were used for data analysis. RESULTS: 12 weeks of aerobic exercise resulted in significantly lower levels of TNF-α in both HT (4.6±1.98 ng/mL, Mean±SD = 3.66±.80, P<.006) and LT (4.3±.70 to 4.05±.77, P<.027). A significant decrease in CRP was observed in HT (6.23 ±.52 mL/mg = 5.92±1.68, P<.035), but not in LT (6.13 ±.71 mL/mg = 6.01±.77, P=416). However, level of adiponectin was not significantly changed in any groups.

CONCLUSIONS: Significant decreases in TNF-α and CRP were found following high intensity aerobic exercise training while low intensity training reduced TNF-α only. The greater changes of pro-inflammatory cytokines in HL indicates high intensity aerobic exercise training may be more beneficial than low intensity training for controlling low-grade inflammation and immune function in obese Hispanic females. The amount of training or fat loss in this study may not be enough to induce changes in adiponectin.

1726  Board #7  June 1 1:00 PM - 3:00 PM Influence of Menopause and Fat Mass Distribution on Lipids and Lipoproteins in Normal-Weight Obese Women
Joshua S. Wooten¹, Benjamin L. Webb¹, Nancy M. DiMarco, FACSM², David L. Nichols, FACSM², C. Barney Sanborn, FACSM². ¹Southern Illinois University Edwardsville, Edwardsville, IL; ²Texas Women's University, Denton, TX.

Email: jwwooten@siue.edu

(No relationships reported)

Normal-weight obesity (NWO), defined as a normal body mass index (BMI), but possessing a high body fat percentage (BF), has been associated with increased risk for cardiovascular disease (CVD) comparable to women with obesity. Following menopause, fat redistribution and increased risk for dyslipidemia are common; however, the effect of menopausal-related shifts in fat distribution and lipids and lipoproteins in NWO women remains to be determined.

PURPOSE: To determine the influence of menopausal status on changes in regional abdominal and hip fat masses and lipids and lipoproteins in NWO women.

METHODS: Sedentary, non-smoking women (n=214), not taking medications for the treatment of dyslipidemia, were grouped based on two categories: 1) menstrual status: premenopausal (PRE) or postmenopausal (POST) and 2) BF status: non-obese (BMI <25 kg/m² and BF <36%), obese (BMI ≥25 kg/m² and BF ≥36%), or obese (BMI ≥25 kg/m² and BF ≥36%). Fasting (12 hr) serum samples were analyzed for lipid and lipoprotein-cholesterol concentrations. Percent BF and abdominal and hip regional fat masses were quantified by DXA. A 2x3 ANOVA was used to identify differences between groups. Statistical significance was set at P<.05.

RESULTS: Independent of menopausal status, both abdominal and hip fat mass in NWO was 27.39% (P<.001) greater than non-obese women, but 37.43% (P<.001) less than obese women. Cholesterol was greater in non-obese (186±33 vs. 212±28 mg/dL, P<.001), NWO (196±35 vs. 219±26 mg/dL, P<.028), and obese (201±34 vs. 223±25 mg/dL, P<.005) POST women when compared to PRE women. LDL-C was not different between normal BF PRE and POST women, however, HDL-C was greater in POST women who are NWO (111±36 vs. 131±25 mg/dL, P<.034) and obese (121±30 vs. 138±23 mg/dL, P=0.017) when compared to PRE women. In contrast, HDL-C was lower in only non-obese POST women (62±13 vs 75±14 mg/dL, P<.001) when compared to non-obese PRE women. In POST women, only HDL-C was significantly lower (62±15 vs 75±14 mg/dL, P<.001) in NWO than non-obese women.

CONCLUSIONS: Based on these findings, menopausal status was not associated with a change in fat distribution; however, the age-related changes in lipids and lipoproteins appear to be due to a change in menopausal status, not shifts in fat distribution.

1727  Board #8  June 1 1:00 PM - 3:00 PM Measurement of Subcutaneous Adipose Tissue in Pre-School Children using Ultrasound
Anne Kelso, Katharina Vogel, Juergen Steinacker, FACSM. University of Ulm, Ulm, Germany. (Sponsors: Prof. Dr. Juergen Steinacker, FACSM)

Email: anne.kelso@uni-ulm.de

Abstracts were prepared by the authors and printed as submitted.

Studies analyzing the weight status of children, especially in overweight and obese children, often use skinfold measurements as part of a standard anthropometric assessment. This commonly used method to assess body fat has inherent shortcomings in accuracy and reliability. In the HAPPY CHILD study (Healthy eating, Active Play-Promoting a healthy lifestyle in Young CHILDren), we used ultrasound to measure subcutaneous adipose tissue (SAT) in pre-school children. In taking these measurements, we applied a recently introduced protocol developed by the International Olympic Committee (IOC) Working Group on Body Composition, Health and Performance (under the auspices of the IOC Medical Commission).

PURPOSE: To determine if the above-mentioned protocol for ultrasound measurements of SAT is a feasible method to assess body fat in pre-school children, aged 3-5 years. METHODS: Ultrasound measurements of SAT were taken at eight body sites from 112 children in ten kindergartens. Site marking was performed in reference to a child’s body height. The sum of SAT (D) from these eight sites is reported as: Dsum (including embedded structures) and Dsub (excluding embedded structures). Fat patterning profiles were established, and boys were compared to girls. RESULTS: Fat patterning profiles of 59 boys and 33 girls with an average age of 4.05 years ± 0.72 were established. A comparison of SAT thickness using the Mann-Whitney U test showed a significant difference between girls and boys in the sum of SAT: Dsub in girls was 52.91 mm ± 19.03 (Dsum: 47.46 mm ± 18.05) vs. 46.9 mm ± 18.48 (Dsum: 41.27 mm ± 17.27) in boys (Dsub: P = 0.036; Dsum: P = 0.024). Both groups had the highest SAT values at the
lateral thigh and the lowest values at the erector spinae. CONCLUSION: The applied protocol for ultrasound measurements of SAT is a feasible method to assess body fat in pre-school children. The results show that the girls have a higher amount of SAT than the boys. Adjustments in calculation of measurement sites may be necessary in some cases, depending on the length of a child’s limbs.

D-08 Thematic Poster - Bone Quality in Special Populations

Thursday, June 1, 2017, 1:00 PM - 3:00 PM
Room: 505

1728 Chair: Lisa Ferguson-Stegall, Hamline University, Saint Paul, MN. (No relationships reported)

1729 Board #1
June 1 1:00 PM - 3:00 PM
Sclerostin And Biomarkers Of Bone Health, Energy And Vitamin D Status In Elite Male Athletes
Sarah J. Allisson1, Ana Anton-Solanas2, Ken A. van Someren3, Dinesh Sirisena4, Kathryn E. Ackerman, FACSMB1, Charles Pedlar1, 1University of Surrey, Guildford, United Kingdom. 2GSK Human Performance Lab, Brentford, United Kingdom. 3Koo Teck Puat Hospital, Yishun, Singapore. 4Boston Children’s Hospital, Boston, MA. (Sponsor: Kathryn E Ackerman, FACSMB)
Email: s.allisson@surrey.ac.uk (No relationships reported)

Sclerostin is a hormone secreted by osteocytes that inhibits bone formation and is affected by mechanical loading. Few studies have investigated serum sclerostin levels in athletes and no investigations have focused on elite long-distance runners. PURPOSE: The aim of this study was to investigate serum levels of sclerostin in male and female long-distance runners and to explore their association with bone mineral density (BMD), bone turnover, energy and vitamin D status. METHODS: Twenty-five elite distance runners (23±6 yrs; M=13, F=12) had their BMD assessed through dual-energy x-ray absorptiometry (DXA). Dual-energy x-ray absorptiometry (DXA) and bone blood samples taken in the fasted state and before exercise on one occasion. Blood samples were analysed for serum sclerostin, N-terminal propeptide of procollagen type 1 (PINP), C-terminal telopeptide of type 1 collagen (CTX), 25 hydroxy vitamin D [25(OH)D] and free triiodothyronine (fT3) levels. Comparison between M and F were made using independent t-tests with Bonferroni correction. Analysis of covariance was used to control for potential confounders when making comparisons and Pearson correlations analysed variables for relationships. RESULTS: Serum sclerostin levels were not significantly different between males and females (25±6 vs 23±5 ng/mL, unpaired t-test, P=0.398). In males, serum sclerostin correlated positively with CTX (r=0.72, p=0.006) and fT3 (r=0.62, p=0.023) and this association remained significant after adjustments for age and weight. No other significant associations were observed for sclerostin and other biomarkers. CONCLUSIONS: Serum sclerostin levels in elite distance runners were not influenced by sex, but were significantly associated with biomarkers of bone resorption and may be related to energy availability in elite male distance runners. Further research is needed to explore the clinical implications of measuring sclerostin in elite distance runners.

1730 Board #2
June 1 1:00 PM - 3:00 PM
A 1-Year Longitudinal Study of the Bone Mineral Density of Division I College Distance Runners
William P. McCormack, Haywle C. Almedt, Todd C. Shoepe, Caitlin A. Jennings, Loyola Marymount University, Los Angeles, CA. (No relationships reported)

PURPOSE: The purpose of this investigation was to examine the changes in bone mineral density (BMD) in a Division I cross-country team over a 1-year period. METHODS: Fourteen men (66.8 ± 4.6 kg; 178.7 ± 5.0 cm; 20.4 ± 1.0 yrs; 20.9 ± 1.1 BMI) and nine women (52.5 ± 5.9 kg; 161.8 ± 6.9 cm; 20.2 ± 1.0 yrs; 20.3 ± 1.1 BMI) collegiate distance runners volunteered for bone scans using dual-energy x-ray absorptiometry (DXA). Initial scans were conducted at the beginning of the cross-country season, a second scan at the beginning of the spring track season and a third scan was conducted at the beginning of the following cross-country season. Scan sites included the lumbar spine, proximal femur, and non-dominant forearm. A repeated measured analysis of covariance was utilized to determine any differences between BMD at the three time points. Lean body mass was the co-variant during the statistical analysis. A p-value of 0.05 was used for significance.

1731 Board #3
June 1 1:00 PM - 3:00 PM
Bone Metabolic Response to 216 km Ultra-Marathon Running
Renate M. Leithaeuser1, Heinz J. Roth2, Michael Dopplemayr3, Serge P. von Duvillard1, Lance A. Golightly4, FACSMB, Ralph Benecke, FACSMB, 1Philippus-Universität Marburg, Germany. 2Limbach Laboratory, Heidelberg, Germany. 3Johannes Gutenberg University, Mainz, Germany. 4University of Salzburg, Salzburg, Austria. (Sponsor: Kathryn E. Ackerman, FACSMB)
Email: rena.leithaeuser@staf.funi-marburg.de (No relationships reported)

Physical exercise is a known source of increased bone turnover. Playing sports is recommended for preventing osteoporosis. The positive effects on bone mass of short-duration, high-intensity exercise is well accepted. Bone mass can be considered as net product of bone formation and bone resorption. However, although weight-bearing in nature, endurance running has been shown to increase bone resorption but not formation in some populations potentially increasing the risk of stress fractures. Further investigation is needed to explore reasons for annual BMD maintenance in young-adult, male and female collegiate runners experiencing seasonal fluctuations in skeletal health.

1732 Board #4
June 1 1:00 PM - 3:00 PM
Seasonal Differences In Bone Characteristics In Elite Team Sport Players
Ian Varley1, Ryan Williams1, Julie P. Greeves2, Rachel Izard3, Craig Sale, FACSMB, 1Nottingham Trent University, Nottingham, United Kingdom. 2Women Ground Close Combat Review, Andover, United Kingdom. 3Women's Army Recruiting and Training Division, Upavon, United Kingdom. (Sponsor: Prof. Craig Sale, FACSMB)
Email: ian.varley@ntu.ac.uk (No relationships reported)

The size and structure of bone is influenced by habitual mechanical loading. In elite team sport players, it remains unclear whether bone structural properties change during a playing season and if sport specific bone adaptations occur. Purpose: To compare bone characteristics between different team sports and determine whether seasonal
INTRODUCTION: Bone mineral density (BMD) is a measure that can be used to determine density of a bone, bone region, or skeleton relative to a sample size or to a standardized population. Shown in previous studies, runners and swimmers can show lower BMD than athletes in ball sports or inactive controls. PURPOSE: Compare BMD between swimmers, runners and soccer players. METHODS: Volunteers from collegiate cross country, women’s soccer, and women’s swimming teams were recruited. Ages ranged from 18-25 years with male (n=15) and female (n=36) athletes. DEXA was used to measure BMD. Age and gender were self-reported by the participants, all subsequent data was generated from the DEXA scan. Total and regional BMD data were collected from the DEXA output. Results are reported as a mean and standard deviation. One-way ANOVA was used to analyze differences between groups in total and regional BMD and Tukey post hoc testing determined significance between two groups. Significance was set at P < 0.05 and when Tukey’s post hoc comparison of 95% confidence intervals did not contain zero. RESULTS: Regional BMD included the arms, legs, pelvis, spine, and head. The values for arms and legs are averages of the left and right arm, and left and right leg. Men’s endurance running (1.256 g/cm², 0.948 g/cm², and 1.529 g/cm²) was significantly higher than women’s endurance running (1.187 g/cm², 0.828 g/cm², and 1.351 g/cm²) in total BMD, arms, and legs. Also, men’s endurance running (1.529 g/cm²) had significantly higher BMD in the legs than women’s soccer (1.427 g/cm²) and women’s swimming (1.295 g/cm²). Women’s swimming (0.912 g/cm²) was found to have higher arm BMD than women’s endurance running (0.828 g/cm²). Women’s soccer (1.427 g/cm² and 1.356 g/cm²) had a higher BMD in the legs and pelvis than the women’s swimming (1.293 g/cm² and 1.228 g/cm²) and higher pelvis than the women’s endurance runners (1.221 g/cm²). No significant difference was found between any of the sports for spine and head regional BMD. CONCLUSION: Running may have a slight benefit in female athlete’s BMD and that swimmers may have a higher arm BMD than female runners. Of note is that the sport involving multi-planar, multi-speed directional forces (women’s soccer) demonstrated the densest bones in the lower extremity in comparison to the other sports.
Drink temperature disproportionately influences sweating rate and volume during low intensity exercise in temperate conditions that permit full sweat evaporation. Specifically, cold drinks may reduce sweat production and hot drinks are thought to increase it by stimulation of a gut thermoreceptor. Consequently, cold drinks may have a negative influence on thermoregulatory responses during exercise in the heat. PURPOSE: The effect of drink temperature has yet to be examined on the sweat response, thermoregulation and performance in hot, dry conditions using an ecologically valid protocol with measurement of regional sweating responses. METHODS: Ten trained cyclists completed three trials prior to and during which they ingested 3.2 mL kg⁻¹ of a cold (5.3 ± 1.7 °C) or hot drink (49.0 ± 1.9 °C), which was contrasted to a no drink CONTROL. They cycled in hot, dry conditions (34.5 ± 0.6 °C & 22 ± 1% RH) for 60-minutes at 55% of pre-determined maximal power output (Pmax) and then completed a test to exhaustion at 80% Pmax. Local sweat responses at the bicep and upper back were not different. Throughout the fixed intensity exercise period, local sweat responses were not different (absorbent pads & galvanic skin conductance GSC) were recorded. TTE duration indicated the performance effect. Comparisons were made using ANOVA. Data are displayed as mean [SD]. RESULTS: Participants’ TTE performance was significantly worse in the CONTROL (170 [132] s) condition (p<0.05) than the cold (371 [272] s) and hot drink (367 [301] s) conditions which did not differ. Throughout the fixed intensity exercise period, local sweat responses at the bicep and upper back were not different (p>0.05) between any of the test conditions (e.g. grand mean [SD] Bicep GSC CONTROL 15.2 [8.0] μS, HOT 17.3 [8.0] μS & COLD 14.0 [6.0] μS). Temperature and physiological responses to cycling exercise at a fixed rating of perceived exertion (RPE) were similar (CON: 1.36±0.34°C, NEC: 1.37±0.32°C, ABD: 1.28±0.36°C, MEN: 1.24±0.25°C; P=0.01) and skin temperature responses or regional sweat responses during high-intensity exercise in hot, dry conditions. Consumption of fluid, irrespective of its temperature, provided a benefit to exercise performance in the heat in contrast to not drinking. Supported by European Hydration Institute Grant.

Drinking a hot beverage can improve performance during exercise in the heat, especially when compared to a no drink condition. The use of heat to increase sweat production and thus improve thermoregulation during exercise is supported by this study. Future research should investigate the effects of different temperatures on performance and thermoregulation in various settings and conditions.
The standard of care for initial cooling of a suspected exertional heat illness (EHI) in military training environments is application of ‘ice sheets’ to a casualty. Beginning in 2011 Ft Benning emergency medical services implemented cold (4°C) saline infusion in military training environments is application of ‘ice sheets’ to a casualty. The standard of care for initial cooling of a suspected EHI in the military is application of ‘ice sheets’ to a casualty. The standard of care for initial cooling of a suspected EHI in the military is application of ‘ice sheets’ to a casualty.

**CONCLUSIONS**: The lowest thermal strain occurred with ABD, but the coolest whole-body and neck thermal sensation occurred with MEN; however none of these differences yielded performance benefits in the heat.

<table>
<thead>
<tr>
<th>Variable</th>
<th>CON: 2009-10</th>
<th>CWI: 2011-12</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS, days</td>
<td>Median</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ALT, U/L</td>
<td>84</td>
<td>170</td>
<td>51</td>
</tr>
<tr>
<td>AST, U/L</td>
<td>105</td>
<td>203</td>
<td>87</td>
</tr>
<tr>
<td>CK, U/L</td>
<td>2335</td>
<td>5598</td>
<td>1530</td>
</tr>
<tr>
<td>Cr, mg/dl</td>
<td>1.80</td>
<td>0.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**: These data suggest that the initiation of cold (4°C) saline infusion while en route to a medical treatment facility results in reduced length of stay and lessened severity, as indicated by significantly lower peak ALT and Cr concentrations. Body core temperature data were not available and the effect of CSI on cooling rate remains to be determined.

**PURPOSE**: The expression of inflammation-associated circulating microRNAs (ci-miRNAs) has been shown to be upregulated following acute aerobic exercise in both obese and normal-weight individuals. Research has recently discovered that acute high-intensity interval exercise (HIIE) promotes the release of specific ci-miRNAs as regulators of skeletal myogenesis; however, no study has examined the effects of acute HIIE on inflammation-associated ci-miRNAs. Therefore, this study attempted to conduct an exploratory investigation on serum expression of inflammation-associated ci-miRNAs (miR-21, -126, -130b, and -221) after acute HIIE in healthy young males. METHODS: Eight males were recruited to participate in HIIE on a cycle ergometer, which consisted of 10 bouts of 1 min cycling at 90% maximum power output, separated by 2 minutes of active rest. Blood samples were collected prior to, immediately after exercise, 30, and 60 minutes into recovery. RESULTS: Acute HIIE did not elicit significant alteration on the expression of miR-21, -126, -130b, and -221 across the four time points. CONCLUSION:Unlike aerobic exercise, acute HIIE may not regulate the expression of inflammation-associated ci-miRNAs in healthy young males. Further investigation is warranted to recruit individuals with inflammatory conditions (e.g., obesity), as well as modify the work-to-rest ratio of HIIE protocol, to gain a better understanding of the potential role of these inflammation-associated ci-miRNAs in response to exercise.
1745 Board #3 June 1 1:00 PM - 3:00 PM

Differences In Plasma And Serum BDNF In Response To Acute HIIE
Virginia T. Patterson, Aaron L. Slusher, Edmund O. Acevedo, FACSM. Virginia Commonwealth University, Richmond, VA. (Sponsor: Edmund Acevedo, FACSM)

Email: pattersonv@vcu.edu

(NO relationships reported)

PURPOSE: Circulating concentrations of brain-derived neurotrophic factor (BDNF) are reported to increase with acute exercise in a dose-dependent manner; however, the sources of elevated plasma and serum BDNF may differ as workload increases. Elevated plasma BDNF concentrations are believed to reflect release from the brain, which can indicate positive adaptations in brain health whereas elevations in serum may reflect increased platelet release by the spleen. The popularity and documented benefits of high intensity interval exercise (HIIE), prompted the aim of this study to clarify the acute effects of low-volume, supramaximal HIIE on circulating BDNF. Furthermore, to examine a possible explanation for the changes in plasma BDNF, irisin, a protein involved in the mechanism linking muscle contraction and hipoAMPK, was measured in plasma. METHODS: Healthy, sedentary males (N=11) participated in HIIE on a cycle ergometer (10 x 20 seconds of maximal pedaling against 5.5% of the subject’s body weight x 10 seconds of rest). Whole blood samples were collected from the antecubital vein prior to, immediately after (POST), and 15 minutes after (15POST) HIIE for BND and irisin analyses. RESULTS: At rest, serum BDNF concentrations were nearly 40-fold greater compared after (POST), and 15 minutes after (15POST) HIIE for BND and irisin analyses.

CONCLUSIONS: LIF concentrations were attenuated at 60P in response to an acute bout of RE after 7-weeks of training. Similarly, FSTL1 concentrations, collapsed across groups, were attenuated after exercise. Changes in LIF were highly correlated to changes in FSTL1 suggesting that adaptations regulating these myokines may be linked.

1747 Board #5 June 1 1:00 PM - 3:00 PM

High Intensity Interval Training Improves Disease Activity and Immune Function in Patients with Rheumatoid Arthritis
David B. Bartlett1, Criş A. Slentz2, Leslie H. Willis3, William E. Kraus, FACSM4, Janet M. Lord2, Kim M. Huffman1.

(Duke University, Durham, NC. 1University of Birmingham, Birmingham, United Kingdom.

Email: david.bartlett@duke.edu

(NO relationships reported)

PURPOSE: Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by a dysfunctional immune system which contributes to disease pathology. Exercise training has many anti-inflammatory and immune enhancing properties. Although exercise training is encouraged in those with RA, adherence is problematic. Adherence to higher intensity interval training is better in deconditioned adults and may offer a means to improve health of those with RA. The aim of this study was to determine if fitness, disease activity and immune dysfunction were modified by ten-weeks of a high intensity interval walking program in older adults with RA.

METHODS: Twelve older (64±7) years) sedentary participants with confirmed RA were randomized into either a HV (n = 10, 4 x 10-12RM, 1-min rest) or HI (n = 10, 4 x 3-5RM, 3-min rest) training protocol for 7 weeks (4 d·week-1). Blood draws were done at PRE, 15POST and 15POST (F = 7.277, p = 0.002). Plasma irisin concentrations significantly decreased at POST (p = 0.029). In addition, a positive association between the total change in irisin and total change in plasma BDNF approached significance (r = 0.501, p = 0.097). CONCLUSIONS: These findings demonstrated that this low-volume, supramaximal HIIE protocol was sufficient for elevating serum BDNF, but not adequate for increasing circulating plasma BDNF in sedentary males. These results may suggest that the intensity of physical activity can differentially affect plasma and serum levels of BDNF. Additional research on HIIE volume and the mechanisms underlying BDNF responses (e.g. irisin) is warranted.

1746 Board #4 June 1 1:00 PM - 3:00 PM

The Response of Leukemia Inhibitory Factor to High-Intensity and High-Volume Resistance Training in Trained Men

David C. Church1, Jay R. Hoffman, FACSM1, Gerald T. Mangine2, Adam R. Jaitner3, Jeremy R. Townsends4, Adam M. Gonzalez5, Kyle S. Beyer1, Ran Wang1, Carleigh H. Boone1, Michael B. La Monica1, Amelia A. Mirambot1, Adam J. Wells1, David H. Fukuda1, Jeffery R. Stout, FACSM1. 1University of Central Florida, Orlando, FL. 2Kennesaw State University, Kennesaw, GA. 3Kent State University, Kent, OH. 4Lipscomb University, Nashville, TN. 5Hofstra University, Hempstead, NY. 6University of Nebraska, Lincoln, NE. (Sponsor: Jay R. Hoffman, FACSM)

(NO relationships reported)

PURPOSE: Leukemia inhibitory factor (LIF) and Follistatin-like 1 (FSTL1) are myokines involved in the inflammatory response, and have been suggested to be involved in muscle adaptation. The purpose of this study was to characterize the LIF and FSTL1 response to a high intensity (HI) and high volume (HV) bout of resistance exercise (RE) before (PRE) and after (POST) 7 weeks of HI and HV resistance training (RT).

METHODS: Twenty resistance trained men (23.5±2.6 y, 1.79±0.05 m, 75.7±13.75 kg) volunteered for this study. Following a 2-week preparatory phase, participants were randomized into either a HV (n = 10, 4 x 10-12RM, 1-min rest) or HI (n = 10, 4 x 3-5RM, 3-min rest) training protocol for 7 weeks (4 d·week-1). Blood draws were obtained prior to (BL), immediately (IP), 30 min (30P), and 60 min (60P) post-exercise at PRE and POST. Plasma LIF and FSTL1 concentrations were determined using a multiplex signaling assay kit and analyzed with MAGPIX® technology. Area under the curve (AUC) for each myokine was calculated via the trapezoidal method. Data were analyzed using a repeated measures ANOVA. When appropriate, post-hoc analysis using unpaired t-tests were conducted with Bonferroni corrections. In addition, bivariate relationships were examined using Pearson product-moment correlations. RESULTS: A significant (p<0.021) training x time interaction was observed for LIF. No main effect of time (p=0.262) was observed at PRE, but at POST (p=0.025). LIF concentrations at 60P (13.29 pg·mL-1) trended (p=0.083) towards an attenuation from BL concentrations (32.67 pg·mL-1). A significant main effect of time was also observed for FSTL1. FSTL1 concentrations at 60P (6693 pg·mL-1) were significantly (p=0.013) lower compared to IP (7542 pg·mL-1) when collapsed across PRE and POST. Significant correlations were noted between ABLIF and ABLFSTL1 (r=0.834, p=0.01), and between ΔAUCFLIF and ΔAUCFSTL1 (r=0.809, p=0.01).

CONCLUSIONS: LIF concentrations were attenuated at 60P in response to an acute bout of RE after 7-weeks of training. Similarly, FSTL1 concentrations, collapsed across groups, were attenuated after exercise. Changes in LIF were highly correlated to changes in FSTL1 suggesting that adaptations regulating these myokines may be linked.

1748 Board #6 June 1 1:00 PM - 3:00 PM

Effect of Interval vs Continuous Exercise Training on Acylated Ghrelin and Appetite in Prediabetic Adults

Emily M. Heistin, Natalie ZM Eichner, Nicole M. Gilbertson, Zhenqi Liu, Eugene J. Barrett, Arthur Weltman, FACSM, Steven K. Malin. University of Virginia, Charlottesville, VA. (Sponsor: Arthur Weltman, FACSM)

(NO relationships reported)

Obese individuals are characterized by blunted acylated ghrelin (AG) and increased appetite in response to fasting and feeding. Although exercise may improve weight regulation, few exercise intensity data exist in obese adults with prediabetes in relation to appetite.

PURPOSE: To determine the effects of short-term interval (INT) vs. continuous (CONT) training on appetite regulation in this clinical population. METHODS: Thirteen obese adults (Age: 57.8±2.2y, BMI: 34.5±2.2kg/m2) were screened for prediabetes based upon American Diabetes Association criteria (75g OGTT and HbA1c). Subjects were randomized to work-match INT (n=7, 90% HRRmax for 3 min and 50% HRRmax for 3 min) or CONT (n=6, 70% HRRmax) for 12 supervised sessions over 2 weeks for 60 min/d. Plasma AG was measured at 0, 30 and 60 min of a 75g OGTT before and after training. Visual Analog Scales (VAS) were also administered at 0 and 120 min of the OGTT to examine appetite. Two-day food logs were collected pre- and post-testing to assess ad-libitum diet. Data were analyzed using repeated measures ANOVA and Spearman correlations. Results: Fasting AG was not significantly different following INT (64.8±19.7 vs. 75.1±23.5 pg/ml, P=0.31, n=6) or CONT training (71.1±21.6 vs. 70.4±25.9 pg/ml, P=0.49, n=5). Likewise, AUCAG was not altered following either exercise intensity intervention (P=0.89). INT and CONT exercise also had no statistical effect on total calorie or macronutrient intake. However, fasting fullness tended to increase following INT exercise only (4.1±5.2 vs. 24.1±27.9 mm, P=0.11).
**Conclusion:** Despite seemingly divergent responses between AG and fullness, these preliminary data suggest that exercise intensity favorably influences appetite in adults with prediabetes. Further work is required to determine how exercise intensity impacts appetite to optimize weight loss for cardiometabolic health.

**D-11 Thematic Poster - Wearables: Applications in Research and Practice**

**Thursday, June 1, 2017, 1:00 PM - 3:00 PM**  
**Room: 304**

**1749**  
**Chair:** Patty Freedson, FACSM. University of Mass Department of Kinesiology, Amherst, MA.  
(No relationships reported)

**1750**  
**Board #1**  
**June 1 1:00 PM - 3:00 PM**

**A Consumer Activity Tracker is Sensitive to Changes In Steps during Simulated Free-Living**

Greg J. Petrucci, Jr, Brittany R. Masterlifer, Melanna F. Cox, John W. Staudenmayer, John R. Sirard, Patty S. Freedson, FACSM. University of Massachusetts Amherst, Amherst, MA.  
(Sponsor: Patty S. Freedson, FACSM)  
Email: gpetrucci@umass.edu

**Reported Relationships:** G.J. Petrucci: Contracted Research - Including Principle Investigator; This research was funded by: UMass Institute for Life Sciences Seed Grant and Misfit/Fossil Contract.

**Abstract:**

Noted as the top fitness trend for 2016 and 2017, activity trackers are expected to continue to increase in popularity. Forecasts predict that by the end of 2021 over 560 million units will ship, compared with $2 million units that were shipped in 2015. Moreover, there have been inclinations toward adopting consumer activity trackers in intervention research, despite limited validation efforts.

**PURPOSE:** To determine the sensitivity of a consumer activity tracker (AT) to detect changes in step counts using a research grade accelerometer (RA) to assess concurrent intervention research, despite limited validation efforts.

**METHODS:** Twenty participants wore the AT and RA, on the right and left wrist, and hip, during three one-hour lab sessions: sedentary session (SS), sedentary plus walking (SW), and sedentary plus jogging (SJ) session. For the SW and SJ sessions, participants performed 30-minutes of sitting and 30 consecutive minutes of walking or jogging at 5.15 and 8.0 kph, respectively. Presentation of sessions was balanced among subjects to eliminate the order effect.

**RESULTS:** Displayed in figure are total step means and 95% CI's for the 3 sessions.

**CONCLUSIONS:** While these results are promising, the sensitivity of the AT in detecting changes in usual physical activity volume should be examined under free-living conditions.

Little research exists on behavioral outcomes utilizing wrist-worn activity trackers (AT’s). Recent information from Endeavour Partners wearable research shows that sales of AT’s have tripled. An estimated 33% of the US population are predicted to own a wearable AT by 2017. Therefore, it’s important to conduct behavioral evaluations exploring wrist-worn AT use in combination with physical activity (PA) programming.

**PURPOSE:** This three-year university community engagement study revealed how student coaching in combination with wrist-worn AT’s impacted participant’s perceptions of PA and self-reported sitting time.

**METHODS:** Quantitative questions regarding sitting time, importance of PA, and confidence in sustaining PA were utilized pre/post 10 week Ready to Move (RTM) program intervention. Six separate groups of employee participants (n=173) received student coaches (n=100) and wrist-worn AT’s. Intervention included AT’s being distributed to participants along with a student coach to provide instructions on use of AT’s.

**RESULTS:** PA Importance, pre-survey results showed that participants placed an importance of 8.2/10. Post results showed that participant’s importance of PA significantly (p<.001) increased to 8.92/10. Confidence in PA showed pre-results of 7.55/10 and significantly (p<.001) increased in post-results to 8.24/10. 82% of participants self-reporting sitting ¾ of the time or greater. Post-RTM results demonstrated a self-reported significant (p<.001) decrease in general sitting time with 73.7% of participants reporting sitting ½ of the time or greater. The BRFSS question at work question revealed that 93.75% of participants’ pre-RTM reported mostly sitting while at work. Post-RTM results of 92.1% of participants indicated that sitting at work was not impacted.

**CONCLUSION:** Overall, the RTM survey results revealed that a combination of coaching and wrist-worn AT usage increased the importance of regular PA for participants, their confidence in sustaining PA and movement, and success in reducing general sitting time. Further policy changes in the workplace are necessary to allow employees to move more while at work.

**Abstracts were prepared by the authors and printed as submitted.**

**THURSDAY, JUNE 1, 2017**

**THURSDAY, JUNE 1, 2017**

**1751**  
**Board #2**  
**June 1 1:00 PM - 3:00 PM**  
**Move More, Sit Less? Analysis of an Employer Activity Tracker Workplace Wellness Program**

Peter B. Kiessling IL, Carol Kennedy-Armbruster, FACSM, Mariah Deinhart, Mary Kerby, Rachel Ryder, Katherine Zukerman, Samantha Schaefer. Indiana University; Bloomington, IN. (Sponsor: Carol Kennedy-Armbruster, FACSM)  
Email: pkiessl@indiana.edu  
(No relationships reported)

**Conclusion:** Despite seemingly divergent responses between AG and fullness, these preliminary data suggest that exercise intensity favorably influences appetite in adults with prediabetes. Further work is required to determine how exercise intensity impacts appetite to optimize weight loss for cardiometabolic health.

**Web- and community-based programs effectively promote weight loss, and individuals who use program features more often are more likely to lose a clinically meaningful amount of weight. Many such programs allow participants to synchronize commercially available physical activity (PA) trackers, but the degree to which the provision of such a device would improve participant engagement and weight loss is unclear. Purpose:** To determine the reach and effectiveness of offering a PA tracker to program participants with the goal of improving program engagement and weight-loss outcomes.

**Methods:** A sample of 525 obese (37±6.2 kg/m²) females (44±12.6 yrs) newly enrolled in a web- and community-based weight-loss program were randomized into either an experimental or control group. The experimental group was offered a free PA tracker and asked to provide size and color preferences. Devices were sent to experimental participants who accepted the offer. Program engagement, device use, and weight (lbs) were tracked for three months after program enrollment. **Results:** Of the 266 participants in the experimental sample, 134 (50%) accepted the offer, and 62 (23%) synced the device to their program account. Twenty-two (9%) of the control participants independently obtained and synced a PA tracker. At 3-month follow-up, the experimental group demonstrated greater program engagement than the control group, but only with regard to their likelihood of completing online journal entries (OR(95%CI)=2.08 (1.29, 3.37)). There were no significant differences in weight-loss outcomes. Secondary analyses revealed that those who accepted the offer weighed more at baseline (231 vs. 214 lbs; t(6)=−3.40 (260); p=0.001), and lost more weight (4.71 vs. 1.90 lbs; t(6)=−2.73 (264); p<0.007) than those who did not accept the offer, and they were more likely to lose 3% body-weight (OR(95%CI)=2.30 (1.21, 4.37)) and less likely to drop-out (OR(95%CI)=2.60 (1.58, 4.28)).

**Conclusions:** Offering a free PA tracker for use in a web- and community-based weight-loss program increases a greater proportion of the sample than would independently use this feature. Whether this translates into improved weight-loss outcomes remains unclear. Data collected at 6 and 12 months will be used to determine longer-term effectiveness.
Information technology (IT) provides efficiency and convenience, however it also reinforces physical inactivity. To provide a remedy the IT industry has designed products that combine mobile apps, websites, and movement detection technologies in Hong Kong School Students.

Methods: A total of 185 primary and 178 secondary students were recruited and randomly assigned (by schools & grades) into either an intervention group (n=189) or control group (n=174). The intervention group engaged in a 3-month 7-day moderate intensity interval exercise training (MIET) program (at least 3 times a week) that incorporated the use of an instructor-led video demonstration website, mobile apps and a wearable movement device (wrist-band); whereas the control group engaged in the same exercise training but without movement detection devices. Major outcome measures were the exercise compliance and health-related fitness before and after intervention.

Results: Two-way repeated measured MANCOVA revealed that, all students regardless of group assignment, improved fitness significantly (p<0.05). However, the intervention group indicated higher fitness improvement (p<0.05). The intervention group demonstrated higher (P<0.05) exercise compliance (80.53±59.42%) than the control group (65.32±57.20%).

Conclusion: With the inclusion of a wearable movement detection devices(e.g. mobile apps + wrist bands) in an exercise training program, exercise compliance and physical fitness could be better improved, and may be considered when planning health and fitness promotion for school students.

Previous research has focused on the accuracy of smartphone pedometer apps in laboratory settings, however less information is available in outdoor (free living) environments.

Purpose: To determine the accuracy of 5 smartphone apps at recording steps at a walking speed in a gymnasium versus an outdoor setting.

Methods: Thirty-three healthy college students consented (11Male; Mean±SD; 22±3.8yrs; BMI 24.9±4.13kg/m²) to participate in 2 separate visits. During the first visit participants walked 500 steps at 3mph on a treadmill while wearing a pedometer and a smartphone placed in the pocket using 5 pedometer apps concurrently (Moves, Google Fit (G-Fit), Runtastic, Accupedo, S-Health). During the second visit, participants walked 400 meters at 3mph on a sidewalk outside. Actual steps for each visit were recorded using a hand tally counter device. Zero and negative values were replaced with the mean value for that trial. Statistical analyses were performed using IBM SPSS 23.0. Mean bias scores were calculated between the step count for each app and the respective tally count for each trial. Mean bias scores were correlated between trials for each app using Pearson correlations and significance was set at p<0.05. Mean Absolute Percent Error (MAPE) values were also calculated for each app for both trials.

Results: G-Fit recorded 2 zero values and 2 negative values and Moves recorded 1 zero value. Mean bias scores were significantly correlated between the indoor and outdoor protocols for the pedometer (r=0.67, p<0.01) and S-Health (r=0.46, p<0.05). The remaining apps were not correlated between protocols. The outdoor protocol producing a greater mean bias for the outdoor protocol for G-Fit, Runtastic, and Accupedo (mean bias ≥ SD indoor, outdoor; -4.3±3.5; -9.1±3.2; 0.8±3.6; -10.7±6.3, -33.4±118.7, 16.0±143.6, 79.0±75.0, respectively) and a greater mean bias for the indoor protocol for the pedometer, Moves, and S-Health (mean bias indoor, outdoor; -1.4±4.15, 0.0±3.41, -117.4±196.7, -42.2±209.6, 11.3±28.4, 0.0±58.7, respectively). MAPE was below 5% for the pedometer and S-Health for both trials.

Conclusions: Apps with the lowest error in a controlled setting may be less affected when used in other settings, while apps with greater variation in a controlled setting may be affected when used in a different environment.

Many consumer activity trackers (AT) can be worn at different locations such as the hip, shoe, or wrist. The versatility of wear locations makes these devices attractive to the consumer. However, there is limited data on the differences between wear locations of the dominant (D) and non-dominant (ND) wrist location when estimating steps, a common metric produced by many AT.

Purpose: To compare estimates of total steps (TS) obtained from a consumer AT and a research accelerometer (RA) worn simultaneously on the dominant (D) and non-dominant (ND) wrist during three simulated free-living conditions.

Methods: Twenty healthy adults wore an AT and RA on the D and ND wrist and completed three 1-hour laboratory conditions: 1) sedentary (SED), 2) sedentary plus walking (SW), and sedentary plus jogging (SJ). During the SED condition, participants completed 60 minutes of sitting. During the SW and SJ conditions, participants completed 30 minutes of sitting plus 30 minutes of continuous walking or jogging at 3.0 or 5.0 mph, respectively. Means and 95% confidence intervals were used to assess differences of FFTS between the D and ND wrist locations for the AT and RA among the three conditions.

Results: Within devices, similar TS estimates were produced from the D and ND wrist across all three conditions. Between devices, the AT and RA placed at the D and ND wrist produced similar estimates of TS during the SED and SW conditions. For the SJ condition, the AT produced significantly higher TS estimates, compared with the RA, which was less sensitive to TS detection with increasing intensity.
Evidence is equivocal regarding the benefits of wearable technology for increasing physical activity. Use of these devices in combination with health coaching strategies like motivational interviewing (MI) may be more effective. PURPOSE: The study examined if physical activity trackers increase activity levels in healthy adults and if the addition of MI results in greater benefits. A secondary purpose was to examine characteristics of those who were successful in increasing physical activity versus those who were not in order to determine who is more likely to benefit from this type of intervention. METHODS: Ninety-four healthy men and women (mean age 41 ± 9 years) were randomly assigned to one of two groups for a 12-week intervention. Groups received either 1) a physical activity tracker (PAT) alone, or 2) a physical activity tracker and three sessions of MI (PAT+MI). Physical activity was assessed pre and post-intervention with accelerometers. Average steps per day were compared within and between groups pre- and post-intervention using paired and independent sample t-tests. Participants were then split into two groups based on whether they increased their mean daily step count from baseline. These post-hoc groups were then compared on demographic and baseline physical activity characteristics. RESULTS: Complete data were collected on 84 individuals. Physical activity measured in average steps per day did not increase significantly for either group (PAT+MI – pre: 7496 ± 1289 steps/day, post: 7624 ± 2259 steps/day; PAT – pre: 7519 ± 2259 steps/day, post: 7097 ± 2179 steps/day; p>0.05); further, no group differences were observed (p>0.05). When comparing those who improved over the intervention to those who did not, there were no differences in demographic characteristics including age, gender, income, or education level. However, those who improved over the intervention accumulated significantly fewer steps at baseline (6650 ± 2056 vs. 8522 ± 2871, p < 0.0001). CONCLUSION: The provision of a physical activity tracker (with or without brief MI sessions) was not sufficient to increase physical activity in this sample; however, individuals with low baseline activity achieved more significant benefits.

Conclusions: Researchers should use caution when using TS detected from a wrist-worn RA. An additional criterion measure, such as manual step counting, would more clearly identify under- and over-reporting of TS output from AT and RA during controlled laboratory settings. Supported by: Seed Grant from the Institute of Applied Life Sciences at University of Massachusetts, Amherst and by Fossil Inc.

D-12 Free Communication/Slide - Biomechanics after ACL Reconstruction
Thursday, June 1, 2017, 1:00 PM - 3:00 PM
Room: 104

1758 Chair: Susan M. Sigward. University of Southern California, Los Angeles, CA.
(No relationships reported)

1759 June 1 1:00 PM - 1:15 PM
Limb Asymmetry During Anterior Cruciate Ligament Reconstruction Recovery
Robin M. Queen, FACSM1, Thomas K. Miller2,1Virginia Tech, Blacksburg, VA. 1Virginia Tech Carillon School of Medicine, Roanoke, VA. Email: rmqueen@vt.edu
(No relationships reported)

Limb asymmetries in loading and movement patterns persist up to 2 years after anterior cruciate ligament reconstruction (ACLR) and are related to re-injury risk. PURPOSE: To determine changes in limb asymmetry across the first year following ACLR. METHODS: 23 adolescent ACLR athletes participated in the study (14 female, 9 male). Movement and loading mechanics were collected using an 8 camera motion capture system (120Hz) and 2 embedded force plates (2400Hz) during five vertical stop-jump trials. All analyses were completed using the MIXED models ANOVA procedure in SAS (version 9.3, Cary, NC), with a type I error rate of α=0.05. RESULTS: An interaction between time and surgical limb was observed for the peak knee extension moment (KEM) (p=0.041) with the surgical (Sx) and non-surgical (NSx) limbs converging across time (Figure 1). When examining side-to-side symmetry, there were no differences in frontal plane knee range of motion (ROM), sagittal plane hip ROM, and sagittal plane knee angle at contact independent of time. For the peak vertical ground reaction force (GRF) (p<0.001), impulse (p<0.001), limb stiffness (p<0.001), peak posterior GRF (p<0.001), and peak knee flexion angle (p=0.049) the NSx side demonstrated an increased value when compared to the Sx side. The peak vertical GRF and impulse were asymmetric up to 12 months after ACLR. However, loading rate and peak posterior GRF demonstrated asymmetry up to 6 months after ACLR, while limb stiffness asymmetry perpetuated until 5 months after ACLR. CONCLUSIONS: Movement and load asymmetry remain up to 12 months following surgery indicating that these patients are at risk for subsequent injuries even after being released to return to sports. Additional therapeutic interventions need to be implemented to restore symmetry and improve landing mechanics prior to athletes being return to sports.
Figure 1: Peak knee extension moment differences between limbs and across time.
and contralateral limbs using paired t-tests. RESULTS: At the first visit, operative limbs exhibited less knee flexion (94 vs. 98°, p=0.002) and ankle dorsiflexion (28 vs. 30°, p=0.02), lower vertical ground reaction force (vGRF) (1.5 vs. 2.1 body weights, p=0.002), lower knee and ankle sagittal moments (knee 0.71 vs. 0.97 Nm/kg, p=0.002; ankle 0.70 vs. 0.86 Nm/kg, p=0.001) and power absorption (knee 0.83 vs. 1.4 Nm/kg, p=0.001; ankle 0.56 vs. 0.77 Nm/kg, p=0.03) compared with the contralateral side. Between visits, hip and knee flexion increased on the operative (hip 10.4°, p=0.005) and contralateral (hip 10.4°, p=0.007; knee 7.6°, p=0.01) sides, as well as hip flexion moments and power absorption (p=0.01). Power absorption at the knee increased on the operative side only (0.18 Nm/kg, p=0.01), with a trend of increased vGRF (p=0.08), but remained lower than the contralateral side. No significant changes between visits were observed at the ankle, and only minor differences were observed in the frontal and transverse planes.

CONCLUSION: During early rehabilitation pediatric and adolescent athletes with ACLR show reduced knee flexion and loading of the knee and ankle on their operative limb, possibly representing an avoidance mechanism. Motion and loading at the knee increase over time but remain reduced relative to the contralateral side 6-10 months post-operatively. Increased hip flexion motion, moments, and power absorption may indicate improvements in proximal control as rehabilitation progresses, which may aide in compensation for persistent deficiencies at the knee. Motion analysis appears to provide valuable insight into resolution of this avoidance mechanism and improvements in proximal control which may be used as a valuable marker for readiness to return to play after ACLR.

RESULTS: The ACLR limb had significantly greater knee and hip flexion angles than the control group (Knee:-31 ± 9.4 vs -22 ± 5.1°, p=0.004, Hip: 27.2 ± 12.9 vs 17.2 ± 14.5°, p=0.04). Additionally, the ACLR limb demonstrated less knee extensor moment, 14.5°, p=0.04). Running, jumping, and most sports activities involve sequences of rapid muscle activation and relaxation, or rapid increases and decreases in force production. Rapid quadriceps activation and force development (typically assessed with isolated, isometric methods) are reduced after anterior cruciate ligament reconstruction (ACLR). Rate of neuromuscular activation during sports activities after ACLR has not been studied.

Purpose: To investigate side-to-side asymmetries in rate of neuromuscular activation of the thigh and hip muscles during jumping and running in collegiate athletes post-ACLR.

METHODS: Twelve Division I athletes (age 20.6 ± 1.8, BMI 25.5 ± 2.8, 7.0 ± 3.1 months post-surgery) performed maximal countermovement jumps (CMJ) and treadmill running at preferred speed (2.88 ± 0.27 m/s) while surface electromyography (EMG) of the bilateral rectus femoris (RF), vastus lateralis (VL), medial hamstrings (MH), biceps femoris (BF), and gluteus maximus (GMX) was recorded. Root mean square values of the EMG signal from 0-50 ms were computed from the initiation of the eccentric (ECC), concentric (CONC), and landing (LAND) phases of the CMJ (e.g., RF<sub>ECC</sub>). During running, rate of EMG rise (e.g., RF<sub>R</sub>) was averaged over 18.8 ± 1.3 strides. Limb asymmetries were computed and compared for each muscle and condition using Wilcoxon Signed-Ranks tests.

Running, jumping, and most sports activities involve sequences of rapid muscle activation and relaxation, or rapid increases and decreases in force production. Rapid quadriceps activation and force development (typically assessed with isolated, isometric methods) are reduced after anterior cruciate ligament reconstruction (ACLR). Rate of neuromuscular activation during sports activities after ACLR has not been studied.

RESULTS: The ACLR limb had significantly greater knee and hip flexion angles than the control group (Knee:-31 ± 9.4 vs -22 ± 5.1°, p=0.004, Hip: 27.2 ± 12.9 vs 17.2 ± 14.5°, p=0.04). Additionally, the ACLR limb demonstrated less knee extensor moment, but greater hip extensor moment compared to the control group (Knee: -0.22 ± 0.21 vs 0.03 ± 0.21 Nm/kg*m, p=0.002, Hip: -0.32 ± 0.2 vs -0.13 ± 0.24 Nm/kg*m, p=0.01). CONCLUSIONS: The combination of greater knee flexion angles with a reduced knee extensor moment suggests the ACLR limb is unable to control the increased sagittal plane demands of the 2nd landing. Additionally, increased hip extensor moment in the ACLR group indicates an altered landing strategy to transfer load absorption from the knee to the hip musculature. Future work should explore the relationship between altered landing strategies to hip and knee muscle strength to identify possible interventions to restore knee neuromuscular control after an ACLR.

RESULTS: The ACLR limb had significantly greater knee and hip flexion angles than the control group (Knee:-31 ± 9.4 vs -22 ± 5.1°, p=0.004, Hip: 27.2 ± 12.9 vs 17.2 ± 14.5°, p=0.04). Additionally, the ACLR limb demonstrated less knee extensor moment, but greater hip extensor moment compared to the control group (Knee: -0.22 ± 0.21 vs 0.03 ± 0.21 Nm/kg*m, p=0.002, Hip: -0.32 ± 0.2 vs -0.13 ± 0.24 Nm/kg*m, p=0.01). CONCLUSIONS: The combination of greater knee flexion angles with a reduced knee extensor moment suggests the ACLR limb is unable to control the increased sagittal plane demands of the 2nd landing. Additionally, increased hip extensor moment in the ACLR group indicates an altered landing strategy to transfer load absorption from the knee to the hip musculature. Future work should explore the relationship between altered landing strategies to hip and knee muscle strength to identify possible interventions to restore knee neuromuscular control after an ACLR.

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants

Participants
Hop testing after an Anterior Cruciate Ligament reconstruction (ACLR) is a common functional test to determine return to play status. Due to the difficulty in capturing knee and hip mechanics over a large area while hopping little is known of differences in kinematics that may persist. Assessments in inertial sensor technology allow for assessment of hop and knee mechanics outside the laboratory setting and could provide significant insights into how these functional tests are performed.

Purpose
To investigate hop and knee mechanics in ACLR patients and healthy controls in the sagittal and frontal plane during hop tests, using inertial magnetic measurement units (IMMUs).

Methods
5 ACLR patients (2 male, 3 female, 20.4 ± 2.1 yrs, 164.2 ± 10.7 cm, 69.1 ± 23.5 kg) one year post reconstruction, and 10 healthy controls (7 male, 3 female, 21.8 ± 2.0 yrs, 178.3 ± 10.2 cm, 73.5 ± 14.3 kg) performed a single leg hop and a triple hop for distance with the reconstructed or dominant leg while wearing a suit equipped with 8 IMMUs at the feet, tibia, upper legs, sacrum and sternum. Sagittal and frontal plane hop and knee angles (flexion, abduction) at initial contact (IC) were calculated. Independent Mann-Whitney U-tests were used to statistically compare the data.

Significant differences (p<0.05) in knee and hip flexion and knee abduction were observed at IC for the single leg hop and triple hop between groups (table 1).

| Table 1: Knee and hip mechanics (3D stabilizing single leg and each landing from triple hop at IC; an asterisk denotes a statistical significant difference at p<0.05) |
|------------------|------------------|------------------|------------------|------------------|------------------|
| Single leg hop | Triple Hop | ACLR | Control | ACLR | Control | ACLR | Control | ACLR | Control | ACLR | Control |
| Knee flexion | 10.1 (9.9) | 16.7 (9.3) | 34.1 (14.1) | 13.3 (9.0) | 32.7 (17.4) | 11.0 (8.6) | 22.9 (20.7)* |
| Abduction | 9.3 (10.3) | 3.5 (4.5) | 6.1 (6.1) | 0.8 (1.4) | 3.0 (5.1) | 0.3 (7.5) | 7.3 (9.7) |
| Hip flexion | 29.3 (13.1)* | 44.1 (5.5) | 33.5 (7.6) | 42.2 (8.5) | 32.1 (6.8) | 34.3 (15.8) | 28.8 (15.1) | 40.5 (12.5) |
| Abduction | 6.0 (6.0) | 1.5 (2.5) | 2.4 (2.9) | 0.7 (4.5) | 0.5 (7.7) | 1.0 (6.2) |

Conclusions
Subjects who have had an ACLR employ landing strategy of less hip and knee flexion and abduction when performing a single leg and triple hop as compared to the mechanics of healthy control subjects. This results in a stiffer landing strategy that may predispose them to secondary injuries if not fully addressed.

Supported by a grant from the Dutch Famke Centre.

1766  
June 1 2:45 PM - 3:00 PM
The Long Term Effect Of Quadriceps Strength On Patient Reported Outcomes After An ACL Reconstruction
Molly Lex, Darren Johnson, FACSM, Mary Lloyd Ireland, FACSM, Brian Noehren, FACSM. University of Kentucky, Lexington, KY.

(No relationships reported)

Reductions in quadriceps strength following an anterior cruciate ligament (ACL) reconstruction have been hypothesized to reduce quality of life in as little as five years. While commonly speculated upon, the relationship between quadriceps strength and patient reported outcomes (PRO’s) has not been formally tested. We hypothesized that greater quadriceps strength and better performance on the timed step down test (TSDT) would predict patient reported outcomes.

Purpose: To determine if quadriceps strength and the 60 second TSĐT were able to predict patient reported outcomes at an average of an eight year follow up after ACL reconstruction.

Methods: 40 subjects (29 F, 34 ± 11 years old, H 1.71 ± 0.1 m, M 73 ± 12 kg, Tegner 5.7 ± 1.3) at least 5 years from an ACL reconstruction completed the study. Five maximum voluntary isometric contractions were measured using the Biodex dynamometer and normalized to body weight. Patient reported outcomes were recorded on the International Knee Documentation Committee (IKDC) and Lysholm Knee Questionnaire. Multiple linear regressions were performed to assess the relationship between strength and PRO’s. Significant contrasts were: 60 second TSĐT, and the interaction between quadriceps strength and Tegner activity level explained 55% of the variance in the IKDC (F=9.816, p=0.0001) and 45% of the variance in the Lysholm scale (F=7.034, p=0.0003).

Conclusion: Quadriceps strength, TSĐT, and Tegner activity levels explained almost half of the variance in self-reported knee functioning long term after an ACL reconstruction. These results suggest that modifiable factors such as muscle strength and endurance could have a significant impact on improving long term outcomes for patients following an ACL reconstruction. Additional studies are needed to assess the effect of maximizing quadriceps strength on the improvements in patient’s quality of life.

1765  
June 1 2:30 PM - 2:45 PM
Relationship Between Quadriceps Function and Patient Reported Outcomes in ACL-R Patients With and Without Osteoarthritis
Grant Norte1, Jay Hertel, FACSM2, Susan Saliba2, David Diduch2, Joe Hart, FACSM3. 1University of Toledo, Toledo, OH. 2University of Virginia, Charlottesville, VA. (Sponsor: Joe Hart, FACSM2)

(No relationships reported)

The relationship between quadriceps muscle function and patient-reported outcomes over time after ACL reconstruction (ACLR) may help clinicians better understand which factors may be affecting quality of life. PURPOSE: To identify the relationship between objective measures of quadriceps function and patient-reported outcomes early (< 1 year) and late (> 2 years) after ACLR, including patients who experienced post-traumatic knee osteoarthritis. METHODS: This was a cross sectional study of 72 ACLR patients, categorized as early (n = 34, age = 22.5 ± 6.3, height = 174.1 ± 11.0 cm, mass = 73.9 ± 16.9 kg, time from surgery = 9.0 ± 4.3 months), late (n = 30, age = 24.9 ± 5.9, height = 171.7 ± 11.8 cm, mass = 74.9 ± 16.2 kg, time from surgery = 70.5 ± 41.6 months), or diagnosed with knee osteoarthritis (n = 8, age = 45.4 ± 7.4, height = 170.0 ± 9.7 cm, mass = 85.2 ± 24.8 kg, time from surgery = 115.9 ± 110.0 months). Quadriceps isokinetic strength (peak torque, total work, average power), maximum voluntary isometric contraction (MVIC) torque, fatigue index, central activation ratio, spinal reflex excitability (Hoffmann [H] reflex), and corticospinal excitability (active motor threshold [AMT]) were measured bilaterally. The Knee Osteoarthritis Outcome Score (KOOS) and Veteran’s Rand 12-item Health Survey (VR-12) were used to quantify regional knee function and global health. Multiple linear (stepwise) regression analyses were used to predict patient reported outcomes using measures of quadriceps function and patient demographics (pain, activity level, time since surgery, and age) in each group. RESULTS: In patients early after ACLR, knee extensor path, AMT symmetry, pain, and activity level explained 67.8% of variance in KOOS (p < .001); whereas, knee extensor work, activity level, and pain explained 53.0% variance in VR-12 (p < .001). In patients late after ACLR, age and isokinetic torque symmetry explained 28.9% variance in KOOS (p < .004), and did not explain variance in VR-12. In patients with osteoarthritis, kinesiophobia and isokinetic torque explained 77.8% of variance in KOOS score (p < .010); whereas, activity level explained 86.4% variance in VR-12 (p < .010). CONCLUSION: Factors that predict patient reported outcomes are different for patients early and late after ACLR, and in those with diagnosed knee osteoarthritis.

D-13  
Free Communication/Slide - Mechanisms of Muscle Atrophy and Hypertrophy
Thursday, June 1, 2017, 1:00 PM - 3:00 PM
Room: 504

Chair: Brian Ferguson. University of Illinois - Chicago, Chicago, IL.
(No relationships reported)

1767  
June 1 1:00 PM - 1:15 PM
Development of a Risk Index for Predicting Older Adults’ Sarcopenia
Jingmin Liu1, Cao Chunmei1, Zhih Tang1, Weimo Zhu, FACSM2. 1Tsinghua University, Beijing, China. 2University of Illinois at Urbana-Champaign, Urbana, IL. (Sponsor: Weimo Zhu, FACSM2)

(No relationships reported)

Muscle attainment well exists in adults especially in old adults. Decay rate of muscles in old adults was a key symbol of aging. Delaying sarcopenia is an important focal point for the elderly. The limitation of current approaches to predict sarcopenia lies in a lack of valid biomarkers and accurate assessment tools. Therefore, there is an urgent need to develop a reliable tool to screen out the risk group for sarcopenia. In this study, we probed a new risk index model which was based on the factor analysis of muscle mass and the factors that may affect muscle mass. The new model was validated by the clinical data of 6674 community-dwelling older Chinese adults (age ≥ 65). The results showed that the new model had a better predictive capacity than the previously developed risk index model. The new model was also able to detect the muscle atrophy and gain in both men and women. The new risk index model can be used for assessing and predicting sarcopenia in elderly Chinese adults.
Heat Treatment Regulates Autophagy in C2C12 Myotubes

Corey M. Summers, Rudy J. Valentine. Iowa State University, Ames, IA.

June 1 1:15 PM - 1:30 PM

Heat treatment regulates autophagy by increasing AMPK phosphorylation and reducing proteasome activity.

CONCLUSION: Heat treatment promotes autophagy in C2C12 myotubes.

Heat treatment regulates autophagy in C2C12 myotubes. METHODS: C2C12 myotubes were differentiated and cultured in 6-well plates. After 72 hours, cells were treated with heat for 1 hour at 43°C. Cell lysates were collected for western blot analysis of AMPK and ATG5. RESULTS: AMPK phosphorylation increased by 44% (p<0.05) and proteasome activity decreased by 64% (p<0.001) compared to control. CONCLUSION: Heat treatment promotes autophagy in C2C12 myotubes.

1770 June 1 1:30 PM - 1:45 PM

Impact of Downhill Running on Proteasome Content in Mouse Skeletal Muscle

Cory W. Baumann, Dongmin Kwak, Deborah A. Ferrington, LaDora V. Thompson. University of Minnesota, Minneapolis, MN.

Email: cbbaumann@umn.edu

(No relationships reported)

PURPOSE: To investigate the effects of an acute bout of heat treatment on autophagic signaling in skeletal muscle, leading to deleterious consequences. In contrast, exposure to short durations of heat (heat treatment) appears to elicit a protective effect of heat treatment on autophagy remains unknown.

PURPOSE: To investigate the effects of an acute bout of heat treatment on autophagic signaling in skeletal muscle cells. METHODS: C2C12 myoblasts were grown and differentiated into myotubes. Following differentiation, cells were maintained at 37°C (tissue culture, TN) or heated at 43°C (heat treatment, HT). RESULTS: Heat treatment increased AMPK phosphorylation and decreased proteasome activity.

CONCLUSION: Heat treatment promotes autophagy in C2C12 myotubes.

The Chemokine Cxcl10 is Not Needed For Normal Skeletal Muscle Regeneration Following a Toxin-induced Injury

Michael R. Deyhle, 84602, Coray Peerce, Marissa Robison, Jacob W. Parmley, Jacob R. Sorensen, Paul Hafen, Robert D. Hyldahl. Brigham Young University, Provo, UT.

Email: mdeyhle@byu.edu

(No relationships reported)

PURPOSE: The CCL2/CCR2 chemokine receptor axis is necessary for successful muscle regeneration following injury. Recently, another chemokine known as CXCL10 (IP-10) was found to be elevated in human skeletal muscle following muscle damaging eccentric contractions. This finding may indicate that CXCL10, like CCL2, is important for muscle regeneration.

METHODS: To test this, we measured functional and histological markers of muscle regeneration in mice out to 14 days post muscle injury (DPI) in wild type (WT) mice and Cxcl10 knockout knockout (KO) mice (n=13 and 12, respectively). The muscle injury was induced by cardiotoxin (CTX) injection into the tibialis anterior (TA) muscle of a hind limb of each mouse. The opposite limb was injected with saline to serve as a within-animal sham control. At 2, 7 and 14 DPI muscle function of both the CTX- and saline-injected TA muscles was assessed using an in situ contraction preparation. After the contraction testing, the TA muscles were fixed, sectioned, and stained using standard methods. Muscle regeneration was assessed using histological sections.

RESULTS: Relative to the saline-injected TA, strength significantly decreased (p<0.05) at 2 (WT=46.7±15.9%, KO=44±9.4%), 7 (WT=65±8.3%, KO=66±15.9%) and 14 DPI (WT=81±3.3%, KO=105±15%) and was not significantly different between genotypes. Compared to the control TA, the CTX-injected TA muscle mass was significantly reduced (p<0.05) at 7 DPI (WT=86±3%, KO=55±8.3%, WT=103±15%) and 14 DPI (WT=93±3%, KO=105±11%) and was not significantly different between genotypes. Cross-sectional area of regenerating myofibers was greater at 14 DPI compared to 7 DPI (p<0.05), yet again no...
The age-related loss of muscle mass and function are key contributors to the decline in healthspan. Maintenance of proteostasis (protein synthesis and breakdown) is critical to maintain muscle quality and function during advancing age. We have previously shown that interventions that slow aging increase the ratio of skeletal muscle protein to DNA synthesis, which we believe are indicative of improved proteostatic mechanisms. Oxidative stress and inflammation blunt the anabolic response to protein feeding, thus supplementation with a nuclear factor, erythroid 2 like 2 (Nrf2) activator could restore the anabolic response to protein feeding in older adults. PURPOSE: To test the hypothesis that supplementing with a Nrf2 activator alongside protein feeding would increase muscle cell protein in healthy skeletal muscle fibers to increase translational capacity and/or proteostasis.

METHODS: In 5-6-week-old C57BL/6 mice, Nrf2 activator or placebo was added to the diet. The mice were fed a high-fat diet for 8 weeks, and then euthanized for muscle protein analysis. RESULTS: The Nrf2 activator significantly increased muscle protein synthesis and muscle mass compared to placebo. CONCLUSIONS: These data suggest that Nrf2 activators could be used to increase muscle mass and function in older adults.
A 13-year-old male baseball pitcher presents with intermittent lateral and posterior elbow pain. 

The pain worsened in the cocking stage of throwing, and he reported decreased elbow mechanics are normal.

PHYSICAL EXAMINATION: Right elbow with mild tenderness on the olecranon and triceps insertion. No tenderness over the medial epicondyle, ulnar collateral ligament, flexor pronator mass, radiocapitellar joint, or lateral joint aspect of his elbow. Full ROM with mild pain on passive extension of the elbow. No significant pain with valgus stress. Neurovascularly intact.

DIFFERENTIAL DIAGNOSIS: Olecranon stress fracture, avulsion fracture, posterior olecranon impingement, olecranon bursitis.

TEST AND RESULTS: 3V XR of right elbow - delayed closure of the olecranon physis with widening and chronic changes when compared to the uninvolved side. No osteochondral injury or other growth plate abnormality. MRI of the right elbow - inflammation and edema near the olecranon growth plate.

FINAL WORKING DIAGNOSIS: Olecranon stress fracture TREATMENT AND OUTCOMES:

- Completely shut down from a throwing perspective and referred to physical therapy.
- Physical therapy focused on stretching to increase shoulder mobility as well as scapular and rotator cuff strengthening in an effort to decrease the amount of stress on the elbow. - Referral to an orthopedic surgeon to discuss operative (screw fixation) vs non-operative treatment. The choice was made to pursue a trial of non-operative treatment. - At 6 weeks follow up, he had minimal pain. - At 3 months, he was pain free with a normal exam. Repeat radiographs at 3 months showed a marked amount of healing around the olecranon physis. MRI showed no visualized loose bodies.
- New 9 mm oval cartilaginous defect from the central capitellum, displaced in the medial joint recess posteriorly.
- Underlying capitellar edema.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

DIFFERENTIAL DIAGNOSIS:
1. Osteochondritis Dissecans (OCD) of the capitellum
2. Ulnar Collateral Ligament Sprain
3. Olecranon stress fracture
4. Lateral/medial epicondylitis
5. Triceps tendinitis
6. Ulnar collateral ligament sprain
7. Olecranon stress fracture/loose body

TEST AND RESULTS:
- Right elbow radiographs:
  - Small right elbow joint effusion
  - Right elbow MRI:
    - Focal bone marrow signal changes in the anterior capitellum
    - Lateral joint effusion
    - Focal tiny subchondral fluid signal abnormality in mid capitellum
    - No visualized loose bodies
    - Suggestive of Ulnar and early OCD of the elbow

Repeat right elbow MRI for increased pain after three weeks:
- New 9 mm oval cartilaginous defect from the central capitellum, displaced in the medial joint recess posteriorly
- No definite bony component
- Underlying capitellar edema.

FINAL WORKING DIAGNOSIS: OCD of the capitellum.

TREATMENT AND OUTCOMES:
1. Right elbow arthroscopy with OCD drilling microfracture and loose body removal
2. Adjustable hinge elbow brace locked at 60-90 degrees of flexion for 2 weeks
3. Brace was loosened to 40-120 degrees after 2 weeks
4. Doing well at 5 week postoperative follow up. The brace was removed, and activities were restricted to no throwing activities for an additional 6 weeks. Then he was allowed slow return to throwing.
5. At one year follow up, he was doing well with no pain or symptoms. He was cleared for sports but instructed to refrain from pitching.

HISTORY: 15-year-old right-hand dominant male baseball pitcher present with 3 weeks right posterior elbow pain. The pain started after a weekend of extended pitching. He describes the pain with ball release, extension type movements, and hitting. He denies numbness, tingling, swelling, erythema, medial elbow pain, or shoulder pain. There are no prior injuries and his father states that his son’s throwing mechanics are normal.

PHYSICAL EXAMINATION: Slight right elbow effusion with tenderness over the olecranon and lateral and medial epicondyles. Range of motion was decreased to 15 degrees. Strength deficits on rotator cuff. Pain with resisted elbow extension. Negative D-14 Clinical Case Slide - Elbow

Chair: Jason L. Zaremski, FACS.M. University of Florida, Gainesville, FL.

Discussant: Sean Engel. University of Minnesota, Minneapolis, MN.

Discussant: Poonam P. Thaker, FACS.M. Presence Resurrection Medical Center, Chicago, IL.

Elbow Pain in an Adolescent Baseball Pitcher

Mallory Shasteen, Kyle Cassas, FACS.M. Greenwood Health System/Steadman Hawkins Clinic of the Carolinas, Greenville, SC.

Email: mallory.shasteen@gmail.com

Elbow Injury - Baseball

Terin Sysma, Timothy McKenna. Mayo Clinic, Rochester, MN.

Email: sytsma.terin@mayo.edu

Elbow Pain-Young Baseball Pitcher

Luis A. Sanchez1, Juan C. Galloza2, William Micheo, FACSM1.

1University of Puerto Rico, Medical Sciences Campus, San Juan, PR. 2University of Texas Health Science Center at Houston (UTHealth), Houston, TX.

Email: luisalberto721@gmail.com

Elbow P

Elbow P

Elbow P

Elbow P

Elbow P

Elbow P
**Clinical Case Slide - Foot and Ankle II**

**Thursday, June 1, 2017, 1:00 PM - 2:40 PM
Room: 402**

**Vol. 49 No. 5 Supplement S379**

**Chair:** Ashley Zapf, Schwab Rehabilitation Hospital, Chicago, IL.

(No relationships reported)

**Discussant:** Michael Fredericson, FACSM. Stanford University, Stanford, CA.

(No relationships reported)

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

(No relationships reported)

---

**TREATMENT AND OUTCOMES:**

Patient was treated with dry needling with STEM in the sports medicine clinic. He was placed on rest and treated with modalities by ATC. He continued to have pain. He was offered PRP and placed in arm sling for a duration of 2 weeks. Repeat evaluation at 2 weeks post PRP showed 80% reduction in pain and he was started on home exercises. Week 4 follow up visit, he was started on low weight with high repetition exercises. Week 5 follow up visit revealed that the patient was able to tolerate light weights and was 95% better. He was released to full weight room and started on RTP throwing protocol. He completed throwing protocol without issue and has been returned to full play.

---

HISTORY: 17-year-old female presents complaining of left elbow pain ongoing for 4 years. She has a history of a diagnosed subluxing ulnar nerve on the left. She complains of difficulty playing sports such as softball and doing push-ups. She would like to enlist in the Armed Services and is concerned about the symptoms limiting her from doing so. She mainly complains of symptoms when the nerve is subluxing during flexion of the elbow, including discomfort over the cubital tunnel with numbness and tingling in her 4th and 5th digits. She denies symptoms when the nerve is not subluxing. She is right hand dominant and has never had treatment for this, including physical therapy. She believes the symptoms of subluxation started when she suffered a direct fall to the ground landing on the elbow years ago. No fractures were diagnosed at that time.

**PHYSICAL EXAM:** Examination of the left upper extremity reveals intact skin without discoloration, atrophy or swelling. Mild tenderness to palpation in the cubital tunnel. Sensation to light touch is intact. AROM with flexion is to 140 degrees. Strength is 5/5 with arm flexion. Tinel’s sign is positive at the elbow. There is palpable subluxation of the ulnar nerve over the medial epicondyle when brought into flexion from extension. A second snap is also appreciated when the elbow is brought into further flexion.

**DIFFERENTIAL DIAGNOSIS:**

1. Subluxing Ulnar Nerve
2. Snapping Triceps
3. Cubital Tunnel Compression

**TESTS AND RESULTS:**

-EMG shows no cubital tunnel compression at baseline.
- Dynamic ultrasound evaluation reveals an ulnar nerve in cross section located in the normal position within the cubital tunnel during extension. With the elbow slowly flexed past 90 degrees, a palpable snapping of the ulnar nerve was noted on exam and seen dynamically with ultrasound crossing over the medial epicondyle. As the elbow was brought into further flexion, a second snap was appreciated by palpation and on dynamic ultrasound evaluation as the muscle belly of the triceps was noted snapping over the medial epicondyle.

**FINAL WORKING DIAGNOSIS:**

-Subluxing Ulnar Nerve
- Snapping triceps muscle

**TREATMENT AND OUTCOMES:**

1. Conservative measures including physical therapy and bracing with no relief.
2. Surgical Treatment: Anterior transposition of the ulnar nerve with triceps transfer.
3. Ulnar neuritis/subluxation.
4. Medial epicondylitis. 5. Ulnar collateral ligament (UCL) sprain
8. Ulnar neuritis/subluxation.

---

HISTORY: A 14-year, 2-month old male right-handed baseball pitcher presented with chronic right medial epicondylar pain over 18 months, with no inciting injury/trauma. Initially he had mild right medial epicondylitis on magnetic resonance imaging (MRI) which resolved with rest and physical therapy. Still his right elbow pain recurred when throwing, ultimately failing conservative measures. Our collaborating orthopaedists then referred him to us for ultrasound and nonsurgical management. At his initial visit with us, he reported no pain at rest. He last had elbow pain one month earlier while doing lighter outfield (non-pitching) throws.

**PHYSICAL EXAMINATION:** Able to flex elbow with normal range of motion at 145 degrees and extend to 95 degrees. No swelling or bruising. Range of motion normal with no pain with flexion/extension. No locking or swelling. He did have laxity of his right elbow with valgus stress.

**DIFFERENTIAL DIAGNOSIS:**

1. Valgus extension overload.
2. Osteochondritis dissecans.
3. Olecranon stress fracture.
5. Medial apophysitis.
7. Ulnar collateral ligament (UCL) sprain or tear.
8. Ulnar neuritis/subluxation.

**TESTS AND RESULTS:**

Initial MRI 18 months prior showed no UCL injury, but rather fluid at the flexor pronator mass consistent with medial epicondylitis. New MRI showed a partial right UCL tear at the proximal insertion. No full tear, fracture, or other connective tissue injury. Under ultrasound, laxity of the right UCL and pathology consistent with the partial UCL tear was seen, with no fracture, loose bodies, or epicondylitis.

**FINAL WORKING DIAGNOSIS:** Partial UCL tear at the right elbow.

**TREATMENT AND OUTCOMES:** We injected platelet rich plasma (PRP) under ultrasound to the pathologic site of the right UCL. The boy then proceeded with our 12-week PRP rehabilitation protocol tailored to throwing athletes. He completed throwing protocol without issue and has been returned to full play.

---

**1782**

**June 1 2:00 PM - 2:20 PM**

**Medial Elbow Pain - Young Baseball Pitcher**

Andrew H. Gordon, Arthur J. DeLuigi, MedStar National Rehabilitation Hospital, Washington, DC. (Sponsor: Garry Ho, FACSM)

Email: Andrew.Gordon@medstar.net

(No relationships reported)

**1783**

**June 1 2:20 PM - 2:40 PM**

**PRP For Treatment Of Lateral Epicondylitis In A Division I Collegiate Pitcher.**

Ryan Hudson, D.O., Andrew T. Martin, D.O., Campbell University School of Osteopathic Medicine, Lillington, NC. (Sponsor: Pat Leary, FACSM)

(No relationships reported)

---

**D-15**

**Clinical Case Slide - Foot and Ankle II**

**Thursday, June 1, 2017, 1:00 PM - 2:40 PM
Room: 402**

**Chair:** Ashley Zapf, Schwab Rehabilitation Hospital, Chicago, IL.

(No relationships reported)

**Discussant:** Michael Fredericson, FACSM. Stanford University, Stanford, CA.

(No relationships reported)

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

(No relationships reported)
1788 June 1 1:00 PM - 1:20 PM
Uncommon Cause Of Footpain After Trauma In A Collegiate Rugby Union Player
Pierre L. Viviers, FACSM, Wayne Derman, Jeandre T. Viljoen. Stellenbosch University, Stellenbosch, South Africa.
Email: plviviers@sun.ac.za
(No relationships reported)

HISTORY: A 22 year old male rugby union loose head prop received a ball prior to a contact situation. He was tackled from the front with his left foot firmly planted on the surface. He immediately experienced footprint pain, however not severe enough to cause him to stop. Whilst he could not identify the exact location of the pain he indicated that it was under the foot on the medial aspect He completed the match in pain and discomfort. Scrummage intensified the pain during loading of the affected foot. He applied RICE after the match. The next morning he experienced severe pain in the medial arch and described difficulty flexing his big toe. Weight bearing during the gait cycle, especially toe-off caused extreme pain. Previous history included two concussions and a right-sided turf toe. He also suffered from lower back pain during pre-season gymnasium training as well as during scrummaging sessions. He described effective relief from his lower back pain following ingestion of NSAID’s and physiotherapeutic management. PHYSICAL EXAMINATION: Healthy rugby player, unable to bear weight on his left foot. No obvious bruising or any deformity of the left foot. Severe medial arch tenderness of the affected foot to palpation (plantar fascia, sesamoids). No bony tenderness over the whole forefoot or medial arch. Neurovascullarly intact. Severe pain during active plantar flexion, as well as pain with passive stretching (dorsiflexion) of the big toe.

DIFFERENTIAL DIAGNOSIS: • Sprain 1st MTP joint (Turf toe) • Collateral ligamentous injury 1st MTP joint • Flexor hallicus longus strain/ rupture • Planar fascia - acute tear • Subluxation/ Dislocation 1st MTP joint • Sesamoids fractures (acute) • 1st Metatarsal avulsion fracture • Metatarsal fracture • Phalangeal fracture • Sesamoiditis • “Undiagnosed” soft tissue injury

TESTS/RESULTS: X-rays: reported as normal

MRI: reported partial tears of the medial and lateral heads of flexor hallicus brevis. No collateral ligament injury.Sesamoids were normal and no avulsion of the plantar plate could be demonstrated.

FINAL WORKING DIAGNOSIS: Partial ruptures medial and lateral head of the left flexor hallicus brevis

TREATMENT AND OUTCOMES: • Imobilized non-weight bearing in moonboot for 2 weeks • Physical therapy • Gradually mobilized over next 2 weeks and full return to train and play after 4 weeks

1789 June 1 1:20 PM - 1:40 PM
Dance is Pain
Thomas A. Moran1, Holly Benjamin, FACSM. 1University of Chicago-NorthShore, Glenview, IL. 2University of Chicago, Chicago, IL.
(No relationships reported)

HISTORY: 15-year-old female dancer who attends a dance academy and regularly dances 5-6days/week presented for routine followup regarding a resolving grade I Left Navicular stress fracture. She reported initial swelling over dorsum of midfoot extending to the lateral ankle, no swelling or eccymosis. Full Active and Passive range of motion, pes planus, no swelling or eccymosis. Avascular necrosis talus.

PHYSICAL EXAM: Nonantalgic gait. Examination of both ankles revealed bilateral pes planus, no swelling or ecymosis. Full Active and Passive range of motion, Dorsifleion 20 degrees, hyper-plantarflextion to 70degrees, inversion 30degrees and approximately 75 degrees eversion and the distal tibia protruding anteriorly from ankle joint. She continued dance through the pain but limited her running 25 min. pain-free in knees and feet.

DIFFERENTIAL
Lateral ankle sprain, specifically ATFL injury
Navicular fracture
Osteochondral defect of talar dome
Avascular necrosis talus
Tarsal tunnel capsulitis

TESTS/RESULTS
Xray AP, lateral mortise of ankle unremarkable (foot XR's not obtained)

MRI: Diffuse abnormal narrow signal within navicular bone and cortical irregularity at articulation with talus.

CBC, CMP, Calcium and ViD 25-OH levels within normal limits.

FINAL WORKING DIAGNOSIS
Navicular stress fracture

TREATMENT/OUTCOMES
1.Short leg cast x 4 weeks

2.NWB with crutches
3. PT for crutch strengthening and Core Strengthening
4.OTC ViD and Ca supplementation
5.F/U with walking boot
6. Anticipate transition to walking boot at 4-6 weeks
7. Anticipate CT foot at 6 weeks

1790 June 1 1:40 PM - 2:00 PM
Chronic Planter Fasciitis: From Disability To Running!
Lindsay Troilo, Irene Davis, FACSM. Spaulding Outpatient Center Cambridge, Cambridge, MA.
(No relationships reported)

HISTORY: 27 yr. old male with BIL knee and plantar foot pain R>L. Knee pain developed while running in college. Foot orthotics resulted in no change in symptoms. Thus he stopped running and stopped wearing them. Pt. moved to London 5 yrs ago and increased his daily walking. He also began wearing a flat, less supportive shoe. As a result, he developed heel pain that radiated to the arch and gradually progressed to a burning sensation. He returned to the United States and underwent steroid injections, orthotics, tarsal tunnel release and 4 months of PT without relief. At the time of our assessment, foot pain was 6/10 after 3 minutes of standing/walking. He was unable to take public transportation or care for his young daughter due to this pain. PHYSICAL EXAMINATION: Pain in posterior talibias muscle and tendon, plantar fascia origin, and 1st MTP joint R>L. Posterior talibias, peroneals, and toe flexors were weak and painful on contraction. A (+) patella compression BIL and (+) Ober’s R noted. Weakness noted in hip EXT. and ABD BIL. Pt presented with contralateral hip drop L>R, hip ADD and IR, and midfoot pronation BIL during a brief running assessment. He was a rearfoot striker with mildly elevated vertical load rates. These loadrates were markedly reduced when he ran on his_forefoot. His knee pain was also reduced when he ran on his_forefoot. WORKING DIAGNOSIS: 1. BIL planter fasciitis due to foot weakness and overuse, with associated posterior talibias and flexor hallicus longus tendinosis. 2. BIL patellofemoral pain due to increased Hip ADD and IR associated with hip weakness. TREATMENT: Goal1: Pain-free standing and walking Progressive foot core program performed barefoot Soft tissue and joint mobilization to foot/ankle Fibit to monitor walking step progressions Wear out of orthotics and into minimal shoes to promote foot strength Gait retraining to promote activation of foot intrinsic muscles during walking Goal 2: Pain-free running Progressive and dynamic hip strengthening Gait retraining to promote activation of hip musculature to improve hip mechanics OUTCOME: After 32 visits over 11 mos. pt was walking 1-2 hrs with < 1/10 pain in his feet. Pt. worked on home program of hip strengthening for 8 mos. He then returned for 8 sessions of gait retraining to improve hip mechanics. Pt. discharged running 25 min. pain-free in knees and feet.

1791 June 1 2:00 PM - 2:20 PM
Ankle Injury - Football
Philip Hoffman, Igor Danelisen, Jonathan Vanadore, Andrew Martin. Campbell University, Lillington, NC. (Sponsor: Patrick Leary, FACSM)
Email: mbdrphil@gmail.com
(No relationships reported)

History:
A 17 year old high school football player, free-safety position, blocked a kick by the opposing team, landing on his left foot and falling in obvious distress. Examination on the field revealed injury to the left lower extremity, with his foot being stuck in approximately 75 degrees evasion and the distal tibia protruding anteriorly from ankle joint.

PE
Examination revealed intact neurovascular structures and no break in the skin. There was a step off of his lateral malleolus concerning for fracture. 1 attempt was made at relocation of the ankle joint but was not successful on the field.

Differential
Dislocation of left ankle
Fracture distal left fibula
Test and results
AP X-ray confirmed lateral displacement of ankle and distal fibular fracture
Lateral x-ray showed posterior dislocation of ankle and distal fibular fracture.

Final diagnosis
Closed ankle dislocation with displaced distal fibular fracture

Treatment and outcomes
ER relocation of ankle
Surgical fixation and plating of distal fibular fracture
Aircast boot and non-weight bearing for 6 weeks; anticipated date he may start weight-bearing activity is 11/5/16.
Official Journal of the American College of Sports Medicine

Vol. 49 No. 5 Supplement S381

1792 June 1 2:20 PM - 2:40 PM
An Atypical Cause for Posterior Medial Ankle Pain in a Runner
Nicole T. Yedlinsky, 22033, Garry W. K. Ho, 22033, FACSM.
VCU - Fairfax Family Practice Sports Medicine Fellowship Program, Fairfax, VA. (Sponsor: Garry Ho, MD, FACSM)
Email: nyedlinsky@ffpcs.com
(No relationships reported)

HISTORY: A 44-year-old female presented with 3 weeks of left posterior ankle pain and foot pain and swelling occurring with running. It did not bother her while walking and she experienced no injury or trauma.

PHYSICAL EXAMINATION: Normal walking gait with full range-of-motion. Significant tenderness over tarsal tunnel approximating posterior tibial tendon and mild tenderness over the medial retrocalcaneal area. Drawer test, Cotton test, Squeeze test, Talar tilt test, and Thompson test all negative. Too-Many-Toes and Peck-a-Boo heel signs negative, and Rise on Toe exhibited normal heel varus. Dorsolateral compression negative. Strength testing was 5/5 globally with increased pain on resisted inversion. Tinel’s sign negative over the tibial nerve. Distal pulses intact.

DIFFERENTIAL DIAGNOSIS:
1. Posterior tibialis or insertion Achilles tendinopathy
2. Stress fracture
3. Cartilage or osteochondral injury
4. Accessory soleus muscle
5. Soft tissue neoplasm

TEST AND RESULTS:
Radiographs negative for fracture or acute bony injury. Patient was prescribed relative rest and activity modification, and was given a home exercise program and referred to physical therapy. MRI of the foot and ankle performed when symptoms failed to improve after 6 weeks of PT. MRI showed a prominent accessory soleus muscle with minimal edema. The tendinous attachment inserted medially at the margins of the posterior calcaneus. The accessory soleus muscle abutted the posterior margins of the tarsal tunnel.

FINAL DIAGNOSIS:
Accessory soleus muscle

TREATMENT AND OUTCOMES:
1. Symptoms improved 80% with continued focus on eccentric rehabilitation of ankle flexors and evertors.
2. Patient able to gradually return to light exercise.

DISCUSSION:
The accessory soleus muscle is a rare anatomical variant that can cause exertional pain and swelling in athletes. Most patients present with swelling and pain. It usually manifests in the late teens. Accessory soleus can also be found as an incidental finding. No treatment is required for asymptomatic patients. Conservative therapy can be attempted but many patients require surgical excision due to persistent symptoms.

D-16 Clinical Case Slide - Hip and Pelvis I

Thursday, June 1, 2017, 1:00 PM - 3:00 PM
Room: 103

1793 Chair: John C. Hill, FACSM. University of Colorado, Denver, CO.
(No relationships reported)

1794 Discussant: Siobhan M. Statuta. University of Virginia, Charlottesville, VA.
(No relationships reported)

1795 Discussant: Scott A. Paluska, FACSM. Christie Clinic Sports Medicine, Champaign, IL.
(No relationships reported)

1796 June 1 1:00 PM - 1:20 PM
Painful Hip Snapping In A 15 Year Old Female Soccer Player: A Case Report
Melissa Roscher, Kentaro Onishi. University of Pittsburgh Medical Center, Pittsburgh, PA. (Sponsor: Brian A. Davis, FACSM)
Email: rigginms@upmc.edu
(No relationships reported)

HISTORY: A 15 y/o girl with history of bilateral iliotibial band (ITB) lengthening was referred to sports medicine clinic for diagnostic ultrasound of the right anterior hip due to painful snapping in the groin. Pain was exacerbated by kicking a ball. Sonographic examination demonstrated snapping iliaca and psous major tendons with reproduction of groin pain. Physical therapy (PT) focusing on iliopsoas stretch was ineffective; she underwent iliopsoas tendon lengthening and synovectomy with complete resolution of pain. Five months following iliopsoas tendon lengthening, she returned with a new painful grinding sensation in the right buttock. Pain was exacerbated by walking, specifically at toe-off. Pain was sharp, episodic, and debilitating. She denied groin pain or pain with hip flexion. She denied neurologic deficits.

PHYSICAL EXAMINATION:
Gen: No acute distress
Neuro: Audible clunk with ambulation. Non-focal sensory, motor, and reflex examination of the RLE
MUSK: No visible defect of right buttock. Nontender over the gluteal region and ischial tuberosity. Pain reproduced with passive external hip rotation. Negative FABER, FAIR, log roll, Stinchfield, Ober, and sour

DIFFERENTIAL DIAGNOSIS:
1. Iliopectineal impingement
2. Hip labral-intraarticular pathology
3. Snapping gluteus maximus tendon/muscle
4. Iliotibial band snapping

TEST AND RESULTS:
MRI arthrogram: minimal labral fraying. Minimal symptom improvement with intraarticular steroid. Diagnostic ultrason: hypertrophy of the right quadratus femoris (QF) (2.51 cm right vs 1.54 cm left) with dyskinetic motion of the QF between the ischiatic tuberosity and lesser trochanter during external hip rotation. Dyskinesis was more pronounced with standing and walking. Contralateral QF was also dyskinetic in movement. She underwent injection of lidocaine and triamcinolone into the right QF under sonographic guidance.

FINAL WORKING DIAGNOSIS:
Iliopectineal impingement 2/2 hypertrophiou QF

TREATMENT AND OUTCOMES:
1. Sonographically guided injection of lidocaine/ corticosteroid resulted in diagnostic block from lidocaine component only
2. Discussed repeat injection vs debunking operation vs trial of botulinum toxin injection to the QF
3. Referred to PT for hip stretching and pelvic stabilization exercises

1797 June 1 1:20 PM - 1:40 PM
Pelvis And Hip Injury - Soccer
In-Kyu Choi, 90015. Kaiser Permanente Fontana Medical Center, Fontana, CA. (Sponsor: Aaron Rubin, FACSM)
Email: inkyu9025@gmail.com
(No relationships reported)

HISTORY:
A 18 year old male soccer player presented with a 2 week history of gradually worsening left sided groin pain without any radiation or radicular symptoms. Pain was initially only with activity such as sprinting and kicking, but now with just walking. Patient is a right leg dominant attacking mid-fielder and reports having similar symptoms about 2 years ago while in Germany. He had negative work up for hernia and the symptoms eventually resolved with rest at the time. He denies any recent history of trauma or change in activity level. No history of urinary or testicular symptoms.

PHYSICAL EXAMINATION:
Full range of motion of the left hip. Pain with resisted hip adduction but no pain with resisted flexion, extension and abduction. Tenderness to palpation over the pubis symphysis and medial inguinal region. No testicular/inguinal lumps and negative cough test for hernia. Positive FADIR and FABER. No leg length discrepancy. Neurovascuurally intact.

DIFFERENTIAL DIAGNOSIS:

TEST AND RESULTS:
1. XR Pelvis, AP and lateral - reported normal, but possible CAM lesion and possible degenerative changes at the pubis symphysis. 2. MRI Pelvis - Osteitis Pubis. Stress reaction at the bilateral inferior pubic rami. Possible labral tear. 3. MR Arthrogram of the left hip (obtained 3 weeks after initial MRI) - No evidence of labral tear. Stress reaction at the right inferior pubic ramus resolved, improved on the left. CAM lesion

FINAL WORKING DIAGNOSIS:
1. Stress reaction of the inferior pubic rami 2. Osteitis Pubis 3. Femoroacetabular impingement

TREATMENT AND OUTCOMES:
1. Crutches while having pain with walking for 1-2 weeks 2. NSAIDs as needed for pain 3. Restriction on soccer/running for 8 weeks 4. Plan for gradual return to activity

THURSDAY, JUNE 1, 2017

Back And Buttocks Pain In An Adolescent Athlete
Andrew Getzin, FACSM. Cayuga Medical Center, Ithaca, NY.
Email: agetzin@cayugamed.com
(No relationships reported)

History
"I hurt my glut in football, then on and off in basketball, as of one week it seems like much different injury." LS is a 14-year-old male with right-sided 9/10 lower back and gluteal pain for six months. There was no specific injury. He was able to complete football (linebacker, QB, tight end) and basketball seasons with mild pain and has now

Abstracts were prepared by the authors and printed as submitted.
progressed into the start of baseball season. Eight days prior, his pain changed to be first thing in the AM, stabbing pain over his glute and ischial tuberosity- made worse with sudden movement, swinging, throwing, squatting, and lateral bending. Pain was better with not moving but did not disturb his sleep. No relief with stretching nor ibuprofen.

Physical Exam:
Athletic looking adolescent male mildly uncomfortable
Chest: normal respiratory effort
Skin: no visible rashes or lesions
Normal gait
Back: right glut pain on flexion with finger tips to the floor, FROM on extension without pain, -Slump test bilaterally, +R SLR with severe glut pain, -L SLR, dermatomes and Myotomes WNL
Right Hip: mild tenderness over ischial tuberosity, FROM, +FABER’s, -OBER’s, 5/5 strength with mild pain on resisted hip extension

1. LS strain
2. Axial discogenic pain
3. Spondylolysis
4. Slipped Capital Femoral Epiphysis
5. High hamstring tendinopathy
6. Proximal adductor tendinopathy
7. Piriformis syndrome
8. Juvenile Spondylarthropathy
9. Pelvic stress fracture

Tests and Results:

MRI LS spine: WNL
MRI LS pelvis: WNL

1. Edema within the left L4 pedicle
2. Small focal protrusion at the L4-L5 level in the right lateral recess, possibly impinging on the L5 nerve root

Treated with Medrol dose pack and PT for discogenic pain. One morning he felt an explosion of pain in his right glut, 10/10 that kept him out of school for the next few days. Due to exacerbation and chronicity, further imaging was performed.

MR arthrogram R hip:
1. Mild cam FAI
2. Small focus of edema right greater trochanter
3. R unilateral sacroiliitis with erosion of subchondral bone along the iliac margin and iliac margin subchondral marrow edema

MR LS Spine: WNL
CBC: WNL
ESR: 8
CRP: <0.5
RF: <15
HLA-B27: positive
ANA: positive
Final Dx: Juvenile Spondylarthropathy

Outcome: He initial did well with Humira injections.

1799 June 1 2:00 PM - 2:20 PM
Hip Pain - Women's Soccer
Shawn D. Felton, Taylor K. Kramer, Jason C. Craddock. Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)
Email: sfelton@fgcu.edu

(History includes relationships reported)

History:
Athlete is a 20-year-old NCAA Division II women’s soccer player. Athlete’s previous medical history includes chronic pelvic instability, Legg-Calve Perthes Disease (LCPD), and chronic exertional compartment syndrome bilaterally.

Physical Examination:
Athlete reported to athletic trainer complaining of sharp pain near right proximal hip region. Athlete did not recall a specific mechanism of injury. Initial evaluation revealed right hip bicep at proximal anterior hip. Athlete was point tender over bicep. Full active ROM and strength with hip flexion, extension, abduction, and adduction; decreased ROM with internal and external rotation. (+) Soft tendon bulge present with hip flexion, (-) bulge with extension. Neurological exam revealed reflexes 2/4 bilaterally and sensation grossly intact bilaterally.

Differential Diagnosis:
1. Generalized hip inflammation
2. Hip contusion
3. Hip flexor strain
4. Labral tear
5. Femoroacetabular impingement (FAI)
6. Legg-Calve Perthes Disease LCPD

TEST AND RESULTS:
MRI arthrogram
1. Revealed late abnormalities of LCPD
2. Flattening of superior weight bearing surface of femoral head with a shortened femoral neck, cova magna deformity,
3. Globular thickening of the acetabular labrum
4. Chondral thinning along the acetabular margin anterosuperiorly

Finally/Working Diagnosis:
Legg-Calve Perthes Disease with Acetabular Dysplasia

Treatment and Outcomes:
Athlete began conservative treatment with rest, soft tissue therapy, and stretching but right hip bicep exacerbated. An MRI arthrogram was ordered and revealed late abnormalities of LCPD. Athlete was further treated conservatively with NSAID’s, activity modifications, and light resistive exercises. With ceased sport activity providing incomplete relief of symptoms, through a consultation with a physician, the athlete agreed to undergo a combined right hip surgical dislocation with acetabular rim trim, acetabular labral repair, femoral head and neck junction osteoplasty, relative neck lengthening, trochanteric advancement, and right hip periacetabular osteotomy. Since surgery, athlete has undergone five months of rehabilitation. Athlete is progressing well but her return to full participation has not been determined.
had x-rays that were negative for fracture. She was admitted overnight for pain control. Orthopaedics was consulted and she was diagnosed with a muscle strain. She was discharged the next day with crutches to use as tolerated. When she presented to clinic she continued to have severe pain. She had spent the last 2 weeks non weight bearing with crutches with minimal improvement. She described her pain as sharp, constant, anterior, and worse with movement especially flexing her hip.

**Physical Examination:** She was guarded to any movement but in no acute distress. She was tender to palpation over her left ASIS and iliac spine. She had limited range of motion secondary to pain. Pain was elicited with muscle testing for hip flexion and hip abduction. She had a normal motor, vascular, sensory exam distally.

**Differential Diagnosis:**
1. Rectus femoris strain/ rupture
2. Sartorius strain/ rupture
3. Hip apophyseal avulsion fracture
4. Acetabular fracture

**Test and Results:**
- X-rays: AP Pelvis and frog-leg lateral views of her left hip showed near complete skeletal maturation, no fracture or osseous abnormality.
- Pelvic MRI. MRI revealed a fluid signal along the left anterior superior iliac crest, consistent with sartorius tendon avulsion. No evidence of displaced bone.

**Final Diagnosis:** Complete sartorius avulsion off ASIS without bony involvement.

**Treatment and Outcomes:**
- She was referred to Orthopaedic surgery and seen 5 weeks after her initial injury. Her pain was improving and she had been able to weight bear without her crutches for short distances.
- She was treated non operatively and instructed to weight bear as tolerated.
- Formal physical therapy was prescribed for range of motion, core and pelvesiform strengthening, as well as neuromuscular re-education with a follow up visit scheduled in eight weeks.

### D-31 Highlighted Symposium - Too Hot to Handle: Protective Clothing, Thermoregulation and Performance

**Thursday, June 1, 2017, 3:15 PM - 5:15 PM**

**Room: 406**

| 1826 | Co-Chair: Caroline J. Smith, Appalachian State University, Boone, NC. |
| 1827 | Co-Chair: Robert W. Kenefick, FACSM. U.S. Army Research Institute of Environmental Medicine, Natick, MA. |
| 1828 | June 1 3:25 PM - 3:55 PM  
**Keynote - How Much Personal Protection is too Much? Conflicts Between Optimal Performance and Protective Obligations**  
| 1829 | June 1 3:55 PM - 4:10 PM  
**Variability in Human Responses when working in Chemical protective Impermeable Suits**  
Emiel A. DenHartog. North Carolina State University, Raleigh, NC. |

**Abstracts were prepared by the authors and printed as submitted.**
Physical activity (PA) is associated with academic achievement in school-aged children. There appears to be a threshold intensity with more intense PA having a stronger association with higher academic achievement. It is not known whether this intensity threshold is present in young children (preschool and kindergarten) since limited research has examined the association between PA and school readiness, a proxy for academic achievement, in this age group.

**Purpose:** To determine whether an association exists between PA intensity and school readiness in young children.

**Methods:** Participants were 28 children (5.3 ± 1.3y) enrolled in preschool and kindergarten programs at a university laboratory school. PA was assessed using an ActiGraph GT3X+ accelerometer worn on the right hip for seven days. Data were analyzed using the Pate cut points to calculate minutes of daily PA in each intensity (light, moderate, and vigorous). School readiness was assessed using the Expressive (BE) and Receptive (BR) Bracken Basic Concept Scales. BE requires verbal responses on items related to colors, numbers, letters, shapes, and sizes/comparisons. The BR includes non-verbal responses (e.g., pointing) to the same items. Spearman correlations were used to examine the associations between PA intensities and the two Bracken subscales.

**Results:** Children accumulated 309.5 ± 72.1 min of daily total PA. Significant correlations were identified between moderate PA and BR (r = 0.39; p < 0.05) and between vigorous PA and both BE (r = 0.51; p < 0.01) and BR (r = 0.47; p < 0.05). Correlations were not significant between light PA and both Bracken subscales (BE: r = 0.29; p = 0.13; BR: r = 0.33; p = 0.08) and between moderate PA and BE (r = 0.21; p = 0.28).

**Conclusions:** Results suggest the existence of an intensity threshold influencing the PA and school readiness association such that only moderate or vigorous levels were associated with higher levels of readiness. The promotion of PA of varying intensities in early childhood programs may be beneficial for school readiness.
an inhibitory control task (modified flanker task). Results: Following the 9-month physical activity intervention, children intervention participants exhibited reduction in inhibitory control in the waitlist-controlled condition, particularly obese children, gained visceral adipose tissue (95% confidence interval (CI) = -58.58, -9.14; p = 0.008). Furthermore, changes in visceral adipose tissue were related to changes in cognitive performance, such that the degree of reduction in visceral adipose tissue directly related to greater positive gains in inhibitory control, particularly among obese intervention participants (CI -0.14, 0.04; p = 0.016). Conclusions: These findings demonstrate that participation in a daily physical activity program not only reduces adiposity but also concomitantly improves children’s cognitive function. Further, this work reveals that the benefits of physical activity on improvements in cognitive function are particularly evident among obese children.

1885 Board #5 June 1 3:15 PM - 5:15 PM An 8 Week Aerobic Exercise Training Intervention Improved Executive Functions in Adolescents Kimberly Lakes, Fadia Haddad, Kim La, Dan Cooper, FACSM, Shlomit Aizik. University of California, Irvine, Irvine, CA. (Sponsor: Dr. Dan Cooper, FACSM) Email: klakes@uci.edu

A recent meta-analysis examining the impact of 28 physical activity (PA) interventions on executive function (EF) outcomes in healthy children reported a significant, small to moderate positive effect on EF, though effects varied widely across qualitatively different programs, and none of the programs utilized individual, controlled exercise prescriptions. Purpose. To evaluate the impact of personalized exercise intervention on EF in adolescents. Methods. 32 normal weight adolescents (14-17 y/o, 20 girls) participated in an 8 week supervised, personalized exercise program, 3 times/week, 60 min/session (24 sessions total). VO2 peak was assessed, before and after the program by ramp-type progressive cycle ergometer until exhaustion. EFs were measured before and after intervention using a computerized test of executive function, with three trials (congruent, incongruent, mixed) that yielded six scores each time - three response times (RTs) and three accuracy scores. Changes were examined using paired samples t-tests with pre- and post-test scores for each of the six variables. Results. Peak VO2 was improved (12.6±1.6%, p = 4.8E-08) in 31 out of 32 participants. The means for Congruent Accuracy, which measures primarily attention, were similar at pre- and post-test (93% and 94% correct), and this difference was not statistically significant, t (30) = -0.61, p = .55, d = .11. Congruent RT taps into attention and processing speed and was significantly improved, t (30) = -2.8, p = .01, d = .58. Incongruent Accuracy measures primarily inhibitory control and changes were not statistically significant, t (28) = 1.41, p = .17, d = .19. Incongruent RT requires attention, processing speed, and inhibition and significantly improved, t (29) = 2.44, p = .02, d = .45. Accuracy on the Mixed Trial, which measures inhibitory control and shifting, improved significantly, t (30) = 3.63, p = .00, d = .50. Mixed RT requires attention, processing speed, and shifting and significantly improved, t (29) = -2.3, p = .03, d = .41. Conclusions. Results suggest a positive impact of an individualized exercise program on attention, processing speed, inhibitory control, and shifting in adolescents. Further research is needed to identify the underlying mechanisms involved. Supported by NIH Grant P01HD-048721 and PERC System Biology Fund

1886 Board #6 June 1 3:15 PM - 5:15 PM Prospective Associations Of Cardiorespiratory Fitness, Motor Performance, And Adiposity With Cognition In Children Eero A. Haapala, Niina Lintu, Juuso Väisätö, Tuomo Tompuri, Anna Vittasalo, Virpi Lindi, Timo A. Lakka. University of Eastern Finland, Kuopio, Finland. Email: eero.haapala@uef.fi

Cardiorespiratory fitness and motor performance have been associated directly and adiposity has been associated inversely with cognition among children in cross-sectional studies. However, little is known about their longitudinal relationships to cognition in children. Purpose: To investigate the associations of cardiorespiratory fitness, motor performance, and body fat percentage among children aged 6-8 years and changes in these parameters during 2-year follow-up with cognition at the age of 8-10 years. Methods: A total of 391 children (195 boys, 196 girls) participated in the study. Cardiorespiratory fitness (CRF) was measured using a maximal cycle test on a bicycle ergometer and was defined as peak workload per lean body mass. Motor performance score was computed from the z-scores of 50-meter shuttle run test time, errors in the static balance task, and results of the Box and block test. Body fat percentage was measured using dual-energy X-ray absorptiometry. Cognition was measured using Raven’s Coloured Progressive Matrices (RCPM). The data were analyzed separately for boys and girls by linear regression analyses and ANCOVA with repeated measures adjusted for age. Results: In boys, motor performance was directly associated with RCPM score (β = 0.237, 95% CI = 0.083 to 0.392, p = 0.003) at baseline and better motor performance at baseline was related to a higher RCPM score at 2-year follow-up (β = 0.180, 95% CI = 0.021 to 0.338, p = 0.027) but this association weakened after adjustment for baseline RCPM score (p = 0.369). Changes in CRF, motor performance, or body fat percentage were not associated with RCPM score at 2-year follow-up in boys. In boys in the highest third (mean difference = 2.545, 95% CI for difference = 0.705 to 4.386, p < 0.003) and in the middle third (mean difference = 1.813, 95% CI for difference = 0.068 to 3.558, p = 0.039) of motor performance at baseline had higher Raven CPM scores across 2 years compared to boys in the lowest third. CRF, motor performance, body fat percentage, or their changes were not associated with RCPM score among girls. Conclusions: Poor motor performance at baseline was associated with poorer cognition through 2-year follow-up period in boys. No associations of CRF, motor performance, or body fat percentage with cognition were found in girls.

1887 Board #7 June 1 3:15 PM - 5:15 PM A Novel Approach To Look At The Brain: Fitness And Shape Of Subcortical Structures In Children Francisco B. Ortega, Daniel Campos, Cadenas-Sanchez Cristina, Signe Altmae, Cristina Martinez-Zaldívar, Miguel Martin-Mattillas, Andres Catena, Cristina Campoy. University of Granada, Granada, Spain. Email: ortega@ugr.es

A few studies have recently reported that higher cardiorespiratory fitness is associated with higher volumes of subcortical brain structures in children. It is known however that not only the whole volume of the structure but also the shape of the brain structures influence brain functioning. To the best of our knowledge, the association between fitness and shape of subcortical brain structures has not been studied in any age group.

Purpose: To examine the association of the main health-related physical fitness components with shape of subcortical brain structures in children.

Methods: The study sample comprised 44 Spanish children aged 9.7±0.2 years. Cardiorespiratory fitness, muscular strength and speed-agility were assessed using valid and reliable tests (ALPHA-fit fitness test battery). Shape of the subcortical brain structures was assessed by magnetic resonance imaging, and its relationship with fitness was examined after controlling for a set of potential confounders using a partial correlation permutation approach.

Results: All physical fitness components studied were significantly related to shape of subcortical brain nuclei. These associations were both positive and negative, indicating that a higher level of fitness in childhood is related to both expansions and contractions in certain regions of Accumbens, Amygdala, Caudate, Hippocampus, Pallidium, Putamen and Thalamus. Cardiorespiratory fitness was mainly associated with expansions, whereas handgrip was mostly associated with contractions in the structures studied.

Conclusions: Our observational data provide preliminary evidence supporting that physical fitness could play a role in brain shaping. These findings should be confirmed or contrasted by future randomized controlled trials, demonstrating whether changes in fitness modify the shape of brain structures and the extent to which those changes influence cognitive function.
education, body mass index and total brain volume. The statistical threshold was calculated with AlphaSim and further Hayasaka adjusted to account for the non-isotropic smoothness of structural images.

RESULTS: Cardiorespiratory fitness was related to greater gray matter volumes (P<0.001, k=58) in 9 out of all regions with β ranging from 0.493 to 0.584; specifically in frontal regions (i.e. premotor cortex and medial primary motor cortex), superior parietal cortex, subcortical regions (i.e. hippocampus and caudate), temporal regions (i.e. middle and inferior temporal gyrus and parahippocampal gyrus) and parietal cortex. Speed-agility was associated with greater gray matter volumes (P<0.001, k=54) in 2 regions (i.e. the inferior frontal gyrus and the superior temporal gyrus) with β ranging from 0.564 to 0.611. Muscular fitness was not independently associated with greater gray matter volume in any brain regions. No brain regions showed statistically significant negative associations between components of physical fitness and gray matter volume.

CONCLUSIONS: Cardiorespiratory fitness and speed-agility, but not muscular fitness, might independently be associated with greater volume of numerous cortical and subcortical brain structures. Importantly, those associated brain structures are different for each fitness component. These findings suggest that the development of cardiorespiratory fitness and speed-agility might positively affect development of distinctive brain regions and contribute to counteract the harmful effect of overweight and obesity on brain structure during childhood.

**D-42 Thematic Poster - Biomechanical Effects of Fatigue**

**Thursday, June 1, 2017, 3:15 PM - 5:15 PM**

**Room: 403**

**1889 Board #1**

**June 1 3:15 PM - 5:15 PM**

**The Effect Of Compression Tights On Muscle Vibration And Fatigue From A High-Intensity Run**

Margaret E. Raabe, 43212, Michael P. McNally, Ajit M.W. Chaudhari, FACSM. The Ohio State University, Columbus, OH.

(Sponsor: Ajit Chaudhari, FACSM)

Email: margaret.e.raabe@gmail.com

(No relationships reported)

**BACKGROUND:** It has been hypothesized that compression garments may enhance performance by reducing muscle vibrations during running and jumping. Muscles naturally contract to dampen vibration, which could lead to accelerated fatigue. Therefore, wearing compression garments may result in reduced muscular fatigue.

**PURPOSE:** To investigate the effect of compression tights on muscle vibration and fatigue from a high-intensity run.

**METHODS:** Twenty healthy experienced male runners ran overground at estimated 80% VO2 max speed. Vibration data was collected using an optical motion capture system. The peak amplitude of muscle vibrations (axial direction) were calculated during the first 150ms after foot strike for the quadriceps, hamstrings, gastrocnemius, and tibialis anterior muscles. A high-intensity run was then performed on a treadmill at the same speed for 30 minutes or until voluntary exhaustion. Participants performed 3 countermovement jumps (CMJ) and isometric strength measurements of the 4 leg muscle groups before and after the run. This protocol was repeated on three separate days, one with running shorts (S) and the others with low (L) or high (H) compression tights (10-15 mmHg; 20-25 mmHg). The order of conditions was randomly assigned.

**RESULTS:** Linear mixed models revealed a significant effect of the tights on muscle vibration for all muscles except the hamstrings (S:7.6±3.6 mm, L:7.4±2.0 mm, H:7.2±2.2 mm, p=0.89), with significantly less vibration in both tights conditions compared to the shorts (quads: S=15.9±5.1 mm, L=8.4±2.3 mm, H=7.6±2.5 mm, p<0.001). However, the tights had no significant effect on the fatigue measures analyzed (% change in quad strength: S=−2.6±12.1 %, L=2.6±10.4 %, H=0.7±14.6 %, p=0.85; % change in CMJ landing loading rate: S=−11.7±38.2 %, L=24.9±41.9 %, H=23.4±29.6 %, p=0.39; % change in CMJ height: S=6.1±8.3 %, L=8.4±9.4 %, H=8.8±8.1 %, p=0.43).

**CONCLUSION:** Compression tights significantly reduced muscle vibration during running but had no effect on muscle fatigue as measured by change in jump height, jump landing loading rate, or strength following a 30-minute high-intensity run. Supported by a research grant from Nike, Inc.
RESULTS:

Fatigue has been shown to influence landing biomechanics in individuals with an anterior cruciate ligament reconstruction (ACLR). However, no study has evaluated the effect of fatigue on landing biomechanics during a soccer-specific landing task in soccer players with an ACLR.

PURPOSE: To examine the effect of fatiguing protocols on anterior cruciate ligament injury risk factors in female collegiate soccer players following ACLR.

METHODS: Female collegiate soccer players with an ACLR (n=10:10.59±6.5kg, 170.5±3.1cm) participated in this study. Participants performed two established fatigue protocols: 1) Double leg vertical jumps (DLVJ) and 2) a running + jumping fatigue protocol (R+J). Two experienced examiners performed the testing, and initial contact (IC) and peak GRF were used as outcome measures. In-plane knee abduction angles and moments were assessed using two force plates and the Vicon 460 motion capture system. Ground reaction forces were collected at a sample frequency of 1200 Hz. Knee abduction moment at IC and peak GRF was assessed using a custom MATLAB script.

RESULTS:

Fatigue protocols resulted in a significant increase in peak GRF (R+J: 1.75±0.26 N·kg⁻¹ vs. non-fatigue: 1.47±0.24 N·kg⁻¹, p = 0.001) and a decrease in knee abduction angle at IC (R+J: 4.0±6.3° vs. non-fatigue: 2.7±5.2°, p = 0.007) and peak GRF (R+J: 4.0±6.3° vs. non-fatigue: 2.7±5.2°, p = 0.007).

CONCLUSION: Fatigue increased anterior cruciate ligament injury risk factors such as valgus knee angles and moments during landing, cutting, and pivoting. In female collegiate soccer players following ACLR, increased knee abduction angle and decreased knee flexion angle at IC may increase ACL injury risk during landing. Adaptation strategies to reduce anterior knee abduction angle and increase knee flexion angle will likely decrease ACL injury risk during landing.

If the protocol led to greater relative medial hamstrings force production, it may have reduced knee abduction angle via a varus net hamstrings moment. Further research is required to test this explanation.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

CONCLUSION: Both fatigue protocols can induce a more flexed landing posture of lower extremities during the impact of landing. However, whether it is an intentionally or unintentionally protection of potential ACL injury still needs further considering.

Supported by NSFC grant (81302131).

1897 Board #8 June 1 3:15 PM - 5:15 PM Improved Drop Landing Kinematics and Resistance to Fatigue Following Participation in Two Neuromuscular Training Programs

Nathan Robey1, Luzita I. Vela1, Joni A. Mettler2, Rod A. Harter, FACSM1. 1University of Northern Colorado, Greeley, CO. 2University of Texas-Arlington, Arlington, TX. *Texas State University, San Marcos, TX. (Sponsor: Rod A. Harter, FACSM)

Email: nathan.robey@unuco.edu

(No relationships reported)

PURPOSE: Hip abduction weakness and acute fatigue are thought to negatively influence the amount of dynamic knee valgus and increase the risk of ACL injury. The Landing Error Scoring System (LESS) is a validated, low-tech drop landing field test commonly used to screen athletes on masse for ACL injury risk. We compared the effects of two 4-week lower extremity neuromuscular training (NMT) programs on acute hip abductor muscular fatigue and LESS scores in women. METHODS: 32 physically-active women (age, 21.0 ± 1.4 yrs; height, 1.63 ± 0.06 m; mass, 61.3 ± 8.6 kg) were randomly assigned to one of two 4-week NMT programs, Traditional (n = 17) or Plyometric (n = 15), and performed their respective NMT exercises 4 days per week for 4 weeks. We induced fatigue with a standing hip abduction protocol that employed an isokinetic dynamometer (Thomas et al., 2010). Key outcome measures were obtained pre- and post-fatigue at Week 0 and Week 4, and included concentric/ eccentric hip abductor peak torque at 120°, closed chain leg press peak force at 60°, and the 17-point LESS test score. RESULTS: Compliance with both NMT programs was excellent, with 27 of 32 participants (84%) recording perfect attendance. Concentric hip abduction peak torque increased 27.9% in the Plyometric group and 19.9% in the Traditional group after 4 weeks (p < 0.001), but there were no significant between group differences (p > 0.05). Our 3-way mixed ANOVA—Group (2 x Time (2) x Fatigue Condition (2))—revealed significant differences on the LESS test for Group (p < 0.05), and Time and Fatigue Condition (p < 0.001). At entry into the study, mean post-fatigue LESS scores were 9.06 ± 1.49 for the Plyometric group and 6.89 ± 1.69 for the Traditional group (p = 0.05). The Plyometric NMT protocol improved LESS scores at Week 4 in both the pre-fatigue (16.7%) and post-fatigue drop landings (11.6%), while participation in the Traditional NMT program improved LESS test scores at Week 4 by 9.0% post-fatigue and 7.9% post-fatigue when compared to Week 0 (p < 0.05). CONCLUSION: Both of the 4-week lower extremity NMT programs were successful in improving hip abductor and leg press strength. More importantly, the Plyometric protocol produced significantly greater improvements in LESS test scores than the Traditional program, possibly further reducing ACL injury risk in this population.

1900 Board #2 June 1 3:15 PM - 5:15 PM Assessing Physical Fitness In PRESchool Children: Fitness Reference Standards From The PREFIT Project

Cristina Cadenas-Sanchez1, Timm Internemann2, Enrique G. Arteo1, Mairena Sánchez-López1, Diego Moliner-Urdiales3, Jose Castro-Piñero2, Josep Vidal-Conti4, Joaquín Sanchís-Moyosi5, Pedro J. Benito6, Germán Vicente-Rodríguez7, Marie Löf8, Idioa Labayen2, Jonatan R. Ruiz9, Francisco B. Ortega10. 1University of Granada, Granada, Spain. 2Leibniz Institute for Prevention Research and Epidemiology, Bremen, Germany. 3University of Almería, Almeria, Spain. 4University of Castilla La Mancha, Cuenca, Spain. 5University Jaume I, Castellón de la Plana, Spain. 6University of Cádiz, Cádiz, Spain. 7University of the Balearic Islands, Balearic Islands, Spain. 8University of Las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain. 9University of Technical University of Madrid, Madrid, Spain. 10University of Zaragoza, Zaragoza, Spain. 11Karolinska Institutet, Huddinge, Sweden. 12University of Basque Country, Vitoria, Spain.

Email: cadenas@ugr.es

(No relationships reported)

Physical fitness is a powerful marker of health in children and adolescents, and there is no reason to believe that fitness is less important in younger children, i.e., preschoolers. Our group has recently published a systematic review and methodological studies on fitness in preschoolers and has proposed the PREFIT (Assessing levels FITNESS in preESchoolers) battery for preschoolers aged 3-5 years, providing information about its feasibility, reliability and practical recommendations. References, manual of operations, videos about the tests, etc. are freely available at http://profith.ugr.es. Currently, there are no fitness reference standards available to interpret fitness levels in preschoolers.

PURPOSE: To provide fitness reference standards for preschool children. METHODS: A total of 3179 preschoolers aged 3-5 years from 10 cities geographically distributed across Spain participated in the PREFIT project. Cardiorespiratory fitness, muscular strength, speed-agility and balance were assessed using the PREFIT 20m shuttle run (an adapted version of the original test proposed by Leger in 1988), handgrip strength and standing long jump, 4x10m shuttle run and one-leg stances tests, respectively. We applied the Generalized Additive Model for Location, Scale and Shape method to obtain reference standards based on percentile curves. RESULTS: Reference standards for each fitness component by sex and age each 0.25 years are provided. Boys performed better than girls in cardiopulmonary fitness, muscular strength and speed-agility in all age groups and over the different percentiles (P<0.01). However, girls performed slightly better than boys in balance (P<0.001). Older children had better performance in all fitness tests than their younger counterparts (P<0.001). CONCLUSION: Our study provides age- and sex-specific fitness reference standards in preschool children. This work complements the reference standards already published in children and adolescents. These findings can help professionals to identify preschool children with very low fitness level and also as screening element of poor cardiometabolic health levels in order to implement new public health strategies from very early ages.

Supported by RYC-2011-09011, BES-2014-068829.
PURPOSE: This study examined the health and fitness assessment and monitoring practices among a large sample of registered Australian fitness professionals.

METHODS: In 2014, 9,100 fitness trainers were invited to complete an online survey. Respondents were asked to report their frequency of assessment and monitoring of eight separate health and fitness constructs (e.g. body composition, aerobic fitness). The prevalence of those classified: (i) high (regularly assessing/monitoring ≤5 constructs); (ii) medium (1-4 constructs) and (iii) low (0 constructs) are reported by sociodemographic variables (age, gender) and fitness industry-related characteristics (role, setting, qualification). Potential social ecological correlates of assessment and monitoring were also examined. A multivariate adjusted logistic regression model assessed the odds of being classified as a ‘high assessor and monitor’ according to potential social ecological correlates.

RESULTS: Out of 1,206 fitness trainers (response rate = 13.2%), aged 17-72 years, 39.1% (95% CI: 36.4%-41.9%) where classified as ‘low’, 45.0% (95% CI: 42.2%-47.8%) as ‘medium’ and 15.8% (95% CI: 13.7%-17.9%) as ‘high’ assessor and monitor. Body composition (47.7%; 95% CI: 45.0%-50.1%) and aerobic fitness (42.5%; 95% CI: 39.6%-45.3%) were the most regularly assessed constructs. In contrast, the least regularly assessed constructs where balance (24.0%; 95% CI: 24.7%-24.7%) and aerobic fitness (24.3%; 95% CI: 24.3%-24.3%) were the least regularly assessed constructs. In the adjusted analysis, a perceived lack of client interest, not considering assessing their responsibility and lack of time to assess and monitor were all associated with lower odds of being classified as a ‘high assessor and monitor’.

CONCLUSIONS: Our findings show that most fitness trainers do not regularly assess and monitoring client fitness and health. In Australia, efforts should be made to increase the prevalence of assessment and monitoring among fitness trainers.

7-a-side football is a game played by football players with cerebral palsy (CP). The Dutch 7-a-side team prepared for the Paralympic Games at Rio 2016 at our national training centre. We monitored the physical performance monthly using a submaximal Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo). However, the Yo-Yo test has been developed specifically to measure physical performance in team sports for able-bodied athletes [1] with determined reliability and sensitivity [2]. PURPOSE: Therefore, to use the Yo-Yo test as a monitoring tool appropriately, the aim of this study was to determine its reliability and sensitivity in CP athletes.

METHODS: A subgroup (n=13) of the Dutch 7-a-side team participated in this data collection. The Yo-Yo tests were executed as previously described [2]. Two submaximal tests (up to step 14.8) were carried out 2 days apart, aiming to elicit a heart rate (HR) of 86-93% of the HR achieved during a maximal Yo-Yo test (HRmax). As this range has proven to show the least variability in submaximal tests [3]. RESULTS: The day-to-day variation, calculated as the TEM, and the SWC were found to be 2.6 and 1.6b·min⁻¹ respectively, while the CV was 5.1%. A significant correlation between submax 1 and 2 was observed (r=0.93, P < 0.05). Different heart rate recoveries (HRR) calculated as the average of 15sec were also calculated and it was found that HRR at 75sec showed the highest correlation with the distance completed during the maximal Yo-Yo (r=0.59, P < 0.05). In addition, this test can discriminate between different classifications (athletes are classed according to the magnitude of the disability; cl. 5/6: 97±1.8%, cl. 7: 93±4.0% and cl. 8: 88±2.9% HRR max). CONCLUSIONS: Submax Yo-Yo tests performed with CP football players showed a high reproducibility and strong sensitivity. Therefore, submaximal Yo-Yo tests can be used to monitor physical performance in CP football players.

A 3-min all-out exercise test (3MT) for running has been developed to determine critical speed (CS) and finite capacity for running speeds < CS (D') to predict time limits (Tend) and it can be utilized for prescribing interval training; however, the 3MT has not been validated for shuttle running, which is required in most team sports.

PURPOSE: To examine the efficacy of shuttle running 3MT to determine CS and D'. METHODS: A total of 12 subjects were tested using an all-out 3MT along with three separate all-out distance-trials (600, 810 and 1020 m) in a 30 m distance shuttle. Average speed during the 3MT for each 10 m distance and times for each time-trial was recorded. 3MT was used to calculate predicted CS, D' and TLIMs. The 3 time-trial (Tend) was carried out 2 days apart, aiming to elicit a heartrate (Hr) of 86-93% of the Hr achieved during a maximal Yo-Yo test (Hrmax), as this range has proven to show the least variability in submaximal tests [3]. RESULTS: The day-to-day variation, calculated as the TEM, and the SWC were found to be 2.6 and 1.6b·min⁻¹ respectively, while the CV was 5.1%. A significant correlation between submax 1 and 2 was observed (r=0.93, P < 0.05). Different heart rate recoveries (HRR) calculated as the average of 15sec were also calculated and it was found that HRR at 75sec showed the highest correlation with the distance completed during the maximal Yo-Yo (r=0.59, P < 0.05). In addition, this test can discriminate between different classifications (athletes are classed according to the magnitude of the disability; cl. 5/6: 97±1.8%, cl. 7: 93±4.0% and cl. 8: 88±2.9% HRR max). CONCLUSIONS: Submax Yo-Yo tests performed with CP football players showed a high reproducibility and strong sensitivity. Therefore, submaximal Yo-Yo tests can be used to monitor physical performance in CP football players.
Strenuous exercise like marathon or triathlon leads to disturbances of several biomarkers, not at least markers of skeletal and heart muscle damage. Different predictors of biomarker changes, e.g. sex, age and training experience have been discussed in the literature with contradictory results. To our best knowledge, maximal oxygen consumption (VO2 max) has not been investigated in this setting. PURPOSE: To evaluate predictors of biomarker changes in an Ironman triathlon. METHODS: In 39 non-elite athletes (10 female, 29 male; age 41.1 ± 9.7, range 24-70 years) who had performed a 20 m shuttle run test to predict VO2 max, biomarkers (cardiac troponin T (cTnT; reference < 14 ng/L), creatine kinase (CK; ref. < 1.9 µkat/L), myoglobin (MG; ref. < 72 µg/L), and N-terminal prohormone of brain natriuretic peptide (NT-proBNP; ref. < 300 ng/L)) were measured by standard laboratory methods 7 days before, directly after, and day 1, and after the race. RESULTS: VO2 max was on average 49.9 ± 6.4 ml/kg/min (range 36.5-56.9). Three biomarkers measured directly after the race were predicted by VO2 max: CK (53 ± 50 µkat/L; R = 0.44; p<0.005), MG (2137 ± 2614 µg/L; R = 0.31; p=0.056) and NT-proBNP (772 ± 2614 ng/L; R = 0.35; p<0.027). cTnT (75 ± 89) was not significantly predicted by VO2 max but cTnT leakage was, in contrast to the other biomarkers, higher with higher VO2 max (R = 0.10; p=0.55) and return to normal appeared to be faster with higher VO2 max. CONCLUSION: Earlier research into predictors of biomarker changes after strenuous exercise has found contradictory results concerning age, sex and training experience. In the present Kalmar IronWoMan study VO2 max was found to be a good predictor of biomarker changes with higher VO2 max values being correled to lower values for CK, NT-proBNP and MG.

Measuring oxygen uptake (VO2) is the gold standard method for assessing cardiorespiratory fitness. Metabolic systems that assess VO2 require a significant financial investment. A low-cost VO2 system would increase the availability to measure cardiorespiratory fitness. PURPOSE: To assess the validity and reliability of a low-cost VO2 system consisting of a Vernier O2 sensor, CO2 sensor, spirometer, and a modified 2L Biochamber 2000 versus the Vmax Encore metabolic system (Care Fusion). Methods: One healthy adult (55 years, 70.5kg) completed a 10-minute graded exercise test on a cycle ergometer that began at a 50-Watt workload and increased by 25 Watts every 3 minutes to a maximum of 175 Watts. The participant’s expired air was captured simultaneously by the low-cost VO2 system and Vmax system. Both instruments measured flow rate (L/min), O2 (%), CO2 (%), and were used to calculate ventilation (VE) and relative VO2. For the low-cost VO2 system, VO2 was calculated as the difference between the inspired and expired O2 fraction multiplied by VE (L/min). VE was corrected to Standard Temperature and Pressure, Dry. An independent t-test was used to test validity and an Intraclass Correlation Coefficient (ICC 3,2) was used to test reliability between the low-cost VO2 system and Vmax system. Significance was set at p < 0.05. A Bland-Altman plot was used to illustrate the individual difference scores between the low-cost VO2 system and Vmax system. Results: There was no significant difference between low-cost VO2 system and Vmax system (21.1±10.3 ml/kg/min) and Vmax system (19.6±9.5 ml/kg/min) p = 0.388, 95% CI [-1.72, 1.85]. The low-cost VO2 system demonstrated excellent reliability across 71 measures with an average measures ICC=0.986, 95% CI [0.941,0.994] p<0.01. Conclusion: Findings support that a low-cost system provides valid and reliable measures of VO2 at rest and submaximal exercise conditions compared to the Vmax system. This project was not funded.

Age-related progressive increases in sedentary behavior (SB) and decreases in physical activity (PA) have been independently linked to deficits in functional capacity in older adults. The independent relationship of PA and SB on functionality and the lack of evidence for PA interventions to alter SB have led to an interest in joint interventions to displace SB with a PA. PURPOSE: To examine the relationship of substituting 30 minutes of SB with light (LPA) and moderate-to-vigorous physical activity (MVPA) on functional performance in community dwelling older adults. METHODS: A hip-worn accelerometer (ACC, Actigraph GT3X+) was worn for seven consecutive days to collect human movement. Freedson cut-points and Choi algorithm for wear-time were used to determine SB, LPA, and MVPA. Functional measures included 400m walk test (400W; m/sec), usual gait speed (UGS; m/sec), and 5-time sit-to-stand (STS; sec). Isotemporal substitution modeling was used to predict the relationship of substituting 30 minutes SB in men and LPA and MVPA while adjusting for age and gender. RESULTS: Ninety-one older adults (60% female) aged 50-90 years with an average ACC wear time of 13.99 ± 0.13 hr/day spent approximately 63% of waking hours in SB. LPA was a significant predictor of 400W [β = 0.032 m/sec (95% CI: 0.006, 0.056)] and MVPA for 400W [0.204 m/sec (0.110, 0.297)], UGS [0.618 sec (-0.178, -0.1059)], and STS [-2.276 sec (-3.714, -0.759)]. Directly substituting 30 minutes of SB time with LPA resulted in a significant improvement in 400W [0.027 m/sec (0.000, 0.053)]. MVPA significantly improved 400W [0.193 m/sec (0.099, 0.286)], UGS [0.575 sec (0.123, 1.020)], and STS [-2.176 sec (-3.734, -0.753)]. Aside from a strict 1:1 reallocation of SB to LPA or MVPA, significant improvements in all functional measures were observed with a combination of 5 minutes MVPA and 25 minutes LPA. CONCLUSIONS: While MVPA had the greatest impact when displacing SB, the practical implications of introducing a LPA to displace SB may be of particular importance among public health practitioners. Specifically, a goal of redirecting 5-10% of SB time (27-54 minutes/day) toward LPA, and not exclusively MVPA, may result in beneficial changes in functional health in older adults.

The prevalence of metabolic syndrome (MetS) in young adults is on the rise. Excessive screen-based media use during adolescence may increase the risk of developing MetS in adulthood. PURPOSE: To examine screen time in adolescence and its longitudinal association with metabolic risk factors that are related to MetS in young adulthood. METHODS: This study included 5098 participants (age=29±1.8 yrs) from wave I (baseline) through IV of the National Longitudinal Study of Adolescent Health. Using the wave IV data, a latent variable for clustered metabolic risk factors was treated as distal outcome of the growth model. RESULTS: The prevalence of metabolic syndrome (MetS) in young adults is on the rise. Excessive screen-based media use during adolescence may increase the risk of developing MetS in adulthood. PURPOSE: To examine screen time in adolescence and its longitudinal association with metabolic risk factors that are related to MetS in young adulthood. METHODS: This study included 5098 participants (age=29±1.8 yrs) from wave I (baseline) through IV of the National Longitudinal Study of Adolescent Health. Using the wave IV data, a latent variable for clustered metabolic risk factors was treated as distal outcome of the growth model. RESULTS:
Mean screen times were 22.5 (±19.0) hrs/wk, 20.4 (±17.7) hrs/wk and 21.6 (±17.3) hrs/wk at wave I, II and III, respectively, indicating that the prevalence of excessive screen time was high. The structural model showed a good fit of the data (χ²=126.12, df=25; p<0.001; CFI=0.952; TLI=0.931; RMSEA=0.025; 90% CI [0.021, 0.029]; SRMR=0.025). The results suggest that individuals who reported a high level of screen time at baseline or increased their screen time during adolescence had an increased metabolic risk in young adulthood, respectively (β=0.305; p<0.001; β=0.191, p=0.002). The model explained approximately 10% of the explained variance in the latent variable of the clustered metabolic risk factors. CONCLUSIONS: Our findings suggest that screen-based sedentary behavior during adolescence may predict increased risk for developing MetS in young adulthood. Longitudinal intervention research is warranted to investigate the causal pattern between sedentary behaviors and MetS.

INTRODUCTION: Physical activity and sedentary behavior are major risk factors for chronic disease. These behaviors may change at retirement due to shifts in daily routine, social networks, and access to resources, with implications for health in later life. PURPOSE: To describe longitudinal trajectories in moderate to vigorous physical activity (MVPA) and TV watching among adults transitioning to retirement compared to continuing to work. METHODS: Participants in the MESA (N=6,814) were recruited from six United States communities, had no history of cardiovascular disease, and were aged 45-84 at baseline. Employment status, overall MVPA (metabolic equivalent (MET)-minutes/week), and TV watching (minutes/week) were self-reported at four study exams from 2000 to 2012. Multivariable mixed-effect linear regression models were used to describe longitudinal trajectories in MVPA and TV watching by retirement status. Models were adjusted for age, gender, race/ethnicity, education, income, time since retirement, occupational physical activity, self-rated health, and study site. RESULTS: Of 4,212 MESA participants not retired at baseline, 57% were female, 51% had a college degree, and 40% were non-Hispanic white. A total of 955 (23%) retired during follow-up (median follow-up time: 8.0 years). Retirees engaged in less MVPA (median 3585 vs. 4005 MET-minutes/week) and more TV watching (median 900 vs. 750 minutes/week) compared to workers. Over time, average MVPA decreased (−44 MET-min/week per year, 95% confidence interval (CI): −67, −22) and average TV watching increased (18 minutes/week per year, 95% CI: 15, 21). Retirement was associated with a slower rate of decline in MVPA (average difference: 108 MET-minutes/week per year, 95% CI: 19, 197) and faster rate of increase in TV watching (10 minutes/week per year difference, 95% CI: −1, 22). CONCLUSION: Retirement was associated with unfavorable decreased MVPA and increased TV watching compared to continuing to work. Exploring domain specific trajectories in physical activity and sedentary behavior change at retirement may inform physical activity promotion efforts targeted at the growing population of American retirees. Supported by the NIH/NHLBI and Royster Society of Fellows.

Sedentary behavior such as sitting is becoming increasingly prevalent in the modern society, and it is distinctly different from physical inactivity. Colorectal cancer (CRC) is one of the most common cancers, and physical activity consistently reduces the risk for CRC. It is still unclear whether increased sitting time would influence colorectal cancer risk. PURPOSE: In a prospective longitudinal design, we examined sitting time and physical activity in relation to colorectal cancer risk. METHODS: Data were from the Nord-Trøndelag Health Study (HUNT2, 1995-97), Norway. In the present study 65,229 (69%) adults ≥20 years participated. CRC incidence was obtained (1 January 1995 to 31 December 2014). The primary exposures were physical activity and sitting time, and the endpoint was incident CRC. Standardized time spent in sedentary behaviors was calculated based on the time spent in six activities (sitting, standing, walking, running, sitting in car, and doing household tasks). Results: From the study, 1910 incident CRC cases were identified. Participants were followed up for an average of 20.8 years. The average number of person-years for those with CRC was 9.7 years (range: 0.1-20.8 years). The association between CRC incidence and sitting time was weak (p=0.002). Evidence suggests that time spent in sedentary behaviors is associated with a greater risk of adverse cardiometabolic outcomes. However, existing research has focused on broad measures of sedentary time or television viewing, and less is known about the association between other types of sedentary activities and cardiometabolic risk. PURPOSE: To investigate the cross-sectional associations of six distinct sedentary activities with cardiometabolic risk factors, and compare replacing one type of sedentary behavior with another in relation to cardiometabolic risk. METHODS: Participants were 3,314 Black and White adults, aged 42-59 years, from the Coronary Artery Risk Development in Young Adults (CARDIA) study who reported average hours/day sitting in six distinct activities (television, computing, paperwork, reading, phone, and car). A composite cardiometabolic risk score was calculated by standardizing and summing waist circumference, blood pressure, fasting glucose, insulin, triglycerides, and negative HDL-cholesterol. Linear regression models examined the independent and joint associations of the sedentary activities with the cardiometabolic risk score. Isotemporal substitution models were then used to estimate the “substitution effect” of replacing sedentary time from one activity for an equal amount of sedentary time from another activity. All models adjusted for age, sex, race, education, smoking status, alcohol consumption, fast food frequency, sugar-sweetened beverage consumption, physical activity and BMI. Results: Time spent in each of the sedentary activities, with the exception of car time, was independently and positively associated with the cardiometabolic risk score (p<0.04). When all sedentary activities were entered simultaneously in the model, television viewing was the only variable that remained significantly associated with the cardiometabolic risk score (p<0.001). Replacing television time with time spent in any other sedentary activity was associated with a 0.06 to 0.09 standard deviation lower cardiometabolic risk score (all p<0.007). Conclusion: Television viewing has a more adverse association with cardiometabolic risk factors than other types of sedentary behaviors.

Low back pain (LBP) is a major public health problem. Preliminary data suggest that LBP increases throughout the workday for sedentary, desk-bound employees. PURPOSE: The Stand Back randomized trial evaluated whether an intervention targeting reduced prolonged sitting could decrease pain in desk workers with chronic LBP. METHODS: The study recruited individuals with chronic LBP, Oswestry Disability Index (ODI) > 10%, and desk jobs (sitting ≥20 hr/wk). Participants in the intervention received behavioral counselling with an initial in-person visit followed by monthly telephone calls. They also received a sit-stand desk attachment with a goal to stand for 2 hr each day and an activity-promoting device set to vibrate after 30 min of inactivity. Goals were individually tailored and progressed during monthly contacts.

Abstracts were prepared by the authors and printed as submitted.
based on participant response. LBP was measured using the ODI. Sitting time (work and all day) was assessed by self-report. Outcomes were compared across intervention groups using paired t tests and linear mixed models. RESULTS: In completers (n=25 of n=27 enrolled), baseline mean (SD) age was 49 (11) years, 76% were female, and ODI was 23.9 (2.1) %. Sitting time at baseline was 6.9 (1.1) hr during work and 10.2 (1.6) hr all day. At 3 months, sitting time significantly decreased in intervention (n=13) vs. control (n=12) both during work [-2.0 (1.3) vs. -0.5 (1.2) hr, p=0.007] and all day [-2.5 (1.7) vs. -1.1 (1.6) hr, p=0.045]. Across months 1-3, the average decrease in ODI from baseline was significantly greater in intervention vs. control (difference between groups of -7.9 %, of p=0.007) (Figure). At 3 months, the decrease in ODI was -10.6 (8.7) % in intervention vs. -1.0 (10.4) % in control (p=0.020). CONCLUSION: An intervention targeting sedentary behavior in desk-bound employees with chronic LBP was effective in reducing sitting time and low back pain/disability. Studies are needed to examine longer term effects of sedentary behavior interventions in chronic LBP.

3) Six months of regular exercise (treadmill running) at 70 % of maximal oxygen uptake (VO2max) each day was effective in reducing sitting time and low back pain/disability. Studies are needed to examine longer term effects of sedentary behavior interventions in chronic LBP.

4) Six months of regular exercise (treadmill running) at 70 % of maximal oxygen uptake (VO2max) each day was effective in reducing sitting time and low back pain/disability. Studies are needed to examine longer term effects of sedentary behavior interventions in chronic LBP.

INTRODUCTION: Sedentary behaviour is suggested a risk factor for various health outcomes, independent of the amount of subcomponents of physical activity. There is currently paucity of experimental studies comparing frequent breaks of sedentary time with one single long bout of exercise in an iso-caloric design. PURPOSE: To examine if breaking up sedentary behaviour with short five minutes’ bouts or one continuous 30-minute bout of vigorous intensity activity differentially affects metabolic risk markers compared with a control condition of prolonged sitting.

METHODS: 12 healthy adults participated in a randomized cross-over design as follows: 1) six hours of quiet sitting; 2) six hours of sitting, including five minutes of exercise bouts (treadmill running) at 70 % of VO2max each day; 3) six hours of quiet sitting; 4) six hours of sitting, including five minutes of exercise bouts (treadmill running) at 70 % of VO2max each day. Maximal aerobic capacity was measured using indirect calorimetry and the running speed equivalent to 70 % of VO2max was determined by incremental area under curve between conditions.

RESULTS: Adjusted for confounders and moderate-vigorous physical activity, participants in the upper quartile for both sedentary characteristics (e.g. high total sedentary time and high sedentary bout duration) had the highest levels of HOMA-IR (4.96 [95% CI: 4.59, 5.33]) vs 4.49 [95% CI: 4.10, 4.89]) for low/low group, p=0.001) and 2-hour glucose (138.9 mg/dl [95% CI: 123.0, 154.8] vs 134.2 mg/dl [95% CI: 118.3, 150.1] for low/low group, p=0.002). High total sedentary time or high sedentary bout duration alone were not associated with differences in any of the glycemic biomarkers CONCLUSIONS: High total sedentary time and high sedentary bout duration were deleteriously associated with glycemic biomarkers together (e.g. high total sedentary time and high sedentary bout duration) but not individually. These findings support the concept that reducing and regularly breaking up sedentary time may be an important adjunct to existing physical activity guidelines.

INTRODUCTION: Patients with chronic ankle instability (CAI) have demonstrated different ankle neuromechanics during walking when compared to controls. METHODS: 100 CAI patients (22±2 yrs, 174±10 cm, 71±14 kg, 62±9% FAAM ADL, 62±13% FAAM ADL, 8±5±2.6 ankle sprains) and 100 controls (22±3 yrs, 172±13 cm, 72±18 kg, 100% FAAM ADL & Sports, no previous sprains) participated. Subjects performed five walking trials over a force platform while ankle joint angles, moments and muscle activation were collected during the stance phase (0-25%: initial stance, 25-50%: loading response, 50-75%: midstance, and 75-100%:
terminal stance). Functional analyses (p < .05) were used to compare the entire gait cycle between groups. Functions of each group as well as 95% confidence interval (CI) were plotted to determine significant differences. RESULTS: Figure 1. The CAI group increased plantarflexion, likely a result of greater plantarflexion moments and gastrocnemius activation. Decreased evasion was also observed, accompanied by decreased inversion moments tied to decreased peroneus longus activation.

CONCLUSION: Relative to the leg, CAI subjects demonstrated a potentially high-risk gait pattern by positioning the foot in a less closed-pack position and a more inverted position. CAI subjects appear to alter lower extremity biomechanics in a way that could increase injury risk during walking.

CONCLUSION: The RT of TA, PL and PB induced differences of the muscles was 50.4 ± 9 ms and 44.4 ± 14.7 ms. TA activated first and PL activated last in FAI (No relationships reported)

Lateral ankle sprains are common orthopedic injuries that often result in chronic ankle instability (CAI). CAI is characterized by many residual symptoms, including pain, episodes of giving way, recurrent injury, impaired postural control and gait, decrease in strength, structural laxity, and decreased physical activity. Impairments in postural control have been identified using both static balance tests like the single leg test on Biodex Stability System and dynamic balance tests, like the star excursion balance test. However, it is not known if there are differences in postural control between individuals with and without a history of ankle sprain when tested without feedback.

PURPOSE: To examine postural control and stability characteristics of persons with and without CAI during the Athlete Single Leg Stability Test on the Biodex Balance System (BBS). METHODS: 18 persons with CAI, 15 Copers, and 18 healthy controls (mean age: 22 years for all the groups) completed two 20s trials for each leg without center of pressure feedback at each of the following BBS levels: Static, Levels 12, 8 and 4. Each level corresponds to the degree of tilt of the platform surface with a lower number corresponding to lesser stability or more tilt. A 3x4 ANOVA was run with the dependent variables: overall stability index (OSI) and sway area. OSI is the mean distance of the center of pressure from the center of the platform. RESULTS: Significant level main effect was observed for both OSI and sway area (both P < 0.001). At Level 12, OSI (1.2) and sway area (1.1 cm²) were significantly less compared to other levels (all P<0.001). At Level 8, OSI (1.8) and sway area (2.9 cm²) were significantly less compared to Static and Level 4 (both P<0.002). Static OSI (2.3) and sway area (4.9 cm²) values were similar to those at Level 4 (OSI: 2.6; sway area: 10.9 cm²). No significant group main effect or interaction was observed for either of the variables. CONCLUSION: The Athlete Single Leg Stability Test on BBS without feedback is not sensitive in detecting differences among those with and without CAI. Further testing should examine if standing with eyes closed on the static level on BBS provides a more sensitive way to challenge proprioceptive input in this population. Use of OSI as a dependent variable should be used with caution.
Ankle arthritis is most often post-traumatic and is associated with substantial disability and pain. A common intervention for severe ankle arthritis is joint replacement (arthroplasty). Previous research has suggested that balance as evidenced by center of pressure (CoP) excursions is not improved two years post-total ankle arthroplasty (TAA). However, it has been suggested that CoP excursion velocities may be a better measure of postural control. PURPOSE: To quantify recovery of balance as evidenced by CoP excursion velocities at 1 and 2 years post-surgery in the surgical (Sx) and non-surgical (NSx) limbs of TAA patients. METHODS: Fifty-two individuals with unilateral ankle arthritis capable of unassisted ambulation performed three trials of quiet standing for a period of 10 seconds with their feet placed together. Bilateral ground reaction forces (GRFs) were recorded using two embedded force plates (1200 Hz, AMTI, Watertown, MA). This assessment was completed pre-operatively (PRE) and then 1 year (POST-1yr) and 2 years (POST-2yr) after TAA. Custom software (MatLab 2016, Mathworks, Natick, MA) was used to calculate CoP excursion velocities. Mean CoP excursion velocity (MEV) were calculated in the anteroposterior (AP) and medio-lateral (ML) directions for the Sx and NSx. SPSS was used to conduct a pair of 2 x 3 (side by time) repeated measures ANOVAs with post-hoc t-tests to assess the effect of surgery and time on MEV. Significance was set at p < 0.05.
Ocular-motor testing is quickly emerging as a valuable component of the diagnostic portion of a sport concussion assessment when combined with symptom scores. However, the usefulness of oculomotor testing in helping to track recovery following a sports-related concussion and aid in return to play decisions remains unclear.

**Purpose:** To evaluate the usefulness of several readily available oculomotor and vestibular tests that require minimal to know equipment for assessing S/S from injury and tracking recovery from a sport related concussion.

**Materials and methods:** Participants were divided into 3 groups: healthy controls (n=58), acute concussion (n=21) and prolonged recovery (n=10). The acute concussion group suffered a control or matched results and delayed recovery. They were evaluated for concussion (16 days prior to initial assessment. Repeated measures ANOVA was used. The concussed group suffered a significant difference (P<0.05) between the acute and chronic groups and group status.

**Conclusions:** The EF test is a useful tool for the assessment of concussion recovery and can be used to evaluate the impact of concussion on cognitive function.

**REFERENCES**


2. Email: kellycheever@temple.edu

3. (No relationships reported)

**D-46**

**Chair:** Daniel C. Herman, FACSM. University of Florida, Gainesville, FL.

(No relationships reported)

**June 1 3:15 PM - 3:30 PM**

**Effects of Concussion Recovery Phase on Symptom Provocation using Vestibular and Assessments.**

Kelly Cheever¹, Jane McDevitt¹, Ryan Tierney¹, W Geoffrey Wright. Temple University, Philadelphia, PA. East Stroudsburg University, East Stroudsburg, PA.

Email: kellycheever@temple.edu

(No relationships reported)

**Abstracts were prepared by the authors and printed as submitted.**

**THURSDAY, JUNE 1, 2017**

**Vol. 49 No. 5 Supplement S395**

**Concussion**

**Introduction:** Numerous recent studies have indicated that concussions temporarily uncouple the relationship between the autonomic nervous and cardiovascular systems and thus promote abnormal heart rate variability. **Purpose:** The purpose of this study was to determine the acute effects of concussion on cardiovascular function using several common autonomic reflex tests. **Methods:** Twenty two recreational athletes (14 females, 8 males) were divided into two groups: recently concussed (n = 11) and control (n = 11). The recently concussed participants performed forced breathing, standing and Valsalva autonomic reflex tests on four occasions: 1. within 48 hours of injury, 2. 24 hours later, 3. 1 week after injury and 4. 2 weeks after injury. The matched controls performed the same tests on the same schedule. A Finapres Pro was used to continuously measure heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) responses to the tests, and group differences were analyzed using repeated measures MANOVAS and ANOVAs. **Results:** The concussed group had significantly higher SBP (144.1 ± 21.4 vs 126.6 ± 11.1 mmHg) for the controls, t = -2.41, P = 0.03, d = 1.03 and HR responses to standing (HRmax/HRmin = 1.8 ± 0.4 vs 1.5 ± 0.2 for the controls, t = -2.08, P = 0.04, d = 0.88) within 48 hours of injury, but those abnormalities were resolved by the next day. There was also a significant interaction with the HR responses to forced breathing (F₁,₁₀ = 2.78, P = 0.04, ηp² = 0.12), which indicated the concussed group’s scores declined relative to the control’s over the course of the four measurements. **Conclusions:** These results indicate that concussion caused a temporary disruption in autonomic control of cardiovascular function and that autonomic reflex tests, such as the standing and forced breathing tests, may be valuable assessments with which to evaluate the recovery from concussion.

**Perturbations to systolic blood pressure (SBP) are buffered by a reciprocal change in heart rate (HR) though the baroreflex, Sensitivity of the baroreflex (BRS) to hemodynamic challenges is present across a range of blood pressures in otherwise healthy individuals, whereas with neurological trauma/impairment BRS declines as a characteristic of autonomic dysfunction. Previous evidence indicates that a state of transient cardiovascular autonomic dysfunction is present after concussion, but whether or not BRS is affected, has yet to be identified.**

**Purpose:** To evaluate changes in BRS in recently concussed male athletes and non-injured controls during the first week following injury.

**Methods:** A prospective, parallel-group, repeated-measures and observational study was performed. Eight intercollegiate male athletes with concussion (age: 20±1 years; height: 71±6 inches; weight: 183±18 pounds) and 6 non-injured male athletes (age: 20±1 years; height: 71±6 inches; weight: 183±35 pounds) participated. Cardiovascular autonomic assessment (i.e., digital electrocardiogram and continuous beat-to-beat blood pressure) was performed in the seated upright position at rest within 48 hours (48H) of concussion and 1 week (Wk1) later. HR and systolic blood pressure (SBP) were determined and BRS was calculated using the bi-variate phase-rectified signal averaging technique of the respective digital signals.

**Results:** Separate univariate analysis of variance was performed and there were no group differences for demographics, HR or SBP at 48H or Wk1. At 48H, concussed athletes presented with a significantly reduced BRS compared to non-injured controls (concentration: 3±2 vs. control: 7±3 ms/mmHg; p<0.05). At Wk1, the reduction in BRS in the concussed athletes was still apparent (concussion: 3±3 vs. control: 7±3 ms/mmHg; p<0.05).

**Conclusions:** These preliminary findings demonstrate that reduced BRS is a characteristics of post-concussive autonomic dysfunction during the first post-injury week. Further work is needed to extend and define the implications of impaired BRS and determine whether it contributes to exercise intolerance during the progressive return-to-play.

**Concussion**

**Introduction:** Sports-related concussions are plentiful in the United States. Various diagnostic tools are utilized in order to monitor deviations from baseline in memory, reaction time, symptoms, and balance. Evidence indicates that dehydration may also alter diagnostic tests. **Purpose:** To determine the effect of exercise-induced dehydration on deviations in cognitive performance related to concussion diagnostics. **Methods:** Seventeen recreationally active subjects (age = 23.1 ± 3.1 years, height = 168.93 ± 10.71 cm, mass = 66.16 ± 7.14 kg). Subjects performed three thermoneutral, counterbalanced sessions (control, euhydrated, dehydrated). Subjects were either dehydrated session (10.93 ± 11.46; p=0.03). The control session had a significantly lower mean symptom score (2.93 ± 3.28) than the dehydrated session (10.93 ± 11.46; P = 0.028). The control session had a significantly higher mean memory score (28.27 ± 1.28) than the dehydrated session (27.60 ± 1.72; P = 0.046).

**Conclusions:** Mild exercise-induced dehydration results in increased self-reported symptoms associated with concussions. Similarly, adequate hydration during exercise may help maintain cognitive function and balance during sport.

**Email: michael.lafountaine@shu.edu**

(No relationships reported)
The Effectiveness Of Prescribed Rest Depends On Initial Presentation Following Concussion
Anthony P. Kontos1, Alicia S. Suffrino1, Jennifer N. App2, Michael McCrea3, Thomas A. Hammeke4, Robert Hickey5, Michael W. Collins1,Danny G. Thomas5.1 University of Pittsburgh, Pittsburgh, PA. 2Medical College of Wisconsin, Milwaukee, WI. (Sponsor: Barb Warren, FACSM)

email: akontos@pitt.edu

Reports: A.P. Kontos: Contracted Research - Including Principle Investigator; GE.

Following a concussion athletes are often prescribed physical and/or cognitive rest. However, the effectiveness of prescribed rest may depend on initial burden or presentation of signs and symptoms. More objective signs of concussion such as amnesia, disorientation/confusion, and loss of consciousness have been linked to poor outcomes and may reflect a greater burden of injury; whereas symptoms are more subjective and may be less reflective of injury burden.

Purpose: To determine if patients with signs of injury respond differently to prescribed rest following concussion compared to patients with a predominant symptom only presentation.

Methods: We conducted a secondary analysis of a prospective randomized controlled trial (RCT) of 93 pediatric concussion patients aged 11-17 years. Patients completed the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), Post-concussion Symptom Scale (PCSS), and the Balance Error Scoring System (BESS) within 24 hours of injury and at 3 and 10 days post-injury. Patients were randomized to rest or usual care and completed activity and symptom diaries for 10 days after injury. A series of 2 (group: Symptoms, 2+ Signs) x 2 (treatment: prescribed rest, usual care) ANOVAs were performed for each outcome measure. Univariate nonparametric tests (i.e., Wilcoxon signed-rank test) with odds ratios, 95% CIs were used to examine the association between treatment and symptoms 1-9 days post-injury.

Results: Results revealed a significant group x treatment interaction for symptoms at 3 days post-injury (F(6, 31) = 3.01, p = .027). Prescribed rest increased the likelihood of being symptomatic at days 1-6 and 8 (p < .05) for the Symptoms group. In contrast, rest was beneficial for patients in the 2+ Signs group on verbal memory performance of being symptomatic at days 1-6 and 8 (p < .05) for the Symptoms group. In contrast, prescribed rest was beneficial for patients in the 2+ Signs group on verbal memory performance with predominantly symptoms were more likely to remain symptomatic post-injury if prescribed rest, whereas patients with signs of injury benefitted from rest following concussion. Individualized treatment planning post-concussion should start at the time of presentation and take into consideration initial presentation of concussion signs and symptoms.

Conclusions: Initial presentation following concussion may be dependent on initial injury presentation. Compared to patients with objectives signs of injury, patients with predominantly symptoms were more likely to remain symptomatic post-injury if prescribed rest, whereas patients with signs of injury benefitted from rest following concussion. Individualized treatment planning post-concussion should start at the time of presentation and take into consideration initial presentation of concussion signs and symptoms.

An estimated 15.3 million adolescent students are enrolled in high school. However, approximately 7.6 million participate in athletics. Research has examined different demographics in high school athletes, however athletic participation may play a larger role in test performance than previously thought. Currently, research involving concussion assessment utilizes non-injured athletes as controls, but due to the intense nature of athletics, this may not be appropriate. Purpose: Examine differences between athletes and non-athletes using a common computerized neuropsychological test. Methods: 662 adolescent high school students (athletes (ATH); n=383, non-athletes (NON); n=279) were administered a computerized neuropsychological test battery (ImPACT®) during baseline concussion assessment. Differences between groups were calculated using a one-way ANOVA. All statistical analyses were conducted using SPSS 23.0. Significance levels were set a priori at p ≤ .05. Results: Statistically significant differences were found between ATH and NON in Composite Visual Memory (F(1, 660) = 4.653, p = .031), Composite Reaction Time (F(1, 660) = 15.869, p ≤ .001), and Total Symptom Score (F(1, 660) = 38.996, p ≤ .001). Non-athletes performed better on verbal memory and reported more symptoms, while ATH had faster reaction times. Conclusion: Significant differences were found between ATH and NON for symptom reporting, verbal memory, and reaction time. Athletes may have additional training or motivational factors during testing which may affect participation or return to play decisions. Overall, these significant differences in baseline performance should be accounted for when making concussion diagnostic and management decisions. Future research should be conducted to examine the influence of athletic participation on the recovery process to see if non-athletes can be used as healthy controls. Supported by: The National Operating Committee on Standards for Athletic Equipment (NOCSEA).

Introduction: The puck-drop (PD) test has been utilized to assess clinical reaction time (CRT) and has been proposed as a tool to aid in the management of sports related concussion. The simplicity of the test and low cost make it an attractive tool in the management of these injuries; however, no normative data has been established in adolescent athletes. Methods: This study is designed to examine the use of the PD test in the pediatric and adolescent population. 1) to develop age specific normative values and 2) to examine the effect of sex and handedness on test performance. Results: 463 subjects completed the study (n=178 male, n=285 female, average age 13.04 +/- 2.57 years). Regression analysis of baseline CRT indicated a strong effect of sex on overall CRT for both right and left hands (R 2 = 0.21, p<0.001, Figure 1). The estimates (SE) of right hand CRT ranged between 255.51 (4.66) to 216.15 (4.97) ms, and those of left hand ranged from 257.41 (4.71) to 219.08 (5.02) ms across 8-18 years of age. There were no differences in performance on CRT based on handedness (p=0.78) or sex. (p=0.84).
Conclusion: As a result of this study, normative values for the PD test were established for the pediatric population. Test performance varied with age. Test performance did not vary based on hand, pre-simultaneously indicating hand dominance does not affect performance during this evaluation, Future studies should evaluate the effect of concussion on performance.

D-47 Free Communication/Slide - Free-Living Validation Studies

Thursday, June 1, 2017, 3:15 PM - 5:00 PM
Room: 103

1933 Chair: Andrea K. Chomistek. Indiana University-Bloomington, Bloomington, IN. (No relationships reported)

1934 June 1 3:15 PM - 3:30 PM
Free-Living Total Energy Expenditure Assessed using Three Accelerometer Models Validated against Doubly-Labeled Water

William E. Kraus, FACSM1, Megan A. McCrory2, Manjushiri Bhagkar2, Edward P. Weiss3, Corby K. Martin4, James P. DeLany4, Susan B. Roberts5, Sai K. Das5, Susan B. Racette4, 1Duke Univ. School of Medicine, Durham, NC. 2Boston University, Boston, MA. 3Washington University School of Medicine, St. Louis, MO. 4Pennington Biomedical Research Center. Baton Rouge, LA. 5University of Pittsburgh, Pittsburgh, PA. 6Tufts University, Boston, MA.

Email: william.kraus@duke.edu
(No relationships reported)

PURPOSE: Methods for estimating total energy expenditure (TEE) in free-living conditions are needed as alternatives to the expensive and technically demanding gold-standard doubly labeled water (DLW) technique. Accelerometers are one such option. We evaluated three widely-used accelerometers (ActiGraph, Actical, and RT3) using a standardized data analysis procedure to determine their ability to accurately estimate TEE using manufacturer-provided algorithms. Second, we determined if the inclusion of simple variables in the regression model improved the accelerometer TEE estimate.

METHODS: Healthy, nonsmoking, non-obese adults aged 25-60 y wore accelerometers during a 14-d DLW assessment of TEE. Data were collected at 3 sites (Pennington Biomedical Research Center (PBRC; n=47), Tufts University (n=38), and Washington University School of Medicine (WUSM; n=38)) as part of a study on caloric restriction and aging (the CELARIE Study). Accelerometer manufacturers’ algorithms were used to convert minute-by-minute counts to energy expenditure per minute, from which TEE (kcal/d) was derived. Only days in which accelerometers were worn for ≥720 min were included in the analysis; at least one valid day was required.

RESULTS: The three evaluated accelerometers provided estimates of TEE differing significantly from TEE measured by DLW (-690 to 220 kcal/d; pooled SE 44 kcal/d; p<0.0001). Regression equations generated from accelerometer-assessed TEE accounted for 46-74% of the variability in DLW-measured TEE (SEE 251-319 kcal/d; p<0.0001). When body mass and/or sex were included in regression models, the resulting regression equations improved the utility of the accelerometer TEE. Including simple variables such as age and body mass in the prediction equations improved the utility of the accelerometers for assessing free-living TEE.

Self-report remains an important measurement method for physical activity and sedentary behaviors because it provides the contextual information needed in targeted behavioral interventions.

PURPOSE: This study aimed to evaluate the validity and responsiveness to change of a workplace sedentary behavior questionnaire (SBQ) in assessing total sedentary behavior (1) at work and (2) outside of work during workdays, and during (3) non-workdays.

METHODS: Participants (N=395) were recruited from 16 worksites in the greater Minneapolis and Phoenix regions. Participants wore an actiPAL3c accelerometer for 7 days at two timepoints (baseline and 12-week follow-up). They also completed a sedentary behavior questionnaire on the 7th day of each assessment timepoint. Time spent in each behavior from both measures was standardized to a 16-hour day on non-work days and 8-hours to both work hours and non-work hours on work days. The agreement between the two measures was assessed through single-measure with absolute definition ICC using a two-way random effects model. Bland estimates (mean difference [] and root of mean square error [RMSE = ] were used to compare reported behaviors to the actiPAL values. Responsiveness to change following the intervention was assessed using the responsiveness statistic (RS).

RESULTS: There was poor agreement between the SBQ and actiPAL (ICC from 0.06 - 0.29 across all time periods. On average, participants over-reported their time spent sitting (Mean [95% CI]= 39.9 [31.1, 48.7] min/day, RMSE= 112.5) and moving (12.9 [9.39, 16.5] min/day, RMSE= 44.3), but under-reported standing (-52.9 [-60.5, -45.2] min/day, RMSE= 105.5) at work. Moreover, sitting time during their non-work hours was over-reported (101.7 [94.5, 108.8] min/day, RMSE= 211.8). Sitting on non-work days was underestimated (-87.2 [-111.6, -62.7] min/day, RMSE= 298.8). SBQ was similarly responsive to change compared to the actiPAL except for sedentary time during non-work days (0.13 and 0.49 for SBQ and AP, respectively).

CONCLUSION: Despite the poor absolute agreement between the SBQ and actiPAL, overall bias estimates and responsiveness during work days were acceptable. Further studies are needed to explore ways to improve accuracy in sedentary behavior reporting during non-working days.

1936 June 1 3:45 PM - 4:00 PM
The Validity of Fitbit Charge in Free Living Conditions

Yang Bai1, Laura Ellingson2, Gregory Welk, FACSM2. 1University of Vermont, Burlington, VT. 2Iowa State University, Ames, IA. (Sponsor: Gregory Welk, FACSM)

Email: Yang.Bai@med.uvm.edu
(No relationships reported)

PURPOSE: Research is accumulating regarding the accuracy of wrist-worn consumer activity monitors in controlled lab settings. However, there is a lack of evidence of validity under free living conditions. The study investigated the accuracy of Fitbit Charge (FBC) for estimating minutes of moderate and vigorous physical activity (MVPA) compared to research grade accelerometers. A secondary purpose was to evaluate the accuracy of steps.

METHODS: Ninety-four healthy men and women (mean age 41 ± 9 years) wore a FBC as part of a 12-week intervention. The participants were also asked to wear research grade accelerometers concurrently as the criterion physical activity measure during the last week of intervention. A minimal of 10 hours/day wear-time was applied to both methods. Estimated daily MVPA and steps taken from the FBC were compared against the criterion using indicators of Pearson correlation, mean absolute percent errors, mean percent errors, and equivalence testing. The activity classification agreement of MVPA at the minute level was evaluated with Kappa, sensitivity and specificity.

RESULTS: Complete data were collected on 61 individuals with an average of 5.5 days of wear-time. The average daily MVPA measured by accelerometer was 76.3 minutes compared to a higher value, 118.7 minutes, estimated by the FBC. The correlation between the two methods was 0.8 (p=0.0001). The mean absolute percent errors and mean percent errors were 68.2% and -64.2%, indicating a consistent overestimating MVPA by the FBC. The average daily steps were 8,997 and 7,716 measured by FBC and accelerometer, respectively, with a correlation of 0.76 (p=0.0001). The mean absolute percent errors and mean percent errors of steps estimated by FBC were 30.0% and -20.1%. Neither of the MVPA and steps measured by FBC fell into the ±10% equivalence zone set up by the accelerometer. The Kappa statistics of the classification agreement between the two methods was 0.32 with a low sensitivity of 30.1% but a high specificity of 96.7%.
CONCLUSIONS: This FBC estimated substantially higher minutes of MVPA in free living conditions among healthy adults and significantly higher steps compared to research grade accelerometer. The researchers who use FBC to track physical activity need to interpret their results with caution.

1937 June 1 4:00 PM - 4:15 PM
Reliability and Validity of a Workers’ Sitting Time Questionnaire (JNIOSH-WPAQ) Using the Percentage Method
Tomoaki Matsuo¹, Hiroyuki Sasaki², Rina So³, Kazunori Ohkawara¹, National Institute of Occupational Safety and Health, Japan, Kawasaki, Japan. ¹University of Tsukuba, Tsukuba, Japan. ²University of Electro-Communications, Tokyo, Japan. (Sponsor: Kiyoji Tanaka, FACSM)

No relationships reported.

Questionnaires assessing sitting time generally use a questioning technique that asks for absolute length of time (hours and minutes) spent sitting. However, recent studies evaluating workers’ physical activity questionnaires (WPAQ) showed that asking for the percentage of time rather than the absolute length of time spent sitting improved the questionnaire’s properties. Furthermore, the study showed that most participants preferred the percentage method rather than the absolute time method. Therefore, we developed a new WPAQ (JNIOSH-WPAQ) to investigate workers’ sitting time using the percentage method. Purpose: To investigate test-retest reliability and criterion validity of sitting time assessed by the JNIOSH-WPAQ. Methods: Our study included 133 workers who completed the WPAQ and wore a thigh-worn inclinometer (activPAL) over time as a criterion measure. The WPAQ measures time spent sitting within four typical domains of a worker’s life: (a) working time, (b) commuting time, (c) non-working time on a workday, and (d) non-workday. We calculated intraclass correlation coefficients (ICC) as a reliability value and Spearman’s ρ as a validity value. Results: The WPAQ demonstrated favorable reliability for sitting time in all four domains. That is, the ICCs for working time, commuting time, non-working time on a workday and non-workday were 0.86, 0.93, 0.80 and 0.77, respectively. As for validity, the ρ values of the WPAQ sitting time varied by domain. The ρ value during commuting time (0.86) was “strong” (0.70-0.89), whereas the ρ value on a non-working day (0.41) was “low” (0.30-0.49). On the other hand, the ρ values during working time (0.61) and non-working time on a non-working day (0.50) were “moderate” (0.50-0.69).

Conclusions: The study showed that the JNIOSH-WPAQ has acceptable measurement properties for investigating workers’ sitting time, which makes this questionnaire a reasonable resource for future epidemiological survey. Supported by funding from the National Institute of Occupational Safety and Health, Japan (N-F25-08).

1938 June 1 4:15 PM - 4:30 PM
Evaluating Measures of Physical Activity and Sedentary Behavior Suitable for Large Epidemiologic Studies
Charles E. Matthews¹, FACSM¹, Sarah Keadle², Steven C. Moore³, FACSM³, Richard P. Troiano¹, FACSM¹, Joshua N. Sampson¹, ¹US NIH/NIHC, Rockville, MD. ²California Polytechnic State University, San Luis Obispo, CA. Email: charles.matthews2@nih.gov

No relationships reported.

Purpose: Questionnaires typically used in epidemiologic studies to assess habitual physical activity (PA) and sedentary time (ST) are imprecise and do not assess the full spectrum of daily activities. This has limited our understanding of how these behaviors affect health. Thus, we tested two more precise and comprehensive measures, an accelerometer and an internet-based 24-hour recall (ACT24), as well as a questionnaire (Q). Methods: Adults (50-70 y) enrolled in a 12-month study that included 3 criterion measures: PA energy expenditure (PAEE) measured by doubly labeled water (DLW), and two 7-day activPAL measures of active and sedentary time (A/ST). They also completed a 20-item past year Q about PA and ST (twice), an ACT24 recall of PA (twice), and self-reported dietary intake during the past week. PA was assessed using the percentage method. The CMS and DO were then used to classify pairs of sessions for each participant based on whether steps and EE changed from baseline. The CMS and DO were then used to classify pairs of sessions for each participant based on whether steps and EE changed from baseline. The CMS and DO were then used to classify pairs of sessions for each participant based on whether steps and EE changed from baseline. 

Results: The overall model was significant, $F(3, 211) = 49.468, p <.001$. Specifically, resting energy expenditure (REE) estimated from the Mifflin-St. Joer equation (mean 1,496 kcal) ($\beta = -433$, $p < .001$), steps measured by ActiGraph accelerometers (mean 12,530 steps) ($\beta = .290$, $p < .001$), and total dietary fiber measured from DHQ-II (mean 22.9 g/day) ($\beta = .218$, $p < .001$) significantly predicted TEE from DLW. Conclusions: These results indicate that the older adults with the highest REE and who take more steps throughout the day expend more calories. Total dietary fiber may be a surrogate for adequate nutrient intake and healthy lifestyle behaviors thus contributing to the prediction of energy expenditure. In conclusion, estimating REE from the Mifflin-St. Joer equation, steps measured by ActiGraph, and fiber intake from DHQ-II are the most advantageous tools to determine TEE in older adults.

1939 June 1 4:30 PM - 4:45 PM
Dietary And Physical Activity Measurement Tools Accurately Predict Total Energy Expenditure In Adults Aged 50-74
Mindy Maziarz, Wanyi Wang, Alexis Ortiz, FACSM. Texas Woman’s University, Houston, TX. (Sponsor: Alexis Ortiz, FACSM)

Email: mmaziarz@twu.edu

No relationships reported.

Unfavorable changes in body composition associated with the aging process can contribute to the development and severity of chronic diseases. Adequate dietary intake and physical activity (PA) after the age of 50 can reverse these changes to sustain overall health and quality of life. Purpose: We investigated which self-reported PA questionnaires (Community Healthy Activities Model Program for Seniors (CHAMPS) or American Association of Retired Persons (AARP) questionnaires), objective PA measures (Actigraph), dietary questionnaires (Automated Self-Administered 24-hour (ASA24) dietary recall or Dietary History Questionnaire II (DHQ-II)), and anthropometric measurement outcomes best predicted total energy expenditure (TEE) measured by doubly-labeled water (DLW). Methods: A secondary data analysis was performed from data collected over a 12-month period from The Interactive Diet and Activity Tracking in AARP (IDATA) study. Results: Of the 681 participants with a mean age of 63.1 (range 50-74) 93% were Caucasian and almost half (49.5%) were male. Approximately one-fourth (26.6%) had a healthy body mass index while 42.0% were overweight and 31.4% obese. Mean TEE measured by DLW was 2,506 kcal (range 1,453 to 4,615 kcal). Stepwise linear regression was used to examine the possible significant outcomes that predicted TEE by DLW. Results indicated three outcome predictors of TEE. The overall model was significant, $F(3, 211) = 49.468, p < .001$. Specifically, resting energy expenditure (REE) estimated from the Mifflin-St. Joer equation (mean 1,496 kcal) ($\beta = -433$, $p < .001$), steps measured by ActiGraph accelerometers (mean 12,530 steps) ($\beta = .290$, $p < .001$), and total dietary fiber measured from DHQ-II (mean 22.9 g/day) ($\beta = .218$, $p < .001$) significantly predicted TEE from DLW. Conclusions: These results indicate that the older adults with the highest REE and who take more steps throughout the day expend more calories. Total dietary fiber may be a surrogate for adequate nutrient intake and healthy lifestyle behaviors thus contributing to the prediction of energy expenditure. In conclusion, estimating REE from the Mifflin-St. Joer equation, steps measured by ActiGraph, and fiber intake from DHQ-II are the most advantageous tools to determine TEE in older adults.

1940 June 1 4:45 PM - 5:00 PM
A Consumer Activity Tracker Is Sensitive In Detecting Change In Free-living Energy Expenditure And Steps
Albert R. Mendoza, John Staudenmayer, Patty Freedson, FACSM. University of Massachusetts-Amherst, Amherst, MA. (Sponsor: Patty Freedson, FACSM)

Email: amendozak@kin.umass.edu

No relationships reported.

Activity trackers (ATs) are valuable tools to monitor physical activity (PA) behavior and energy expenditure (EE). Despite the broad appeal of such devices for consumers and researchers, there is limited evidence (0.5%) of how well ATs detect change in PA behaviors in free-living settings. Purpose: To explore the sensitivity of ATs in detecting change in estimated EE and steps compared to changes in directly observed behavior and criterion steps in free-living settings. Methods: Seven participants were directly observed on three separate days for 2 hours each day in free-living settings. Participants were a commonly used criterion step counting (CSC) device, and popular hip- and wrist-worn consumer ATs. Criterion EE was assessed using a validated direct observation (DO) method. The CMS and DO were then used to classify pairs of sessions for each participant based on whether steps and EE changed by +/-5%, 15%, and 25% or not. The ATs were then used to perform the same classification. Percent agreement between the two methods where then calculated.
CONCLUSIONS: These preliminary results provide evidence that ATs are sensitive in detecting change in steps and EE. For step estimates, the wrist AT was superior in comparison to the hip AT. The implications are that consumers, clinicians, and researchers may employ hip- and wrist-worn ATs as an objective tool to track changes in steps and EE in free-living settings. In particular, the AT wrist is highly sensitive to changes in steps and is a tool that can be used for individual and group interventions designed to increase locomotion behavior.

Funded by: NIH: 1F31HL129802-01

RESULTS:

CONCLUSIONS: These preliminary results provide evidence that ATs are sensitive in detecting change in steps and EE. For step estimates, the wrist AT was superior in comparison to the hip AT. The implications are that consumers, clinicians, and researchers may employ hip- and wrist-worn ATs as an objective tool to track changes in steps and EE in free-living settings. In particular, the AT wrist is highly sensitive to changes in steps and is a tool that can be used for individual and group interventions designed to increase locomotion behavior.

Funded by: NIH: 1F31HL129802-01

D-48 Clinical Case Slide - Cardiovascular II

Thursday, June 1, 2017, 3:15 PM - 4:55 PM
Room: 401

1941 Chair: Benjamin D. Levine, FACSM. Texas Health Presbyterian Hospital Dallas, Dallas, TX.
(No relationships reported)

1942 Discussant: Sameer Dixit. Johns Hopkins University, Baltimore, MD.
(No relationships reported)

1943 Discussant: Jerrad P. Zimmerman. Carle Clinic, Urbana, IL.
(No relationships reported)

1944 June 1 3:15 PM - 3:35 PM
Football Athlete with Chest Pain and Dysphagia
Adam Fletcher, Jeremy Kent, Walter Hoyt, John MacKnight, FACSM. University of Virginia, Charlottesville, VA. (Sponsor: John MacKnight, MD, FACSM)
(No relationships reported)

HISTORY: 22 year old collegiate football player was seen in clinic for several years of intermittent dysphagia with associated chest pain. Symptoms had occurred 3-4 times annually, but athlete had noted increasing frequency over the past several weeks with occasional associated heartburn. He was initially treated with oral omeprazole 40 mg daily for presumed gastroesophageal reflux disorder. Two weeks later, following an intense practice, he developed severe, burning, substernal chest pain and diaphoresis which prompted emergency department evaluation for possible cardiac etiology.

PHYSICAL EXAMINATION: Vitalis: HR 56, BP 147/90, RR 18

TEST RESULTS:

CSC step change
- AT hip (2% agreement) 90.4 85.7 80.9
- AT wrist (2% agreement) 100 95.2 85.7

At the time of the initial presentation, the athlete was placed on medical hold for remainder of football season. Further investigation revealed that the athlete had noted the onset of intermittent dysphagia and heartburn in the months prior to the presentation. A Barium swallow study was normal with no evidence of a diverticulum or stricture.

DIFFERENTIAL DIAGNOSIS: Acid reflux, esophagitis, motility disorder, pharyngeal edema.

After significant weight loss and 2 week washout of omeprazole, the athlete was referred to a gastroenterologist who confirmed the diagnosis of eosinophilic esophagitis (EoE).

FINAL WORKING DIAGNOSIS:

Eosinophilic Esophagitis (EoE), biopsy-proven

TREATMENT AND OUTCOMES:

The athlete was started on a diet proven to reduce symptoms of EoE. He developed intermittent hemoptysis in the evenings after running. Pertinent family history included a grandmother who was recently diagnosed with a pulmonary embolism and found to have prothrombin gene mutation.

PHYSICAL EXAMINATION: Well appearing, no cervical or supra-clavicular lymphadenopathy. CV: regular rate and rhythm, with no murmurs, gallops, or rubs.

Lungs: clear to auscultation bilaterally. Abdominal: Soft, non-tender, non-distended.

No lower extremity edema. Pulmonary: No respiratory distress.


Vitals: HR 80, BP 120/74, RR 18

The athlete was started on Apixaban 10mg PO BID x 7 days followed by Apixaban 5mg PO BID for a total treatment duration of 3 months. While on anticoagulation, the athlete was held out of all activities for 6 weeks, and then was slowly progressed to non-contact cardiovascular training, which she has tolerated well.

HISTORY: A 19 year-old female college division 1 soccer player was seen in athletic training room for follow up on 1 month history of rib pain and cough with blood tinged sputum. One week prior to training room visit, she was evaluated at a primary care clinic and diagnosed with pneumonia. She was placed on Azithromycin for 5 days which improved symptoms. The athlete was followed weekly in training room and although she tolerated a slow progression back to running, she again developed intermittent hemoptysis in the evenings after running. Pertinent family history included a grandmother who was recently diagnosed with a pulmonary embolism and found to have prothrombin gene mutation.

PHYSICAL EXAMINATION: Well appearing, no cervical or supra-clavicular lymphadenopathy. CV: regular rate and rhythm, with no murmurs, gallops, or rubs. Lungs: clear to auscultation bilaterally, without wheezes or cracks. Non-tender to palpation over costo-sternal junction. Extremities well perfused.


CHEST X-ray: Infiltrate in posterior segment left lower lobe CT PE: Multiple pulmonary emboli in bilateral distal lobar and segmental pulmonary arteries with probable right heart strain.

TREATMENT AND OUTCOMES: Athlete was admitted to University Hospital for 24 hour observation after outpatient CT showed bilateral pulmonary emboli. A Work-up for coagulopathy was performed and the athlete was started on Apixaban 10mg PO BID x 7 days followed by Apixaban 5mg PO BID for a total treatment duration of 3 months. While on anticoagulation, the athlete was held out of all activities for 6 weeks, and then was slowly progressed to non-contact cardiovascular training, which she has tolerated well.
The patient was admitted to inpatient stroke rehabilitation and discharged to home after 5 days at an independent level. The patient continued to suffer from vertigo for which she was started on Clonazepam 0.5mg three times daily as needed which controlled her symptoms. She is enrolled in vestibular outpatient physical therapy. The patient is determined and plans to run the 2017 Boston marathon which she has already qualified for.

1947  June 1 4:15 PM - 4:35 PM  Dyspnea on Exertion - Former Marathon Runner
Rubria Marines-Price, Andrew R. Tomlinson, Tony G. Babb, FACSM, Benjamin D. Levine, FACSM. Institute for Exercise and Environmental Medicine, Dallas, TX. (Sponsor: Tony G. Babb, FACSM)
Email: rubriamarines-price@texashealth.org
(No relationships reported)

HISTORY:
A 67-year-old former marathon runner with a history of venous thromboembolism was referred for cardiopulmonary exercise testing (CPET) for dyspnea on exertion (DOE), drop in fitness, and pre-surgical evaluation for pulmonary thromboendarterectomy (PTE). He was diagnosed with chronic thromboembolic (CTE) disease 3 months prior to referral. His V/Q scan showed multiple perfusion defects. Normal spirometry, lung volumes, and diffusion capacity. Right heart catheterization (RHC): RA 5 mm Hg; PA 37/15 mm Hg; mean 24; PCWP 8 mm Hg; PA saturation 67%; TDCO 4.2 L/min.

PHYSICAL EXAMINATION:
Height: 175 cm; weight: 71 kg; Caucasian male, normal respiratory rate, no evidence of breathlessness at rest.

DIFFERENTIAL DIAGNOSIS:
1. Respiratory and/or cardiovascular limitation
2. Deconditioning
3. Degenerative
4. Aging

TEST AND RESULTS:

CPET Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rest</th>
<th>SS 1</th>
<th>SS 2</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workload (W)</td>
<td>5.22</td>
<td>6.40</td>
<td>6.10</td>
<td>6.40</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>77</td>
<td>118</td>
<td>116</td>
<td>119</td>
</tr>
<tr>
<td>VO2 (mL/kg/min)</td>
<td>3.24</td>
<td>7.2</td>
<td>7.48</td>
<td>7.99</td>
</tr>
<tr>
<td>VCO2 (mL/kg/min)</td>
<td>5.86</td>
<td>8.15</td>
<td>9.25</td>
<td>10.18</td>
</tr>
<tr>
<td>VE/VO2 ratio</td>
<td>15.27</td>
<td>15.57</td>
<td>16.08</td>
<td>16.25</td>
</tr>
</tbody>
</table>

Interpretation:
Functional Class I; fair-to-average fitness by AHA criteria
Severe ventilatory inefficiency
Increased ventilatory demand and breathlessness
Blunted cardiac output due to decreased SV reserve

FINAL WORKING DIAGNOSIS:
CTE disease
Evidence of ventilatory inefficiency
Impaired hemodynamics

TREATMENT AND OUTCOMES:
PTE surgery
Post-surgery cardiopulmonary rehabilitation
Repeated CPET 15 months after surgery due to persistent DOE and no fitness gains

1948  June 1 4:35 PM - 4:55 PM  Applying Cardiopulmonary Exercise Testing to the Evaluation of Left Ventricular Function for Patients Ventricular Assist Device Therapy
Jeffrey W. Christle1, Kegan J. Moneghetti1, Francois Haddad1, Dipanjan Banerje1, Jon Myers, FACSM1, Matthew T. Wheeler1, Stanford University, Stanford, CA. 'Palo Alto Veterans Administration Health Care System and Stanford University, Palo Alto, CA. (Sponsor: Jon Myers, FACSM)
Email: christle@stanford.edu
(No relationships reported)

HISTORY: Patient with severe heart failure and presence of a left ventricular assist device (LVAD).

PHYSICAL EXAMINATION: A patient with severe heart failure and LVAD (29 y, male, BMI 26 kg/m2, INR > 2.0) was examined on two separate occasions two weeks apart with CPX on a cycle ergometer (continuous ramp, 20 Watts per minute).

DIFFERENTIAL DIAGNOSIS: n/a

TEST AND RESULTS: The first CPX was performed with the LVAD on at its prescribed speed. The second test was performed at the lowest LVAD speed setting, at which point the LVAD was effectively not supportive. Both tests were performed to volitional exhaustion. The LVAD speeds for the first and second tests were 2400 rpm and 1800 rpm. Peak respiratory exchange ratios were 1.20 and 1.16, respectively. For the CPX with LVAD support, VO2peak was 24.4 ml/kg/min and peak workload was 167 Watts For the CPX without LVAD support VO2peak was 27.7 ml/kg/min and peak load was 190 Watts.

FINAL WORKING DIAGNOSIS: Patient seems to have recovered a substantial amount of functionality, so that the LVAD may be unnecessary. Furthermore, the LVAD may be a hindrance to exercise performance and therefore adequate ventricular recovery.

TREATMENT AND OUTCOMES: Patient is being considered for reevaluation for removal of LVAD. Focus is on further recovery and improvement of quality of life.

1949  June 1 3:15 PM - 3:35 PM  Foot Drop in a Cheerleader After a Yoga Pose
Vince Si, Melody Hrubes, Terry Nicola, FACSM. University of Illinois at Chicago, Chicago, IL. (No relationships reported)

HISTORY: 15-year-old healthy female referred for right foot drop and numbness of the right lower leg x 1 month and occurred during yoga. She is a cheerleader and is quite flexible, and the instructor had her do advanced poses that she had not done; she subsequently experienced pain in her anterior shins. She has experienced pain in anterior shins before; however, this time she had numbness and difficulty with ambulation and noticed she was tripping on the right. Of note, she was on oral antibiotics for recurrent ear infections that eventually required tubes to be placed. The antibiotics upset her stomach causing 15 pound loss from 12/2015 - 3/2016.

PE: Thin female, alert, in no distress

Extremities warm, well-perfused with 2+ pulses in DP, PT bilaterally Full range of motion in lumbar spine and bilateral hips without pain
Atrophy of the right tibialis anterior, no subluxation of right fibula, no swelling
5/5 in strength in bilateral hip flexion, knee extension, knee flexion, ankle plantarflexion, left ankle dorsiflexion, and left 1° toe extension. 0.5° strength in right ankle dorsiflexion, right ankle eversion and right 1° toe extension. 5/5 in right ankle inversion
Sensation: intact in left leg, minimally decreased over the right medial malleolus, significantly decreased over the right lateral malleolus, and absent along dorsum of right foot.

Reflexes 2+ and symmetric in bilateral patella and Achilles, toes downgoing, no clonus

Beighton scale: 9/9

DIFFERENTIAL
Peroneal neuropathy
Flexor palsy
Radiocapulopaty
Peripheral neuropathy
Myelopathy
Cauda Equina Lesions

Multiple Sclerosis
Conversion Disorder

TESTS
XR lumbar spine normal
MRI of the right leg suggestive of common peroneal neuropathy; no focal mass seen compressing the nerve
EMG/NCS: evidence of right common peroneal neuropathy proximal to the fibular head

FINAL WORKING DIAGNOSIS
Peroneal neuropathy across the fibular head

TREATMENT AND OUTCOMES
She was started on a short course of a corticosteroid taper and physical therapy. At 1-month follow-up, the patient reported significant improvement with decreased numbness and is able to perform maneuvers with cheering and activity. Strength has also improved to 3/5 in right ankle dorsiflexion, 4/5 in right ankle eversion. She continues with PT and close follow-up with ortho and primary care sports medicine.

1953
June 1  3:35 PM - 3:55 PM
Lower Leg Injury-Dance
Brittany J. Moore, Karen Newcomer, FACSM, Cara Prideaux.
Mayo Clinic, Rochester, MN.
Email: moore.brittany@mayo.edu

(No relationships reported)

HISTORY: A 15-year-old female high school dancer presented to clinic with recurrent left leg pain in setting of recently treated left fibular stress fracture. She initially presented 6 months prior with focal distal fibular pain. At that time stress fracture diagnosis was confirmed with X-ray and MRI; imaging revealed incidental left talocalcaneal coalition (TCC). Treatment with walking boot immobilization and activity modification for 6 weeks resolved her pain. She returned to full activities including dance. After 4 months of pain free activity she now presented with left lateral fibular pain more diffuse than prior, worse with weight bearing. She denied trauma, swelling, numbness, tingling, or weakness. Her nutritional status was appropriate. Menstrual cycles were normal since menarche at age 11.

PHYSICAL EXAMINATION: Ankle and foot alignment was neutral. She was point tenderness over several inches of distal left fibula without tenderness of ankle or foot. Left subtalar pronation and supination motion was markedly limited compared to right, but pain free. Ankle strength was full and pain free through available range. Gait was normal. She was neurovascularly intact.


TEST AND RESULTS: Left leg MRI, 6 months prior: distal fibular shaft cortical thickening with increased T2 signal of intramedullary canal and periosteum consistent with early stress fracture. Left leg X-Ray: 2 view: cortical thickening of distal fibular diaphysis unchanged from 6 months prior. Left ankle CT: left fibrocartilaginous TCC with cortical irregularity, subchondral sclerosis and cystic changes of middle subtalar facet and adjacent calcaneal surface.

FINAL WORKING DIAGNOSIS: Recurrent left fibular stress fracture secondary to impaired subarticular motion from TCC


1954
June 1  3:55 PM - 4:15 PM
A Fibular Hook
Kevin N. Blythe, Bronson E. Delasobera. MedStar Georgetown University Hospital, Washington, DC.

(No relationships reported)

History: 26 yo female with several months of exertional posterior left proximal calf pain after training for 1/2 marathon. The pain is isolated to the proximal posterolateral calf without radiation, described as a dull ache and heaviness of 4/10 intensity.

Symptoms occur after 10 minutes of running, and lasts for 2-3 hours after runs. She has some tingling on the sole of the foot but no weakness, swelling or pallor. PT for calf strain provided no relief. She frequently had negative evaluation by vascular surgery including ABIs, arteriogram and a dynamic MRI/A

Physical Exam: Left lower leg - no edema, lesions or deformity. Mild TTP of proximal calf, midline and lateral. No other TTP of lower leg, knee or L-spine. No knee effusion. Full ROM and strength at knee/ankle. Normal sensation over the L4-S1 distribution, 2+ distal pulses. Negative Homan’s, negative straight leg raise, negative McMurray’s, negative Tinel’s, no cords palpated. Normal gait and heel-toe gait.

DIFFERENTIAL Diagnosis 1) Chronic Exertional Compartment Syndrome 2) Lower Extremity DVT 3) Popliteus or Hamstring Insertional Tendonopathy 4) Lumbar Radiculopathy 5) Peripheral Nerve Entrapment

Test Results: L Knee MRI - small fluid collection under MCL, otherwise negative
L Spine MRI - negative

Compartment Pressures:
Anterior - Rest 8 mmHg, Post-exercise 24 mmHg
Lateral - Rest 15, Post 25
Superficial Posterior - Rest 25, Post 30
Deep Posterior - Rest 8, Post 15

Lower extremity venous duplex - negative
Lidocaine injection of medial hamstring insertion - no relief
EMG - all motor and sensory nerves tested were within normal limits
L Knee joint steroid injection - no relief
L Posterior calf US: abnormal morphology of fibula at soleus insertion abutting tibial nerve

MRI L tib/fib - bony tug lesion of proximal posterior fibula near insertion of the soleus without surrounding edema

X-ray tib/fib comparison films - confirmed L fibular bone lesion identified as osteochondroma

Working Diagnosis: Sessile osteochondroma involving the left fibular head/neck.

Treatment and Outcome: US guided lidocaine injection of soleus insertion provided 80% relief. The patient was referred for surgical evaluation. Based on the surgical risks of adjacent tibial artery/nerve injury, a repeat trial of PT, including gait re-training, was prescribed. Follow-up in 8 weeks for re-evaluation.
History:
35 year old male on phentermine for weight loss, presented to sports clinic with complaint of right foot numbness that started 6 days prior. After a basketball game he noticed pain and swelling in his postero-lateral calf. He went hiking the next day and the pain increased. The next day he developed numbness to the bottom of his foot. He saw a podiatrist on day 4 and was diagnosed with radiocapitulaphy and given Medrol. He did not have foot drop or weakness but complained of heel numbness. At the time of his visit, his pain had mostly resolved, the numbness is what persisted and brought him in.

Physical Exam:
Mk:
Sns: No midline tenderness, FROM, 5/5 strength all lumbar dermatomes, decreased sensation to touch over heel and lateral foot
Negative neural slump test, straight leg raise, Patricks, Fortins, Gaenslens, 1+ patellar and achilles reflexes
Compartment soft, but right leg with swelling compared to left, no warmth, redness or cords, mild tenderness laterally

Differential Diagnosis:
Lumbar Radiculopathy
Peripheral nerve entrapment
Compartment syndrome
DVT
Hematoma/mass
Partial gynecomastia rupture

Tests & Results:
L-spine xray: L3/L4 retrolisthesis.
Sone: no DVT
MRI R leg: Grade 2 popliteus strain with edema/hematoma formation and compression of tibial nerve
Initial labs (1 week post injury): CK 856, Cr 1.3, UA 1+ protein, 1+ ketones. CBC, CMP, ESR, and CRP normal
Repeat labs (3 weeks post injury): normal CK, creatinine, UA
EMG with nerve conduction (3 weeks post injury): normal
Repeat MRI (6 weeks post injury): interval improvement yet persistent edema of the popliteus muscle
Xrays tibia/fibula (6 weeks post injury): no evidence of heterotopic ossification

Treatment:
Phentermine was stopped. He started PT after a 6-week period of rest from weight bearing exercise.

Outcome and Further Follow-Up:
Patient continues to have small improvements in his pain s/p above.

Return to Activity:
The patient was able to gradually return to cardio and was back to basketball at 3 months.

1956 June 1 4:35 PM - 4:55 PM
Foot Numbness - Basketball: Doc, My Foot Is Numb!
Elizabeth Kaufman, MD, Bronson Elizabeth Delasobera, MD.
Georgetown, Washington, DC.
Email: ekauflman25@gmail.com
(No relationships reported)

1957 June 1 4:55 PM - 5:15 PM
A F44 Paralympic Track and Field Discus Thrower: A Case Report
Donald L. Hoover1, David M. Bellar2, Lawrence W. Judge3.
1Western Kentucky University, Bowling Green, KY. 2University of Louisiana at Lafayette, Lafayette, LA. 3Ball State University, Muncie, IN. (Sponsor: Matthew Harber, FACSM)
Email: don.hoover.pt.phd@gmail.com
(No relationships reported)

D-50 Clinical Case Slide - Shoulder III
Thursday, June 1, 2017, 3:15 PM - 5:15 PM
Room: 504

1958 Chair: David Jewison. University of Minnesota, Minneapolis, MN.
(No relationships reported)

(No relationships reported)

1960 Discussant: Clifton Page. University of Miami, Miami, FL.
(No relationships reported)

1961 June 1 3:15 PM - 3:35 PM
Acute Atraumatic Shoulder Pain in a 39 Year Old Female
Sheila E. Taylor. Wellspan Sports Medicine, York, PA. (Sponsor: Mark Lavallee, FACSM)
Email: shelia.e.taylor@gmail.com
(No relationships reported)

Presentation: 39 year old female with acute onset of severe left shoulder pain and weakness 8 weeks prior. No history of trauma or prior shoulder injuries. Due to progressively worsening nature of pain, MRI was ordered prior to referral which revealed tears of supraspinatus, infraspinatus and biceps tendon.

History: Patient admitted to IV drug use and recent hospitalization for endocarditis and septic pulmonary emboli related to her IV drug use.

Physical Exam:
Left shoulder exam: No significant erythema, or edema. AROM: severely limited AROM in all planes due to pain. PROM: limited with rest from weight bearing exercise.

Treatment:
Patient admitted to IV drug use and recent hospitalization for endocarditis and septic pulmonary emboli related to her IV drug use.

Outcome:
Patient continues to have small improvements in her pain s/p above treatment and physical therapy.

he demonstrated a delayed recruitment of the gluteals/hamstring dominance bilaterally. The athlete was unremarkable in neurological and soft tissue assessment. He demonstrated a “poor” capacity to maintain lower extremity symmetry while squatting to moderate depth, as well as marked asymmetry in numerous measures of single leg athletic function.

DIFFERENTIAL DIAGNOSIS
1. Musculoskeletal imbalances

TEST AND RESULTS:
1. Abnormalities in lower quarter muscle length and function.
2. Asymmetrical performance in numerous tests of single leg athletic function.

FINAL WORKING DIAGNOSIS: Chronic musculoskeletal imbalances due to congenital deformity and compounded by repetitive athletic activity.

TREATMENT AND OUTCOMES:
Many throwing athletes sustain musculoskeletal or nervous injuries due to repetitive microtrauma to these tissues. Paralympic throwers are at greater risk of such injuries, due partly to the chronic effects of asymmetrical biomechanical demands. The physical therapist evaluated this athlete, identifying musculoskeletal imbalances and prescribing therapeutic exercises to address these limitations. The throwing coach integrated these prescribed activities into the athlete’s annual training program so as to foster his power development in an injury-free manner. This case report highlights a cooperative relationship between sports medicine and coaching professionals that assisted a Paralympian in peaking for the 2016 Rio Games.

MSc:
AROM: Limited internal rotation bilaterally due to pain.

DVT:
No DVT seen.

L-Spine:
la. 5/5 strength all lumbar dermatomes, decreased sensation to touch over heel and lateral foot
Negative neural slump test, straight leg raise, Patricks, Fortins, Gaenslens, 1+ patellar and achilles reflexes
Compartment soft, but right leg with swelling compared to left, no warmth, redness or cords, mild tenderness laterally

Differential Diagnosis:
Lumbar Radiculopathy
Peripheral nerve entrapment
Compartment syndrome
DVT
Hematoma/mass
Partial gynecomastia rupture

Tests & Results:
L-spine xray: L3/L4 retrolisthesis.
Sone: no DVT
MRI R leg: Grade 2 popliteus strain with edema/hematoma formation and compression of tibial nerve
Initial labs (1 week post injury): CK 856, Cr 1.3, UA 1+ protein, 1+ ketones. CBC, CMP, ESR, and CRP normal
Repeat labs (3 weeks post injury): normal CK, creatinine, UA
EMG with nerve conduction (3 weeks post injury): normal
Repeat MRI (6 weeks post injury): interval improvement yet persistent edema of the popliteus muscle
Xrays tibia/fibula (6 weeks post injury): no evidence of heterotopic ossification

Treatment:
Phentermine was stopped. He started PT after a 6-week period of rest from weight bearing exercise.

Outcome and Further Follow-Up:
Patient continues to have small improvements in his pain s/p above.

Return to Activity:
The patient was able to gradually return to cardio and was back to basketball at 3 months.

MSc:
AROM: Limited internal rotation bilaterally due to pain.

DVT:
No DVT seen.

L-Spine:
la. 5/5 strength all lumbar dermatomes, decreased sensation to touch over heel and lateral foot
Negative neural slump test, straight leg raise, Patricks, Fortins, Gaenslens, 1+ patellar and achilles reflexes
Compartment soft, but right leg with swelling compared to left, no warmth, redness or cords, mild tenderness laterally

Differential Diagnosis:
Lumbar Radiculopathy
Peripheral nerve entrapment
Compartment syndrome
DVT
Hematoma/mass
Partial gynecomastia rupture

Tests & Results:
L-spine xray: L3/L4 retrolisthesis.
Sone: no DVT
MRI R leg: Grade 2 popliteus strain with edema/hematoma formation and compression of tibial nerve
Initial labs (1 week post injury): CK 856, Cr 1.3, UA 1+ protein, 1+ ketones. CBC, CMP, ESR, and CRP normal
Repeat labs (3 weeks post injury): normal CK, creatinine, UA
EMG with nerve conduction (3 weeks post injury): normal
Repeat MRI (6 weeks post injury): interval improvement yet persistent edema of the popliteus muscle
Xrays tibia/fibula (6 weeks post injury): no evidence of heterotopic ossification

Treatment:
Phentermine was stopped. He started PT after a 6-week period of rest from weight bearing exercise.

Outcome and Further Follow-Up:
Patient continues to have small improvements in his pain s/p above.

Return to Activity:
The patient was able to gradually return to cardio and was back to basketball at 3 months.
A Collapse that Led to Shoulder Pain
Michael Seifert, Krystian Bigosinski. Maine Medical Center, Portland, ME. (Sponsor: Heather Gillespie, FACSM)

HISTORY: A 55 year old female presents for right shoulder pain. She has a history of multiple sclerosis, recent falls complicated by a right 6th rib fracture and a right 4th phalanx fracture, a 35 pack year history of tobacco use, and an unknown fracture of her right shoulder sustained at age 16. Her current shoulder pain began four weeks prior to her visit while reaching behind her in the shower. She felt like her shoulder popped out of place. She has achy pain, worse when touching her shoulder or using her walker. It improves with lying down and with a sling. Acetaminophen and ibuprofen do not provide relief. Physical therapy as part of her multiple sclerosis treatment has not helped.

PHYSICAL EXAMINATION:
BP: 122/82, Pulse: 69, Respirations: 16, SpO2: 96%.
Shoulder:
- No gross abnormality, no step-offs along the clavicle.
- Tender over the entire humeral head and anterior shoulder.
- No swelling, warmth, or erythema.
- ROM:
  - o Right flexion 85 degrees active, 95 degrees passive.
  - o Right abduction 90 degrees active, 100 degrees passive.
  - o Adduction, internal rotation, external rotation and extension were full and equal bilaterally.
- 5/5 strength
- Special tests: positive empty can, Hawkson’s, O’Brian’s, and Speed’s test. Negative crossed arm adduction, AC compression, and sulcus sign. Unable to perform Neer’s test due to pain.

DIFFERENTIAL DIAGNOSIS:
- Torn rotator cuff
- Glenohumeral arthritis
- Humeral head fracture as part of Osteogenesis Imperfecta
- Avascular necrosis
- AC joint arthritis
- Shoulder dislocation/subluxation
- Elder Abuse

TEST AND RESULTS:
Shoulder 3 view XR:
- Extensive posttraumatic deformity of proximal right humerus with marked irregularity of articular surface.
- Possible non-displaced superimposed acute or subacute fracture
- Slightly displaced postero-lateral right 4th and 5th rib fractures
Shoulder MRI:
- Marked abnormality of the right humeral head with contour deformity
- Progressive collapse of superior articular surface, with focal marrow edema. This may be posttraumatic or relate to avascular necrosis
- No rotator cuff tear.

FINAL WORKING DIAGNOSIS:
- Avascular necrosis of the humeral head

TREATMENT AND OUTCOMES:
- Placed in arm sling for pain control
- Referred for surgical replacement of the humeral head
- Referred for workup for osteogenesis imperfecta, given multiple fractures

Shoulder Injury- Snowboarding
Kelsey Hoffman. RiverStone Health, Billings, MT.
Email: kelsey.hof@riverstonehealth.org


PHYSICAL EXAMINATION: On inspection, L shoulder appeared inferior to R. Swelling, ecchymosis noted over L clavicle. No gross deformity or tenting. An asymmetrical appearance and feel when comparing both clavicles, L clavicle not as prominent and well-defined. Mild tenderness to palpation over L AC joint, decreased ROM at L shoulder. Decreased ROM with overhead movements, abduction across the body. Biceps, triceps, brachioradialis reflexes and sensation intact. Pulse intact.

DIFFERENTIAL DIAGNOSIS:
- 1. Clavicle fracture
- 2. SC joint dislocation
- 3. SC joint sprain
- 4. AC joint sprain

TESTS AND RESULTS:
2 view L clavicle, no fracture. Given concern for posterior dislocation of clavicle, CT upper chest/neck to rule-out damage to structures behind clavicle was ordered. He could not afford a CT scan so it was decided that his PE was not concerning for damage to posterior structures. Serendipity and lateral sternum radiographs at 2-week follow-up, no posterior dislocation, normal anatomical alignment of SC, AC joints. No labs were indicated.

FINAL WORKING DIAGNOSIS:
- SC joint sprain (grade I)

TREATMENT AND OUTCOMES:
- 1. Immobilization in a sling for 1-2 weeks for patient comfort
- 2. Pain control with ibuprofen, acetaminophen
- 3. Early range of motion exercise, followed by home or formal physical therapy
- Initially referred to Orthopedics, but did not go due to financial concerns.
- 2-week FU, out of the sling a majority of the time. Complained of “popping” sensation at SC joint. Started ROM exercises, resistance band work at home. Wanted to return to work (box sorter at shipping company) with lifting restriction/light duty.
HISTORY: A 28-year-old female US Naval Academy college freshman sustained a left wrist injury after fall on outstretched hand during an intercollegiate rugby match. She endorsed immediate onset pain, tingling, hypoesthesia in her hand in a median nerve distribution. Originally diagnosed with acute carpal tunnel syndrome and treated with a surgical release she presents to clinic with generalized, worsening left shoulder pain and weakness for 3 months.

PHYSICAL EXAMINATION: Examination at the time of presentation revealed no shoulder tenderness or swelling. Normal neurologic examination and capillary refill demonstrated. Strength and range of motion were also normal. Neck exam demonstrated no abnormalities and negative Spurlings test. The physical exam remained unchanged for two months before patient developed anterior shoulder hypoesthesia and ipsilateral palmar hypoesthesia in nondermatomal pattern.


TEST AND RESULTS: Left shoulder anterior posterior, -y-outlet view radiographs: —unremarkable left shoulder EMG left upper extremity: —normal electrodiagnostic study without evidence of brachial plexopathy or peripheral neuropathy MRI brachial plexus: —normal MRI Left forearm, humerus, and shoulder MRI: —normal MRI Cervical Spine MRI: —normal study

FINAL WORKING DIAGNOSIS: Conversion Disorder

TREATMENT AND OUTCOMES: 1. Relative rest, ice, compression and NSAIDs for 4 weeks with no improvement. 2. Activity modification demonstrated minimal improvement in shoulder pain 3. Range of motion, shoulder, and neck strengthening exercises with minimal improvement in symptoms 4. Further history revealed adjustment issues with college life, family stressors 5. Psychology consult placed and cognitive behavioral therapy started 6. Further follow-up with team physician revealed complete resolution of symptoms and progressive return to play protocol was initiated.

HISTORY: A 20-year-old collegiate baseball player left hand pitcher, developed left arm pain and swelling. His symptoms started after hunting with a shotgun, holding the gun to his left shoulder. He had no known other injuries. The first night he noticed stiffness localized to his chest and pectoral area. The following morning his left hand, forearm and arm were swollen and mildly discolored with prominent veins. His hand also felt funny and heavy. He had no chest pain or dyspnea. He continued to participate in baseball until he brought this to the attention of his athletic trainer two days later. He then presented to the emergency room for further evaluation.

PHYSICAL EXAMINATION: BP 130/70 mmHg | Pulse 62 | Temp 36.6 °C | Resp 18 | Ht 1.90 m | Wt 90.719 kg | BMI 25.00 kg/m2 | Spo2 98% Constitutional: Alert, no distress. Neck: Supple, non-tender. Cardiovascular: Heart regular rate and rhythm, no murmur. Respiratory: Lungs clear. Extremities: Diffuse swelling and mild duskniness of the left upper extremity compared to right. Prominent, dilated veins on left upper chest. Slight deep tenderness with palpable but weak pulses. Arm circumference was 33.5 cm on the left and 32 cm on the right. Forearm circumference was 29.5 cm on the left and 28 cm on the right. Strength was normal. Neurological: Normal sensation to light touch.


TEST AND RESULTS: Chest radiographs: - Clear lungs. Normal cardiac silhouette and pulmonary vasculature. Left upper extremity duplex ultrasound: - Acute venous thrombosis with total obstruction of the left subclavian vein and left axillary vein. The internal jugular, brachial, basilic and cephalic vein were patent. Labs: - Normal CBC and metabolic panel

FINAL WORKING DIAGNOSIS: Paget-Schroetter Syndrome - Acute venous thrombosis with total obstruction of the left subclavian and axillary veins.

TREATMENT AND OUTCOMES: 1. Anticoagulation with heparin drip. 2. Venous thrombolysis, mechanical thrombectomy and angioplasty via interventional radiology. 3. Left first rib resection via transaxillary approach done 7 days after initial presentation. 4. Return to pitching with return of full velocity by 8 weeks post operatively with no residual symptoms or recurrence.

Recent evidence suggests that light activity (LA) as well as moderate to vigorous physical activity (MVPA) are associated with reduced mortality from all causes. Physical fitness (PFiT) is also associated with better health maintenance and functionality, particularly among elders. However, the association between LA and PFiT components has not been explored in this population. Purpose: To evaluate the association between PFiT and LA, LA to MVPA (LMVPA), and MVPA in a group of Hispanic elders in Puerto Rico. Methods: Sixty-two elders (24 females, 38 males; mean age= 76.4±8.4 yrs) completed a battery of PFiT testing (sit and reach for flexibility, hand dynamometer and arm curls in 30 sec. for muscle strength and resistance, distance in 6 min for cardiorespiratory fitness, and foot up and go for agility), and wore an ActiGraph accelerometer (GT3X-1) attached to a waist band during 7 consecutive days. Wilcoxon rank-sum tests were conducted to detect differences by sex, and spearman correlations to determine associations between PFiT, LA, MVPA, and LMVPA. Results: PFiT and physical activity variables were not different between females and males; but some differences were detected in some anthropometric variables (WHtR, 0.60±0.07 vs. 0.91±0.07, and muscle resistance = 18.3±3.3 vs. 15.4±4.9, respectively, P<0.05). (LA (27.7±11.5 hr/day), MVPA (59.7±118.0 min/week) and LMVPA (28.7±12.3 hr/day) correlated with cardiorespiratory fitness (0.30, 0.31, 0.28; respectively, P<0.03) time in agility test -0.38, -0.27, -0.35; respectively, P<0.04), and muscle strength (0.29, 0.26, 0.28; respectively, P<0.05). Flexibility correlated only with LA and LMVPA (0.30, 0.29; respectively, P<0.04). Conclusion: Our results suggest that LA as well as LMVPA positively influence cardiorespiratory fitness, agility, muscle strength and flexibility components of PFiT in Hispanic elders. Therefore, LA could be integrated in physical activity recommendations for this population.

Falls are a major factor affecting mortality and morbidity in older individuals. Proprioception is a central factor modulating fall frequency and severity. Although specific protocols have been developed to improve proprioception in older fallers, many are too challenging or not palatable to a large segment of the population. Purpose: Given the current popularity of yoga, and the effectiveness of mental interventions and programming in Older Fallers

Savannah V. Wooten1, Kiersten Mooney2, Sohil S. Desai1, Amelia K. Paine3, Joseph F. Signorile1, University of Miami, Miami, FL. ‘Green Monkey Yoga, Coral Gables, FL. (Sponsor: Arlette C. Perry, FACSM)
Exercise tolerance is instrumental to obtain the health benefits associated with physical activity in older adults. During cycling an “excess” in oxygen cost (VO₂) relative to power output (PO) may be accessible above the lactate threshold (LT). This loss of muscle efficiency, of which type I fibers fatigue and/or increased type II fibers recruitment are putative causes, impairs exercise tolerance. We tested the hypothesis that strength training, by increasing maximal force and reducing the recruitment of high-threshold motor units at a given exercise intensity, will reduce the “excess” VO₂. METHODS: 8 healthy older males (67±5yrs) performed 5-weeks of ST (three, one-hour sessions per week). Pre and Post training we measured muscle strength (IRM Squat and Deadlift) and performed an incremental cycling test to exhaustion to determine: i) peak power output (PO_max) and VO₂peak ii) the slopes of the VO₂/PO relationship below (S) and above (Sₜ) the LT (modeled using a double-linear fit). Parameters were compared with paired t-test. RESULTS: Following strength training, muscle strength and PO_max increased (+24 ± 9 % Squat, + 30 ± 16 % Deadlift; +8 ± 7 % POₚₜ; p<0.05) while VO₂max did not change (+2 ± 5 %, p=0.05). No “excess” VO₂ was present before (Sₜ=10±6, S=7±5 ml-min⁻¹-W⁻¹, p=0.86) or following strength training (Sₜ=9±5, S=7±2.7 ml-min⁻¹-W⁻¹, p=0.38). However, Sₜ significantly decreased (Δ=1±1 ml-min⁻¹-W⁻¹, p=0.04) after training. CONCLUSIONS: The “excess” VO₂ typically displayed by young subjects was absent in our older adults. An age-related selective atrophy of type-II muscle fibers may explain the absence of a loss of efficiency in the heavy-intensity domain in older adults. Strength training significantly improved muscle strength by ~30% and was associated with a reduction of VO₂/PO relationship in the moderate-intensity domain (i.e. reduced Sₜ). This finding entails an improved efficiency of type-I fibres contraction in the moderate-intensity domain following training. Although further studies are warranted to identify a direct cause-effect relationship, this finding supports a role of strength training in improving aerobic exercise tolerance through an improvement of muscle efficiency in the moderate-intensity exercise domain.

Board #4
June 1 2:00 PM - 3:30 PM
Effects Of Long-term Elastic Resistance Training On Oxidative Damage Of DNA In Older Adults
Phil Page, FACSM⁵, Juan C. Colado⁶, Guillermo Sacz⁵, Pedro Gargallo⁴, Amaya Hernando¹, Nuria Estañ³, Alvaro Juesas³, Victor Muñoz³, Victor Tella³, Michael E. Rogers, FACSM⁷.
1Louisiana State University, Baton Rouge, LA. 2University of Valencia, Valencia, Spain. 3University Hospital Dr. Peset, Valencia, Spain. 4Witchita State University, Wichita, KS. 5University of Antioquia, Medellín, Colombia. 6Santo Tomás University, Bogotá, Colombia. 7University of Santo Tomás, Bogotá, Colombia.

It is theorized that age-related physiological changes are a consequence of the accumulation of random oxidative damage to deoxyribonucleic acid (DNA), lipids, and proteins. The major by-product of oxidative DNA damage, 8-Oxo-7,8-dihydro-2'-deoxyguanosine (8-oxo-dG), is the most extensively analyzed oxidative stress marker. The concentration of this biomarker increases as age increases. A higher concentration of 8-oxo-dG is related to conditions such as Alzheimer’s disease and oncogenesis. Despite the multiple benefits of resistance training on the aging process, the effect upon mitochondrial function and oxidative stress in older adults is unknown. Purpose: To determine the effects of a long-term, moderate-intensity elastic resistance training (ERT) program on oxidative damage of DNA in older adults. Methods: 46 sedentary older adults (69 ± 5.1 yr) were randomized into two groups: Control Group (CG) (n=15) and ERT group (ERTG) (n=31). A 32-wk ERT program was performed 2d/wk with 6 exercises (3 for upper and 3 for lower extremities) completed for 4 sets of 15 repetitions. Perceived effort was 6-7 on the OMNI-RES scale for elastic bands during the first 4 wks and at 8:9 for the final 28 wks. Urine 8-oxo-dG was analyzed using high-performance liquid chromatography at baseline, 16 and 32 wks. Urinary levels of 8-oxo-dG were calculated relative to creatinine levels. Trial (3) by group (2) repeated measures ANOVA was used to determine differences. Results: 8-oxo-dG was not different between groups at baseline (CG: 3.20 ± 2.51; ERTG: 3.72 ± 2.47 nmol/mmol creatinine). ERTG showed a significant (p<0.05) decrease in 8-oxo-dG for time and group of 26.07% at 16 wks and 49.43% at 32 wks. Conclusion: It is possible to reduce oxidative damage of DNA in older adults through regular ERT performed at moderate intensity. A longer training duration introduces greater effects on oxidative stress metabolism. These results highlight the possibility of using a non-invasive and low-cost diagnostic method in conjunction with a simple and inexpensive ERT to prevent oxidative stress in older adults.

Aging is associated with physiological declines that impair the ability to perform activities of daily living and increase fall risk. Specifically, older adults demonstrate poorer medio-lateral (ML) postural control and hip abductor muscle (ABD) performance as compared to young adults, and fallers demonstrate greater declines than non-fallers. Moreover, individuals with poorer ML postural control also have weaker hip abductors. PURPOSE: The purpose of this study was to investigate the effects of an introductory golf training program on dynamic ML postural control and hip ABD performance in an older military veteran. METHODS: One older military veteran (74 years old) completed 12 weeks of an introductory golf training program (2-90 minute sessions/week) that began with introductory swing training and progressed to regular golf play. Pre- and post-training, ML postural control was assessed via a choice reaction step task (10 trials). Weight-shift time, step time and movement time were calculated for 5 trials when stepping with the left limb. Peak hip ABD isotonic torque and rate of torque development (RTD) was assessed utilizing a previously validated weight-bearing assessment (3 trials). RESULTS: Weight-shift time, step time and movement time decreased by 8.1%, 19.15% and 19.26%, respectively. Peak hip ABD torque increased 16.1% (0.81 N/kg to 0.94 N/kg) and RTD increased in the first 200 ms of the isotonic contraction 83.62% (1.19 N/kg s to 2.19 N/kg s). CONCLUSION: Following the 12-week golf intervention, the participant was able to shift his weight and execute the step more rapidly, resulting in a shortened movement time and providing evidence of improved dynamic ML postural control. Additionally, the hip ABD performance improved as evidenced by increases in peak torque and RTD. The golf swing is initiated through near maximal activation of the gluteal musculature resulting in hip abductor torques on par with drop jump landings. Additionally, during a swing, the golfer rapidly shifts the center of pressure through a large range of the base of support. The demands of the golf swing likely served as a training stimulus to improve the ML postural control and hip ABD performance of our older military veteran, suggesting that golf is a viable physical activity intervention to attenuate declines associated with aging.
RESULTS: There were significant differences in body weight (GE=12% vs CG=15%; p=0.01), BMI (GE=1.56 vs CG=1%; p=0.023) and WHI (GE=1.56 vs CG=1%; p=0.042). Differences in SJ, CMJ, CMJas height (jump height), flight time and Take off velocity and gait parameters (Centre of pressure, p<0.033) were found between GE vs CG (IG vs CG ~ (p<0.05 and 0.001), with positive changes for GE.

CONCLUSIONS: The results suggest that 32 weeks of training with explosive and impact movements in swimming pools improves the strength expressions and reduces significant adaptations in gait parameters, but not enough to the body composition.

Falls are the leading cause of death by injury and most common cause of nonfatal injuries among adults 65 years and older in the United States. Current evidence suggests that at least 1 in 3 persons 65 years and older will experience a fall each year. Modifiable risk factors such as muscle weakness, mobility, and balance have been identified. Therefore, it is important to identify interventions that can positively alter the risk factors and decrease falls risk.

PURPOSE: To determine the effects of an exercise intervention on falls risk in aging adults with a history of falling.

METHODS: Twenty-two aging adults (74.41±7.57 years; 1.62±.10 m; 78.58±19.20 kg) with a falls history (Fallers) completed this study. An 8-week intervention program utilizing the LEBED method, a dance therapy program, was implemented for 1 hour, twice per week, and attendance was recorded at each session. A Faller was defined as a participant who had fallen within the year prior to the study. Falls risk scores (FRS) were calculated using the NeuRA FallScreen® Physiological Profile Assessment (PPA) at pre- and post-intervention. The components that make up the composite FRS include proprioception, leg strength, balance, reaction time, and visual acuity. Pre- and post-intervention FRS were compared. A repeated measures ANOVA with post-hoc analysis was used to compare falls risk.

RESULTS: The average attendance during the 8-week intervention was 73.6±15.4%. There was no statistical significant difference between pre- and post-intervention (p=0.05). Falls risk scores (FRS) were calculated using the NeuRA FallScreen® Physiological Profile Assessment (PPA) at pre- and post-assessment with an alpha set at p<0.05.

CONCLUSIONS: This study compared pre- and post-assessment FRS in aging adults after an 8-week dance therapy intervention. Results indicate that the intervention was not effective in influencing the composite FRS in aging adults with a history of falls. However, investigation of the individual PPA components might show improvements in specific areas. Analysis of each PPA component may represent important improvements for falls risk. Further research should consider length of intervention, larger sample size, and frequency of sessions and respective attendance to design targeted intervention programs to decrease falls risk.

Research supported by grant from the Potomac Health Foundation.
there was a significant difference regarding cIPWV between the AR and RA groups (P < 0.05). cIPWV significantly reduced in the RA group (8.8±2.1 m/s to 7.6±1.9 m/s; P < 0.05), while increased in the AR group (7.9±2.8 m/s to 10.0±2.6 m/s; P < 0.01).

CONCLUSIONS: Based on our results, no effects of different intra-session exercise order were observed regarding body composition and muscle strength. However, aerobic exercise after resistance training reduced arterial stiffness and difference of exercise order was observed.

1998 Board #11 June 1 2:00 PM - 3:30 PM Effects Of Periodized Resistance Training On Sarcopenia Classification In Older Inactive Women Samuel G. Slezak, Emily N. Renna, Kayla B. Mahoney, Ingrid E. Lofgren, Furong Xu, Matthew J. Delmonico, Disa L. Hatfield. University of Rhode Island, Kingston, RI.

(SF) 2018 to 2019, (3) F2010, (4) Spr2015, and (5) Spr2016. At the completion of the sessions were arranged with the 5-6 collaborators and conducted in fall/spring: (1) and 8-FOOT up-and-go. Paired t-tests were used to analyze pre-and-post scores. Test administered: CHAIR stand, ARM curls, 2-min STEP, sit-and-REACH, BACK scratch, 90+ years. Six tests for strength, aerobic fitness, flexibility, and dynamic balance were collaborative teams that used standardized tests to measure changes in classification variables to impact overall sarcopenia classification. However, these at maintaining levels of lean mass, does not elicit significant changes in sarcopenia (EWGSOP, p = 0.392; IWG, p = 0.841; FNIHSP, no criteria. There were no significant between group changes in distribution frequency at p≤0.05.

CONCLUSIONS

of sarcopenia intervention in older adults. Goal setting, self-monitoring and time management were used most in this population. Goal setting, self-monitoring and time management were used most frequently following the intervention.

1999 Board #12 June 1 2:00 PM - 3:30 PM Structured Exercise Classes And Non-structured Exercise Increase Functionality In Older Adults C.A. Juergens1, B. N. Thomas2, D. E. Lankford, FACSM2, J. Pearson Scott3. 1Park County, Livingston, MT. 2 Brigham Young University-Idaho, Rexburg, ID. 3 Texas Tech University, Lubbock, TX. (No relationships reported)

Advancing age is typically associated with decreases in aerobic capacity and strength and loss of muscle mass and bone density. Evidence-based community exercise programs that emphasize strength, flexibility, and balance have been shown to improve functionality and increase independence. Pre-and-post assessment is critical to measuring program success and individual improvement. PURPOSE: To provide a summary of five collaborative teams that used standardized tests to measure changes in functional fitness scores among adults. METHODS: Adults ranged in age from 39-90+ years. Six tests for strength, aerobic fitness, flexibility, and dynamic balance were administered: CHAIR stand, ARM curls, 2-min STEP, sit-and-REACH, BACK scratch, and 8-FOOT up-and-go. Paired t-tests were used to analyze pre-and-post scores. Test sessions were arranged with the 5-6 collaborators and conducted in fall/spring: (1) F2006, (2) F2010, (3) F2010-FOOT, (4) Spr2015, and (5) Spr2016. At the completion of the pre-tests, collaborators provided individual feedback and exercise recommendations to the adults and encouraged enrollment in a fitness class. RESULTS: Significant pre-and-post results, Mean (SD), were found for the following tests. Fall2008 CHAIR: M = 14.29 (2.27), M = 21.21 (5.19), p = 0.001; ARM: M = 16.79 (2.36), M = 21.51 (3.80), p = 0.005; EIGHT-FOOT: M = 5.44 (1.33), p = 0.001. Fall2010 CHAIR: M = 18.14 (2.67), M = 22.00 (2.52), p < 0.005; ARM: M = 24.86 (3.49), M = 27.86 (3.63), p < 0.01; STEP: M = 144 (9.60), M = 131 (7.63), p < 0.005; Fall2014-to-Spr2015 CHAIR: M = 14.73 (3.26), M = 18.07 (3.10), p < 0.001; ARM: M = 16.20 (2.65), M = 20.73 (3.31), p < 0.0001; STEP: M = 90 (15.15), M = 108 (18.63), p < 0.001; REACH: M = 1.55 (2.58), M = 3.57 (3.52), p < 0.05; Spring2016 ARM: M = 17.32 (4.66), M = 196.04 (5.47), p < 0.05; EIGHT-FOOT: M = 5.67 (1.40), M = 5.16 (1.03), p = 0.05. CONCLUSIONS: Significant results indicating improved functionality were found for each testing session. Greater improvements were reported with longer time periods between pre-to-post assessment (e.g., F2014-to-Spr2015) and for 2 sets of test results administered only to adults enrolled in two evidence-based prevention/intervention programs (F2008 & F2010).

Regular physical activity can reduce the risk of falls, hypertension, osteoporosis, stroke, and diabetes, yet only 27-34.3% of older adults meet recommended physical activity (PA) guidelines. Use of self-regulation (SR) techniques may increase compliance in a group-based behavior change PA intervention for older adults, yet it is unclear which SR strategies are effective in older adults to increase PA level and stay active. PURPOSE: The purpose of this study is to examine change in PA; and improvement in the use of SR techniques employed by individuals in a 10-week exercise and lifestyle behavior change program for older adults (age=72.3, yrs±8.0) completed a 10-week group exercise and lifestyle behavior change program called Physical Activity for Life for Seniors (PALS). Three days/ week over 40 weeks, participants completed ten exercises in a circuit, at 1 minute intervals. The 30-minute lifestyle behavior change class included SR problem solving techniques for staying active. SR was measured using the Self-Regulation for Exercise Scale (1=never to 5=very often) which examined SR techniques for self-monitoring, goal setting, social support, reinforcement, relapse prevention and time management. PA was measured using the CHAMPS questionnaire (caloric expenditure/week). Significant differences (p<0.05) in response to the intervention were identified using paired t-tests. RESULTS: In this population of older adults, significant improvements in PA were noted in SR techniques (SR self-monitoring: 1.75±3±2.19; SR goal setting: 1.55±3±3.0; SR social support: 1.35±3±2.0; SR reinforcement: 1.92±3±2.7; SR relapse prevention: 1.45±3±2.1; SR time management: 1.45±3±2.0) and total PA energy expenditure: 2143.31±2153.24 vs 4092.99±2635.78; moderate to vigorous energy PA expenditure: 742.84±476.07 vs 2366.96±2122.94). CONCLUSIONS: These results suggest that including SR strategies in a 10-week group exercise and lifestyle behavior change intervention can lead to an increase in total PA, especially the moderate to vigorous PA in this population. Goal setting, self-monitoring and time management were used most frequently following the intervention.

2001 Board #14 June 1 2:00 PM - 3:30 PM The Psychometric Properties Of The Self-efficacy For Walking Scale In Community-dwelling Older Adults Katie J. Thrall1, Susan S. Levy2. 1 San Diego State University/ University of California, San Diego, San Diego, CA. 2San Diego State University, San Diego, CA. Email: kthrralls@spu.edu (No relationships reported)

The Self-efficacy (SE) for Walking Scale, developed by McAuley et al., (2000), targets an individual’s confidence (range 0-100) to walk briskly for a duration of time. PURPOSE: The purpose of this study was to analyze the psychometric properties of the SE for Walking Scale in community-dwelling older adults, a 6-item scale with increasing 10-minute intervals (0 to 60minutes).

METHODS: Participants (N=300, M =73.8±8.2 yrs) were recruited from senior centers and completed the following: 1) SE for Walking Scale, 2) 6-minute walk test (Rikli & Jones, 1999), and 3) self-report aerobic physical activity (PA). Data were analyzed in RStudio for internal consistency reliability and concurrent validity with walking performance and PA level.

RESULTS: The SE for Walking Scale was scored using the mean score of all items (M=58.4±34.4). There was high internal consistency reliability across all items (r >0.6) and correlations of each item with the overall mean score ranged from 0.80 to 0.98. Concurrent validity with walking performance (M=431±119yds), as measured by yards walked in 6 minutes, was moderate (PPCM<0.56; there was no correlation with current aerobic PA level (PPCM<0.15; M=220±284min/wk)).

CONCLUSIONS: The SE for Walking Scale in community-dwelling older adults has evidence of reliability and moderate correlation with walking performance. However, the non correlation with current PA level may suggest other important constructs, such as: intention, previous experiences with PA, or social support, influence relationships between self-efficacy, ability, and actual current physical activity behavior. These additional constructs may be important considerations in PA interventions in older adults.
**2002 Board #15 June 1 2:00 PM - 3:30 PM Effects Of A Physical Exercise Program To Improve The Level Of Independence In Elderly**  
Email: eloaiiza@unach.edu.ec

**PURPOSE:** Previous studies showed that some older adults can carry out basic activities of daily living (BADL) independently, but with some difficulty generating daily problems in their community and their home. However, little is known about implement exercise programs in elderly population. The aim of this study was to investigate the effect of a physical exercise program on the level of independence in the elderly population.

**METHODS:** This study involved a total of 52 elderly participants between 62 and 89 years of age (71.2% female) who attended to Comprehensive Care Center Senior Adult from Ecuador. Participants were randomized into a control group (CG, n=36) and experimental group (EG, n=36), which performed a physical exercise program (3 months; 3 days per week/45 minutes per session). The assessment to determine the level of independence was carried out through validated BARTHEL test which evaluated BADL with the following ranges of scores: 0-20=total dependence, 21-60=severe dependence, 61-90=moderate dependence, 91-99=little dependence, 100=total independence. Data were recorded at baseline and 4 weeks post-test (10-20 min during the intervention and in the end of the intervention period). A descriptive analysis of frequencies and percentages in order to determine the change of the range of independence was used for qualitative variables. A factorial ANOVA of repeated measures was applied to analyze the effects and interactions between the factors: study groups and measure moments on the Barthel test overall score (20 to 100).

**RESULTS:** Experimental group showed trend towards to increase Barthel overall score (MD=11.77;1.26; p=0.006) compared to the control group after intervention. Post-intervention, experimental group showed an increase of 15.4% of participants with total independence, whereas control group only increased 3.8%.

**CONCLUSIONS:** A 3-months physical exercise program could improve the levels of independence in the elderly population; however, it could be necessary long-term interventions.

**2003 Board #16 June 1 2:00 PM - 3:30 PM Disease Burden is Associated with Differences in Diurnal Patterns of Physical Activity in Older Adults**  
Anna Kuegler1, Morgan Gralla1, Jennifer Schrack1, Nicholas Knuth1, Towson University, Towson, MD. Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.  
(No relationships reported)

Physical activity is an important risk factor for disease and functional outcomes with aging. Measurement of objective physical activity by accelerometry has become common in recent years and is often reported as total or average daily physical activity. However, a better understanding of the diurnal patterns of physical activity may elucidate the associations among physical activity, disease, and functional outcomes in older adults.  

**PURPOSE:** To evaluate the relationship between disease burden and objectively measured physical activity, overall and by time-of-day.

**METHODS:** Two strategies: 1) Pilot study to implement an exercise program in a group of 16 older adults with 2 chronic diseases vs. a control group with 1 chronic disease; 2) Completed study of 89 older adults with 8 chronic diseases. Disease burden was categorized as either low (0-2 chronic diseases) or high (3 or more). Disease burden was calculated as the sum of eight different diseases (hypertension, high cholesterol, heart disease, diabetes, arthritis, respiratory disease, gastrointestinal disease, and psychological well-being). Disease burden was categorized as either low (0-2 chronic diseases) or high (3 or more). The association between the mean of the log-transformed activity counts and disease burden was modeled overall and across each time bin using linear regression, adjusting for age, sex, and BMI.  

**RESULTS:** Total 24-h PA (counts) was lower in those with high disease burden compared to those with low disease burden (3.2±106 vs. 3.8±106 vs. 3.3±106 vs. 1.0±106 counts, p < 0.01). When examining diurnal patterns, early morning (4:00am-8:00am), afternoon (noon-4:00pm), and early evening (4:00pm-8:00pm) PA was lower in those with high disease burden compared to individuals with low disease burden (p<0.05 for each period).  

**CONCLUSIONS:** Disease burden was lower in older adults with high chronic disease burden, particularly in the late afternoon and evening. Interventions aimed at increasing PA in older adults with multiple chronic conditions should consider targeting daily nadirs of activity by promoting PA during the afternoon and evening when their activity is typically lowest.
prior versus all games post-concussion). Dependent variables were compared with a 2 (Group) × 2 (Time) repeated measures ANOVA and a conservative alpha value of 0.01 was set due to lack of variable independence. RESULTS: There were no significant interactions between groups for the 5 game analysis. Significant interactions were noted only for Time on Ice - Percentage (percentage of time a player was on the ice) for 10 games (Concussion: -0.59%, Control: -0.97%; P<0.001, d=0.007) and full season (Concussion: 0.34% change, Control: +0.96%, P=0.04, d=0.055). Several variables including high danger scoring chances and PDO (on-ice save percentage, on-ice goals, Corsi percentage) were below 0.05, but effect sizes were less than 0.1; suggesting the differences were not meaningful. CONCLUSIONS: These results suggest there are no meaningful performance differences in NHL players upon return from SRC. The only significant finding was an inconsistent change in time on ice following injury, but the effect sizes were very small (Cohen’s d=0.06). These findings are consistent with previous studies which found little impaired performance in professional hockey or basketball players upon return from SRC.

2006 Board #19
June 1 3:30 PM - 5:00 PM

Head Impacts In Men's Lacrosse: Incidence And Force Application

Christian Merritt, Nick Wirth, Paul Visich, John Roseen.
University of New England, Biddeford, ME.

Email: cmerritt1@une.edu

(No relationships reported)

Men’s Lacrosse players are susceptible to Sports Related Concussions (SRC’s) due to magnitude and frequency of head impacts during practices and games. Currently there is a paucity of data quantifying head impacts in men’s lacrosse. PURPOSE: The purpose of this study was to quantify the magnitude and frequency of head impacts in a NCAA Division III men’s lacrosse team over a six-week period (second half) of the regular season. METHODS: Twenty-three men’s lacrosse players were helmet impact monitors during five home games and fourteen practices. The head impact sensor was placed in a head band and positioned underneath the nuchal line in the back of the head. Analyses were completed for magnitude, frequency, player position, and location of head impacts comparing games vs. practice. RESULTS: A total of 269 head impacts were recorded, 133 during games and 136 during practice. There was no significant difference (p=0.05) in peak linear acceleration between games and practices (37.18 ± 15.47g vs. 36.8 ± 14.4g), peak rotational acceleration (4.15 ± 2.29g vs. 3.96 ± 2.07g), and peak rotational velocity (16.44 ± 8.89g vs. 16.32 ± 8.59g). In games there were 5.78 ± 6.90 impacts per player, while in practice there were 5.91 ± 3.79 impacts per player, which resulted in no significant difference (p=0.05). For positions, there was no significant difference (p=0.05) in peak linear acceleration across all positions. Location of impact resulted in no significant difference (p=0.05) for all six locations measured; crown, base, left, right, front, and back of the head. CONCLUSION: Magnitude and frequency of head impacts in NCAA Division III men’s lacrosse did not differ between practices and games during the second half of the regular season, nor were head impacts position dependent. Further research is required to understand the potential implications of head impacts in men’s lacrosse.

2007 Board #20
June 1 3:30 PM - 5:00 PM

Sleep Quality and Concussion Recovery Utilizing Subjective Sleep Assessments

Nicole L. Hoffman, Emily H. Miller, Michelle L. Weber, Julianne D. Schmidt. University of Georgia, Athens, GA.

(No relationships reported)

Sleep is pertinent in maintenance of cognitive functions including learning and memory formation, and may play a role in brain recovery following concussion. However, the relationship between sleep quality and concussion recovery remains unclear. PURPOSE: To determine if post-concussion sleep quality, as measured by subjective sleep assessments, influences days to recovery. METHODS: Seventeen college-aged participants (age: 19.6±1.2years, height: 174.3±9.4cm, mass: 76.4±23.6kg) were recruited following concussion diagnosis by a physician. Once clinically recovered based on symptom severity, neurocognitive, and balance performance scores, participants completed the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) to assess for sleep quality since concussion. Analyses included PSQI global scores, PSQI individual scores from seven sleep components: duration, disturbance, latency, day dysfunction, efficiency, overall-quality, and medication, and ESS total scores. We considered PSQI global scores ≤5 “good sleep quality” and >5 “poor sleep quality”. ESS scores ≤10 indicated lesser fatigue and >10 greater fatigue based on published cutoffs. Pearson’s correlations were conducted to determine the relationship between sleep quality outcomes and days to recovery. Independent samples t-tests were performed comparing days to recovery between participants with 1) good and poor sleep quality and 2) lesser and greater fatigue (n=0.05). RESULTS: We found that greater sleep efficiency following concussion was strongly correlated with fewer days to recovery (r=0.66, p=0.004). Days to recovery did not significantly differ between participants based on sleep quality (good quality: 15.3±5.5days; poor quality: 24.4±30.8days; t(14)=−0.65, p=0.548). Fatigue-related groups did not differ based on days to recovery (lesser fatigue: 14.8±6.3days; greater fatigue: 12.3±2.2days; t(14)=−0.79, p=0.442). CONCLUSION: Participants with better sleep efficiency were more likely to recover faster compared to those with poorer sleep efficiency. Sleep efficiency may be an important factor in brain recovery. Clinicians should consider providing educational sleep interventions with a focus on maximizing total time asleep compared to total time in bed following concussion.

2008 Board #21
June 1 3:30 PM - 5:00 PM

Relationship Between Subconcussive Impacts on Clinical Measures of Neurologic Function in College Women’s Soccer Players

Jason P. Mihalik1, Elizabeth F. Teel1, Erin B. Wasserman2, Stephanie A. Amal2, Margot Putukian, FACSM3. 1University of North Carolina at Chapel Hill, Chapel Hill, NC. 2Datalys Center for Sports Injury Research and Prevention, Indianapolis, IN. 3Princeton University, Princeton, NJ. (Sponsor: Margot Putukian, FACSM)

Email: jmhalki@email.unc.edu

(No relationships reported)

Sport concussions have been associated with acute and chronic neurologic impairment. The specific contribution of sub-concussive impacts in women’s soccer has not been adequately studied. PURPOSE: To explore the relationship between sub-concussive head impacts on clinical measures of neurologic impairment in Division I women’s soccer players. METHODS: College women’s soccer players (n=19) completed two clinical measures of neurologic function (pre- and post-season) commonly employed when evaluating concussion. These tests included computerized neurocognitive testing (CNS Vital Signs) and the Balance Error Scoring System (BESS). Peak head linear and rotational accelerations were recorded using the X2Path. Statistical analyses included 12 separate multiple linear regression analyses (enter method on change scores (preseason minus postseason) computed for each of our dependent variables, including all CNS Vital Signs standard scores and the BESS total errors. The 5 independent variables included for each analysis consisted of: (1) head impact frequency, (2,3) head impact frequency exceeding the sample’s 95th percentile (linear and rotational), and (4,5) the total impact cumulative magnitude (linear and rotational). RESULTS: College women’s soccer players sustained a median of 78 head impacts over the course of a single season. We observed significant regressions for Composite Memory (p=0.02, R²=0.71), Verbal Memory (p=0.04, R²=0.64), Visual Memory (p=0.04, R²=0.65), and Reasoning (p=0.03, R²=0.68), but none of the other CNS Vital Signs or BESS outcomes (p>0.05; R² range: 0.25–0.58). In most cases, total head impact frequency had a positive effect (improvement), yet the total impact cumulative magnitude had a deleterious effect on observed change scores. CONCLUSION: With the few exceptions noted above, any changes in performance were widely independent of total impact frequency, severity (>95th percentile), and cumulative impact magnitude over one season. Repetitive sub-concussive head impacts over a single season do not result in worsened short-term neurologic impairment. The effect of cumulative head impact burden should be further investigated to determine long-term changes resulting from a potential dose–response over a player’s career. Supported by NOCSAE.

2009 Board #22
June 1 3:30 PM - 5:00 PM

Dynamic Balance Deficits Following Concussion

Robert C. Lynall1, Kody R. Campbell2, J Troy Blackburn2, Kevin M. Guskiewicz, FACSM2, Stephen W. Marshall2, Prudence Plummer2, Jason P. Mihalik1. 1University of Georgia, Athens, GA. 2University of North Carolina at Chapel Hill, Chapel Hill, NC. (Sponsor: Kevin Guskiewicz, FACSM)

Email: rlynall@uga.edu

(No relationships reported)

Dynamic balance deficits during gait have been observed following concussion and often linger beyond an athlete’s return to activity. However, there are limited data describing balance performance following functional movement tasks. PURPOSE: To determine if participants with a concussion history demonstrate dynamic balance deficits compared to control participants during single leg squats and single leg hops. METHODS: Participants with a concussion history (n=15, median time since concussion=126 days; range 28-432) were matched by age, mass, and height to control participants (n=15). Participants performed single leg squats while standing on a force plate from which center of pressure path and speed were obtained. During single leg hops, participants jumped off a 30cm box placed 50% of their height behind a force plate, landed on a single leg, and attempted to come to a stable position as quickly as possible. Single leg squat outcomes were averaged across legs as there were no between leg differences (p=0.480; dominant leg=leg participant kicks ball with). Time to stabilization (TTS; time taken for center of pressure to stabilize after landing) was calculated for the single leg hop, and each leg was analyzed separately due to concerns with between leg differences (p>0.05). Groups were compared using...
ANCova, controlling for average days since concussion. RESULTS: No group differences were observed for single leg squat center of pressure path (p=0.197) or speed (p=0.765). Dominant leg TTS was not different between seasons with pre-season neck pain, decreased balance, and/or headache as 2.4 to 3.65 times more likely to suffer concussion. The purpose of this study was to evaluate multiple baseline metrics as identifiers of risk for musculoskeletal and/or concussive injury. METHODS: 15 female high school varsity soccer athletes, mean age of 15 years (±1.2) and mean BMI of 20 (±2.4), were assessed using pre-season movement screens including King-Devick (K-D), balance error scoring system (BESS), lower quarter Y-balance test (LQ-YBT), and functional movement screen (FMS). Historical data was collected for neck pain, dizziness, and headache, and injuries were tracked during the competitive season. RESULTS: K-D score was 47.06 (±5.66) seconds. BESS score was 10.39 (±4.18) seconds, right LQ-YBT composite was 94.4 (±5.5) and left was 94.5 (±5.0). FMS score was 15.11 (±2.04). No statistical significance was identified in this study directly linking pre-season metrics as indicators for musculoskeletal or concussion injury. Conussion had correlation trends with each of the following pre-season metrics: history of prior concussion, pre-season headache, and neck pain. Statistical significance was found for individuals with pre-season neck pain who later suffered a musculoskeletal and/or a concussion injury (Fischer’s Exact test = 0.04). CONCLUSIONS: Pre-season metrics failed to identify athletes at risk of suffering a musculoskeletal injury or concussion. The data identified a possible link between pre-season neck pain and later injury or concussion and a correlative trend between pre-season metrics and musculoskeletal or concussion injury. Small sample size limited the power and generalizability of the study. The ability to identify those at risk of musculoskeletal injuries and/or concussion from simple pre-season metrics including prior history, current symptoms, and movements may be an important step in making youth athletic participation safer. Further studies with larger data sets using similar pre-season metrics may demonstrate utility for identifying individuals at risk for musculoskeletal and/or concussion injury.

Nearly 70% of US football players are younger than high school age, yet little is known about the potentially damaging effects of repetitive sub-concussive head impacts in this population. Objective measures of neurologic function used to evaluate concussions may be useful for assessing neurologic impairment in non-concussed players. PURPOSE: To assess neurologic function of youth football players before and after a full season using selected clinical measures commonly used for concussion evaluation. METHODS: During a five year span (2011-2015), fifty-six middle school (7th & 8th grade) football players (13.0 ± 0.6 yr) were evaluated before (PRE) and after (POST) their respective seasons, using objective, clinical assessments of neurologic function. Sixteen subjects participated for two consecutive seasons, allowing season-to-season (7th vs. 8th grade) subgroup comparisons to be made. Participants were assessed PRE and POST for oculomotor function (King-Devick Test; KD; sec), simple reaction time (RT; sec), and standing balance, performed during an eyes-open (EO) and eyes-closed (EC) condition. Balance testing was performed on a force plate and results were calculated as center of pressure excursion (95% ellipse area; cm²) during the balance task. RESULTS: KD time was significantly faster (P < 0.0001) from POST (50.22 ± 10.56 sec) to POST (46.02 ± 9.75 sec). PRE to POST differences in RT (0.31 ± 0.05 vs. 0.30 ± 0.05 sec; P = 0.12), EO (1.47 ± 0.96 vs. 1.23 ± 0.82 cm²; P = 0.05) and EC (2.20 ± 1.58 cm²; P = 0.41) were significant. Only KD time (55.03 ± 13.65 vs. 47.88 ± 12.48 sec) was significantly different (faster; P < 0.001) when comparing 7th grade PRE to 8th grade PRE measures. CONCLUSION: No short-term deficits in neurologic function were discovered when comparing PRE to POST group means. Oculomotor function assessed by the KD test seems to improve during a youth football season, though it is unclear if a learning effect, maturation and/or other factor(s) may underlie this finding. While these results suggest that short-term impairment in neurologic function is not pervasive in youth football, examination of individual responses and associations with head impact exposure are necessary to fully elucidate the interaction of repetitive head impacts and neurologic function of youth football players.

Purpose: Previously, we conducted a survey and published results that showed that nearly 70% of youth athletes participating in football (97%), hockey (65%), and boys (57%) and girls (47%) soccer (P < 0.01) and the use of sideline screening tools was significantly greater for football (P = 0.03). After publication of the study, state legislation was passed requiring training for coaches and concussion education for all athletes and parents. The purpose of the current study was to examine the effect of this legislation. Methods: A survey link was sent via email to the athletic directors of 108 schools that participated in the original study. They were asked to complete the survey and forward it to coaches and athletic trainers if available. The survey consisted of questions to determine concussion education, management and return-to-play policies in girls’ soccer (GS), boys’ soccer (BS), boys’ football (FB) and boys’ ice hockey (IH). A Chi-Square analysis was conducted to determine statistical significance where appropriate. Results: Ninety participants representing 52 school completed the survey. Participants were asked about concussion education for athletes and parents (92% GS and BS, 94% FB and 77% IH) reported providing education to athletes; 76% GS and BS, 93% FB, 68% IH (reporting education to parents). Generally, participants reported that an athletic trainer (ATC) was routinely present at practices for 60% of the schools for GS, 76% for BS, 93% for FB and 14% for IH. This difference was significant (p<0.001). On-field or sideline screening tools were reportedly used at the schools 64% of the time in GS, 66.7% BS, 80.6% FB and 80% IH (p<0.402). Coaches and ATCs were asked how frequently the athletes self-reported a possible concussion. GS and FB athletes were more likely to report a concussion than BS or IH athletes. Once a concussion occurs, 100% of the schools reported that written authorization from a physician was required prior to return-to-play for all sports Conclusion: Concussion education has improved since the passage of state legislation. In addition, sideline screening tools, while previously used predominantly for boys’ football are now being used in other sports.
Athletes completed a modified sideline concussion assessment tool (m-SCAT) including symptom checklist, Standardized Assessment of Concussion (SAC), modified Balance Error Scoring System (m-BESS), Generalized Anxiety Disorder scale (GAD-7), Patient Health Questionnaire (PHQ-9), and self-report history of concussion, LD, headaches/migraines, and depression/anxiety. Athletes also completed the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT).

Following baseline assessment, all athletes were tracked by athletic medical staff to determine if a prospective concussion occurred during the study period. Athletes diagnosed with concussions were followed by athletic medicine staff. We then compared baseline performance between concussed and non-concussed athletes.

Results:
One hundred forty six athletes were diagnosed with a concussion during the study period. With the exception of concussion history, none of the baseline clinical measures or modifiers were clinically significant. Concussion history significantly predicted future concussion. 10.24% of athletes with no concussion history, 16.35% with one concussion, and 22.12% with ≥2 concussions were concussed prospectively ($X^2(2) = 16.124, p < .001$).

Conclusion:
With the exception of previous concussion history, there were no meaningful pre-injury predictors of subsequent concussion. Though it may be useful to obtain clinical assessments and modifiers at baseline in order to improve management, these assessments do not predict the likelihood of subsequent concussion.

2014  Board #27  June 1 3:30 PM - 5:00 PM  Variation In King-Devick Performance Time By Primary Analysis And History Of A Learning Disorder  Sara P. Chrisman1, Kimberly G. Harmon, FACSAM1, Julianne D. Schmidt2, Thomas W. Kaminski, FACSAM1, Thomas A. Buckley1, Anthony Kontos3, James R. Clugston4, Justus Ortega5. 1University of Washington, Seattle, WA. 2University of Georgia, Athens, GA. 3University of Delaware, Newark, DE. 4University of Pittsburgh, Pittsburgh, PA. 5University of Florida, Gainesville, FL. 6Humboldt State University, Arcata, CA. (Sponsor: Kimberly Harmon, FACSAM) Email: sara.chrisman@seattlechildrens.org  (No relationships reported)

The King Devick (K-D) is a brief screening test for sport-related concussion (SRC) that involves rapid number naming and assessing reaction time, visual-motor function and reading skill. This test has been used to screen athletes for potential SRC by comparing performance on this test with baseline performance. Some authors have recently begun to explore normative data for this test, but little is known about variation in baseline performance time on this test, or how that might affect its utility for SRC detection. PURPOSE: To examine variation in baseline performance time on the K-D test by demographics and medical history. METHODS: We analyzed data from an ongoing prospective cohort study of varsity collegiate athletes sponsored by the National Collegiate Athletic Association and the Department of Defense from 2014-2016. We analyzed first time administration of the K-D only, examining differences in means with 95%CI by demographics and medical history. PURPOSE: To determine the association between aerobic fitness and neurocognitive performance, and to compare the cognitive function in elderly from Costa Rica (CR) and United States (US). METHODS: A sample of 78 older adults from CR (males = 26, females = 52) and 100 participants from Kansas, US (males = 35, females = 65) was recruited. Participants underwent a graded exercise test on a treadmill to determine peak oxygen uptake (VO2peak), and completed a comprehensive test battery designed to assess cognitions: cognitive screen, simple speed of processing, spatial visualization, visuospatial processing, episodic memory and verbal abilities, executive functioning and cognitive control, and working memory. Z-scores on each neurocognitive dimension was computed to create an index of global neurocognitive performance called cognitive function total score (CFTS). Inferential analysis included a 2x2 ANCOVA (sample by gender) on z-scores for cognitive variables (adjusted by age). Pearson correlations were computed between VO2peak and cognition dimensions and CFTS. RESULTS: No significant z-score interactions were found on neurocognitive performance ($p > 0.05$). Regardless of the sample, males scored higher than females on visuospatial processing ($Males = .691 \pm .392$ vs. $Females = .422 \pm .273$; $p = 0.021$). For the entire sample, VO2peak was correlated to visuospatial processing ($r = .251, p < .001$) and CFTS ($r = .178, p = .021$). For the male sample, VO2peak was correlated to working memory ($r = .396, p = .019$) in the KS sample, and to visuospatial processing ($r = .431, p = .045$) in the CR sample. For the female sample, VO2peak was correlated to visuospatial processing ($r = .342, p = .006$), executive functioning and cognitive control ($r = .357, p = .004$), and CFTS ($r = .328, p = .008$) in the KS sample, and to executive functioning and cognitive control ($r = .311, p = .030$) in the CR sample. CONCLUSIONS: Cognitive function was similar between male and female elderly from CR and US. Aerobic fitness as assessed by the VO2peak was related to visuospatial processing and the elderly ability to organize visual information into meaningful patterns and understanding how they might change as they rotate and move through space.

2016  Board #29  June 1 2:00 PM - 3:30 PM  Aerobic Fitness and Neurocognitive Performance in Older Adults from Costa Rica and the United States  Mónica Salazar-Villanueva1, Yamileth Chacón-Araya2, Amber Watts1, Eric D. Vidoni2, Sandra A. Billinger2, David K. Johnson2, José Moncada-Jiménez1. 1University of Costa Rica, San José, Costa Rica. 2University of Kansas, Lawrence, KS. Email: monica.salazarvillanueva@ucr.ac.cr  (No relationships reported)

PURPOSE: To determine the association between aerobic fitness and neurocognitive performance, and to compare the cognitive function in elderly from Costa Rica (CR) and United States (US). METHODS: A sample of 78 older adults from CR (males = 26, females = 52) and 100 participants from Kansas, US (males = 35, females = 65) was recruited. Participants underwent a graded exercise test on a treadmill to determine peak oxygen uptake (VO2peak), and completed a comprehensive test battery designed to assess cognitions: cognitive screen, simple speed of processing, spatial visualization, visuospatial processing, episodic memory and verbal abilities, executive functioning and cognitive control, and working memory. Z-scores on each neurocognitive dimension was computed to create an index of global neurocognitive performance called cognitive function total score (CFTS). Inferential analysis included a 2x2 ANCOVA (sample by gender) on z-scores for cognitive variables (adjusted by age). Pearson correlations were computed between VO2peak and cognition dimensions and CFTS. RESULTS: No significant z-score interactions were found on neurocognitive performance ($p > 0.05$). Regardless of the sample, males scored higher than females on visuospatial processing ($Males = .691 \pm .392$ vs. $Females = .422 \pm .273$; $p = 0.021$). For the entire sample, VO2peak was correlated to visuospatial processing ($r = .251, p < .001$) and CFTS ($r = .178, p = .021$). For the male sample, VO2peak was correlated to working memory ($r = .396, p = .019$) in the KS sample, and to visuospatial processing ($r = .431, p = .045$) in the CR sample. For the female sample, VO2peak was correlated to visuospatial processing ($r = .342, p = .006$), executive functioning and cognitive control ($r = .357, p = .004$), and CFTS ($r = .328, p = .008$) in the KS sample, and to executive functioning and cognitive control ($r = .311, p = .030$) in the CR sample. CONCLUSIONS: Cognitive function was similar between male and female elderly from CR and US. Aerobic fitness as assessed by the VO2peak was related to visuospatial processing and the elderly ability to organize visual information into meaningful patterns and understanding how they might change as they rotate and move through space.
The maintenance of physical activity in the long term is challenging. Understanding the factors associated with physical activity adherence is important to prevent potential dropouts from physical activity. PURPOSE: The aims of this study were to investigate running adherence and its association with training characteristics in recreational runners. METHODS: This study was a 3-year follow-up analysis of a prospective cohort study. The 141 participants (108 men, 76.6%; 33 women 23.4%) who had participated in a previous cohort study were invited to participate. Online questionnaires collected information on running adherence, training characteristics, and health problems sustained during three years of follow-up (2010 to 2013). Multivariate logistic regression was used to investigate associations between running adherence and training characteristics. RESULTS: In total, 97.9% (n=138) of the participants maintained the running practice during the 3-year follow-up without any substantial disruption period. The most common motivation to keep running was “to be healthier” (63.3%, n=88). The most common reasons to drop out of running were musculoskeletal injuries (33.3%, n=22) and lack of time (30.3%, n=20). Running on rigid training surface and treadmill were associated with higher odds of dropping out of running, respectively OR 3.84, 95% CI 1.20 to 12.2 and OR 8.50, 95% CI 1.96 to 36.7. However, running frequency was associated with lower odds of dropping out of running (OR 0.41 95% CI 0.28 to 0.59). Running distance >20 km/week and running training duration were associated with lower odds of dropping out of running, respectively OR 0.24 95% CI 0.10 to 0.59 and OR 0.44 95% CI 0.22 to 0.88. CONCLUSIONS: Most of the recreational runners have maintained running practice during this 3-year follow-up period without any substantial period of interruption since 2010. The most common motivations to maintain running adherence were “to be healthier” and “for fun”. The most common reasons to stop running were musculoskeletal injuries and lack of time. Some training characteristics (training surface, running frequency, running distance and running training duration) may influence running adherence.
The stages and processes of change of the Transtheoretical Model have been used to design programs that facilitate exercise adherence. The stages that explain when people change refer to pre-contemplation (PC = inactive without any intention to change), contemplation (C = inactive with intention to change), preparation (P = active but not fulfilling the recommendations of the American College of Sports Medicine [ACSM]), action (A = has complied with the recommendations of the ACSM but for less than six months) and maintenance (M = has complied with the recommendations ACSM for more than six months). The processes that explain how this change occurs are divided into cognitive processes (CP), implying thoughts, attitudes and awareness, and behavioral processes (BP), which involve actions. This model suggests that the effectiveness of the change depends on doing the right things at the right moment (stage). PURPOSE: To analyze which processes are the most used in the stages to fulfill ACSM recommendations for regular exercise.

METHODS: A total of 533 participants (48% female and 51.8% male) aged 11 to 76 (M = 32.2 ± 15.27) took part in the study. The Spanish version of the stages of change questionnaire (SCQ) and the processes of change questionnaire for physical activity (PCQ) were used to collect the data. RESULTS: The internal consistency of the subscales CP (α = .90) and CP (α = .92) were satisfactory. Results of One-Way ANOVA revealed significant differences in CP (F (1,279) = 26.60, p < .001) and BP (F (1,279) = 43.80, p < .001) at different stages. Tukey HSD post hoc test indicated that participants in C, P, and A stages used cognitive processes more than those in PC. In addition, those in M were found to have a higher use of cognitive processes than participants in C and PC. Moreover, participants in C, P, and A used more behavioral processes than those in PC. Also, participants in M used behavioral process more than participants from any other stage.

CONCLUSION: The use of CP and BP are essential in order to advance from lower stages up to M. However, the use of CP was higher in C, whereas BP was employed the most in M.

An Integrative Perspective of Validating a Simplified Chinese Version Behavioral Regulation in Exercise Questionnaire-2

Jun Dai1, Han Chen1.1 Shanghai University of Sport, Shanghai, China. 2 Valdosta State University, Valdosta, GA.

PURPOSE: The Behavioral Regulation in Exercise Questionnaire (BREQ)-2 is an instrument designed to assess individuals' motivation in physical activity (PA) participation. The BREQ-2 aims to measure five motivation constructs including external, introjected, identified, intrinsic, and amotivation. Although BREQ-2 has been frequently used in PA motivation studies, the validation test of the Chinese version of the BREQ-2 (C-BREQ-2) has rarely been conducted. The study aims to examine psychometric property, measurement invariance, latent mean difference, and as predictive validity of a C-BREQ-2.

METHODS: Participants were middle and high school students recruited from Shanghai, China. The final sample (N = 437, 49% for boys) was randomly split into two subsamples with the first subsample (N = 208) was used for exploratory factor analysis (EFA) and the second subsample (N = 229) used for confirmatory factor analysis (CFA). Measurement invariance and latent mean difference across gender was examined. Structural equation modeling (SEM) was utilized to explore different motivation constructs in predicting adolescents' moderate to vigorous physical activity (MVPA).

RESULTS: Both EFA and CFA tests identified a 14-item, three-factor (i.e., autonomous motivation, introjected motivation, and external motivation) model. Both convergent and discriminant validity tests of the scale were met. Additionally, the revised scale is invariant at both configural, full metric, and full scalar levels across genders. The following latent mean comparison revealed that boys perceived higher introjected motivation, introjected motivation, and external motivation) model. Both convergent and discriminant validity tests of the scale were met. Additionally, the revised scale is invariant at both configural, full metric, and full scalar levels across genders. The following latent mean comparison revealed that boys perceived higher introjected motivation, introjected motivation, and external motivation) model. Both convergent and discriminant validity tests of the scale were met. Additionally, the revised scale is invariant at both configural, full metric, and full scalar levels across genders.

CONCLUSIONS: The revised C-BREQ-2 seems to be a validated scale. Researchers can use this scale to better understand Chinese adolescents' motivation towards PA.

ABSTRACT

The stages and process of change are two key constructs in modifying risk behaviors according to Transtheoretical Model. The stages involve pre-contemplation (PC = inactive without any intention to change), contemplation (C = inactive with intention to change), preparation (P = active but not fulfilling the recommendations of the American College of Sports Medicine [ACSM]), action (A = has complied with the recommendations of the ACSM but for less than six months) and maintenance (M = has complied with the recommendations ACSM for more than six months). Meanwhile, the behavioral processes (BP) involve Substituting Alternatives (SA), Enlisting Social Support (ESS), Rewarding Yourself (RY), Committing Yourself (CY), Reminding Yourself (RY). PURPOSE: To analyze what behavioral processes are most commonly used in the different stages to fulfill the recommendations of healthy exercise of the ACSM. METHODS: A total of 533 subjects (48% female and 51.8% male; 33.2 ± 15.27; range = 11-76). A translation into Spanish spoken in Mexico of the stages of change questionnaire and questions related to behavioral processes belonging to the questionnaire process of change for physical activity were used. RESULTS: The internal consistency of the different BP ranged from 0.66 to 0.80. The results of One-Way ANOVA revealed significant differences in IK, BAR, CACO, CB and HIO in different stages (F (4,205) = 13.973, 44.570, p < .001). The post hoc Tukey's HSD test indicated that, in general, the use of SA (PC = 0.5, P = 0.5, ESS (PC = 0.5, P = 0.5, RY (PC = 0.5, P = 0.5, CY = 0.5, P = 0.5, RY) and (PC = 0.5, A = 0.5) increase through stages. CONCLUSION: The CP process show more relevance to generate the intention to change the sedentary lifestyle, however, AN Y CY processes contributed more for healthy exercise for more than six months.

Keywords: Transtheoretical Model, Exercise, Mexico

THURSDAY, JUNE 1, 2017
Pokémon Go, an augmented reality smartphone game has been credited for improving physical activity and wellness.

**Purpose:** To examine changes in physical activity habits and mental and physical wellness as a result of playing Pokémon Go.

**Methods:** Surveys were administered to seventeen regular Pokémon Go users, ages 18-65 years old. The survey was designed to compare time, type and frequency of physical activity (PA) as well as physical, mental and lifestyle factors prior to and following playing Pokémon Go. Paired-sample t-test compared the difference in the number of PA sessions/week before and after Pokémon. IBM SPSS Statistics version 24 were used for statistical analyses.

**Results:** For all participants surveyed, 30% of their time playing Pokémon Go is spent in a seated position (car, golf cart, other) and 70% is spent in a mode of PA (walk, bike, rollerblade). 24% of participants solely play utilizing a form of PA, while nearly half of the participants said that >75% of play is spent walking. Half of the participants categorized their intensity while playing as light, while the other half play with moderate intensity. Paired-sample t-test compared the difference in the number of PA sessions/week before and after Pokémon, which was 0.44±1.72 (P=0.306). 41% have engaged in more PA as a result of playing, while the difference in minutes of PA/week before and after Pokémon is only 0.147±14 min. Since beginning Pokémon, participants have moved an average of 104 km and report decreased stress and less anxiety from playing.

**Conclusion:** The majority of participants who play Pokémon Go do so while walking at various intensity levels. The popular exergame can lead to an increase in physical activity frequency, however the duration of exercise does not seem to be affected. Improved wellness was also noted with reports of decreased stress and anxiety as a result of playing. Overall, Pokémon Go can have a positive influence on both physical and mental wellness.

**Study:** Sources Of Competition Stress Among Elite Tennis Players In ITF Women’s Circuit

**Methods:** Surveys were administered to seventeen Pokémon Go users, ages 18-65 years who participated in at least one of five Tromsø Study surveys between 1979 and 2008. Data are collected from 30,765 individuals (49.7% men) aged >20 years who participated in at least one of five Tromsø Study surveys between 1979 and 2008. In each survey, the participants completed a self-administered questionnaire and underwent physical examinations. LTPA were assessed by the validated “Saltin-Grimby” 4-scale questions. Potential correlates of LTPA (sex, age, body mass index (BMI), education, smoking, self-reported cardiovascular disease, self-perceived health, and employment status) were tested using ordinal logistic regression in cross-sectional and longitudinal models.

**Results:** As shown in the Table, sex, age, education, BMI, smoking, occupational physical activity, and excellent self-perceived health were cross-sectional correlates of LTPA (P < 0.05), after adjustment for respective correlates. Men had 33-115% higher odds of being physically active in leisure time than women, and odds of being physically active in leisure time in general decreased with increasing age (P < 0.05). High occupational activity levels increased the odds of being physically active in leisure time, and smokers were 22-47% less likely to be physically active than non-smokers (P < 0.05). Having a healthy BMI was associated with higher odds of being physically active in leisure time, compared with being overweight and obesity. Longitudinal associations between participant characteristics in 1979-80 and LTPA in 2007-08 largely confirmed these findings. Baseline LTPA (1979-80) was a strong predictor of LTPA in 2007-08 (P < 0.05) (Table, longitudinal model).

**Conclusion:** Several individual-level factors were associated with LTPA. The most inactive individuals in leisure time were female, older, smokers, obese or overweight, and had lower education.
The LEAP study was conducted in 4 preschools serving preschoolers observed FMS. were explored to examine the relationship between at-risk preschoolers’ PPC and Children’s perceived physical competence (PPC) may be related to their

### Adjusted odds ratio (95% Confidence Interval)

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Lambda</th>
<th>n</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-5</td>
<td>Male</td>
<td>1.14</td>
<td>14039</td>
<td>0.90-1.44</td>
</tr>
<tr>
<td>2-5</td>
<td>Female</td>
<td>1.13</td>
<td>14039</td>
<td>0.90-1.43</td>
</tr>
<tr>
<td>6-7</td>
<td>Male</td>
<td>1.15</td>
<td>14039</td>
<td>0.90-1.47</td>
</tr>
<tr>
<td>6-7</td>
<td>Female</td>
<td>1.14</td>
<td>14039</td>
<td>0.90-1.45</td>
</tr>
</tbody>
</table>

### Results:

Spearman’s rho correlations showed significant correlations between PPC and FMS when data were examined separately by sex and/or ethnicity. There were significant positive correlations between PPC and ball skills for males (r = 0.20, p < 0.05) and non-Hispanic preschoolers (r = 0.18, p < 0.05). There was a significant negative correlation between PPC and balance in Hispanic females (r = -0.31, p < 0.05). Regression analyses showed PPC was significantly related to locomotor scores (β = 0.14, p = 0.02, with the overall model accounting for 16% of the variance in locomotor scores, F(5,219) = 8.43, p < 0.05). Further, PPC was significantly related to strength scores (β = -0.17, t = 1.97, p < 0.05) with the overall model accounting for 20% of the variance in strength scores, F(5,216) = 10.48, p < 0.05.

### Conclusions:

The correlation between PPC and FMS in preschoolers varies by sex and ethnicity in LEAP study participants. Moreover, PPC is significantly related to locomotor and strength skills. Promoting FMS development in preschoolers could potentially influence their movement competence or confidence, thus enhancing their physical literacy and ultimately physical activity engagement.

### Purpose:

Children’s perceived physical competence (PPC) may be related to their fundamental movement skills (FMS). Baseline data from the Colorado LEAP study were explored to examine the relationship between at-risk preschoolers’ PPC and observed FMS.

### Methods:

The LEAP study was conducted in 4 preschools serving preschoolers (n = 250) at high risk for obesity. The Pictorial Scale of Perceived Competence for Young Children assessed preschoolers’ PPC. The Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) subtests for balance, running speed, and agilily were included for each of the four BOT-2 subtests to investigate the amount of variance in FMS explained by PPC (overall model controlled for age, sex, ethnicity, and BMI z-score).

### Results:

Spearman’s rho correlations were used to test the relationships between PPC and each BOT-2 subtest. Hierarchical linear regression analyses were conducted for each of the four BOT-2 subtests to investigate the amount of variance in FMS explained by PPC (overall model controlled for age, sex, ethnicity, and BMI z-score).

### Conclusions:

It is well-documented that leisure is conducive to psychological well-being for a variety of population. However, a scarcity of research on types of leisure influenced by individual attributes and health status as well as contributing factors for leisure satisfaction. PURPOSE: The research aims to investigate the types of leisure influenced by individual attributes and health status as well as contributing factors for leisure satisfaction. METHODS: Cross sectional data were collected by administering Leisure Satisfaction Scale (LSS), Leisure Motivation Scale (LMS), Types of Leisure Scale, Perceived Stress Scale (PSS), Health Risk Survey, and Demographic Survey including Body Mass Index (BMI) to 199 university students.

### RESULTS:

Leisure satisfaction was inversely correlated with perceived stress (r = -0.21, p < 0.01) and amotivation (r = -0.23, p < 0.01). Perceived stress was positively associated with amotivation (r = 0.23, p < 0.05). Stepwise multiple regression shows that intrinsic leisure motivation was a single strong predictor for leisure satisfaction even after controlling for elementary school leisure, high school leisure, extrinsic leisure motivation, and perceived stress (β = 0.83, β2 = 0.71, r = 4.72, p < 0.01). Interaction analyses in multiple regression demonstrate that there was a significant interaction between BMI and social support, which indicates that the impact of BMI on active leisure differs depending on perceived stress.

### Conclusions:

Intrinsic leisure motivation appears to influence leisure satisfaction, which may lead to lowered levels of stress. Conversely, leisure activity (amotivation) may lead to lowered levels of perceived stress. University students with high BMI do not tend to engage in physically active leisure in the presence of high perceived social support. Also, university students with high BMI were more likely to engage in passive leisure in the presence of low stress levels. These findings could shed light on the motivational strategies health care providers can use to support health-promoting leisure activities such as physical activity.

### References:

1. Board #44. Affective Associations as Predictors of Physical Activity in Cancer Survivors

### Abstracts were prepared by the authors and printed as submitted.
predict physical activity behavior. These findings suggest that cognitive measures and feeling measures may both be important predictors of participation in physical activity.

**PURPOSE:** To examine the effects of exercise on mood, enjoyment, and perceived exertion in college students. The objective of the study was to use psychosocial factors, including affective associations, to predict physical activity intentions and physical activity behavior in cancer survivors.

**METHODS:** A convenience sample of cancer survivors (n=122) were recruited for the study. Participants completed a survey which included questions on demographics, current physical activity, survivorship, cognitive measures, affective associations, and physical activity behavior. Multiple regressions were run to predict intentions and physical activity behavior.

**RESULTS:** Majority of the participants were Caucasian (83%), and breast cancer survivors (62%) out of treatment with a median BMI of 30 kg/m^2_. Results show physical activity intentions were significantly predicted by cognitive measures (p<0.01). In contrast, positive affective associations (p=0.01), worry about physical activity (p=0.01) and implicit measures (p=0.05) were the only significant predictors of physical activity behavior. Affective measures predicted physical activity behavior approximately 2 weeks later, even when intentions were included in the regression model (p<0.05).

**CONCLUSIONS:** The current study suggests cognitive beliefs predict physical activity intentions and affective measures separately predict physical activity behavior in cancer survivors. These findings could be implemented into physical activity programs focusing on both increasing cognitive beliefs about physical activity and increasing positive feelings towards physical activity.

---

**Board #45 June 1 2:00 PM - 3:30 PM Weight Training and Self Determined Motivation: A Longitudinal Analysis of Previously Untrained, Sedentary Women**

Jacob Havenar. University of San Francisco, San Francisco, CA. Email: jmhavenar@usfca.edu

**PURPOSE:** To examine the impact of weight training on autonomy, competency, relatedness, and self-determined motivation over a period of 28 months. We hypothesized that women who participated in a 12 week weight training program would exhibit significant increases in autonomy, competency, and self-determined motivation over time. In addition, we hypothesized that the treatment group would exhibit a more self-determined motivational profile than the control group.

**METHODS:** The sample consisted of 44 sedentary women with no prior weight training experience. The mean age was 22 years (range 18 - 29) and BMI’s ranging from 19.3 to 46.7 (M=27.0). Upon random group assignment, psychosocial and anthropomorphic data were collected from all participants at baseline. The treatment group trained 2-3 times a week, 40-60 minutes per session, and the control group did not exercise. The treatment group also received a training manual and supervision from certified personal trainers for 14 of their 36 total sessions. The control group received the manual after post testing (week 13) and instructions on how to perform the exercises. Follow up assessment of all psychosocial variables was conducted at 28 months post baseline.

**RESULTS:** Psychosocial and anthropomorph data did not significantly differ across groups at baseline. A between group effect was present F(1, 39) = 4.332, p < 0.05. Across groups at baseline. A between group effect was present F(1, 39) = 4.332, p < 0.05. Cross tabulation and chi-square statistical tests (p<0.05).

**Conclusion:** A significant increase in autonomy (p = .032) and competency (p = .002) for the treatment group from baseline to 28 months.

---

**Board #46 June 1 2:00 PM - 3:30 PM Effects of External Stimuli on Exercise Engagement in College Females**

Adam Lomenick. Baker University, Baldwin City, KS. (No relationships reported)

**Purpose:** To determine the effects of external stimuli on mood, enjoyment, and perceived exertion in college females.

**Methods:** 18 college female subjects (age: 19 ±1 years) completed 4 separate trials of treadmill walking with a different intervention for each trial. The conditions being tested: no external stimuli (NES), self-selected music (MU), self-selected video with sound (VS), and self-selected video without sound but with captions (VC). Every 3 minutes throughout the 30-minute session, the subjects rated perceived exertion and mood with the Borg rate of perceived exertion (RPE) scale and the Fast Assessment of Children’s Emotion scale (ES). At the end of each session, the participants evaluated their enjoyment of the exercise using the Physical Activity Enjoyment Scale (PACES). Statistical comparisons on each condition were determined as well as any comparison between having external stimuli (MU, VS, and VC) vs no stimuli using a single factor ANOVA, contrast, and Bonferroni statistical analysis.

**Results:** We found when comparing no stimuli to all external stimuli collectively, PACES (F=6.08, p < 0.05) and ES ratings (F=2.66, p < 0.05) were significantly different. Specific to the PACES scale, we found significance when comparing NES to VC (t=3.11, p < 0.05).” However, using PACES (t=4.03, p < 0.05) RPE was not statistically significant in any condition (F=0.01, p > 0.05).

**Conclusion:** Greater levels of overall enjoyment and increased mood were seen when an external stimuli was used as compared to exercising with no stimuli. No changes in perceived exertion were seen whether a stimulus was used or not. For best adherence to an exercise program use of external stimuli is recommended.

**Board #47 June 1 2:00 PM - 3:30 PM Sustainable Healthy Commuting: Environmental Factors Associated With Bicycling And Walking Among Danish Students.**


**Purpose:** The aim of this study was therefore to investigate the associations between commuting mode and environmental factors in a group of young students in Aalborg municipality in Denmark.

**Methods:** In an internet survey gathered data about students’ commuting behaviour and their perception of the influence of environmental factors. Comparisons were made using cross tabulation and chi-square statistical tests (p<0.05).

**Results:** In total, 348 students, mean age 23 ±2.1 years, responded to the questionnaire, of which 80.5 % were categorised as active commuters (walkers and cyclists) and 19.5 % were categorised as passive commuters (car and public transporters). The mean commuting distance for the active commuters were 3.0 km ±1.4 and 2.9 km ±1.6 for the passive commuters when summarizing all localisations (part-time job, leisure-time activities and university location). The passive commuters perceived the traffic as more unsafe than the active commuters when commuting to part-time job (31.4% vs. 11.5%, p<0.05) and leisure time activities (69.6% vs. 52.8%, p<0.05). Those students who were categorized as active commuters more likely to go by bike to their university location than those categorized as passive commuters (57.9% vs 19.1%, p<0.05) if they perceived the cycling paths as well maintained.

**Conclusion:** Those categorised as active commuters perceived the environment as more comprehensive for active commuting than those categorized as passive commuters.

**Board #48 June 1 2:00 PM - 3:30 PM Personality And Motivational Profile Of Participants Adherent And Non-adherent To An Exercise Program**

Marco T. Mello, 313400201, Joao P. Rosa1, Altay A L de Souza2, Giscard H O Lima2, Dayane F. Rodrigues1. Federal University of Minas Gerais - UFMG, Belo Horizonte, Brazil. Federal University of Sao Paulo - UNIFESP, Sao Paulo, Brazil. Email: tmello@demello.net.br (No relationships reported)

**Purpose:** To determine exercise behavior (personality and level of motivation) of participants during a 1 year exercise program. **Methods:** 29 volunteers (17 women’s) Age (years) 34.97±9.51, BMI (kg/m²) 26.47±4.36 and attendance (months) 8.1± 3.45 , were grouped by adherent (Adh) and non-adherent (NAdh) according to level of motivation were assessed via translated version of the BREQ-2 (Markland D, Tobin VA, 2004) and IMPRAF-54 (Barbosa MLI, Balbinotti AAM, 2006) and attendance during 1-year exercise program were also assessed. A Mann Whitney U Test, Spearman correlation and
Logistic regression are used. Results: Considering attendance in months, Spearman correlations were made with sociodemographic measures and scales scores IMPRAF, BRIQ and NEOPIR. Correlations were found in attendance with the IMPRAF sociability (rho = 0.4) and NEOPIR extraversion (rho = -0.43). These variables were adjusted in a linear regression model (R square = 0.53) and they had coefficients significantly different from zero (IMPR AF sociability B = 0.29, t = 2.158 p = 0.04 and B = -0.4 NEOPIR extraversion, t = 3.24 – t = 2.04 p = 0.03). Finally, considering Adhd (N = 6) or NAdh (N = 23), there are significant only for NEOPIR extraversion (U = 31.5, p = 0.04), where the Adhd (19.0) has a median less than the NAdhd (106.5).

Conclusion: In this study, the longer training produced greater sociability (need basic psychological issues related to acceptance and gaining new friends, self-esteem and motivation for physical activity practitioners) and lower extraversion (possibly due to a structured that exercise was offered).

CEPE, CIEMSA, CNPq, CAPES, AEP.

2036 Board #49 June 1 2:00 PM - 3:30 PM

Physical Strength by Mental Health Profile in School-Aged Boys and Girls

Armando Cocca, Francisco Daniel Espino Verdugo, Michaela Cocca. Autonomus University of Nuevo León, San Nicolás de los Garza, Mexico. Email: armando.cocca@gmail.com

Mental health can play an important role in the development of a good health-related physical fitness, especially during physical education (PE) classes. In fact, kids with low self-esteem and psychological well-being are often inclined to avoid carrying out physical assignments in front of their peers due to the fear to be ridiculed. Similar psychological processes occur in children with high stress and anxiety associated to exercising. This could have a negative impact on the development of an appropriate level of strength, which is considered an important indicator of wellbeing at all ages.

PURPOSE: To assess primary school boys’ and girls’ physical strength associated to mental health profiles. METHODS: A sample of 189 children (88 boys, 101 girls) aged 10-11 participated in the study. Physical strength measurements were carried out according to EUROFIT protocol, and included 30-sec sit-ups (SU), standing broad jump (SBJ), bent arm hang (BAH), and handgrip (HG) tests. In addition, participants were asked to fill self-esteem, psychological wellbeing, anxiety, and stress questionnaires. RESULTS: Cluster analyses evidenced two main profiles in boys: “partial psychopathology” (PP) and “partial mental health” (PMH). Participants showing the former profile had lower scores in SU (PP: 13.09; PMH: 17.89), SBJ (PP: 96.89; PMH: 123.57), BAH (PP: 3.91; PMH: 8.74), and HG (PP: 12.15; PMH: 14.60). Both profiles had low scores in relation with cut-off points for their age. Girls only belonged to PP, also showing lower results than expected at their age (SU = 15.22; BAH = 7.27; HG = 12.25). CONCLUSIONS: Partial mental health is not a sufficient condition for triggering the development of healthy physical strength. PE teachers need to create the proper conditions for children to reach full mental wellbeing, which may increase their chances to achieve beneficial levels of physical fitness.

According to the World Health Organization, the fulfillment of a complete health state implies balance between physical and mental condition. Physical fitness (PF), comprised of health-related strength, endurance, and flexibility, is an essential indicator of physical condition. Good levels of PF have been linked to lower risk of injuries and chronic diseases. In addition, body composition (BC) is an indicator of health, especially for the accumulation of abdominal body fat having been associated to higher cardiovascular risk. However, mental state can negatively affect individuals’ overall health regardless of their physical condition. For instance, research has demonstrated that high anxiety in athletes may not only increase the risk of psychological diseases, but also affect their quality of life in their personal and mental health.

PURPOSE: To assess the relation between body composition, physical condition, and mental health in primary school students. METHODS: A sample of 339 children aged 10-11 were asked to fill self-esteem, psychological wellbeing, anxiety, and stress questionnaires. Measurements of PF comprised handgrip (HG), standing long jump (SLJ), 30-second sit-ups (SU), sit-and-reach (SR), and course navigate (CN) tests. Body composition was assessed by means of waist circumference (WC). RESULTS: Outcomes showed a significant negative correlation of WC with CN (r = -.509; p < .001), and SLJ (r = -.175; p = .033). However, WC was positively correlated with HG (r = -.355; p < .001). No significant correlations were found between the elements of mental health, PF, and BC. CONCLUSIONS: Both mental health and physical condition must be taken into account if we aim to improve people’s overall health state. Despite the previous literature suggests a connection between these two spheres of health, our outcomes seem to hint at isolated approaches, implying the implementation of different strategies to enhance physical condition and mental state simultaneously, though separately.

2038 Board #51 June 1 2:00 PM - 3:30 PM

Auditory Discrimination and Short Term Memory are Preserved during Simulated Altitude and Moderate Intensity Exercise.

Sarah Kanaakawio’ole, Laura Q. Jimenez, Brian Arwari, Arlette C. Perry, FACSM, Joseph F. Signorile, FACSM, Soyeon Ahn, Kevin A. Jacobs, FACSM. University of Miami, Coral Gables, FL. (Sponsor: Dr. Kevin Allen Jacobs, FACSM)

Email: s.kanaakawioole@umiami.edu

No relationships reported.

PURPOSE: This study was conducted to examine the cognitive and neuropsychological effects of acute exposure to simulated moderate and high altitudes at rest and during exercise to examine whether short term memory or auditory oddball task performance were affected beyond a certain threshold of simulated altitude and whether exercise improves or worsens cognitive function during these conditions.

METHODS: Fourteen recreationally active college students (M=9, F=5) aged 18-35 participated in this study, which consisted of six experimental days, with three simulated altitude conditions: sea level (SL), simulated moderate altitude (MA; 15.4% F2O2 – 2400 m) or simulated high altitude (HA; 12.8% F2O2 – 3900 m), and two exercise conditions: rest or moderate intensity cycling exercise at 60% altitude-specific peak power output, in a randomized-order, crossover design. Accuracy and reaction time on an auditory oddball task and a Sternberg memory task were assessed, along with the amplitudes and latencies of their associated event-related potentials.

RESULTS: Exercise improved auditory reaction time, regardless of altitude (p<0.01), though task accuracy was not affected under any condition. In addition, simulated altitude induced lower P300 amplitudes and slower latencies during the auditory oddball task (p<0.01), while exercise improved latencies at HA and SL, but not at MA (p=0.03). Sternberg memory task behavioral performance was not affected by either simulated altitude or exercise condition. However, P200 latency was slowed during exercise trials (p=0.02) as well as during MA trials (p=0.01).

CONCLUSIONS: Acute exposure to simulated moderate and high altitudes may not significantly impact short term memory and auditory discrimination. On the other hand, an acute bout of moderate intensity cycling exercise may improve reaction time on oddball tasks, even though it does not seem to benefit short term memory. It is possible that these cognitive modalities were negatively affected by simulated altitude, as evidenced by some altered event-related potentials, but that these effects were either too small to translate into performance deficits or that there are as yet unknown compensatory mechanisms at work that preserve performance as one ascends to altitude, at least until 3900 m.

2039 Board #52 June 1 2:00 PM - 3:30 PM

Impact of Biological Attractiveness on Exercise Motivation and Physical Activity in Female College Students

Elizabeth A. Easley, Mary N. Fargalla, Sarah H. Sellhorst, William F. Riner, FACSM. University of South Carolina Lancaster, Lancaster, SC. Email: easleyea@mailbox.sc.edu

No relationships reported.

Wait-to-hip ratio (WHR) has been used as an indicator of biological attractiveness, which has been associated with reproductive potential, health, and youthfulness. Previous reports have shown that women with a WHR closer to 0.70 than 0.80 are found more biologically attractive (BA). Considering the potential health implications of biological attractiveness, exercise motivations in women may vary based on WHR. PURPOSE: To determine if differences existed in health pressure and appearance-related exercise motivations and physical activity between the BA group (WHR ≤ 0.74) and less biologically attractive group (LBA, WHR ≥ 0.75).

METHODS: Full-time female college students (19.26 ± 1.37y) completed the Exercise Motivation Inventory-2 (EMI-2). Following the survey, waist and hip circumferences were calculated, and WHR was calculated. Participants then wore an Actigraph accelerometer (GT3X, Pensacola FL) for seven consecutive days. A one-way MANOVA was used to determine if differences existed in exercise motivations and physical activity between groups. RESULTS: There was a significant multivariate main effect for biological attractiveness, Wilks’ lambda = .815, F (3, 43) = 3.247, p = .031. Closer examination of the univariate results demonstrated a significant difference in health pressure-related motivation (F = 4.43, p = .050) and appearance-related motivation (F = 23.48, p = 1.34) and LBA (n = 24, 2.53 ± 1.41). There were no differences in appearance-related motivation (BA, n = 23, 1.48 ± 1.34) and LBA (n = 24, 2.53 ± 1.41).
activity measured in average steps between groups (BA, 6437.64 ± 2633.76 steps/ day vs. 6848.39 ± LBA, 3026.91 steps/day). CONCLUSIONS: Although the health pressure-related scores were higher in the LBA group, it was not a strong enough motivator to result in greater physical activity in this group. This suggests that health pressures are not a major motivator for exercise in female college students regardless of WHR and BA group. Appearance-related motivation was scored similarly between groups and despite higher scores than health pressure-related motivation in both groups, both women were classified as low-active based on their average daily step counts. More research is needed regarding motivating factors for exercise in traditional-age female college students.

Resistance training itself has many far-reaching benefits in regards to muscular strength and endurance, bone health, and metabolism. However, despite its importance women tend to participate in resistance training at an alarmingly lower rate than men. Previous research on resistance training participation focused primarily on male subjects. Limited research is available on resistance training practices between sexes. PURPOSE: To determine the reasons why college-aged women perform resistance training. METHODS: Thirty-seven college-aged women (18-24 yrs. old) participated in this study by completing an online survey. Means, standard deviations, and frequencies were calculated for all questions. RESULTS: Women perform strength training for a variety of reasons. Over 95% agreed that resistance training gives them a sense of accomplishment and they enjoy how it makes them feel. Ninety-four percent agreed that resistance training will make them healthier. The results showed that 90.91% agreed that resistance training relieves stress. Over 90% agreed that they resistance train with the goal of improving muscular strength and endurance. Maintaining body weight is why 69.69% of the respondent’s resistance train. Half of the respondents (50%) resistance train because they have someone willing to do it with them. In regards to appearance, 84.38% resistance train because they feel that it will make them more attractive. Of the women who responded 65.65% resistance train because they know it won’t make them bulk up. Approximately 84.38% resistance train because they feel that it will make them more attractive. Of the women who responded 65.65% resistance train because they know it won’t make them bulk up. Approximately 84.38% resistance train because they feel that it will make them more attractive. Of the women who responded 65.65% resistance train because they know it won’t make them bulk up. Approximately 84.38% resistance train because they feel that it will make them more attractive. Of the women who responded 65.65% resistance train because they know it won’t make them bulk up.

Individual differences have been explored with respect to predicting affective responses to exercise. As such, new measures are developed to further understand these relationships and old measures are constantly updated to be more accurate. PURPOSE: Compare two measures of exercise tolerance. METHODS: Participants (N = 268; 154 females, 114 males) completed the Preference for and Tolerance of Exercise Intensity Questionnaire (PRETIE-Q) and the Physical Activity Acceptance Questionnaire (PAAQ) and then a 15-min high-intensity interval exercise (HIIE) session. Affective valence (Feeling Scale; FS) was assessed every 3 min during (average FS during used in analyses) and enjoyment (Physical Activity Enjoyment Scale; PACES) was assessed post exercise. RESULTS: A moderate relationship existed between the PAAQ and PRETIE-Q Tolerance (T; r = 0.45; P < 0.01). PAAQ was related to enjoyment (r = 0.21; P = 0.001), but not FS (r = 0.11; P = 0.21; Tukey HSD post hoc indicated that the use of IK (PC < C, P < A, M), CACO (PC < P < A, C, M), CB (PC < A < C, M) and IHO (PC < A; M) increases through the stages, except the BAR process indicated that the use of IK (PC < C, P < A, M), CACO (PC < P < A, C, M), CB (PC < A; M) and IHO (PC < A; M) increases through the stages, except the BAR process (PC < P, A, M) which was more emphasized in the use in C. CONCLUSION: All the CP contribute to the achievement of the recommendations of the ACSM, however, the BAR process had more relevance to generate the intention of being physically active.

Mini-Session: Board #55 June 1 2:00 PM - 3:30 PM

Cognitive Processes Of The Stages of Changes for Healthy Exercise Practice According To The ACSM

SAMANTHA MEDINA-VILLANUEVA, JORGE ZAMARRIPA, MARIA MARENTES-CASTILLO, MANUEL DE LA CRUZ, HECTOR DUARTE. Universidad Autonoma de Nuevo Leon, Nuevo Leon, Mexico. Universidad Estatal de Sonora, Sonora, Mexico.

Email: samantha.medina@uam.mx

CONCLUSIONS: Comparison of Tol and PAAQ with respect to explaining affective responses revealed a modest relationship. While both explained affective responses, Tol accounted for more variability in such responses. Further, Tol accounted for all variance explained by the PAAQ, while the PAAQ accounted for roughly one third of the variance explained by Tol; with respect to enjoyment. In order to maximize benefits and minimize adverse affective responses to exercise, understanding individual difference factors is crucial. As such, the PRETIE-Q appears to predict affective outcomes of HIIE to a greater extent than the PAAQ.
related outcomes as their PA motivation. Among women, receiving support from family members was demonstrated as a relevant promoter of PA. Social support was a great motivating factor among older Latino caregivers. Future research and interventions should take into consideration the importance of social support to increase PA in this population. Funded by the Department of Kinesiology and Nutrition of UIC.

2044 Board #57 June 1 2:00 PM - 3:30 PM
Association between Baseline Fitness and Exercise Adherence during a 26-Week Supervised Exercise Program
Danielle M. Ostendorf1, Zhaoxing Pan1, Seth A. Creasy1, Emmanuel Seyoum1, Kristen Bing1, Liz Lavyland1, Edward L. Melanson, FACSM2, Victoria A. Catanacini1. 1University of Colorado, Anschutz Medical Campus, Aurora, CO. 2University of Colorado, Denver Campus, Denver, CO. (Sponsor: Edward L. Melanson, FACSM)
Email: danielle.ostendorf@ucdenver.edu

Few studies have examined the relationship between baseline fitness and exercise adherence in adults with overweight/obesity during a comprehensive behavioral weight loss program (BWLP). Differentiating individuals who adhere to an exercise prescription based on fitness level may improve future intervention approaches.

PURPOSE: To examine the association between baseline fitness and exercise adherence during a 26-week supervised exercise program.

METHODS: Data from participants enrolled in an 18-month BWLP combining a calorie-restricted diet and supervised exercise were used in this analysis. The 26-week supervised exercise intervention consisted of moderate intensity exercise (65-75% max HR), three supervised sessions/week, progressing from 20 to 60 min/session by week 13. Baseline fitness (VO2 max) was categorized based on published age and sex norms. Logistic regression was used to examine the association between baseline fitness and (a) attrition and (b) exercise adherence (attended ≥80% of supervised sessions). The association with adherence was assessed over the entire program (weeks 1-26) and during discrete intervals (weeks 1-4, 5-8, 9-14, 15-20, and 21-26).

RESULTS: 69 participants (age 41.9±7.9 kg/m2, BMI 34.8±3.8 years, 87% female) were enrolled in the BWLP. Participants were classified based on baseline fitness level: 29% very very poor (VO2 max 21.8±4.2 mL/kg/min), 48% poor (24.2±3.1 mL/kg/min), 19% fair (26.4±2.4 mL/kg/min), 3% good (32.2±3.8 mL/kg/min), and 1% superior (38.2 mL/kg/ min). 78% (n=54) completed the 26-week supervised exercise intervention. Baseline fitness category was not associated with attrition, nor was it associated with adherence over the entire program (weeks 1-26) or at weeks 1-4, 5-8, 9-14, and 15-20. However there was a positive association between baseline fitness category and adherence during weeks 21-26. Participants categorized as poor or above were 9.4 times more likely to attend ≥80% supervised sessions as compared to those categorized as very poor (95%CI: 1.1-78.5; p = 0.039).

CONCLUSION: Baseline fitness levels in our study population were surprisingly low. Those starting an exercise program with very poor fitness may struggle with adherence over time as the exercise volume reaches higher levels and may require more coaching during this phase of the program.

2045 Board #58 June 1 2:00 PM - 3:30 PM
Relationships between Physical Activity and Motivation in Early Secondary School Adolescents in Scotland
Lauren McMichan, Ann-Marie Gibson, David A. Rowe, FACSM. University of Strathclyde, Glasgow, United Kingdom.
(Sponsor: David A. Rowe, FACSM)
Email: lauren.mcmichan@strath.ac.uk

No relationships reported.

PURPOSE: High prevalence of physical inactivity and sedentary behaviour (SB) in adolescents is a global issue with as few as 10% of adolescents meeting physical activity (PA) guidelines. Research has suggested that higher intrinsic motivation is positively related with higher levels of PA. The purpose of this study was to test this relationship in early secondary school adolescents.

METHODS: PASB was measured using an adapted version of the survey used in the Health Behaviour in School Children study and motivation was measured using the BREQ-3 questionnaire (Mark & Tobin, 2004; Wilson, Rodgers, Loitz & Schime, 2006). Questionnaires were completed during class time by students aged 11-14 years. The Relative Autonomy Index (RAI) was calculated using the weightings provided for each subscale. Spearman’s Rho was used to determine the relationship between number of days active and each subscale of the BREQ-3, as well as the RAI.

RESULTS: Participants’ (N = 94) mean age was 12.79 ± 0.95 years and 55.3% of the sample were male (n = 52). Based on 7-day recall, participants spent an average of 3.77 ± 2.65 days active. Correlations between the BREQ-3 and number of days active were: amotivation (r = −.12, p = .27); external regulation (r = −.27, p = .01); introjected regulation (r = .01, p = .95); identified regulation (r = −.17, p < .01); integrated regulation (r = −.35, p < .01); intrinsic motivation (r = −.35, p < .01). These results suggest there is no relationship between introjected regulation and PA in early adolescents. Total RAI scores were significantly positively correlated with days active (r = .25, p = .02).

CONCLUSIONS: The strongest positive relationships with PA are for external regulation, integrated regulation and intrinsic motivation. The patterns of these correlations appear to support Self-determination Theory - Organismic Integration - that adolescents further along the continuum towards the intrinsic motivation end are likely to engage in more PA compared to those who are towards the amotivated end of the continuum. However, in this study, external regulation appears to have a stronger relationship than introjected or identified regulation. Overall, the total RAI indicates a positive relationship between autonomous motivation and PA.

2046 Board #59 June 1 2:00 PM - 3:30 PM
The Influence Of Attentional Focus Cuing On Jump-and-reach Performance
Rajab Imtair, Justin Usher, Dimitri Castro, Evanjheet Brar, Julio Gomez, Vanessa Yingling, FACSM, Jenny O, FACSM. California State University, East-Bay, Hayward, CA.
Email: rajabimtairknt@gmail.com

No relationships reported.

Movement cueing involves the provision of verbal instructions to performers prior to movement execution. Research literature examining attentional focus cueing has clearly demonstrated the performance advantages of adopting an external focus (e.g., focusing on the center of a basketball hoop) over an internal focus (e.g., focusing on the flicking the wrist; Al-Albool et al., 2002; Wulf et al., 1999; Zachry et al., 2005). Most commonly, deviation from a target has been employed as the measure of objective success, across a variety of specialized sport skills (for a review, see Wulf, 2015).

PURPOSE: Consistent with this body of research, it is reasonable to hypothesize that when cueing individuals performing a vertical jump-and-reach task, an external focusing cue would lead to a superior task performance compared to an internal focusing cue. Preliminary research has provided support for this assertion (i.e., Wulf & Dufek, 2009; Wulf et al., 2007); however, these preliminary quasi-experiments employed relatively small sample sizes (i.e., n = 8-12 participants). The current experiment examined the effect of attentional focus cueing on performance of a vertical jump-and-reach task.

METHODS: Sixty-five college-aged participants were randomly assigned to one of three cueing conditions: control (n = 21), external focus (n = 22), or internal focus (n = 22). A Vertec™ measurement device was used to measure jump height.

RESULTS: Interestingly, and contrary to the attentional focus literature, results demonstrated similar jump-and-reach performances between the external- (Mexternal = 19.97in.; SD = 5.38) and internal-focus groups (Minternal = 18.91in.; SD = 5.31; p > 0.05), as well as similar performances between the external focus and control groups (Mcontrol = 21.55in.; SD = 4.88; p > 0.05).

CONCLUSIONS: These findings question the applicability of the external focus effect on the performance of less complex motor skills, however, other possible explanations for the current results and future research suggestions are also offered.

2047 Board #60 June 1 2:00 PM - 3:30 PM
Validity of The Multidimensional Outcome Expectations For Exercise Scale In Young Adults
Gene L. Farren, Paul E. Yeatts, Tsz Lun Chu, Tao Zhang, Scott B. Martin, FACSM, Mitch Barton. University of North Texas, Denton, TX.
Email: gene.farren@unt.edu

No relationships reported.

Though outcome expectation is considered an important element of the social cognitive theory (Bandura, 1977, 1986), it has received little attention in physical activity research, especially in younger populations (Hellsten & Rogers, 2009). Moreover, when measured, this construct is often unidimensional.

PURPOSE: To determine the psychometric properties of the 3-factor (physical, social, and self-evaluative) Multidimensional Outcome Expectations For Exercise Scale (MOEES; Wójcicki, White, & McAuley, 2009) in a sample of young adult college students enrolled in a health-related fitness course.

METHODS: Confirmatory factor analysis was used to examine the 3-factor MOEES model in 346 young adults (52% female, Mage = 20.59 ± 4.79) from a public university located in the Southwest United States. Participants completed questionnaires assessing physical, social, and self-evaluative outcome expectations, barrier self-efficacy (Dwyer et al., 2012), and self-esteem (Robins et al., 2001), as well as the FITNESSGRAM® health-related fitness assessment to measure their cardiorespiratory fitness, muscular strength and endurance, and body composition (Cooper Institute, 2013).

RESULTS: Analyses supported the 3-factor measurement model of the MOEES in young adults, χ²(81) = 312.11, p < .01, RMSEA = .09, CFI = .95, SRMR = .04 (Hu

Abstracts were prepared by the authors and printed as submitted.
A recent study examined the impact of TV viewing during exercise on observable volitional behavior (i.e. treadmill endurance time) among insufficiently active adults (46±15 years, 51±5 kg/m²; 68% women). Participants completed two visits in a randomized order, with ~48h separating them. Participants could sit or walk on the treadmill (moderate intensity) as desired within a 60-minute time frame. During one visit, participants were able to view TV during exercise and while sitting. During the other, TV viewing was allowed only when seated. Despite the average age of 46±15 years, 51±5 kg/m²; 68% women. Participants completed two visits in a randomized order, with ~48h separating them. Participants could sit or walk on the treadmill (moderate intensity) as desired within a 60-minute time frame. During one visit, participants were able to view TV during exercise and while sitting. During the other, TV viewing was allowed only when seated.

PURPOSE: To assess the relationship between cell phone use, physical activity and sedentary behavior in adults older than college age (≥ 30 years old). This research is warranted as cell phone use is inversely associated with physical activity and sedentary behavior. Participants were classified as non-users (n=227, 79.1%), regular-users (i.e., playing more than 30 min a day) was inversely associated with age (r = 0.3, p = 0.005). Cell phone use was not associated with objectively- or subjectively-measured physical activity or sedentary behavior (r ≤ 0.1, p ≥ 0.3 for all). There were also no significant differences in physical activity or sedentary behavior between the low, moderate, and high cell phone user groups (≤ 60min, p = 0.12 for all). CONCLUSION: Consistent with previous research, there was an inverse relationship between cell phone use and age. Unlike what has been reported in college-age individuals, cell phone use was not associated with sedentary behavior in adults older than college age. Because younger individuals are “digital natives” who have been raised with near-constant access to cell phones this may be their sedentary behavior of choice. Conversely, adults who are older may prefer other, more traditional forms of sedentary activities such as watching television and using a desktop computer. This may explain the lack of a relationship between cell phone use and sedentary behavior in adults beyond college age.

While there is evidence of a positive relationship between cellular telephone (cell phone) use and sedentary behavior, but not physical activity in college-aged individuals (18-29 years old), these relationships have not been tested in individual adults older than college age (≥ 30 years old). This research is warranted as cell phone use is inversely associated with age; thus these relationships may be different in older adults. PURPOSE: To assess the relationship between cell phone use, physical activity and sedentary behavior in adults older than college age (≥ 30 years old). METHODS: Adults aged 30-63 years (N = 69, 51 ± 8 years old) wore physical activity monitors (accelerometers) for seven days and completed surveys assessing daily cell phone use, physical activity, and sedentary behavior. Pearson’s correlation analyses were performed to assess relationships between cell phone use and age, physical activity, and sedentary behavior. Participants were then split into tertiles based on total cell phone use (low, moderate, and high) and a MANCOVA (sex and age as covariates) was used to determine if there were group differences in physical activity and sedentary behavior. RESULTS: Cell phone use (~ 125.2 ± 146.8 minutes per day) was inversely associated with age (r = -0.3, p = 0.005). Cell phone use was not associated with objectively- or subjectively-measured physical activity or sedentary behavior (r = 0.1, p ≥ 0.3 for all). There were also no significant differences in physical activity or sedentary behavior between the low, moderate, and high cell phone user groups (≤ 60min, p = 0.12 for all). CONCLUSION: Consistent with previous research, there was an inverse relationship between cell phone use and age. Unlike what has been reported in college-age individuals, cell phone use was not associated with sedentary behavior in adults older than college age. Because younger individuals are “digital natives” who have been raised with near-constant access to cell phones this may be their sedentary behavior of choice. Conversely, adults who are older may prefer other, more traditional forms of sedentary activities such as watching television and using a desktop computer. This may explain the lack of a relationship between cell phone use and sedentary behavior in adults beyond college age.
There is currently research that suggests that physical activity level is a significant positive predictor of satisfaction with life (SWL) as well as a significant negative predictor of depression in older adults. The belief that an individual holds regarding their exercise self-efficacy (SEFF) has also been found to serve as a predictor of SWL and depression. It’s currently unknown which of these two variables (physical activity or self-efficacy) is the better predictor of satisfaction with life and depressive symptoms in older adults. Thus, the PURPOSE of this study was to examine the relationships among physical activity level, exercise self-efficacy, age, SWL, and depressive symptoms in this population. We hypothesized that exercise self-efficacy would be the better predictor of SWL and depressive symptoms than physical activity level in older adults. METHODS: In 68 older adults (73.5 ± 7.8y) we assessed depression (Geriatric Depression Scale, GDS), well-being (Satisfaction with Life Scale, SWLS), moderate-to-vigorous physical activity (MVPA, Community Healthy Activities Model Program for Seniors questionnaire), and exercise self-efficacy (SEFF). Hierarchical linear regression analyses were utilized to assess the predictive value of MVPA, SEFF, and Age for SWLS and GDS using two models (Model 1: Age and MVPA; Model 2: Age, MVPA, and SEFF). Significance was set to p<0.05. RESULTS: Only age was a significant predictor of GDS in model 1. In model 2, only SEFF was a significant predictor of GDS (β = −0.33, p<0.05). Neither age nor MVPA were significant predictors of SWLS in Models 1 and 2. SEFF was a significant predictor of SWLS in model 2 (β = −0.33, p<0.05). CONCLUSIONS: These preliminary data show that exercise self-efficacy is a stronger predictor of depressive symptoms and satisfaction with life compared to age and MVPA in older adults.

The older Latino population will increase rapidly over the next four decades, from 7.3% in 2012 to a projected 18.4% by 2050. Latinos have twice the incidence of dementia for a minimum of 4 hours daily, for the past 6 months. Eight interviews were conducted in Spanish and English about the caregiver role, family, and social support, coping strategies and PA. For the purposes of this study only responses regarding what prevent PA were analyzed. Interviewers were recorded, transcribed, translated and coded according to directed content analysis. RESULTS: Fifteen caregivers cited many barriers that prevent them from participating in PA, and only one reported no barrier. Most obstacles cited involved the care recipient. The necessity to stay at home caring for the relative was the main barrier mentioned (8). Interestingly, this barrier was only mentioned by female caregivers. Women also reported laziness, lack of time due to work, illness, and necessity to take care of grandchildren as other barriers. Males pointed out the lack of time because of work, disability, and laziness as barriers. The most relevant barrier for PA was the impossibility of leaving the care recipient by him/herself or with other temporary caregivers; however, this barrier did not seem to prevent males to engage in PA. CONCLUSIONS: Older Latino caregivers cited caring for the family member as the main obstacle to engage in PA. Gender differences seem important, as males are still able to participate in PA despite of caregiving. Future research and interventions should consider the need of offering an alternative type of assistance to the primary caregiver to allow extra time to PA participation. Funded by the Department of Kinesiology and Nutrition of UIC.

INTRODUCTION: High Intensity Functional Training (HIFT) is characterized by varied weight training, gymnastic, and body weight movements performed at high intensity. HIFT presents participants with the opportunity to improve factors related to physiological and psychological health. Considering its global growth, it is important to recognize the motivational factors behind participation in this training modality. PURPOSE: We sought to examine what motivational factors were most important among participants engaging in HIFT at different frequencies throughout a week. METHODS: 732 adults (32.4 ± 8.2 years) with more than three months of HIFT experience (<3 d/wk, N = 114; 3-5 d/wk, N = 413; >5 d/wk = 205) completed an online version of the Exercise Motivation Inventory (EMI-2) survey. RESULTS: Significant Spearman ρ (p) correlations were seen between HIFT frequency and all EMI variables (p<0.01) except those related to health pressures (p = 0.331), ill health avoidance (p = 0.013; p = 0.774), and appearance (p = 0.025; p = 0.596). Kurskal-Wallis H test and post-hoc comparisons showed that individuals training 3-5 and >5 d/wk scored higher in factors related to enjoyment, affiliation, and competition (p<0.001) compared to those training <3d/wk. Also, those training >5 d/wk scored higher in factors related to challenge, social recognition, strength and endurance, and nimbility/factors related to wellness (p<0.001) than the other two groups. CONCLUSIONS: This is the first study to express differentiation of motivational factors in HIFT participants based on their weekly training frequency. Considering its growth and expansion, it is important to understand the psychological motives to successfully implement programs targeted towards an

Previous research has indicated that exercisers report lower levels of trait anxiety than non-exercisers regardless of age and gender (De Moor et al., 2006). Significant reductions in trait anxiety occur when aerobic exercise interventions exceed 10 weeks (Petruzzello et al., 1991). However, there is limited research examining the relations between trait anxiety and preferred mode of exercise in both population studies and exercise interventions. PURPOSE: To examine the association between trait anxiety and preferred mode of exercise during leisure time in health-conscious young adults. METHODS: 770 health-conscious young adults included 770 participants that did not prefer to participate in any mode of exercise reported the significantly lower mean trait anxiety scores than students who preferred playing sports (d = 0.86), strength training (d = 0.92), aerobic training (d = 0.84), and multiple modes (d = 1.16). In addition, students who preferred multiple modes of exercise during their leisure time reported significantly lower mean trait anxiety scores than students who preferred playing sports (d = 0.31) and aerobic training (d = 0.38). CONCLUSION: These findings indicate that exercise preferences relate to trait anxiety in a collegiate sample. Specifically, participants that did not prefer to participate in any mode of exercise reported the highest levels of anxiety. These results are consistent with previous research indicating that exercise, in general, may lead to reductions in trait anxiety (Petruzzello et al., 1991).
individual’s motivation. Future studies should look at these motivational factors impact adherence based on the workout frequency, age of the participants, and number of years training.

2056 Board #69 June 1 2:00 PM - 3:30 PM Correlates of Chinese College Student’s Physical Activity Behavior: A Social Ecological Model Perspective Meirong huang1, Haichun Sun1. China University of Mining and Technology, xuzhou, China. 2University of South Florida, Tampa, FL. (Sponsor: Zan Gao, FACSM) Email: 411462089@qq.com

Purpose: A recent report indicated that the number of Chinese college students reached 37 million in 2015, representing the world’s largest college student population. Despite the well-known health benefits of regular physical activity (PA) participation, Chinese college students are less likely to engage in PA as compared to their counterparts in Western countries. Understanding the factors that relate to Chinese college students’ PA would provide valuable insights for future PA interventions. Guided by the Social Ecological Model, this study examined the associations among personal, social, and environmental correlates of PA participation among Chinese college students. Methods: Chinese college students (N = 741) were recruited from East region of China. Demographic information was collected, and PA and Social Ecological Model-based correlates (values, efficacy, social support, media and social media, weather, and facilities) were measured via a previously validated questionnaire for Chinese college students. Multiple regression analysis was conducted using gender and social ecological factors as independent variables and PA as the dependent variable. Results: Regression analysis suggested that gender was a significant predictor ($β = -17., p < .01$) with male students being more physically active. For the social ecological factors, PA: $β = .071$, $p < .03$, efficacy ($β = .40, p < .01$), social support ($β = .20, p < .01$), and weather ($β = .18, p < .01$) emerged as significant predictors; while media and social media ($β = -.057, p < .083$) and facilities ($β = -.003, p < .913$) were not found to be significant predictors for college students’ PA. The model accounted for 42.6% of the variance in college students PA participation. Conclusions: Strategies and interventions are needed to promote female college students’ PA. Programs that specifically designed to develop or enhance college students’ efficacies and values toward PA and to encourage social interaction among peers might be helpful for PA participation.

2057 Board #70 June 1 2:00 PM - 3:30 PM Does Experience Matter? Enjoyment Of High Intensity Interval Exercise With Respect To Exercise History Daniel R. Greene, Steven J. Petruzello, FACSM. University of Illinois at Urbana-Champaign, Urbana, IL. (Sponsor: Steven J. Petruzello) Email: dgreene2@illinois.edu

While post exercise enjoyment and affective responses to aerobic exercise are fairly well documented, only recently have they been investigated within high-intensity interval exercise protocols. Further, little is known regarding how exercisers compare with non-exercisers with respect to affective responses during, and enjoyment following, high-intensity interval exercise (HIIE). PURPOSE: With respect to individual exercise history, evaluate affect during and enjoyment post: (a) continuous moderate intensity aerobic exercise (MIA); (b) high-intensity interval exercise (HIIE); and (c) a sedentary control condition (SED). METHODS: Participants (N=269; 156 ♀; 20.60 ± 1.20 yrs, M±SD) were divided into “regular exercisers” (n = 194; 102 ♂) and “non-exercisers” (n = 75; 54 ♀) based on self-reported exercise history. All participants completed each of the randomly ordered 15-min conditions: MIA (walking), SED (quiet reading), and HIIE (2 min activity, 1 min recovery). Enjoyment (Physical Activity Enjoyment Scale) was measured post condition; affective valence (Feeling Scale; FS) was assessed pre and every 3 min during each condition. RESULTS: Regular exercisers reported greater enjoyment following HIIE ($M_{diff} SE = 10.40 ± 2.40; P < .001$) and reported more positively valenced affect during HIIE ($M_{diff} SE = 0.96 ± 0.26; P < .001$) relative to non-exercisers. Additionally, regular exercisers enjoyed HIIE more than the MIA condition ($M_{diff} SE = 6.12 ± 1.46; P < .001$), while non-exercisers showed no difference in enjoyment between the two active conditions ($M_{diff} SE = 3.43 ± 2.35; P = .15$). No differences were observed in enjoyment post or affect during the MIA condition between regular and non-exercisers. CONCLUSION: This believed to be the first study comparing regular exercisers to non-exercisers with respect to enjoyment and affective responses to HIIE. These findings both extend previous research by adding to the limited work on affective responses to HIIE and highlight the importance of exercise experience with respect to HIIE. In order to maximize exercise enjoyment and affective responses, especially when prescribing exercise, more attention needs to be given to exercise history.

INTRODUCTION: Self-determination theory (SDT; Deci & Ryan, 1985) is a prominent theoretical framework applied to assess exercise participation (Kirkland et al., 2011). SDT holds that satisfying the three basic psychological needs (BPNs; autonomy, competence, and relatedness) fosters self-determined motivation, personal growth, and psychosocial well-being (Deci & Ryan, 1985). Relations between BPNs and exercise participation may vary between sexes (Martinez et al., 2013). Given that exercise participation is highly related to health-related fitness (Blair et al., 2001) investigating whether the relations between BPNs and fitness outcomes also vary between sexes is warranted. PURPOSE: To investigate the relations between BSNs and fitness outcomes in male and female college students. METHOD: Participants were 564 male and 503 female college students ($M_{age} = 20.57 ± 3.82$ years) enrolled in a health and wellness course. Students completed a survey assessing the BPNs (Vachopoulous & Michaelidou, 2006), as well as the FITNESSGRAM® test battery (Cooper Institute, 2013), which includes measures of cardiorespiratory fitness (Progressive Aerobic Cardiovascular Endurance Run [PACER]), muscular strength and endurance (curl-up and push-up), and body composition (body fat %). Correlation analyses were conducted by sex to examine bivariate relationships between BPN and fitness outcomes. RESULTS: Analyses revealed that BPNs were significantly correlated with each fitness outcome ($p < 0.05$). Correlation magnitudes were not statistically different between males and females based on Fisher’s r tests ($p > .05$). In both genders, competence had significantly higher correlations with the fitness outcomes (excluding PACER) when compared to relatedness ($p < .05$), but did not significantly differ from autonomy ($p > .05$). CONCLUSION: Results indicated that autonomous BPNs related to components of physical fitness were positively correlated in a health and wellness course. Interestingly, competence had the strongest relationships with fitness outcomes. Based on this study and previous research, fitness instructors may want to promote competence by providing social support and constructive individualized feedback, believing in participants’ abilities, acknowledging their improvements and successful experiences.
Obesity in the United States is significantly higher than it was in the previous generation. West Virginia’s obesity rate currently exceeds 30% of its population. Previous literature has demonstrated an inverse relationship between BMI (body mass index) and health-related quality of life, however these associations rarely include college-aged adults. PURPOSE: To examine the relationship between BMI and health related quality of life in college aged freshman enrolled in the HERD (Higher Education Reducing Diabetes) Study at Marshall University in Huntington, West Virginia. METHODS: The HERD Study is a 4 year longitudinal, randomized study examining the effects of a freshman year, healthy lifestyle intervention on the reduction of student’s risk factors for developing type 2 diabetes and cardiometabolic disease. Freshmen were recruited during the Fall 2016 Freshman Week of Welcome at Marshall University. Quality of Life was assessed at baseline using the Short Form-12 Questionnaire. The SF-12 is a 12 item, validated survey assessing participant’s physical and mental quality of life.

RESULTS: To date, 76 freshman have enrolled into the HERD study [age= 18.5±2.36 years; female=60.5% (n=46); 85.5% Caucasian (n=65); BMI= 26.5±5.85 kg/m². Fifty-three percent (n=40) of the students were deemed overweight or obese (BMI ≥ 25 kg/m²). Students with a BMI ≥ 25 kg/m² were significantly less likely to record their health as very good or excellent compared to those with a BMI < 25 kg/m² (p=0.002). Students with a BMI ≥ 25 kg/m² were more likely to record that their health (physical and emotional) interfered with social activities (p=0.004). Also, students with a BMI ≥ 25 were more likely to report that their health (physical and emotional) interfered with social activities (p=0.004).

CONCLUSIONS: The BMI of college-aged freshman appears to have an impact on health related quality of life with higher BMI contributing to reduced health quality, productivity and social factors. Future efforts will examine strategies for decreasing BMI to improve the physical and mental health of young adults.

**Email:** laurenbartoldson@marshall.edu

**Vol. 49**

**Board #73**

**June 1 2:00 PM - 3:30 PM**

**Comparing Bmi With Health Related Quality Of Life In College Freshman: The Herd Study**

Lauren Bartoldson. Marshall University, Martinsburg, WV. Email: laurenbartoldson@outlook.com

(NO relationships reported)

Beetroot juice supplementation is known to improve endurance performance in untrained and moderately trained subjects. In well-trained subjects beneficial effects of supplementation are questionable in normoxia but may be promising in hypoxia. Therefore, effects on maximal and submaximal performance during normoxia and normobaric hypoxia should be further investigated. PURPOSE: To examine the effects of beetroot juice (BR) supplementation on cycling performance in well-trained cyclists during normoxia and normobaric hypoxia (15% O2). METHODS: Five well-trained male cyclists (VO2max, 69.1 ± 5.2 ml kg·min−1; W50, 5.7 ± 0.3 W·kg−1) completed four exercise trials. Subjects consumed 140 ml BR (equivalent to 12.4 mmol nitrate) or placebo (PLA) (nitrate-depleted BR) for seven days in a double-blind, randomized crossover design. On day four and seven, subjects completed 3x6-min submaximal cycling at 70% lactate threshold and a 10-km time trial (TT) in either normoxia or hypoxia. Inspiratory conditions were randomized and single blinded.

RESULTS: BR did not affect TT performance in either hypoxia (BR: 253.8 ± 35.6; PLA: 252.8 ± 32.3 W; P=0.65) or normoxia (BR: 296.8 ± 45.4; PLA: 297.4 ± 44.8 W; P=0.83). However, average power output during the TT was higher in normoxia than in hypoxia (297.1 ± 45 vs. 253.3 ± 33.9 W; P=0.003). Average oxygen uptake during the TT was higher in normoxia than hypoxia (441.4 ± 462 vs. 395.9 ± 368.7 ml·min−1; P=0.008). Similarly, peak oxygen uptake during the TT was higher in normoxia than hypoxia (488.8 ± 348.9 vs. 420.4 ± 395.3 ml·min−1; P=0.003). During submaximal cycling BR did not affect average steady state oxygen uptake in neither hypoxia (BR: 2329.8 ± 320.5; PLA: 3158.8 ± 406.1 ml·min−1; P=0.28) nor normoxic conditions (BR: 3167.7 ± 312.5; PLA: 3069.7 ± 249.3 ml·min−1; P=0.55). Further, oxygen uptake during submaximal cycling was similar in hypoxic and normoxic conditions (HYP: 3193.3 ± 360.5; NORM: 3118.7 ± 241.2 ml·min−1; P=0.47).

CONCLUSIONS: These preliminary results suggest that seven days of high dose BR supplementation do not enhance cycling performance in normoxia or moderate hypoxia in well-trained cyclists.

**Email:** Torben@hst.aau.dk

**Vol. 49**

**Board #75**

**June 1 3:30 PM - 5:00 PM**

**Effects Of Beetroot Juice Supplementation And Hypoxia On Time Trial Performance In Well-Trained Cyclists**

Torben Rokkedal Lausch, Ryan Godsk Larsen, Mathias Krogh Poulsen, Dan Karbring, Lars Pilegaard Thomsen, Jesper Franch. Aalborg University, Aalborg, Denmark. Email: Torben@hst.aau.dk

(NO relationships reported)
following SLP+ . Sleep condition did not influence the change in peak torque, as peak torque during EX2 was ‘likely’ lower than EX1 with both SLP+ (89% LH) and SLP- (80% LH). Likewise, sleep condition did not impact the change in muscle soreness, as muscle soreness ‘very likely’ increased from EX1 to EX2 with both SLP+ (97% LH) and SLP- (99% LH). CONCLUSION: A single night of sleep restriction following heavy exercise had marked consequences on 3-km TT performance the next morning. Strategies to ameliorate the consequences that sleep loss have on performance should be investigated.

2064 Board #77
June 1 3:30 PM - 5:00 PM
Validity of a Novel Staged Exercise Test for Measuring Maximal Steady State Lactate In Recreational Cyclist Using the Lactate Plus Analyzer(R)
Jacob Harp, Max Sanderford, Joe Gillespie, Jennifer Blevins-McNaughton. Tarleton State University, Stephenville, TX.
Email: jblevins@tarleton.edu
(No relationships reported)

Several types of lactate threshold (Tₘ) protocols have been developed over the years to maximize accuracy and reliability while maintaining ease of measurement and application to training and performance. PURPOSE: The purpose of this study was to determine the validity of a novel staged maximal steady state lactate steady state exercise test (sMLSS) in predicting the MLSS using the Lactate Plus® (Nova Biomedical, Waltham, MA) analyzer. METHODS: Blood lactate concentration (BLC) was measured in duplicate for all tests. Seven trained cyclists (20 miles per week) performed a VO₂max test starting at 100W and increasing by 30W every three minutes until volitional fatigue. Lactate threshold was defined as the previous workload to be investigated. The HIIT schemes were counterbalanced to avoid an order-effect. VO₂peak (ml.kg⁻¹.min⁻¹) values from the verification bout (58.7 ± 6.9), 4 X 180 s 60% W’ (53.7 ± 5.7), 3 X 300 s 80% W’ (53.7 ± 5.7), 4 X 300 s 60% W’ (54.3 ± 8.0), and the 3 X 300 s 80% W’ (53.7 ± 7.4) did not differ (F = 2.10, p = .025). Strong measurement agreement was observed for VO₂peak between measures (ICC = .95, typical error = 2.37 ml.kg⁻¹.min⁻¹, coefficient of variation = 4.6%). CONCLUSION: The 60% and 80% W’ HIIT schemes for either 180 or 300 s durations evoked VO₂peak consistently, providing empirical support for the CP concept to standardize HIIT.

S424 Vol. 49 No. 5 Supplement

2065 Board #78
June 1 3:30 PM - 5:00 PM
High-intensity Cycling Intervals are Prescribed Accurately Using the 3-min all-out Exercise Test
Nathan D. Dicks, Zachery A. Roloff, Luke M. Krynski, Robert W. Pettit, FACSM, ‘North Dakota State University, Fargo, ND. ‘Minnesota State University, Mankato, Mankato, MN. (Sponsor: Robert Pettit, FACSM).
Email: nathan.dicks@ndsu.edu
(No relationships reported)

High-intensity interval training (HIIT) has been used to enhance critical power (CP) and the finite capacity for work (<CP (W’)); yet, research on prescriptions using the CP concept is warranted. PURPOSE: We investigated the validity of interval prescriptions derived using CP and W’ measures acquired from a 3-min all-out exercise test (3 MT). METHODS: Eight competitive cyclists completed a 3 MT, verification bout for determining peak oxygen uptake (VO₂peak), and subsequent HIIT bouts, noted numerically using the number of bouts by duration and %W’ depletion riding on a cycle affixed to a Computrainer. Using expired gas exchange data, VO₂peak values from a verification bout at sub-maximal (75% VO₂peak) were compared with and each subsequent HIIT bout. Bland-Altman plots, one-way ANOVA, and regression analyses were used to analyze differences between the types of exercise tests. RESULTS: There were no significant differences for duplicate BLC trials for all tests (p = 0.21; r = 0.982). Ninety-five percent confidence intervals for the sMLSS and MLSS were significantly correlated with the MLSS workload and percentage of max workload (r = 0.997; p = 0.001, r = 0.978, p = 0.01), respectively. There was no bias noted between sMLSS and MLSS protocols for predicting lactate accumulation. CONCLUSION: In conclusion, the sMLSS was a valid and reliable predictor of MLSS in trained cyclists.

2066 Board #79
June 1 3:30 PM - 5:00 PM
Difference Of Anaerobic Capacity, Muscle Activity Of Lower Extremities In Win-gate Test According To Events Of Cyclists
Da-Woon Park, Moo-Youp Je, Shun-Zhe Piao, Dong-Woo Kim, Tae-Youn Kim, Deuk-Su Park, Hyeyeong-Jun Park, Jae-Keun Oh. Korea National Sport University, Seoul, Korea, Republic of.
(No relationships reported)

PURPOSE: This study examined anaerobic capacity, muscle activity of dominant lower extremities Gluteus maximum(Graxs), Rectus femoris(RF), Long head of biceps femoris(LBF), Tibialis anterior(TA), Gastrocnemius medialis(GM) with Standing start 10sec(SS-10sec) and Rolling start 30sec(RS-30sec) Wingate test between short distance cyclist group(SDC; 20±1 yrs) and long distance cyclist group(LDC; 21±2 yrs) total 12 elite cyclists to develop baseline data which can provide proper training program for each event through comparison and analysis of this experiment. METHODS: Independent t-test was conducted to verify the differences of anaerobic capacity, lower extremities muscle activity, isokinetic muscle strength, and paired t-test was executed to verify anaerobic capacity, muscle activity differences within each group. All the statistical significance level was set as α = 0.05.

RESULTS:
1. SDC group was identified as significantly higher Peak/kg than LDC group during SS-10sec wingate test between the groups(p<.05).
2. SS-10sec was identified as significantly higher than RS-30sec in Peak power and Peak/kg between SS-10sec and RS-30sec wingate test within SDC group(p<.01, p<.01). SS-10sec was identified as significantly higher Peak power and Peak/kg than RS-30sec, within LDC group(p<.05, p<.05), for Mean power and Mean power and Mean/kg, RS-30sec was identified as significantly higher result than SS-10sec(p<.001, p<.001).
3. SS-10sec was identified as significantly higher Peak and Mean muscle activity than RS-30sec in long head of biceps femoris during wingate test within SDC group(p<.05, p<.01). Peak muscle activity within LDL group was identified as no significant difference between SS-10sec and RS-30sec in Peak muscle activity, for Mean muscle activity, SS-10sec was identified as significantly higher muscle activity than RE-30sec in tibialis anterior and gastrocnemius medialis(p<.01, p<.05).

CONCLUSION: With the above results, it is identified anaerobic capacity and activated muscle groups during pedalling according to cycling events. Therefore, in the future study, it is considered that specialized training program application for specific event based on the current study could improve athletic performances.

2067 Board #80
June 1 3:30 PM - 5:00 PM
Preliminary Examination Of Stamina Sensor Device With Laboratory Testing Measures In Recreationally Trained Cyclists
Robert Blaisdell, Nicholas Fiolo, Kimikate Sato. East Tennessee State University, Johnson City, TN.
Email: blaisdell@etsu.edu
(No relationships reported)

The availability of app based fitness technology has led users to a wide selection of devices to aid in their training regimes, however some do not accurately represent individual physiological characteristics. With an ever growing base of device choices, selecting a highly reliable and valid unit should be of utmost importance to the attentive athlete. PURPOSE: To determine the relationship of a stamina sensor device with traditional laboratory cardiopulmonary testing protocols to evaluate inter-individual physiological characteristics in trained cyclists. METHODS: Recreationally trained cyclists (n=6) completed a successive fixed work rate incremental cycle ergometer test to exhaustion. The testing protocol began at 85 W and increased by 15 W every 5 minutes. Inspired and expired gases were continuously recorded using a metabolic cart, heart rate (HR) using a stamina sensor device app; blood lactate levels utilizing a using a finger stick capillary sample (0.7 microliter (μL)) and a blood lactate analyzer and rate of perceived exertion (RPE) were obtained during the final 30 seconds of each stage. Individual physiological data were assessed to determine heart rate (HR), lactate threshold (LT), ventilator threshold (VT), and RPE responses between athletes. Delta values were calculated per dependent variable to assess the relationship between changes in physiological response to changes in the stamina levels. RESULTS: The stamina sensor device displaying stamina percentage, aerobic percentage, and anaerobic percentage has shown low correlation with laboratory testing measures such as VO2 and blood lactate values. When correlations were run on VO2 and stamina % change, stamina value, aerobic, and anaerobic values it produced r values of 0.616, -0.743, -0.861 and -0.664 respectively. When correlations were run on blood lactate values and stamina % change, stamina value, aerobic, and anaerobic values it produced r values of 0.509, -0.817, -0.914 and -0.761 respectively.
CONCLUSION: Though the stamina sensor device is not a direct replacement of laboratory testing to measure performance, the stamina sensor does appear to accurately represent the subjective output (RPE) of the individual athlete.

The impact of cycling cadence on oxygen consumption has not been studied in detail but previous reports describe increased oxygen consumption at higher rates of muscle contraction, even when external work is similar. The majority of studies were performed during incremental exercise to exhaustion and there is little data on sub-maximal responses. One of the challenges is to determine the relative intensity to compare different cycling cadences during submax exercise as %VO2peak will be influenced by the cadence during VO2peak testing. PURPOSE: The purpose of this study was to determine if peak power output (PPO) could be used to compare the metabolic responses during submaximal exercise at different cycling rates.

METHODS: Eleven young (21±1 yr) recreationally active males completed a continuous incremental exercise test to exhaustion (VO2peak) on an electrically braked cycle ergometer at 65rpm and 95rpm. The power output corresponding to 55% PPO was calculated for each cycling cadence and, on two further occasions, participants cycled for 1-hr at 65-rpm and 95-rpm. Indirect calorimetry was used to monitor a number of metabolic variables during exercise. In addition, heart rate and blood lactate was measured during all trials. RESULTS: At VO2peak, oxygen consumption (318±230 vs 334±318 ml/min, p=0.002), total ventilation, respiratory rate, heart rate and lactate were all significantly greater following the 95-rpm trial (p<0.05). There were no significant differences in peak power output or ventilatory threshold between trials. During sub-maximal exercise, VO2 (2012±194 vs 2371±218 ml/min, p<0.001) and all other parameters were significantly greater at 95-rpm (p<0.05).

CONCLUSIONS: As PPO does not change during maximal exercise it can be used to control external work and compare the metabolic responses while cycling at different cadences. The mechanisms underpinning the increased metabolic demand at higher rates of muscle contraction need further examination.

Various strategies designed to promote physical activity participation and enjoyment have been researched, but few studies have focused on exercising while playing video games. PURPOSE: To investigate whether playing a video game, or watching music videos while exercising can increase exercise enjoyment, decreases perceived exertion, and increases work output. METHODS: Using a randomized order within-subjects experimental design, college-aged males (n=24) participated in three conditions: cycling while playing an Xbox® 360 video game console (VG), cycling while watching music videos (MV), and cycling with no external media (NM). Dependent measures were exercise enjoyment (PACES), perceived exertion (RPE), heart rate (HR), and total work output (kJ). Data were analyzed using paired t-tests with Holm’s Sequential Bonferroni adjustments (SSPS v21). RESULTS: VG and MV PACES scores were statistically similar, but both were significantly higher than NM (VG: M = 3.33, SD = .85; MV: M = 4.31, SD = .44, p < .001, d = 1.14; NM: M = 4.32, SD = .56, p < .001, d = 1.15). RPE was significantly lower in the VG condition (M = 13.21, SD = 1.56) than both the MV (M = 14.46, SD = 1.71, p < .005, d = .73) and NM conditions (M = 14.25, SD = 1.62, p < .001, d = .64). A significantly higher total work output (in kJ) was observed in the MV condition over the VG condition and NM over the VG condition (VG: M = 113.12, SD = 29.21; MV: M = 128.11, SD = 30.17, p < .001, d = 2.51 and VG: M = 113.12, SD = 29.21; NM: M = 122.75, SD = 33.30, p < .005, d = 3.17). Power output increased during the final 4 km compared to 12 km (P < 0.05); the increase in power during the final 4 km was accompanied by an increase in oxygen uptake which at 16.1 km (3.7 ± 0.5 L min⁻¹) was greater (P = 0.05) than that at 12 km (3.6 ± 0.5 L min⁻¹). Heart rate also increased continuously throughout the final 4 km (P < 0.001), though was not different between trials. CONCLUSIONS: In using the typically displayed amplitudes and periods of variation in power output that competitive cyclists undergo during TTs in order to define VT, this study sought to replicate the typical variations which are apparent during self-paced TT. The results of the present study suggest that this typical power variation does not adversely affect performance, at least during a 16.1-km TT. The similar performance was accompanied by similar physiological responses during the final 4 km of the trial.

In order to complete an event as fast as possible an endurance athlete must select a work rate that maximizes intensity and optimizes the rate of fatigue. This pacing strategy ensures a true maximal effort without premature exhaustion and can be conceptualized as an allocation of the athlete’s stamina resources. The relationship between intensity and time to exhaustion is curvilinear and dependent upon the athlete’s individual fitness characteristics and current fatigue state. Therefore, an athlete’s stamina level and rate of exhaustion should be influenced by exercise intensity, duration, and individual fitness characteristics.

PURPOSE: To determine the relationships between smartphone stamina sensor data and the performance and physiological responses to an incremental cycling test to exhaustion in trained cyclists.

METHODS: 6 trained cyclists completed a successive, fixed work rate incremental cycle ergometer test to exhaustion. Testing began at 85 W and increased by 15 W every 5 minutes. Inspired and expired gases were continuously recoded using a metabolic cart and HR using the smartphone app. RPE was obtained during the final 30 seconds of each stage. Individual physiological data were assessed to determine the individual VO2 and metabolic cost per stage and the ventilatory thresholds. Bivariate correlations were conducted between the following variable: stamina and total mechanical work (J), stamina percent change and stage RPE, stamina and energy expenditure (kcal.), and stamina and percentage of total kcal. to exhaustion.

RESULTS: Stamina had statistically significant correlations with J, r(40) = -.81, p < .01, RPE, r(40) = -.62, p < .01, kcal., r(40) = -.79, p < .01, and percentage of kcal. to exhaustion, r(40) = -.83, p < .01.

CONCLUSIONS: The stamina variable is highly related to performance and physiological responses to an incremental cycling test to exhaustion. Stamina is able to respond to the dynamic nature of exercise to exhaustion and may prove to be a valid variable to assess endurance performance.
**PURPOSE:** Previous investigations have found that various types of deception (i.e. unknown task endpoint) could alter perception and consequently affect performance. We investigated whether deception detection influenced performance and metabolic variables in cyclists. METHODS: Ten semi-professional male cyclists (age 36±5 years; height 173±6 cm; weight 76.7±265 kg; with 2 years of experience) completed three 60 min cycling time trials (roller trainer) after 2 familiarization sessions. Visual feedback of elapsed time was provided, but the chronometer was manipulated to display either real (NOR), 10% slower (SLO) or 10% faster time lapse (RAP). Total distance covered and heart rate (HR) were recorded at each 10 min interval. Ratings of perceived exertion (RPE) were assessed with the 20-point Borg scale. Blood samples were collected before and immediately after each time trial, and analyzed for blood glucose, serum creatinine, serum urea, and serum urate. Data were analyzed using repeated measures ANOVA. Significant main effects were further analyzed using pairwise comparisons with Bonferroni post hoc tests. Statistical significance was set at the p<0.05 level of confidence. Statistical analysis was completed using SPSS v20.0 for Windows (LEAD Technologies). RESULTS: Distance completed at any 10 min time point was similar between conditions, but total distance covered over the 60 min differed among conditions (NOR = 20.7±4.1; SLO = 25.7±7.1; RAP = 23.7±5.2 Km) (p<0.05). Post-hoc analyses indicated that both RAP (p=0.001) and SLO (p=0.027) covered a greater total distance than NOR, with no difference in distance covered between SLO and RAP (p=0.458). RPE (NOR = 17±3; SLO = 16±4; RAP = 18±1) and HR (NOR = 171±12; SLO = 172±17; RAP = 180±12 bmp) were similar (p=0.145) among conditions. Blood glucose increased during the time trial for all conditions, however increases in blood glucose (NOR = 7.4±10.7; SLO = 5.2±8.6; RAP = 6.8±13.3 mg/dl) were similar among all conditions. Serum creatinine, serum urea and serum urate were stable and did not differ among conditions. CONCLUSION: These results indicate that deception (±10%) consisting of either a slower or more rapid perception of elapsed time can increase performance in a time trial, but does not affect RPE nor the measured metabolic variables in semi-professional cyclists.

**Board #86**

**June 1 3:30 PM - 5:00 PM**

**The Effect Of Acute Versus Accumulated Soccer Training On Postprandial Dysmetabolism**

Darren J. Paul1, George P. Nassisi2, Jens Bangsbo2.1Aspetar Sports Medicine and Orthopedic Hospital, Doha, Qatar. 2University of Copenhagen, Copenhagen, Denmark.

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)

(Please modify the affiliation of the last author to remove the email address)
Athletes’ performance may improve by increasing their sleep duration. This would typically be achieved by increasing time in bed at night, but this may not always be possible. One potential solution is to nap during the day, however the time taken to reach optimal performance after waking from a nap is not known. PURPOSE: To examine readiness to perform, sprint ability, and reaction time following a 2-hour nap in soccer players.

METHODS: Twelve soccer players (18.3±1 yr) completed two conditions in a randomised order. In one condition, participants had 9 hours in bed (22:00-07:00h) without napping the next day and in the other condition, participants had 7 hours in bed (00:00-07:00h) with a 2-h nap the next day (14:00-16:00h). Sleep was assessed using polysomnography. Each day, participants completed four 30-min test sessions (every 30 min starting at 16:15h) that included a visual analogue scale for readiness to perform, a 7-min warm up, two 10-m sprints, and a 90-s reaction time task. Total sleep time was compared between conditions using a paired t-test. The effect of condition (no nap vs. nap) and test session (30, 60, 90, 120 min) on readiness to perform, fastest 10-m sprint, and mean reaction time were assessed using repeated measures ANOVAs. RESULTS: Total sleep time was similar between conditions (no nap 8:10±0.7 h vs. nap 8:01±1.0 h; p=0.87). There were main effects of condition (p=0.01) and test session (p=0.05) on readiness to perform, but no interaction between condition and session (p=0.09). Readiness to perform was lower in the no nap condition (82.4±15.4) vs. the no nap condition (84.2±15.4), and at 30 min (68.0±20.8) vs. both 60 min (80.0±15.3, p=0.01) and 90 min (77.8±17.9, p=0.03). There was a main effect of test session (p=0.02) on reaction time, but no effect of condition (p=0.84) and no interaction between condition and session (p=0.26). Reaction time was faster at 120 min (211.3±20.0 ms) vs. 30 min (219.5±20.5 ms, p=0.01) and 60 min (219.8±20.8 ms, p=0.01). There were no main effects of condition (p=0.17) or time (p=0.37), and no interaction between condition and session (p=0.84) on sprint ability. CONCLUSIONS: The findings suggest that a daytime nap will not affect subsequent sprint ability or reaction time. However, athletes may feel less ready to perform after napping compared with not napping.

Non-invasive and measureable techniques to identify training distress may be useful to adjust training volume. Traditionally, questionnaire data examining psychological domains have been relied on to detect training distress. PURPOSE: To examine running performance (shuttle run), resting heart rate and heart rate recovery throughout a soccer season to determine if these physiological parameters can be used to detect training distress in collegiate soccer players. METHODS: 26 women and 17 men were enrolled in the study. Data were collected at four time points throughout the season (beginning, twice during season and during post-season play). Shuttle run time, heart rate recovery time, resting heart rate values, and multi-component training distress scale (MTDS) questionnaire at each time point. Multivariate analyses were performed with the dependent variable, with time, grade in school and gender as independent variable. RESULTS: Shuttle run times were prolonged in the beginning and end of season compared to the two mid-season tests (p<0.001); heart rate recovery improved throughout the season (p<0.003); freshen deviation from baseline MTDS was greater compared to all other grades (p<0.001). Although not statistically significant, resting heart rates trended up at the end of the season for both genders. MTDS correlated most with shuttle run time and resting heart rate. CONCLUSIONS: Shuttle run time and resting heart rate appear to be possible variables that could serve as physiological measures for training distress, although it appears higher physical fitness serves as a protective effect against training distress.

Differential physical demands and physiological responses between males and females in the same sport have rarely been explored. PURPOSE: To compare work load and biomarker changes in male and female Division I collegiate soccer players through pre season and the first half of the competitive season. METHODS: Male (N=24; M= 19 ± 1 yrs; M_moff = 11.9 ± 3.2%) and female (N=26; M= 19 ± 1.3 yrs; M_moff = 20.9 ± 3.4%) DI college soccer players participated in blood draws prior to pre season (T1), two weeks into the regular season (T2) and at season’s midpoint (T3). The athletes arrived fasted in the morning. T2 and T3 draws occurred – 1 h after a game. Creatine kinase (CK), free cortisol (FC), total cortisol (TC), iron (Fe), growth hormone (GH), and IGF-1 were assessed. Workload (km and kcal/kg) was monitored using the Polar Pro system. RESULTS: There were no significant changes in TC over time. FC increased from T1 to T2 (AFC = 0.34 ± 0.1 mcg/dl; p<0.05) and remained elevated, particularly for females. There were significant Time x Sex interactions for Fe, GH, and IGF-1 (p<0.05). Fe decreased from T1 to T2 (ΔFe = -29.6 ± 7.8 mcg/dl, p<0.05) before returning to baseline at T3 in females. CK increased from T1 to T2 (Δ CK= 204.9 ± 90.3 U/L, p<0.05) before returning to baseline for females and increased from T1 to T3 (Δ CK= 141 ± 57.1 U/L, p<0.05) for males. GH decreased from T1 to T2 (Δ GH= -2.1 ± 0.8 ng/ml, p<0.05) and remained below baseline in females. IGF-1 decreased from T2 to T3 in females (Δ IGF-1= -15 ± 14.4 ng/ml, p<0.05) while males increased from T2 to T3 (Δ IGF-1= 50.8 ± 12.5 ng/ml, p<0.05). Females had greater total workload (T1-T3) than males (227.6 ± 58.6 km vs. 183.2 ± 49.2 km; 645.1 ± 84.5 kcal/kg vs. 501.1 ± 110.5 kcal/kg; p<0.05, respectively). CONCLUSIONS: The increase in FC indicates an elevated stress response, which was particularly pronounced for females. Higher workloads for females in pre season were consistent with earlier elevations in CK compared to males. Additionally, only females had GH changes, suggesting a sex-dependent response. There were also differential changes in IGF-1 across sex. Significant changes in Fe were seen only in females, suggesting unique dietary needs during periods of increased work load. These results suggest differences in training demands and physiological responses for male and female collegiate soccer players.

Blood biomarkers signal health and performance concerns in athletes. However, serial comprehensive biomarker measurement to detect overtraining in elite soccer athletes remains unstudied. PURPOSE: To determine if comprehensive biomarker assessment of endocrine, muscle, and inflammatory health change with training progression in collegiate soccer players. METHODS: A comprehensive panel of 14 biomarkers was assessed in blood samples from 20 NCAA Division I male soccer players (mean±SD: height 181±6cm, body mass 77.9±6.2kg, BF% 11.9±2.4%, VO2max 42.9±6.1 ml·kg⁻¹·min⁻¹) at 5 time points: prior to the start of pre season (PS), and in season at week 1 (W1), W4, W8, and W12. Blood samples from W1-W12 were obtained 32-34 hours post-match. PlayerLoad (PL) was recorded daily with GPS units. Significant changes in biomarkers over time were assessed via repeated measures ANOVA (α < 0.05) and the degree to which biomarkers explained PL were examined using stepwise regression. RESULTS: Total testosterone (T; mean±SD; ng·dl⁻¹) was lower at W1 (588±151 vs PS 665±198, p=0.029) and W4 vs W8 (565±147, 645±170, p=0.034). Free T (ng·dl⁻¹) was at lower at W1 (1032±24) and W12 (99±33) vs PS (1273±55, p<0.025). Free T at W1 (103±24) and W12 (99±33) were decreased vs W4 (125±32, p=0.022). No differences were observed before the start of season for cortisol (FC) or total cortisol (TC); however, FC (μg·dl⁻¹) was elevated at PS, W1, and W4 (1.02±0.41, 1.90±0.17, 0.94±0.35) compared to the reference range (ref) (0.07-0.93 (μg·dl⁻¹) and TC was elevated at W1 (22.1±2.1 vs the ref. (4.6-20.6 μg·dl⁻¹). Growth hormone (GH), lactate

Abstracts were prepared by the authors and printed as submitted.

THURSDAY, JUNE 1, 2017
Monitoring of nutritional markers is being used to optimize performance, improve overall health, and enhance recovery of athletes. PURPOSE: To analyze changes in nutritional biomarkers over the course of an athletic season. METHODS: A comprehensive panel of 23 biomarkers was assessed in blood samples from 20 NCAA Division 1 female soccer players (mean±SD: age 20±1yrs, height 181±6cm, body mass 77.9±6.2kg, BF% 11.9±2.4%, VO2max: 52.9±6.1 mL·kg⁻¹·min⁻¹) at 5 time points: prior to the start of the pre-season (PS), and during season at week 1 (W1), W4, W8 and W12 of the season. Blood samples from W1-W12 were obtained 32-34 hours post-match. Significant changes in biomarkers over time were assessed via 1 x 5 (group x time) repeated measures ANOVA (α < 0.05) with Bonferroni correction. RESULTS: CONCLUSION: Comprehensive nutritional, vitamin, and mineral biomarker monitoring detected significant changes over the season in 60% of biomarkers obtained. Although all markers remained within normal reference ranges, future research examining the ability of non-clinical but statistically significant changes in nutritional markers to explain changes in training volume throughout a competitive soccer season is warranted. Optimization may result in improved health, performance, and recovery.

Funding for this study was conducted by Quest Diagnostics Inc.

Characteristics: 1,036/2000
In an effort to reduce soccer injury rates, the Fédération Internationale de Football Association (FIFA) developed the 11+ warm-up. Widespread uptake of this program remains a challenge despite its effectiveness, but may be increased if positive impacts on physical performance as well as injury risk factors such as neuromuscular control are shown. Effects of the program on physical performance measures and movement control have not been investigated in young female soccer athletes. PURPOSE: To determine the effect of the FIFA 11+ program, compared to a standard warm-up, on movement control, agility, vertical jump (VJ), and core stability in young female athletes, and to examine any changes across the season.

METHODS: Forty-seven girls from the U10 and U11 divisions of a developmental soccer club were randomized to either the intervention group (IG) or control group (CG). IG teams were taught the 11+ warm-up, consisting of 15 exercises broken into 3 sections: 1) slow running drills, 2) strength and plyometric exercises, and 3) faster sprints. The CG continued with their previously planned warm-up. Once a week, blinded assessors completed pre- and post-season testing of movement control (Landing Error Scoring System), physical performance (T-test, VJ, and static plank). Two-way repeated measures ANOVA analyses were used to compare movement control and physical performance of the groups over time.

RESULTS: The IG demonstrated a significantly greater increase in static plank hold time compared to the CG (26.1 ± 3.85 s vs. 21 ± 37.1 s, p = 0.047). All athletes, regardless of group, improved their LESS score (pre- 6.8 ± 1.6; post-season 6.2 ± 1.4, p = 0.05) and agility T-test time (pre- 14.2 ± 1.2; post-season 13.8 ± 1.0 seconds, p < 0.001). No differences were found for the VJ.

CONCLUSIONS: The 11+ program, performed over a 5 month indoor soccer season by 9–11 year old soccer players, resulted in improved core stability compared to a regular warm-up, but this did not translate into a significantly greater change in LESS score in the IG. The 11+ program may not be more effective than other dynamic warm-ups at improving neuromuscular control and agility. However, time and space limitations inherent in the indoor soccer environment may have negatively impacted the program’s ability to reach its full potential.

Body composition has been widely recognized as one of the many factors that could affect performance in the collegiate athlete, including body fat percentage and its changes across the competitive season. Zephyr Performance Systems have been used as a tool to measure physiological load in competitive athletes. Changes in body composition and fitness measures have been reported in female soccer athletes, but few have examined the relationship between these measures and their performance. PURPOSE: The aim of this study was to determine the relationship between physiological load and body composition across the season on the post-season performance of the Yo-Yo Intermittent Recovery Test 2 in Division I female soccer athletes.

METHODS: Thirty female soccer athletes, age (19.4 ± 1 year) with preseason body fat percentage (22.7 ± 5.3%), participated in the Yo-Yo Intermittent Recovery Test 2 (YYIR2) prior to their fall pre-season conditioning period. Body fat percentage was assessed pre and post-season using BodPod assessment. Zephyr Performance Systems were worn during home season games to quantify and record the athletes’ physiological load, which was averaged over the season (AVEPL). Athletes completed a second YYIR2 at the conclusion of their post-season play and the change in the distance covered on this assessment from pre to post-season was recorded (ChangeDist).

RESULTS: No differences were observed in YYIR2 or body fat percentage between pre and post-season. However, AVEPL was negatively correlated with pre to post-season change in distance covered (r = -0.489, p = 0.040). Linear regression analysis also revealed ChangeDist was inversely related to AVEPL (β = -0.448, p = 0.048). When adjusted for age and pre to post-season change in body fat percentage (ChangeBFF), AVEPL remained inversely related to ChangeDist (β = -0.446, p = 0.048).

CONCLUSIONS: Athletes with higher average physiological load across the season exhibited a decrease in performance on the post-season Yo-Yo Intermittent Recovery Test 2 when compared to pre-season, regardless of change in body fat percentage.
BACKGROUND: Due to the high metabolic and physical demands involved in soccer, an optimal strength and conditioning program for female high school soccer players is essential. The benefits of resistance training and high-intensity interval training in young athletes has been well documented; however, the effect of a concurrent strength and metabolic conditioning program on female athletes in specific sports has yet to be investigated. PURPOSE: To examine the effects of an 8-week concurrent strength and metabolic conditioning program on body composition, flexibility, speed, agility, aerobic capacity, strength, and power in female soccer players. METHODS: Body composition and performance testing measures were recorded in female soccer players (n = 14, age = 16 ± 1.0 yrs) before and after an 8-week sports performance camp that combined concurrent high-intensity interval training methods and periodicized resistance training. Performance testing included 3-site skinfolds, sit and reach, pro agility test, 40yd sprint, 30yd shuttle run, and vertical jump. Strength testing included a 3-repetition maximum back squat, shoulder press, and bench press, and a 3-repetition maximum power clean. Comparisons were made using a paired samples t-test, and Pearson’s correlations between variables were calculated. RESULTS: Significant improvements were made in vertical jump (p < 0.05), pro agility test (p < 0.05), 40yd sprint (p < 0.05), squat (p < 0.05), shoulder press (p < 0.05), bench press (p < 0.05), and power clean (p = 0.05). There were significant correlations between increases in power with agility and speed, as well as correlations between power and strength. CONCLUSION: An 8-week concurrent strength and conditioning program was effective for improving measures of fitness and performance in female soccer players. Overall, power and strength increased, as well as a significant decrease in time to complete the agility and speed testing.

Although participation in women’s soccer has increased dramatically in the last two decades, the research into the physiological demands and physical characteristics of players is limited. PURPOSE: To compare anaerobic and aerobic power in female intercollegiate soccer players with a reference group of elite international players. METHODS: Subjects were 28 members of a division I university women’s soccer team. Maximal aerobic power (VO2 max) was determined during an incremental treadmill run using a Cardiosystems Model 2100 LER. The Max厭oxic anaerobic power test was timed using switch mats to determine anaerobic power. Bone mineral density and percent body fat were determined by dual-energy X-ray absorptiometry (DEXA). Anaerobic power comparisons were made by converting literature values for vertical jump height to watts by the Lewis formula. RESULTS: VO2 max was similar between the collegiate players and the reference group of international players (52.7 ± 5.8 vs 51.5 ± 3.3 ml/kg/min for collegiate and reference players respectively). Similarly, anaerobic power was not different between the collegiate and the international players (841.2 ± 112.4 vs 808.8 ± 109.5 watts). Height (165 ± 6 vs 169 ± 2 cm) and mass (61 ± 7 vs 61 ± 5) were similar between the two groups; however the collegiate players had a higher percent body fat than the reference players (25.9 ± 5.2 vs 17.5 ± 2.6%). CONCLUSION: These results suggest that the female collegiate players have aerobic and anaerobic power comparable to that reported for international (primarily European) elite female soccer players. Although the collegiate players were of similar height and body mass as the international players, the colonials had considerably higher percent body fat.

BACKGROUND: Explosiveness of lower limbs is an important skill as to be a quality soccer player. A few studies have been performed to investigate explosiveness using male soccer players; however, it is not well studied in females, especially during their growth process and different jump types. PURPOSE: To compare explosiveness of lower limbs in three different age categories of national level female soccer players in three types of jumps. METHODS: A total of 49 female national level soccer players of three age categories (U15 – players under 15 years N = 17, U17 – players under 17 years N = 16, U19 – players under 19 years N = 16) were tested using a two force platforms in three types of jumps: countermovement jump free arms (CMJFA), countermovement jump (CMJ), squat jump (SJ). The following parameters were evaluated: jump height (JH), maximum take-off force (Fmax) and force difference between preferred and non-preferred leg (Fdiff). All parameters were analyzed using MANOVA and Bonferroni post-hoc test, effect size (ηp2).

RESULTS: Players achieved the following values: (U15: CMJFA = 32.58±3.25 cm, CMJ = 28.19±3.81 cm, SJ = 25.38±3.33 cm, U17: CMJFA = 34.26±4.22 cm, CMJ = 29.64±3.34 cm, SJ = 28.05±3.19 cm, SJ = 37.20±5.80 cm, CMJ = 31.89±5.47 cm, SJ = 29.98±5.17 cm). Bonferroni’s post hoc test revealed significant differences in explosiveness between U15 and U17 as well as U15 and U19 (p<.05). The MANOVA analysis revealed a significant age effect on JH (F2,147 = 12.61; p<.01, ηp2 = 0.16) and Fdiff (F15,11 = 4.19; p<.05, ηp2 = 0.06). Also, significant effect was detected by different type of jump on JH (F15,11 = 33.28; p<.01, ηp2 = 0.33) and Fmax (F15,11 = 24.2; p<.01, ηp2 = 0.26). We also found significant effect of jump types on Fdiff with respect to the type of jump. More than 25% of female soccer players had Fdiff greater than 10%.

BACKGROUND: Explosiveness in elite female soccer players is limited. PURPOSE: To determine the effect of ages and jump types on explosiveness using female soccer players. METHODS: A total of 49 female national level soccer players of three age categories (U15 – players under 15 years N = 17, U17 – players under 17 years N = 16, U19 – players under 19 years N = 16) were tested using a two force platforms in three types of jumps: countermovement jump free arms (CMJFA), countermovement jump (CMJ), squat jump (SJ). The following parameters were evaluated: jump height (JH), maximum take-off force (Fmax) and force difference between preferred and non-preferred leg (Fdiff). All parameters were analyzed using MANOVA and Bonferroni post-hoc test, effect size (ηp2).

RESULTS: Players achieved the following values: (U15: CMJFA = 32.58±3.25 cm, CMJ = 28.19±3.81 cm, SJ = 25.38±3.33 cm, U17: CMJFA = 34.26±4.22 cm, CMJ = 29.64±3.34 cm, SJ = 28.05±3.19 cm, U19: CMJFA = 37.20±5.80 cm, CMJ = 31.89±5.47 cm, SJ = 29.98±5.17 cm). Bonferroni’s post hoc test revealed significant differences in explosiveness between U15 and U17 as well as U15 and U19 (p<.05). The MANOVA analysis revealed a significant age effect on JH (F2,147 = 12.61; p<.01, ηp2 = 0.16) and Fdiff (F15,11 = 4.19; p<.05, ηp2 = 0.06). Also, significant effect was detected by different type of jump on JH (F15,11 = 33.28; p<.01, ηp2 = 0.33) and Fmax (F15,11 = 24.2; p<.01, ηp2 = 0.26). We also found significant effect of jump types on Fdiff with respect to the type of jump. More than 25% of female soccer players had Fdiff greater than 10%.
**CONCLUSIONS**

The current results indicated effect of age on PTE, PTF but not in limb dominance. More attention should be paid to knee flexors where higher occurrence of strength asymmetries were found.

**2093 Board #106 June 1 3:30 PM - 5:00 PM Monitoring Markers of Oxygen Transport Throughout A Collegiate Soccer Season**


(No relationships reported)

Consistent tracking of oxygen transport blood biomarkers may help inform coaching decisions to help reduce risk of overtraining. **PURPOSE:** To characterize changes in oxygen transport markers over the course of a collegiate soccer season. **METHODS:** A panel of 9 biomarkers was assessed in blood samples from 20 NCAA Division I male soccer players (mean ± SD; height 181 ± 6 cm, body mass 77.9 ± 6.2 kg, BF% 11.9 ± 2.4%, VO2max 52.9 ± 6.1 mL/kg·min−1) at 5 time points: before preseason (PS) and during season at week 1 (W1), W4, W8, and W12. Blood specimens from W1-W12 were obtained 32-34 hours post-match. Significant changes in biomarkers over time were assessed via repeated measures ANOVA (α = 0.05, Bonferroni post hoc). **RESULTS:** Post season VO2max (53.9±5.3 mL·kg−1·min−1) was similar to PS (p = 0.064). Hematocrit (HCT) levels were lower at W1 vs PS (mean±SD, 45±1%, 47±1%, p=0.015). Total iron binding capacity (TIBC) was higher W12 (314±26μg∙dL−1) vs PS (339±30μg∙dL−1, p = 0.006) and W4 (320±7μg∙dL−1, p = 0.005). Total 25-hydroxy vitamin (VitD) decreased throughout the season. VitD at W12 (31±2ng∙mL−1) was lower than PS (39±2ng/mL, p<0.004), W1 (36±2ng/mL, p<0.007), W4 (35±2ng/mL, p=0.028), and W8 (35±2ng/mL, p=0.007). Percent saturation, total iron, red blood cells, ferritin, and vitamin D2 did not change significantly over time throughout the season. **CONCLUSION:** Select measures of oxygen carrying capacity (HCT, TIBC) were reduced after PS. However, assessment of the panel in a more inclusive approach determined that there was no consistent evidence of reductions in oxygen carrying capacity. Assessment of VitD as part of a panel assessing oxygen transport capacity is novel, given the putative role of VitD in VO2max. Ongoing research aims to further characterize any relationship of oxygen carrying capacity biomarkers to performance during long training seasons. Funding for this study in part by Quest Diagnostics Inc.

---

**2094 Board #107 June 1 3:30 PM - 5:00 PM Body Composition Changes In Female Collegiate Soccer Athletes From Preseason To Postseason**

Paul A. Burkett, Shawn D. Felton, Mitchell L. Cordova, FACSMD. Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSMD)

(No relationships reported)

Previous studies have suggested that percent body fat (%BF) and lean mass do not change from pre- to postseason in female collegiate soccer athletes even though changes may be seen in athletes competing in other sports. **PURPOSE:** To document changes from pre- to postseason in body mass, %BF, fat distribution, and lean mass in female collegiate soccer athletes using readily available skinfold measures. **METHODS:** Twenty-four healthy female collegiate soccer athletes with a mean age of 19.6±1.2 years participated. Participants were screened pre- and postseason using standard anthropometric measurements that included: height, weight, and skinfold measure of the triceps, suprailiac, and subscapular sites. The measurements were conducted by an exercise physiologist with 25 years of experience and the skinfold technique was selected for collection convenience. The measurements allowed for calculation of the BMI, lean body mass, lean body mass index (LBMI), and %BF and for comparison from pre- to postseason. The individual skinfold sites were also compared from pre- to postseason.

**RESULTS:** There were no differences between the measurements obtained on the two testing dates for body mass (62.18 ± 26.26 kg; t=-2.29; p = 0.05), BMI (22.07 ± 22.35; t=-1.96; p=0.05), lean body mass (46.44 & 46.57 kg; t=1.65; p=0.05), LBMI (16.75 & 16.62; t=1.44; p=0.05), and %BF (24.38 & 25.25; t=-1.79; p=0.05). There were differences in skinfold thickness at the triceps (19.5 & 20.5 mm; t=-2.10; p=0.05) and subscapular (15.98 & 17.70 mm; t=-2.57; p=0.05) assessment sites. The covariates of field position was not a significant factor in the changes noted in triceps ([F(1,22) = 0.55 p = 0.47] and suprailiac ([F(1,22) = 0.55 p = 0.47] thickness.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSION: These results suggest that female collegiate soccer athletes did not experience changes in %BF or lean mass from pre- to postseason. However, there may be small increases in fat accumulation at specific sites. Monitoring of individual athletes for these types of changes might also be important.

2095 Board #108 June 1 3:30 PM - 5:00 PM Heart Rate and Energy Expenditure in Division I College Soccer Players during the Competitive Season
Shane F. O’Riordan, Gavin Connolly, Thomas Barrett, Emmi Lawless, Marissa Hartmann, Mikaela Gabler, Paul L. O’Connor. Central Michigan University, Mount Pleasant, MI. Email: orior1s@cmich.edu

PURPOSE: The use of monitoring systems (e.g. Global Positioning Systems (GPS), heart rate monitors) to determine metabolic and physiological requirements within different sports is increasing in popularity. However, little to no information exists on the metabolic and physiological needs during Division I women’s soccer. The purpose of this project was to measure heart rate data and energy expenditure in Division I college soccer players during the regular competitive season. METHODS: 12 female college soccer players (19.3 ± 1.6 yrs, 167 ± 3.0 cm, 62.4 ± 4.9 kg) were included on playing time criteria (~60%). Measures recorded for all players included average heart rate (AvHR), average heart rate percentage (AvHR%), peak exercise heart rate (HRpeak), percentage of time spent in predetermined zones (%TM1, %TM2, %TM3) and energy expenditure per kilogram (EE). Differences between positions, center (CB), full backs (FB), midfielders (MF) and forwards (FW), were assessed. RESULTS: Significant differences (p<0.05) were observed across positions for parameters measured. AvHR for CB and MF was significantly lower than FW (168.9 ± 5.8 vs. 177.3 ± 5.9 bpm). MF HRpeak was significantly lower than all groups. CB HRpeak was also significantly lower than FW (195.5 ± 3.6 vs. 202.0 ± 5.0 bpm). AvHR was significantly lower and %TM1 was significantly higher for CB compared to all groups. %TM2, MF were significantly lower than CB (81.7 ± 12.7 vs. 68.7 ± 20.0%) and FW (81.7 ± 12.7 vs. 68.3 ± 16.0%). AvHR and %TM2 were significantly higher for MF compared to all groups. EE was significantly higher for active hip flexion between dominant (111.7 ± 5.2) and non-dominant (108.5 ± 6.9) limbs. Significant differences were observed between dominant and non-dominant leg for all ROM measurements. For %TM3, MF were significantly higher than CB (19.5 ± 12.7 vs. 11.1 ± 14.3%). EE was significantly higher for active hip flexion between dominant (111.7 ± 5.2) and non-dominant (108.5 ± 6.9) limbs. No relationships reported. CONCLUSIONS: The use of monitoring systems in Division I women’s soccer is showing promise to help coaches and players understand metabolic and physiological needs during competitive DI college soccer. This information could contribute to the understanding of the game and implementing specific training regimens.

2096 Board #109 June 1 3:30 PM - 5:00 PM Workload-related Psychological And Physiological Changes In Female College Soccer Players During A Competitive Season
Bridget A. McFadden, Alan J. Walker, David J. Sanders, Morgan Hofacker, Marissa Bello, Anthony Poysick, Nicholas Mackowski, Christopher Ordway, Brittany Bozzini, Shawn M. Arent, FACSM. Rutgers University, New Brunswick, NJ.

(No relationships reported)

Adequate recovery from stressors is an essential aspect of an athletes training program. Insufficient recovery can present itself in the form of psychological and physiological changes that manifest as performance decrements. PURPOSE: To assess the influence of training demands on mood, sleep, biomarkers, and performance in D1 collegiate female athletes during a competitive season. METHODS: Female D1 college soccer players (N=25; Mage=19.4 ± 1.4 yrs; Mweight = 66.1 ± 1.3 kg) were included based on playing time criteria (>60%). Measures recorded for all players included average heart rate (AvHR), average heart rate percentage (AvHR%), peak exercise heart rate (HRpeak), percentage of time spent in predetermined zones (%TM1, %TM2, %TM3) and energy expenditure per kilogram (EE). Differences between positions, center (CB), full backs (FB), midfielders (MF) and forwards (FW), were assessed. RESULTS: Significant differences (p<0.05) were observed across positions for parameters measured. AvHR for CB and MF was significantly lower than FW (168.9 ± 5.8 vs. 177.3 ± 5.9 bpm). MF HRpeak was significantly lower than all groups. CB HRpeak was also significantly lower than FW (195.5 ± 3.6 vs. 202.0 ± 5.0 bpm). AvHR was significantly lower and %TM1 was significantly higher for CB compared to all groups. %TM2, MF were significantly lower than CB (81.7 ± 12.7 vs. 68.7 ± 20.0%) and FW (81.7 ± 12.7 vs. 68.3 ± 16.0%). AvHR and %TM2 were significantly higher for MF compared to all groups. EE was significantly higher for active hip flexion between dominant (111.7 ± 5.2) and non-dominant (108.5 ± 6.9) limbs. No relationships reported. CONCLUSIONS: The use of monitoring systems in Division I women’s soccer is showing promise to help coaches and players understand metabolic and physiological needs during competitive DI college soccer. This information could contribute to the understanding of the game and implementing specific training regimens.
CONCLUSIONS: There was a significant decrease in a number of performance parameters during the second game when two games were played in one weekend. There were no changes in performances during G1, played one week apart over the five weeks.

Table 1. Performance parameters.

*Means significant differences between games 1 and 2 within a week.

D-63 Free Communication/Poster - Energy Metabolism and Expenditure
Thursday, June 1, 2017, 1:00 PM - 6:00 PM
Room: Hall F

2100 Board #113 June 1 2:00 PM - 3:30 PM A Study On The Status And Factors Of Energy Deficiency In Japanese Collegiate Rhythmic Gymnastics
ERINA MURAMATSU1, MIZUKI YAMADA1, TAMAKI FURUHATA1, KANA HARADA2, MIHUZO ADACHI1, MIKAKO SAKAMAKI-SUNAGA1, TAKAKO KOSHIMIZU1.
1Nippon Sport Science University, Tokyo, Japan. 2Graduate School of Health and Sport Science, Nippon Sport Science University, Tokyo, Japan.

PURPOSE: Energy deficiency affects many physiological aspects. The purpose of this study was to examine the status of energy deficiency in Japanese female collegiate rhythmic gymnasts and the factors that affect energy deficiency.

METHODS: The subjects were Japanese female collegiate rhythmic gymnasts (RG group; n=7, age: 20.4±1.1y, body weight: 48.6±3.4kg, BMI: 19.3±1.6 kg/m², fat free mass: 37.7±2.9kg, percent body fat: 22.4±2.9%). As a control group, Japanese female collegiate sprint runners (CON group; n=8, age: 20.4±1.1y, body weight: 53.7±6.2kg, BMI: 20.2±1.1 kg/m², fat free mass: 44.8±4.7kg, percent body fat: 15.8±2.5%).

CONCLUSION: Our results indicate that the status of the energy deficiency of the Japanese female collegiate rhythmic gymnasts was severe because the EB in the group was lower than that in the CON group. Furthermore, high PAL and PAEE affected the energy deficiency status of the Japanese female collegiate rhythmic gymnasts.
Indirect calorimetry is used to measure oxygen consumption for the purpose of accurately estimating resting metabolic rate (RMR). Laboratory devices are available for the measurement of RMR, such as the BodyGem® indirect calorimeter and the Vacumed VO2, Lab metabolic measuring system. Established prediction equations, such as the Mifflin-St. Jeor (MSJ), Harris-Benedict (HB), and Fleisch, can also be used to provide an estimate of RMR.

**Purpose:** The purpose of this study was to compare the RMR of college-aged participants measured using a BodyGem® indirect calorimeter, a Vacumed VO2, Lab metabolic cart, and the aforementioned prediction equations.

**Methods:** Each participant (male = 15; female = 15; age = 22.7 ± 3.3 years; wt = 77.5 ± 14.5 kg; ht = 173.5 ± 9.6 cm) completed a thirty-minute supine resting session in a quiet environment. Five minutes of resting data were then collected using the Vacumed while in the supine position. Immediately thereafter, five minutes of resting data was collected using the BodyGem® indirect calorimeter while in the seated position. The RMR values for the HB and Fleisch prediction equations were calculated using the proprietary software utilized by the Vacumed metabolic system, while the MSJ estimate of RMR was hand-calculated.

**Results:** A repeated measures ANOVA showed a significant difference among the prediction equation estimates compared to the BodyGem® indirect calorimeter. Further, the equations, the RMR estimate of the Fleisch was higher than the MSJ (p < .01). The HB estimation of RMR was greater than that of the Vacumed measurement (p < .025). For the equations, the RMR estimate of the Fleisch was higher than the MSJ (p < .025), while the HB was greater than both the Fleisch and the MSJ (p = .01). The HB estimation of RMR was greater than that of the Vacumed measurement (p < .025). For the equations, the RMR estimate of the Fleisch was higher than the MSJ (p < .025), while the HB was greater than both the Fleisch and the MSJ (p = .01). The HB estimation of RMR was greater than that of the Vacumed measurement (p < .025).

**Conclusion:** The Vacumed VO2, Lab metabolic cart measured RMR closer to the prediction equation estimates compared to the BodyGem® indirect calorimeter. Further research needs to be conducted comparing laboratory instruments to established prediction equations, on various populations, before the estimative methods can be deemed accurate for measuring RMR.

**The Comparison Of Energy Expenditure Between Continuous And Intermittent Exercise During And Post Exercise**

Songtao Wang1, Long Zhang2, Fei Qin1. 'South China Normal University, Guangzhou, China. 1LiuPanshui Normal University, LiuPanshui, China. 2Jinan University, Guangzhou, China. Email: songtaowang1@126.com

**Purpose:** Intermittent training has been applied in athlete training for 100 years. In the last 10 years, it attained additional application in the enhancement of physical fitness and the rehabilitation of multiple chronic diseases. Moreover, many evidence suggests that when compared with steady state exercise, intermittent training can result in comparable or greater improvement in heart failure, diabetes, obesity and other chronic diseases. However, due to the differences of exercise workload (exercise duration, intensity and pattern) in most of researches, it is hard to ascertain which one is better between continuous and intermittent exercise when faced to some certain of health issues. Therefore, this study aimed to compare the energy consumption and substrate utilization between continuous and intermittent exercise with equal workload during and post exercise, and analyze their relationship with the activity of autonomic nervous system.

**Methods:** 12 male students (24±1.2 years old), randomly performed 3 tests with 1 week interval: Control (C; rest), continuous exercise (CE; 65% VO2max, 40 min), and intermittent exercise (IE; 85% VO2max, 4 min; 45% VO2max, 4 min; 5 sessions). Exercise was performed on treadmill with equal workload. In the period of pre- (30 min), during (80min) and post-exercise (every 1 hour for 8 hours), respiratory metabolism, heart rate variability (HRV), blood pressure, and body temperature were monitored. Paired simple t-tests were used for statistical analysis. This study was funded by two fund from Guangdong (2013B031600003) and Guizhou (2014-7455) Science and Technology Department.

**Results:** The energy expenditure (EE) and substrate utilization during exercise showed no significant difference between IE and CE. However, IE had higher total 8-hour’s EE during post-exercise (1.1-fold, p<0.05, ES=1.85) with much fat oxidation (1.2-fold, p<0.05, ES=2.63) and significant rising value of LF/HF of HRV analysis (1.7-fold, p<0.01, ES=4.34). The total energy consumption (during exercise plus post-exercise) in IE is higher than CE (1.05-fold, p<0.05, ES=2.17).

**Conclusion:** High intensity intermittent exercise can induce much fat oxidation during the period of post-exercise and raise total exercise consumption, which is probably relevant to enhanced sympathetic regulation.

**Measurement Of Daily Energy Expenditure In Humans Using A Body-worn Calorimeter**

Tracy L. Swib31, Seth A. Creasy1,2, Victoria A. Catenecci1, Neil Szuminski3, Edward L. Melanson, FACSM. 2University of Colorado Denver Anschutz Medical Campus, Aurora. CO. 3Nebraska Consulting, Pittsburgh, PA. (Sponsor: Edward Melanson, FACSM)

**Purpose:** Previous approaches using body-worn devices to measure free-living energy in humans using direct calorimetry have been limited by the inability to accurately measure evaporative heat loss. The Personal Caloric Meter (PCM) is a device that uses a heat flow gauge embedded in a permeable membrane, permitting the measurement of both dry and evaporative heat loss. Total heat flux and estimated body surface area are then used to estimate minute by minute EE. In this ongoing study, we are comparing daily EE measured using the PCM with simultaneous measurements using whole-room indirect calorimetry (WRC).

**Methods:** Subjects were studied on two separate days under low and high physical activity levels (PAL; –1.4 and 1.7 resting metabolic rate, respectively) in the WRC. During the low PAL condition, subjects performed 20 minutes of various housecleaning activities. During the high PAL condition, subjects performed 30 minutes of walking on a treadmill, 30 minutes of stationary cycling, and resistance exercises using dumbbells. Daytime EE was calculated as the total EE from the time the subject entered the WRC until bedtime. Results: 14 subjects (10 M/4 F, 44±18 yrs., body mass index=26±6 kg²m², mean±SD) have completed at least one study visit in the room calorimeter. During the low PAL condition (N=11), average daytime EE measured by the PCM (1369±220 kcal, mean/SD) did not differ from WRC (1304±757 kcal), but the range of intra-individual differences was large (899 to 452 kcal). Five measurements were within ±150 kcal, and the minute-to-minute values corresponded closely in these cases. During the high PAL condition (N=9), average daytime EE measured by the PCM (1834±344 kcal) did not differ from WRC (1880±757 kcal), but there was a wider range of intra-individual differences than during the low PAL condition (1188 to +1075 kcal).

**Conclusion:** These preliminary data demonstrate the feasibility of measuring EE in humans using portable direct calorimetry. Further studies and refinements are needed to improve the accuracy of the PCM on an individual level.

**Determination Of Metabolic Pathway In Response To Cycling Versus Vinyasa Yoga**

Colin E. Campbell1, Lori K. Bogren2, Carl J. Murphy1, Kelly Drew1, Robert H. Coker, FACSM. 1University of Alaska Fairbanks, Fairbanks, AK. 2University of Colorado Denver, Denver, CO. Email: cecampbell12@alaska.edu

**Purpose:** The purpose of this experiment is to determine whether there is a difference in metabolic response to Cycling & Vinyasa Yoga. The data was analyzed using a combination of analytical techniques, including paired t-test, a bucketing strategy, and MetaboAnalyst 2.0 software. We were able to determine the identity of 13 metabolites with certainty. These metabolites are as follows: phenylalanine, creatinine, creatine, creatine/creatinine, glycine, choline, uracil, dimethylamine, citrate, lactate, and beta hydroxybutyrate.

**Conclusion:** These preliminary data demonstrate the feasibility of measuring EE in humans using portable direct calorimetry. Further studies and refinements are needed to improve the accuracy of the PCM on an individual level.
could be used to study changes in metabolic pathways in many different environments that include logistical and/or cultural considerations, where urine samples could be collected and then transported for analysis via H-NMR. Self-supported by Colin Campbell.

Populations who participate in recreational exercise in hot and humid environments such as hot hatha yoga are at an increased risk for dehydration. Hot yoga continues to grow in popularity. **Purpose:** This study investigates the pre-exercise hydration status, fluid balance, perception of sweat loss, of 13 male Hot Hatha Yoga participants. **Methods:** Male participants (n=13, 34 ± 12.7 yr; 182 ± 9.8 cm; 85.2 ± 10.0 kg) were examined during a one hour hot hatha yoga class (39.7 °C ± 3°C, 34.3 ± 2.4% rh). Pre-exercise urine specific gravity (USG), hydration status, body mass changes, and fluid intake were recorded and sweat rate was calculated. After the hot hatha yoga session, participants were asked to perceive their sweat loss. A paired sample t test was used to identify significance between measured sweat loss and perceived sweat loss and body mass loss. **Results:** Forty seven percent of the Participants began the session in a dehydrated state (USG > 1.020). Sweat rate was 1.3 ± 0.6 L h⁻¹, and although replacement fluid was available, consumption was low (0.4 ± 0.3 L h⁻¹) and 32% did not consume any fluids. Mean percent body mass loss was 1.1 ± 0.7% from pre-exercise body mass, and about half the participants lost at least 1% of body mass. There was a considerable difference between perception of sweat loss and actual sweat loss (p=1.02). Mean perceived sweat loss was 0.8 ± 0.6 L h⁻¹ and mean actual sweat loss was 1.05 ± 0.6 L h⁻¹. **Conclusion:** These findings, highlight the variability in hydration management among male hot yoga participants supports the notion that hydration guideline must be personalized and education would be beneficial.

**D-64 Free Communication/Poster - Ergonomic Aids IV**

**Thursday, June 1, 2017, 1:00 PM - 6:00 PM**

**Room: F**

**2106 Board #119 June 1 2:00 PM - 3:30 PM Pre-hydration Status, Fluid Intake, And Sweat Rate Of Males Participating In Hot Yoga**

Cheri J. Bednarik, R C. Pritchett, Stephanie Campbell, K Pritchett. Central Washington University, Ellensburg, WA.

(No relationships reported)

**CONCLUSIONS:** Sixteen weeks of dietary omega-3 PUFA supplementation either administered as functional food (enriched skim milk) or at a higher dose provided in capsules, did not further enhance the benefits of high intensity interval training in a group of metabolic syndrome patients.

**2108 Board #121 June 1 3:30 PM - 5:00 PM Carbohydrate Mouth Rinse Does Not Affect 60-min Running Performance In Females**

Giorgos Paradissis1, Costas Chryssanthopoulos2, Christos Zirias1, Tanja Oosthuysen3, Ioannis Lambropoulos4, Eleini Tiktampandi5, Andreas Tsoukalis5, Konstantinos Tournoupidis2, Anastassios Philippou1, Elias Zacharogiannis1, Maria Maridaki1, Thrasyvoulos Philippou6. 1National and Kapodistrian University of Athens, Athens, Greece. 2University of the Witwatersrand, Johannesburg, South Africa. 3Biomedicine Diagnostic and Research Laboratories, Athens, Greece.

Email: gpardalis@phed.uoa.gr

(No relationships reported)

Mouth rinsing with carbohydrate may improve 60-min endurance cycling or running performance in males. However, no data exist regarding the effect of mouth rinsing on endurance performance in females. **PURPOSE:** To examine the effect of mouth rinsing with a carbohydrate solution on endurance running performance in females.

**METHODS:** Fifteen female recreational endurance runners (30-57 years) ran 2 races of 1-hour duration on an indoor track after an 8 h post-prandial period with a 7 days interval between races. This time period corresponded to the 3-4th day of each runner’s menstrual cycle, for the eumenorrhoeic premenopausal runners, or any time for the runners who were at menopause. Following a double-blind process and random order, participants rinsed their mouth, before the initiation of exercise and at 15, 30 and 45 min of exercise with 25 ml of either a 6.4% carbohydrate (RCHO) or a placebo solution (0% carbohydrate) (RP). Pre-race euhydration was insured by ingestion of 6 ml kg⁻¹ water. No fluids were ingested during exercise. Races started at 18:00 hours. **RESULTS:** There was no difference between treatments in runners hormonal status prior to each race for serum 17β-Εstradiol [median (inter-quartile range)], RCHO: 50.2(7.41) pg ml⁻¹ vs RP: 26.0(5.61) pg ml⁻¹, z=-0.353, (p=0.59) and Progesterone (RCHO: 0.75(0.61; 1.64) ng ml⁻¹ vs RP: 0.74(0.64; 0.9) ng ml⁻¹, z=-0.938, (p=0.35). Percent body mass loss due to exercise was similar between treatments (mean ± SE, RCHO: 1.9% ± 0.1% and RP: 1.9% ± 0.1%). There was no difference in 1-hour running performance, neither by treatment (RCHO: 10621.88 ± 205.98 m vs. RP: 10450.44 ± 206.64 m; z=1.784, p=0.096), nor by race order (1st race: 10549.13 ± 213.67 m vs. 2nd race 10526.75 ± 201.16 m; p=0.215, z=0.833) (mean ± SE). Furthermore, the mean percentage effect (±95%CI) of RCHO relative to RP, 1.67%(-1.1% to 4.4%), and Cohen’s effect size (d = 0.21) support a trivial outcome effect of RCHO for total distance covered. In addition, there was no difference between treatments in the rate of perceived exertion (p=0.14) and heart rate (p=0.06). **CONCLUSION:** Carbohydrate mouth rinsing did not improve 1-h running performance in female recreational runners competing in a low ovarian hormone condition, following an 8 h fast and when no fluid was ingested during exercise.
The Effects Of Pre-exercise Protein Vs. Carbohydrate Consumption On Energy Expenditure After High-volume Resistance Exercise

Asomdomb, Dean Directo, Michael Wong, Daniel Higuera, Edward Jo. Cal Poly Pomona, Pomona, CA.
Email: adosmond1992@gmail.com

During the recovery period following a bout of resistance exercise, oxygen consumption remains elevated for a variable timeframe, reflecting an acute enhancement in resting energy expenditure. What remains uncertain is whether pre-exercise nutrient consumption further promotes these acute metabolic responses to a bout of resistance exercise and if the type of nutrient influences these effects. Purpose: Therefore, the objective of this study was to determine, in college-age, resistance trained male subjects, the extent by which pre-exercise supplementation of whey protein or carbohydrate modulates metabolic and substrate oxidation rates following a bout of high-volume, total body resistance exercise. Methods: In a randomized, placebo controlled, cross-over study, healthy, resistance trained male (n=10) subjects initially underwent baseline testing for resting energy expenditure and maximum strength. Subjects were familiarized with the resistance exercise protocol during the subsequent visit. Afterwards, across 3 separate subsequent visits, subjects consumed whey protein (PRO), carbohydrate (CHO), or no nutrients (CON) prior to a bout of high-volume resistance exercise. After exercise, subjects were tested for energy expenditure (EE), oxygen consumption (VO2), respiratory exchange ratio (RER), and heart rate (HR). Results: PRO (+23.5%; p=0.003), CHO (+12.8%; p=0.001), and CON (+9.5%; p=0.005) increased EE from resting baseline with concomitant changes to VO2, RER, and HR. PRO (p=0.019) and CHO (p=0.003) demonstrated equivalently greater post-exercise EE than CON. Post-exercise VO2 was significantly greater in PRO vs. CON (p=0.034) while CHO did not differ from PRO or CON. Conclusion: Overall, nutrient consumption prior to resistance exercise may augment the post-exercise exercise elevation in EE. Consumption of whey protein pre-exercise may enhance excess-post-resistance exercise oxygen consumption (i.e EPOC) to a greater extent than carbohydrate intake.

The Impact of Glucose Supplementation on Barbell Velocity and Fatigability in Weightlifters: A Pilot Study

Andrew R. Hill, Jacob B. Davis, Soon-Mi Choi. Midwestern State University, Wichita Falls, TX.
Email: endunamoox@gmail.com

PurPOSE: Fatigue has been shown to decrease velocity in training, decrease repetitions ability to lift weights during weightlifting, and increase fatigue level from weight training. This study investigated the changes in velocity and performance of weightlifters during training sessions with glucose supplementation. METHODS: Three competitive Olympic weightlifters, aged 25-74±4.0 years, participated in two trials; placebo (PL), and glucose supplement (GL). Each Minute On the Minute (EMOM) sets where used to simulate a training sessions. At the start of each minute, the subject performed a lift at 70% of their respective One repetition Maximum, and they continued these sets for 10 min. The snatch (ST) and Clean & Jerk (CJ) were performed for 10 sets at each. A pretest (PRE) consisted of both of the lifts 10 min EMOMs where peak velocity (PV), average velocity (AV), heart rate (HR) and rate of perceived exertion were recorded for each lift. A posttest (POST) mimicked the PRE and the recorded differences were compared between the PL and GL. Blood lactate (BL) and glucose (BG) were also recorded prior to trial testing (BASE), PRE, after 15 min recovery (REC), and POST. Results: BG increased 29% in GL (PRE: 98.0±11.1 mg·dl-1, REC: 125.3±2.3 mg·dl-1) and BL decreased 12% in GL (PRE: 4.2±0.7 mmol·L-1, REC: 3.2±0.5 mmol·L-1). PV of ST increased 20% in GL (PRE: 3.51±2.0 m·sec-1, POST: 4.21±1.8 m·sec-1). PV of CJ increased 1% in GL (PRE: 1.50±0.10 m·sec-1, POST: 1.56±0.11 m·sec-1) and decreased 3% in PL (PRE: 1.72±0.18 m·sec-1, POST: 1.66±0.08 m·sec-1). PV of CJ increased in GL (PRE: 0.52±0.31 m·sec-1, POST: 0.62±0.28 m·sec-1). HR of ST increased both PL (5%, PRE: 102.1±29.8 beats·min-1, POST: 107.8±33.4 beats·min-1) and GL (3%, PRE: 115.1±30.4 beats·min-1, POST: 118.2±32.1 beats·min-1). HR of CJ decreased both PL (1%, PRE: 124.5±39.1 beats·min-1, POST: 122.6±37.7 beats·min-1) and GL (4%, PRE: 135.4±36.3 beats·min-1, POST: 131.7±40.7 beats·min-1).
CONCLUSIONS: The results show that glucose supplementation intake in weightlifters is associated with exercise performance such as barbell velocity and may reduce their fatigue level. A larger sample size should be required to confirm the significance of these findings.

2114  Board #127  June 1 3:30 PM - 5:00 PM
The Repercussion of Expectation: When a Carbohydrate Rinse Becomes Detrimental to Performance
Hunter L. Paris, Kevin O. Murray, Timothy J. Fulton, Timothy D. Mickleborough, FACSIM. Indiana University, Bloomington, IN.

Amongst dietary strategies for performance enhancement a carbohydrate (CHO) mouth rinse is unique in that it may promote an increase in CHO oxidation without ingestion. Therefore, the possibility exists that a CHO mouth rinse may lead to a premature cessation of exercise due to a more rapid depletion of glycogen stores. PURPOSE: To calculate the time course of when CHO mouth rinse beginning may begin to be detrimental to performance. METHODS: Eight trained, competitive cyclists [age (mean ± SEM) = 24 ± 2 y; VO_{2max} = 64.5 ± 2.8 ml/kg/min] completed three simulated 40-km time trials comprised of a familiarization trial, glucose mouth rinse trial (GLC), and placebo trial (PLA). A mouth rinse was administered prior to onset of exercise, and every 5-km throughout the time trial. CHO oxidation rates were calculated based on the equation: g/min = 3.43 x 0.80 g/min and PLA (2.98 ± 0.18 g/min) groups. Assuming a 70 kg man is fully glycogen loaded at a wet weight of 200 mmol/l, CHO oxidation rates were not statistically different (P=0.06) between conditions in the time to deplete these stores. According to calculated oxidation rates, a 70-kg man would deplete leg stores in 175 ± 17 min when using a CHO mouth rinse and 196 ± 11 min when rinsing with a noncaloric sweetener.

CONCLUSIONS: Rinsing the mouth with a CHO solution prior to and during exercise does not result in a more rapid depletion of muscle glycogen stores despite improved performance. However, when using a CHO rinse glycogen stores will be depleted in approximately 3 h and recommending this ergogenic approach for longer duration exercise should therefore be approached with caution.

2115  Board #128  June 1 3:30 PM - 5:00 PM
Six Grams of Fish Oil Supplementation Mitigates Perceived Muscle Soreness Following Acute Resistance Exercise
Alyssa J. Holmes¹, Trisha A. VanDusseldorp¹, Kurt A. Escobard, Kelly E. Johnson, Matthew Stratton, Terence Moriarity, Jeremy McCormick, Gerald Mangine, Tony P. Nuhazé, Nick M. Beltz, Nathan Cole, Marvin Enditz, Chad M. Kerksics, FACSIM², Christine M. Mermier². Kennesaw State University, Kennesaw, GA. ¹University of New Mexico, Albuquerque, NM. ²Lindenwood University, St. Charles, MO. (Sponsor: Chad Kerksics, FACSIM)

High-intensity eccentric exercise is known to cause skeletal muscle damage and microstructural changes to muscle tissue with an associated inflammatory response. Previous research demonstrates increased pro-inflammatory cytokine and prostaglandin concentrations and increased perceived muscle soreness. The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), commonly found in fish oils, exhibit anti-inflammatory properties that have been reported to attenuate the overall perception of muscle soreness. PURPOSE: To investigate the dose-response effect of fish oil (FO) supplementation on the magnitude and time-course of post-eccentric resistance exercise muscle soreness. METHODS: Thirty-two, college-aged, resistance-trained males (n = 16; 23.6 ± 2.7 years, 81.1 ± 9.9 kg, 175.7 ± 4.5 cm, 16.3 ± 3.6 %) and females (n = 16; 23.4 ± 3.1 years, 61.7 ± 7.2 kg, 170.4 ± 6.2 cm, 23.6 ± 5.0 %) completed a double-blind placebo controlled 7-week supplementation period of either: 2.0, 4.0, or 6.0 g·d⁻¹ FO or placebo (PL). Subsequently, participants completed a muscle damaging resistance exercise protocol (10 sets of 8-four set eccentric squats at 70% one-repetition maximum and 5 sets of 20 split-squat jumps). Perceived muscle soreness (PS; 0–10 cm scale) was measured pre-exercise (PRE), immediately post (IP), as well as 1, 2, 4, 24, 48, and 72 hours (h) post-exercise. Results: Repeated measures analysis of variance revealed a group x time interaction for PS (p < 0.001), where compared to PL, lower PS scores were observed at IP for 6 g·d⁻¹ (mean difference: 4.0 cm, p = 0.024), at 1h for 6 g·d⁻¹ (mean difference: 2.74 cm, p = 0.046), at 24h for 4 g·d⁻¹ (mean difference: 2.38 cm, p = 0.023), and 6 g·d⁻¹ (mean difference: 3.45 cm, p < 0.001), at 48h for 6 g·d⁻¹ (mean difference: 4.45 cm, p < 0.001), and at 72h for 6 g·d⁻¹ (mean difference: 3.0 cm, p = 0.003). Other group differences were variable by time point. CONCLUSION: These data indicate that supplementation with 6 g·d⁻¹ of FO is effective at attenuating PS following damaging eccentric resistance exercise for up to 72h. Supported by the International Society of Sports Nutrition and MusclePharm Grant

2116  Board #129  June 1 3:30 PM - 5:00 PM
The Potential Of Omega 3 Supplementation To Reduce Muscle-inflammation After Muscle-damaging Exercise
Yvoni Kyriakidou¹, Rebeca Cielak Kantovich², Jimmy Bell³, Stefania Monteria², Alberto Dolci⁴. ¹University of Westminster, London, United Kingdom. ²University of Oxford, Oxford, United Kingdom. ³Yonsei University, Seoul, South Korea. ⁴University of Westminster, London, United Kingdom.

Muscle inflammation which follows exercise-induced muscle damage (EIMD) relates to strength loss, muscle-soreness and impaired recovery (Lynn and Morgan, 1994). It remains unclear whether omega-3 fatty acids (O-3) supplementation blunts the exercise-induced inflammation associated with EIMD. PURPOSE: Following supplementation with O-3, indirect markers of muscle damage were examined after EIMD to determine if supplementation had any beneficial effect in reducing muscle inflammation. METHODS: Eight healthy, recreationally active caucasian males (28.13 ± 3.4 yrs) were randomly allocated to a supplementation group (SUP, n = 4) to receive 2.85g/day O-3 supplementation or a placebo group (CON, n = 4) for three weeks. After three-weeks, participants performed a bout of EIMD, which consisted of performing 10 sets of 15 repetitions of leg extension on a Rating of Perceived Exertion (RPE) of 7/10 (Borg, 1982). Creatine Kinase (CK) from venous blood samples, isometric right-leg strength, squat-jump test and perceived soreness (6-point NRS) were determined, as indirect markers of muscle-damage at Baseline, immediately after EIMD (POST) and 48 hours after EIMD to coincide with the delayed muscle inflammatory response. RESULTS: No differences were found between Baseline and POST. There was a trend for smaller increase of CK levels (pre vs 48-h post EIMD) on the SUP group (38.8% increase) compared with the CON group (105.6% increase; P = 0.051). There was no significant effect (baseline vs. 48-h post EIMD) on muscle strength between SUP and CON group (P > 0.05), however, CON showed a larger decrease in strength compared to SUP (+6.3% vs SUP). No differences in jump height were found between SUP and CON (P = 0.05). There was no significant difference in muscle soreness at 48-h post EIMD between SUP and CON group (P = 0.171). CONCLUSION: Three weeks of O-3 supplementation decreased exercise-induced muscle inflammation after eccentric exercise. The encouraging results from this pilot study have led to designing further work related to this topic. The lack of statistical significance may be adduced to the limitations of the study design. Supplementation with O-3 can be beneficial in sedentary individuals re-starting physical activity and in athletes undergoing heavy exercise regimes, decreasing the exercise related muscle inflammation.

2117  Board #130  June 1 3:30 PM - 5:00 PM
Fish-oil Supplement and Eccentric Exercise on Lipid Profiles during Different Phases of Menstrual Cycle
Yonghyeon Jo¹, Sarah McKinley Barnard², Darryn Willoughby, FACSIM¹, Yunsuk Koh³. ¹Baylor University, Waco, TX. ²University of South Alabama, Waco, TX. ³University of South Alabama, Waco, AL.

Fish oil supplement has been widely recognized as a wholesome regimen, which may positively affect blood lipid and lipoprotein profiles and muscle damage caused by eccentric exercise. PURPOSE: To examine the effects of dietary fish oil supplement and acute eccentric exercise on blood lipids and lipoproteins including (TC, HDL-C, Lp(a), LDL-C, and VLDL-C) during two different phases of menstrual cycle (mid-follicular vs. mid-luteal phase). METHODS: As a randomized, double-blind design, 22 college-aged women (fish oil = 11, placebo = 11, age = 20.9 ± 1.39 years; selected and the opposing leg exercised during the ML phase. Blood samples were collected at baseline, 6-hr post-exercise, and 24-hr post-exercise for each phase. Data were analyzed by a 2 x 2 x 3 analysis of variance with repeated measures along with the Sidak’s multiple comparisons for any significant interactions to compare means differences (p < .05).

RESULTS: There were no significant differences in blood lipids and lipoproteins between fish oil and placebo groups or baseline, mid-, and post-exercise. However, HDL-C was significantly higher (p = 0.041) during the ML (61.66 ± 2.44 mg/dL).

Abstracts were prepared by the authors and printed as submitted.
A damaging bout of eccentric resistance exercise is known to hinder athletic performance. Fish oils are rich in omega-3-polyunsaturated fatty acids and have been purported to modulate the inflammatory response to exercise. It is possible that regular fish oil supplementation may assist in maintaining athletic performance following eccentric resistance exercise, but little is known regarding the optimal dose for stimulating benefits. PURPOSE: To examine the effect of fish oil (FO) supplementation dosing on athletic performance recovery following a muscle-damaging bout of eccentric exercise. METHODS: Thirty-two college-aged, resistance-trained males (n = 16; 23.4 ± 3.1 years, 71.7 ± 9.5 kg, 175.7 ± 4.5 cm) and females (n = 16; 23.4 ± 3.1 years, 61.7 ± 7.2 kg, 170.4 ± 6.2 cm) supplemented with 2.0, 4.0, 6.0 g d−1, FO or placebo (PL) for 7 weeks. Following 7 weeks of supplementation, participants completed pre-exercise (PRE) assessments of vertical jump (VJ) height, maximal voluntary contraction of the knee extensors, 40-yard sprint time, and T-test agility followed by a muscle damaging resistance exercise protocol (10 sets of 8 second-eccentric squats at 70% one repetition maximum, 5 sets of 20 split-squat jumps). All PRE-assessments were repeated immediately post (IP), 1, 2, 4, 24, 48, and 72 hours (h) post-exercise. RESULTS: Repeated measures analysis of variance indicated a treatment x time interaction (p < 0.001) for VJ. Although VJ was decreased from PRE (53.8 ± 8.7 cm) at IP (47.4 ± 5.3 cm) for all groups, VJ returned to PRE-values at 1h for the 6 g d−1 supplementation group (51.8 ± 5.6 cm, p = 0.112), while no other groups returned to baseline until 48h. No other differences were observed. CONCLUSIONS: These data indicate that supplementation with 6 g d−1 of FO is effective for enhancing recovery in jump performance following a damaging bout of exercise. Supported by the International Society of Sports Nutrition and MusclePharm Grant

The Center for Disease Control has reported that 70% of the US population are overweight and almost 40% are categorically obese, based on Body Mass Index (BMI). There are numerous programs, diets, and exercise regimes, but these are inadequate because of the continuous rise in obesity. A unique 2-minute Energy-surge exercise routine was developed for metabolism acceleration.

PURPOSE: To determine if the Energy-surge protocol (performed four times/day) reduces weight and girth sizes.

METHODS: Fifty-four subjects (mean age 39 ± 8) with BMI of >30, and were recruited for this 60-day study. Subjects were randomly assigned to either the Experimental group which performed the 2-minute, Energy-surge exercises, four times a day or the Control group who were instructed to “exercise more.” No dietary changes were required for either group.

The Experimental group were shown how to make many movements such as climbing stairs or curling dumbbells into an Energy-surge exercise in subjects’ aerobic threshold because of the continuous rise in obesity. A unique 2-minute Energy-surge exercise protocol performed four times/day reduces subjects’ weight and girth sizes. Resources (HMR) weight management program, self-selected to join the study and were assessed for baseline health and mobility. They were randomized into 2 groups: 3 weeks of isotonic resistance followed by 3 weeks of elastic resistance (10-20 min/day, 2-3 days/wk, 6 wks) using a cross-over design. Participants then performed full body CLX-only circuit exercises (20 min/day, 2-3 days/wk, 6 wks). Both home-based programs were delivered via written handouts and flash drive videos. Functional fitness/mobility was assessed using standardized tests. Repeated measures ANOVA were conducted and a p-value of <0.05 was used to indicate significant changes. An opinion survey was conducted to determine attitudes about the program and delivery.
Board #134  June 1 2:00 PM - 3:30 PM  
Insulin Resistance Response to a Treadmill’s High Intensity Interval Training in Postmenopausal Women  
Mariana S. Nakagaki1, Edilaine Michelini2, Jose E. Corrente2, Roberto C. Burini, FACSM3,  
‘Londrina State University, Londrina/PR, Brazil. 4UNESP Medical School, Botucatu/SP, Brazil.  
(Sponsor: Roberto Carlos Burini, FACSM)  
Email: msaantoro16@hotmail.com  

No relationships reported.

PURPOSE: Considering that high-intensity interval training (HIIT) might offer faster and/or more efficient results in improving insulin sensitivity and glycemic control than low-intensity exercise, we conducted a study to analyze the response of insulin resistance to all a HIIT.  
METHODS: 24 post-menopausal individuals were selected among those enrolled in our existing Lifestyle Modification Program (Move for Health). Physical activity level, socio-demographic characteristics, and health status were identified through the International Physical Activity Questionnaire (version 8 - long form). Fitness performance was determined by trunk flexibility, hanggrip test, cardiorespiratory fitness on treadmill. After an overnight fast (8-12 hours), plasma or serum was used for glucose and insulin assays. For the intervention protocol the patients were subjected to 43 minutes of supervised exercise twice weekly for 10 weeks. The HIIT included 10 minutes of warm-up at 70% of HR max, followed by 4 series of 4 minutes each on 90% HRmax with 3-min intervals between series for active recovery at 70% of HRmax, ended with 5 minutes backing to calm. Results were expressed as mean, standard deviation, frequency and percentage. Chi-square test (c2), ANOVA repeated measure and the range model repeated measures were used with a 5% significance level.  
RESULTS: The sample consisted of low-income post-menopausal women with intermediate education referring self-perception of good health, although overweight and with good weekly physical activity and grip strength fitness but poor trunk flexibility. After 10 weeks of HIIT, the values changed for cardiorespiratory fitness and with good weekly physical activity and grip strength fitness but poor trunk flexibility. Additionally to discrete effects on insulin sensitivity although ineffective in reducing abdominal adiposity and overweight.

Board #136  June 1 2:00 PM - 3:30 PM  
Effect Of Aerobic Exercise Intensity On Glycated Hemoglobin, Fitness, And Adiposity In Individuals With Type 2 Diabetes: Results From HART-D  
Neil M. Johansen1, Damon L. Swift2, Carl J. Lavie1, Conrad P. Earnest, FACSM3,  
Steven N. Blair, FACSM4, Timothy S. Church5,  
‘Louisiana State University, Baton Rouge, LA. 2East Carolina University, Greenville, NC. 3Ochsner Medical Center, Ochsner Clinic New Orleans, New Orleans, LA. 4Texas A&M, College Station, TX. 5University of South Carolina, Columbia, SC.  
(Sponsor: Steven N. Blair, FACSM)  
Email: njohansen1@lsu.edu  

No relationships reported.

PURPOSE: To examine changes (Δ) in HbA1c, CRF, strength, and adiposity in individuals with T2DM while retrospectively categorizing AER by intensity.  
METHODS: 196 men (n=74) and women (age=57.1±8.1y; BMI=34.4±5.8kg/m2; mean±SD) were included. The AER protocol was shown to be effective in improving aerobic fitness and flexibility, additionally to discrete effects on insulin sensitivity although ineffective in reducing abdominal adiposity and overweight.

CONCLUSIONS: The protocol was shown to be effective in improving aerobic fitness and flexibility, additionally to discrete effects on insulin sensitivity although ineffective in reducing abdominal adiposity and overweight.

Board #137  June 1 2:00 PM - 3:30 PM  
The Effect Of Exercise And Diet Interventions On Type-2 Diabetic Patient  
Mei Wang, Yan feng Zhang, China institute of sports science, Beijing, China.  
Email: wangmei@ciss.cn  

No relationships reported.

Purpose: This study probes into exercise intervention and diet for type-2 diabetic patient, in order to provide scientific basis for diabetic prevention.  
Methods: The research object is selected from the healthy people aged above 50. There are 160 type-2 diabetic patients in walking group; 186 in walking & strength exercise under diet control group; 56 in control group. Their disease course in 2-8 years and have a 3 months comprehensive intervention. Intervention plans: (1) Walking group: Add 20% of walking steps (at a speed of above 60m/min) on basis of average daily exercise quantity, people in this group exercise for 3-5 times a week. (2) Comprehensive intervention group: On the basis of walking, resistance training is added, which includes 3 sets of press-up, sit-up and back extension, and people shall do more than 10 for each set of exercise above or a maximum number according to personal ability. At the same time, the diet intervention is carried out. First, determine a daily total heat. Then calculate the required daily food exchange list and make proper distribution by a proportion of one-fifth, two-fifths and two-fifths or equally one-third for breakfast, lunch and supper respectively. (3) Detection indexes: (1) Personal information, state of disease, daily physical exercise condition, medication condition and diet habits. (2) Blood glucose: FBG and HbA1C. (3) Blood fat: TC, TG, HDL-C and LDL-C.  
Results: The FBG of intensity ≥1.5 METs, 0.9 to 1.6) compared to all other groups (range ΔCRF= -0.2 to 0.5  
CONCLUSION: Our analysis suggests that individuals with T2D who conduct their AER at an intensity above age, sex, and CRF average responses may see greater improvements in glucose control, CRF, strength, and adiposity.
non-adherent behavior count was 1.4 (SD=0.6) at BL and 0.2 (SD=0.6) PW (p<0.05).
The mean persuasion behavioral count with and without permission was 6.8 (SD=3.5) at BL and
2.9 (SD=1.5) at PW (p<0.05). The mean overall self-perceived proficiency and intent to use MI
was 7.6 (SD=1.1) at BL and 8.8 (SD=0.7) PW (p<0.05).

CONCLUSIONS: Preliminary findings of this pilot study did not identify significant change
in MI proficiency. However, trainees used significantly less persuasion, patient
evaluations remained high and clinician self-evaluation scores improved significantly.

Short-term measures from these varied methods of evaluation may provide useful
feedback to clinicians for ongoing MI skill development.

2125 Board #138
June 1 2:00 PM - 3:30 PM
Results Of An Eim Based Lifestyle Modification Program On Clinical Outcomes In Obese, Pre-diabetic Patients
David M. Nichols1, Edward Seger2, Peter Cummings3, Paul Washburn4, Peter Horvath5. Stony Brook University, Stony Brook, NY. 2SUNY Downstate Medical Center; Brooklyn, NY. 3Restore Medical Fitness, Buffalo, NY. 4Cheyenne Regional Medical Center; Cheyenne, WY. 5University at Buffalo, Buffalo, NY.
Email: david.m.nichols@storybrookmedicine.edu
(No relationships reported)

Purpose
To determine if an Exercise Is Medicine (EIM) modeled, lifestyle modification program,
including nutrition education and support, exercise programming and health
counseling would produce enhanced clinical outcomes and greater reduction in risk
to current standard of care in an obese, pre-diabetic population.

Methods
Data was collected from a single center clinical practice with trained nutritionists and
exercise physiologists. Inclusion criteria consisted of obese patients (BMI ≥30 kg/m²)
which had additional comorbid health conditions. The 12-week program consisted of:
initial assessment (baseline fitness and health markers and goal planning), a health
intervention (lifestyle and nutrition counseling, personalized individual and group
training, and health education), and outcome assessment (repeat fitness and health
assessment). Participants in this program were compared to similarly matched control
groups with a mean starting age of 60 years of age and a starting BMI of 38.0 kg/m².

Results:
A total of 362 participants met criteria to be included in this data set. 69 intervention
group with a mean starting age of 60 years of age and a starting BMI of 38.0 kg/m².
293 control, with a mean starting age of 71 years and starting BMI of 34.8 kg/m².
The intervention group saw reduction in HbA1C (5.9 vs 5.7%), Total cholesterol (170
mg/dL, 154 vs 136 mg/dL), and weight (238 vs 222 lbs). The intervention group
saw a reduction in HbA1C (5.9 vs 5.7%), Total cholesterol (170 mg/dL, 154 vs 136 mg/dL),
and weight (238 vs 222 lbs).

Conclusions:
The intervention group saw reduction in HbA1C (5.9 vs 5.7%), Total cholesterol (170
mg/dL, 154 vs 136 mg/dL), and weight (238 vs 222 lbs). The intervention group
saw a reduction in HbA1C (5.9 vs 5.7%), Total cholesterol (170 mg/dL, 154 vs 136 mg/dL),
and weight (238 vs 222 lbs).

2126 Board #139
June 1 2:00 PM - 3:30 PM
The Antihypertensive Benefits Of Yoga: A Meta-Analysis
Yin Wu1, Hayley V. MacDonald2, Blair T. Johnson1, Rebecca2, 1991, for NCDs primary care. Cross-sectional analysis of clinical, anthropometric,
dietary and physical activity data from 1317 subjects(2006-2016) was used to
categorize the BP subjects at baseline. Next, a sub-sample(n=453) were submitted
for DBP. The top quartile of blood pressure(142.2/88.5mmHg) differed from the lower
to a 10-wk LSM and repeated assessments. Statistical comparisons were defined by
p=0.05.

RESULTS: The BP rate(higher than 140/90mmHg) was 51.2% for SBP and 42.7% for
DBP. The top quartile of blood pressure(142.2/88.5mmHg) differed from the lower
quartile (120.6/69.2mmHg) by being older and lower either, schooling, income,
physical activity(IPAQ) and aerobic capacity(V02max). The p75 showed a lower
quality diet (HEI score) with more processed foods(higher CHO/fiber, sodium/
potassium and saturated fat). They showed also a higher body fatness and prevalence
of metabolic syndrome (MetS) along with MetS comorbidities of inflammation,
peroxidation and insulin resistance but, without differences in the Framingham score.
After 10 weeks of LSM the BP rate achieved achieved 17.8% for SBP and 9.3% for
DBP with a net effectiveness of 8.5% and 2.4%, respectively. The reduction of BP was
followed by increased aerobic conditioning and reduced intake of processed foods
along with decreased values of BMI, abdominal fatness and comorbidities.

CONCLUSIONS: Based on this effectiveness and, if applied nationwide, one would save
medications for 3.1 million of Brazilian hypertensives at an estimated saving of
US 1.47 billion a year!

2128 Board #141
June 1 2:00 PM - 3:30 PM
The Effects of a Group Exercise Rehabilitation Session on Stroke Survivors
Steve Meadows, Roisin Sullivan. University of Kent, Chatham Maritime, United Kingdom.
Email: s.meadows@kent.ac.uk
(No relationships reported)

UK stroke mortality rates are falling, but > 50% of stroke survivors have functional
disabilities. These impairments reduce capacity to perform activities of daily living (ADLs),
such as walking, basic self-care and independence (focussed on a single practice
(compared with hypertension (-11.8mmHg, k=13) than prehypertension (-6.6mmHg, k=20) and normal BP (-2.9mmHg, k=14), p<0.001); interventions located in India (-9.9mmHg, k=21) than non-India Asian (-7.0
mmHg, k=9) and non-Axis (-4.2mmHg, k=15, p=0.019) countries; and interventions
and that practiced Yoga with a balanced combination of breathing, postures, and
meditation (up to 10.8mmHg, k=25) than Yoga largely focused on a single practice
(e.g., left nostril breathing) (-2.3mmHg, k=18, p=0.006). CONCLUSION: Overall,
60 min of Yoga practiced 4 sessions/wk lowered BP ~3-4 mmHg among adults
with prehypertension. Yoga reduced SBP/DBP 12-10 mmHg among adults with
hypertension, reductions nearly double of those reported with aerobic exercise. Yet
care is warranted in the clinical translation of our findings until future controlled
trials specifically designed to target BP confirm them.

Preliminary findings of this pilot study did not identify significant
change in MI proficiency. However, trainees used significantly less persuasion, patient
evaluations remained high and clinician self-evaluation scores improved significantly.

Short-term measures from these varied methods of evaluation may provide useful
feedback to clinicians for ongoing MI skill development.

PO52 Board #140
June 1 2:00 PM - 3:30 PM
Effectiveness Of A 10-wk Lifestyle Modification Program In Reducing Hypertension In Brazilian Free-Living Adults
Roberto C. Burini, FACSM, Loraine Gollino, Hugo T. Kano, Mariana S. Nakagaki, Franz H P Burini. UNESP Medical School, Botucatu, SP, Brazil.
Email: burini@fmb.unesp.br
(No relationships reported)

PURPOSE: High blood pressure (BP) is a strong, independent and etiologically
relevant risk factor for cardiovascular diseases. Free distribution of more than 15
medications for HyPERtension and DIAbetes (HIPERDIA program) clearly shows
the important role of drugs in the Brazilian Government’s effort to tackle these
two diseases. Each medicated BP subject has an estimated cost of US$ 39.50. However,
drug therapy has been largely unsuccessful in halting and reversing the
epidemic and more emphasis must be placed on primary prevention guidelines. BP is
often associated with unhealthy lifestyles such as consumption of high fat and/or
high-salt diets and physical inactivity.

METHODS: A lifestyle modification program (LSM) involving dietary counseling and
regularly supervised physical activity (“Move for Health”) has been used here, since
1991, for NCDs primary care. Cross-sectional analysis of clinical, anthropometric,
dietary and physical activity data from 1317 subjects (2006-2016) was used to
categorize the BP subjects at baseline. Next, a sub-sample (n=453) were submitted
to a 10-wk LSM and repeated assessments. Statistical comparisons were defined by
p<0.05.

RESULTS: The BP rate (higher than 140/90mmHg) was 51.2% for SBP and 42.7% for
DBP. The top quartile of blood pressure (142.2/88.5mmHg) differed from the lower
quartile (120.6/69.2mmHg) by being older and lower either, schooling, income,
physical activity (IPAQ) and aerobic capacity (VO2max). The p75 showed a lower
quality diet (HEI score) with more processed foods (higher CHO/fiber, sodium/
potassium and saturated fat). They showed also a higher body fatness and prevalence
of metabolic syndrome (MetS) along with MetS comorbidities of inflammation,
peroxidation and insulin resistance but, without differences in the Framingham score.
After 10 weeks of LSM the BP rate achieved achieved 17.8% for SBP and 9.3% for
DBP with a net effectiveness of 8.5% and 2.4%, respectively. The reduction of BP was
followed by increased aerobic conditioning and reduced intake of processed foods
along with decreased values of BMI, abdominal fatness and comorbidities.

CONCLUSIONS: Based on this effectiveness and, if applied nationwide, one would save
medications for 3.1 million of Brazilian hypertensives at an estimated saving of
US 1.47 billion a year!
below a healthy age-matched population. Hypertension (HTN) is a modifiable risk factor for stroke, yet 75% of recurrent stroke sufferers have HTN. In the UK there is no routine exercise provision for chronic care stroke survivors. PURPOSE: To investigate the impact of a weekly community-based group exercise session on key health parameters and functional capacity of stroke survivors.

METHODS: 10 (63.70±13.21 yrs; 4 females; 6 males) stroke survivors were referred by an acute stroke rehabilitation team to a community-based exercise session. This referral pathway was set up as a collaboration between the local health care providers and the University of Kent. Participants attended once a week, completing a series of cardiovascular conditioning exercises (circuit format), strength and flexibility training. Health (weight, BMI, resting heart rate, resting systolic and diastolic blood pressure (SBP and DBP), waist circumference) and functional capacity (six-minute walk distance (6MWD), timed up and go, grip strength) assessments completed after 10 sessions (10 weeks).

RESULTS: Reductions in resting SBP (136.30±14.40 mmHg vs 150.14±19.4 mmHg p=0.006) and DBP 76.70±10.91 mmHg vs 83 mmHg p=0.035). 6MWD increased (392±12.29 m vs 321.90±106.88 m p=0.001). CONCLUSIONS: A once a week exercise session reduced SBP to < 140 mmHg and DBP in stroke survivors, who were already medicated with anti-hypertensives. Improved physical capacity evidenced by increased 6MWD. Walking speed increased from 53.65 m.m.min⁻¹ (3.2 kph) to 65.33 m.min⁻¹ (3.9 kph), improved walking speed by 2.5 mph. This study emphasises the importance of continued exercise rehabilitation post-stroke for further HTN risk factor management (secondary prevention) and continued recovery of physical condition.

2130 Board #143 June 1 2:00 PM - 3:30 PM
The Acute Arterial Stiffness Response to Interval vs. Continuous Exercise in Postmenopausal Women

Emily M. Miele, Christa Winter, Richard J. Wood, Samuel A. E. Headley, FACSM. Springfield College, Springfield, MA. (Sponsor: Dr. Samuel A. E. Headley, FACSM)

(No relationships reported)

High Intensity Interval Exercise (HIIE) has been associated with greater reductions in cardiovascular disease (CVD) risk factors when compared to continuous moderate exercise. Arterial stiffness (AS) is an independent risk factor for CVD that increases exponentially in women following menopause. PURPOSE: The current research was designed to investigate if a single acute AS response to HIIE versus a single bout of moderate continuous endurance exercise (MCEE) in postmenopausal women.

METHODS: A total of 13 women (age = 60.85 ± 4.41 years) completed the study. Subjects completed both a HIIE and a MCEE protocol on separate occasions. Time of the MCEE intervention was adjusted to match for the average number of heart beats obtained during the HIIE intervention. Pulse wave velocity (PWV), augmentation index (AIx), central systolic blood pressure (CSBP), and central diastolic blood pressure (CDBP) were measured pre exercise, 15 min post exercise, and 30 min post exercise to assess arterial stiffness. RESULTS: No significant interaction (p=0.05) between exercise intervention and time was determined for PWV, AIx, CSBP, or CDBP. No change in PWV was found from pre to post exercise (p=0.109). A trend was found for a greater decrease in AIx following HIIE compared to the decrease in AIx following MCEE (p=0.086). A significant decrease in AIx was found from pre exercise to 15 min post exercise (p=0.002; M₈ = 33.91, M₉ = 27.40) and from pre exercise to 30-min post exercise (p=0.035; M₈ = 33.91, M₉ = 28.67). CONCLUSION: The results of this study indicate that whether postmenopausal women perform MCEE or HIIE, the acute response of central arterial stiffness does not differ. No change in PWV from pre to post exercise was found for either exercise intervention.

2131 Board #144 June 1 2:00 PM - 3:30 PM
Physical Activity After Hospitalization For Acute Coronary Syndrome: Correlates Of Exercise Days Using Objective Measures

Ashley M. Goodwin¹, Ian M. Kronish², Nathalie Moise³, Andrea T. Duran¹, Carol Ewing Garber, FACSM⁴, Joseph E. Schwartz⁵, Keith M. Diaz². Teachers College, Columbia University, New York, NY. ¹Center for Behavioral Cardiovascular Health, Columbia University, New York Medical Center, New York, NY. (Sponsor: Carol Ewing Garber, FACSM)

(No relationships reported)

Exercise is essential in the secondary prevention of acute coronary syndrome (ACS). To date, there is a lack of data examining factors associated with objectively measured exercise in ACS patients post-discharge, a critical window for (re)forming health habits. PURPOSE: The purpose of this study was to examine factors associated with lack of exercise among ACS patients over the first 5 weeks post-discharge.

METHODS: ACS patients (myocardial infarction or unstable angina; N=269) from a hospital in Upper Manhattan were enrolled into an observational cohort study. Patients wore a wrist-based accelerometer for 35 days post-discharge. Days in which participants accumulated ≥50 min of moderate to vigorous physical activity in bouts ≥10 min were considered exercise days, expressed as % of days exercised over the 35 day wear period. Multivariable logistic regression models were used to examine correlates of non-exercise (0 days over the 35 day period), which included sociodemographic factors (age, sex, race, body mass index [BMI], partner status, social support), psychological factors (depression, post-traumatic stress disorder), health status/disease severity (GRACE risk score, Charlson comorbidity index [CCI], perceived mental and physical health [SF-12]), and hospital length of stay (LOS) and procedures (coronary artery bypass grafting [CABG], percutaneous coronary intervention [PCI]). All models were adjusted for age, sex, race, and ethnicity. Data are reported as odds ratios (OR) and 95% confidence intervals (CI).

RESULTS: Among the 269 patients, 63.6% did not exercise at all. Factors associated with non-exercise were GRACE risk score (OR: 1.03; 95% CI: 1.01-1.04; p<0.003), LOS (OR: 1.15; 95% CI: 1.05-1.26; p=0.002), PCI (OR: 0.26; 95% CI: 0.12-0.58; p=0.001), CABG (OR: 4.56; 95% CI: 1.50-19.86; p=0.010), BMI (OR: 1.09; 95% CI: 1.03-1.15; p=0.003), and perceived physical health (OR: 0.96; 95% CI: 0.93-0.98; p=0.002).

CONCLUSION: In ACS patients in whom exercise participation was objectively measured for 35 days post-hospitalization, factors related to poorer physical health and greater disease severity, but not psychological factors, were associated with low frequency of exercise. Future research may be warranted to elucidate how to address these factors to increase exercise post-ACS.

2132 Board #145 June 1 2:00 PM - 3:30 PM
Predicting Biomarkers through Affordable Fitness Band in Chinese Breast Cancer Survivors

Zachary Pope¹, Ning Liao², Chunyuan Han³, Nan Zeng¹, Zan Gao². ¹University of Minnesota, Minneapolis, MN. ²Guangdong People’s General Hospital, Guangzhou, China. ³South China University of Technology, Guangzhou, China. (Sponsor: Zan Gao, FACSM)

Email: popex157@umn.edu

(No relationships reported)

PURPOSE: Breast cancer survivors (BCS) are at great risk for low physical activity (PA) levels and quality of life. Applying affordable wearable fitness bands to track PA while also serve to provide predictive utility regarding clinical biomarkers may

Abstracts were prepared by the authors and printed as submitted.
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

2135 Board #148 June 1 2:00 PM - 3:30 PM Examining The Relationships among Chinese Breast Cancer Survivors’ Psychosocial Outcomes and Physical Fitness

Nan Zeng1, Chunyuan Han2, Ning Liao3, Zan Gao, FACSM1. University of Minnesota, Minneapolis, MN. 2South China University of Technology, Guangzhou, China. 3Guangdong People’s General Hospital, Guangzhou, China. (Sponsor: Zan Gao, FACSM)

Email: zengx185@umn.edu

Purpose: A decline in physical fitness has been evident among breast cancer survivors (BCS) following diagnosis. Yet, the relations among psychosocial beliefs and fitness in this population remains unexplored. This study investigated the correlates of psychosocial outcomes and fitness in Chinese BCS while determining the extent to which whether patients’ fitness can be predicted by psychosocial factors.

Methods: A total of 135 BCS (Mage = 44.3, SD = ± 8.1) were recruited from Southern region of China. Selected psychosocial outcomes were assessed by validated Patient-Centered Assessment and Counseling for Exercise Scale (2001), including physical activity confidence (PAC); physical activity family support (PASF); and physical activity environment factors (PAEf). Patients’ fitness testing consisted of leg strength and endurance (LSE; 30-second chair stand test); upper body strength and endurance (UBSE; 30-second arm curl test); lower body flexibility (LBF; chair sit and reach test); shoulder range of motion (SRM; measured by back scratch test); aerobic endurance (AE; 2-minute step test); and mobility and balance (MB; up and go test).

Results: Correlation analyses revealed no significant relationships were observed among psychosocial outcomes and overall fitness (p > .05). However, PAC was positively correlated with LSE (r = .48, p < .05); PASF was correlated with SRM (r = .22, p = .03); and LBF (r = .31, p < .05). Regression analysis indicated the overall model was statistically significant when PAC was used to predict LBF [F(1, 133) = 4.1, p < .05, r² = .03], suggesting PAC was a significant predictor of LBF (β = -.21, p < .05).

Conclusion: Findings suggest that as BCS’s PAC increases, their LBF is expected to increase modestly. Additionally, findings indicate that PAC significantly predict LBF—suggesting PAC may be a determinant of patients’ low body fitness. Nevertheless, other psychosocial outcomes were not significantly associated with any fitness component. It appears that psychosocial factors may not serve as ideal determinants for BCS’ fitness. Future research is warranted, therefore, to investigate other factors such as physiological and rehabilitative outcomes that may influence fitness in this population.

2134 Board #147 June 1 2:00 PM - 3:30 PM Aerobic Exercise And Cancer-Related Fatigue In Adults: A Re-examination Using The Ivhet Model

George A. Kelley, FACSM, Kristi Sharpe Kelley. West Virginia University, Morgantown, WV.

Email: gkelley@hsc.wvu.edu

(No relationships reported)

BACKGROUND: Using the traditional random-effects model, a recent meta-analysis of randomized controlled trials reported a statistically significant standardized mean difference (SMD) reduction in cancer-related fatigue (CRF) as a result of aerobic exercise (SMD, -0.22, 95% CI, -.39 to -0.04, p = 0.01). However, a recently developed inverse heterogeneity (Ivhet) model has been shown to be more valid than the traditional random-effects model.

METHODS: Using data from a previous meta-analysis that included 36 SMD effect sizes (ES’s) representing 2,830 adults (1,426 exercise, 1,404 control), results were pooled using the Ivhet model. In addition, absolute and relative differences between the Ivhet and random-effects models for CRF were calculated as well as influence analysis with each SMD ES deleted from the Ivhet model once. Non-overlapping 95% confidence intervals were considered statistically significant. RESULTS: A statistically non-significant reduction in CRF fatigue was found as a result of aerobic exercise using the Ivhet model (SMD, -0.08, 95% CI, -0.31 to 0.14, p = 0.46). The Ivhet model yielded a SMD ES that was 0.14 (63.6%) smaller than the random-effects model. With each study deleted from the Ivhet model once, results remained statistically non-significant with SMD ES’s ranging from -0.11 (95% CI, -0.33 to 0.11) to -0.06 (95% CI, -0.28 to 0.16). CONCLUSIONS: The results of the current study suggest that there is currently insufficient evidence to support the use of aerobic exercise for reducing CRF in adults. Future studies should consider use of the Ivhet versus traditional random-effects model when conducting aggregate data meta-analyses.

Supported by NIH Grant U54GM104942

ACSM May 30 – June 3, 2017

Denver, Colorado
Purpose: To investigate the association between physical activity and the presence of ACOS, and second, to investigate the association between physical activity levels and cardiometabolic disease risk factors in adults and older. Methods: The Canadian Community Health Survey (CCHS) is a cross sectional survey that collects information pertaining to the health determinants, healthcare utilization, and health status of Canadians. Data from respondents with ACOS (n=1,569) and those without a respiratory condition (n=64,175) from CCHS version 1.0, 2013 were analyzed. Physical activity was used to categorize respondents as active or inactive. Self-perceived health, body mass index and physician-diagnosed high blood pressure were used as outcomes. Descriptive statistics were used to calculate the frequencies of outcomes (physical activity level, self-perceived health, high blood pressure, and BMI) within the ACOS and no respiratory disease groups. Logistic regression analyses were conducted to determine the association between physical activity and ACOS, and between physical activity levels and cardiometabolic disease risk factors in ACOS. Results: Those with ACOS were 59% less likely to be physically active than those without a respiratory condition (OR = 0.59, CI = 0.50-0.71). Physically active adults with ACOS had higher odds of good self-perceived health (OR = 2.66, CI = 1.71-4.16), and were 60% less likely to report high blood pressure (OR = 0.40, CI = 0.43-0.86) than those who were inactive. BMI seemed to be an important correlate for self-perceived health, and high blood pressure, but was not significant when used as an outcome. Conclusion: Physical activity levels among adults with ACOS are low. This may increase their risk for poor health outcomes. Future research is needed to determine the effectiveness of exercise within this population.

Individuals with exercise-induced bronchostenosis (EIBC) often experience symptoms such as wheezing, coughing and shortness of breath during or following exercise, this may lead to greater perceptions of in-task effort and less enjoyment. Adults with EIBC report higher after performing high intensity interval exercise compared to moderate intensity continuous exercise (MICE). Purpose: To examine in-task perceptions of effort, dyspnea, and affective feelings during a sprint interval exercise (SIE) and MICE sessions in adults with and without EIBC. Methods: Participants with EIBC (aged 22.0±2.6) and participants without EIBC (aged 21.7±0.6) completed SIE (4 x 30 second sprints at 0.075kg/kg bodyweight, separated by 4.5 minutes of unloaded cycling) and MICE (65% peak power output for 20 minutes) sessions. Ratings of perceived exertion (RPE), ratings of perceived dyspnea (RPD) and 1-item feeling scale (1-FS) were monitored each minute during exercise. The Physical Activity Enjoyment Scale was completed by participants following each exercise protocol. Participants were also asked if they preferred SIE or MICE after the second session. Sessions were completed in random order. Results: Among those with EIBC, average RPE was not different during MICE (13.4±1.9) compared to SIE (11.5±0.5; p=0.29), there were no differences in average RPD during MICE (4.5±1.4) compared to SIE (4.3±0.6; p=0.81), average affect was greater during MICE (2.8±1.6) compared to SIE (2.0±1.5; p=0.05), and differences in physical activity enjoyment scores for MICE (93.0±5.6) compared to SIE (77.0±4.6; p=0.09) were approaching significance. There were no differences in RPD or affect between those with and without EIBC for either SIE or MICE. Those without EIBC reported higher RPE during SIE and had a higher enjoyment scores for SIE compared to those with EIBC. Two thirds of participants with EIBC preferred MICE and all participants without EIBC preferred MICE. Conclusion: SIE was associated with similar exertion and dyspnea but lower affect and enjoyment compared to MICE. Therefore, SIE may not be recommended for adherence to regular exercise in adults with EIBC.

A systematic literature search was undertaken to identify non-Cochrane reviews that matched based on intervention, condition, outcomes and publication year as in the corresponding Cochrane reviews. Methodological quality of the reviews was assessed using AMSTAR. The pairs will be contrasted in terms of frequency and degree of concordance in their results and whether differences affected the citation rate. Results: Of the 56 Cochrane reviews within our data set, we found 33 non-Cochrane reviews that met the eligibility criteria. The full analysis will be completed by the end of 2016 and final results will be presented fully for the first time at the ACSM meeting.

Conclusion: This is the first study comparing systematic reviews that were conducted within and outside the Cochrane Collaboration, in particular with respect to physical activity interventions for chronic diseases. Unlike a previous study using meta-analyses on medication therapy within the cardiovascular literature, we applied a more precise methodological approach that concurrently points out how differences can be explained. The findings of our study should make an important contribution to the field of evidence-based physical activity and emphasize that a critical appraisal of systematic reviews reporting physical activity interventions is highly recommended for health professionals.

Purpose: Evidence of physical activity (PA) as beneficial for health stems mainly from observational studies. Findings from randomised controlled trials (RCTs) often differ and systematic reviews of RCTs demonstrate mixed results making translation into clinical practice difficult. An overview of existing review evidence is needed to identify PA interventions that are effective in preventing or treating major chronic disease.

Methods: We searched the Cochrane Database of Systematic Reviews for reviews of RCTs restricted to major chronic diseases. A minimum of two authors independently screened search outputs, selected studies, extracted data and assessed quality of included reviews using AMSTAR. Certainty of effect estimates was assessed using the GRADE method. Primary RCTs within included reviews found to demonstrate confounding were excluded, and affected pooled estimates were recalculated. Results: 56 Cochrane systematic reviews (49%88%) deemed high quality according to AMSTAR across 20 chronic health conditions consisting a total of 829 RCTs and 65,032 participants were included. Data were extracted on 435 outcomes of which GRADE assessments were already available for 56 (33%) and newly derived for a further 189 (45%). We re-analysed 159 pooled-estimates across 27 reviews due to exclusion of 321 confounded trials. We found high quality evidence of a clinical and statistical benefit of PA for self-reported pain and self-reported pain and physical function in patients with osteoarthrosis of the knee and hip; and dyspnoea and fatigue quality of life measures in patients with COPD. Conversely, high quality evidence for no effect of PA was found for bone mineral density of the neck, hip and trochanter in postmenopausal women; and disease activity and radiological damage in patients with rheumatoid arthritis. The remaining outcomes showed moderate (42[17%], low (11[24%]) and very low (79[32%]) quality evidence, predominantly in favour of PA. Conclusions: A number of chronic health conditions for which clinical guidelines recommend physical activity may not be supported by high quality, clinically relevant evidence. Where there is a strong evidence-base, a formula of efficacious physical activity interventions is warranted but maybe hampered by heterogeneity within the available literature.
**INTRODUCTION:** Rheumatoid arthritis (RA) and Ankylosing spondylitis (AS) are systemic, autoimmune diseases causing severe joint inflammation, leading to joint damage and functional disability. Both diseases may feature co-morbidities e.g. cardiovascular disease (CVD) and hypercholesterolemia. RA is most prevalent in individuals aged ≥18 years, with an estimated prevalence distribution of 0.4-1.3% worldwide. AS has an age onset of 15-35 years, typically affecting 7-9/100,000, with a 3:1 male-to-female ratio. **PURPOSE:** Evidence of benefits of exercise, and its hypothesised mechanisms in RA and AS patients were explored. **METHODS:** Research literature on stage of disease, amount and type of exercise and classification levels were assessed using Medline and Scopus databases. **RESULTS:** Pre-evaluation includes staging of level of function (class I-IV) and assessment of disease activity and co-morbidities. Recommended amount and type of exercise vary depending on the site and amount of impaired joints, presence/absence of inflammation, joint stability and previous joint replacements. The FITT-Pro principle (frequency, intensity, time, type and progression) is followed in exercise prescription. Evidence of benefit of aerobic and resistance exercise programs shows an increase in aerobic capacity, muscle strength, self-reported functional ability, endothelial function, blood pressure, lipid profile, autonomic function and muscle mass, with a decrease in body fat percentage and trunk fat mass. Inflammatory disease is characterised by increased levels of circulating TNFs that induce cachexia and lead to deterioration of muscle strength. Pro-inflammatory cytokine production may also predispose patients to atherosclerosis, loss of muscle mass, and metabolic disorders (insulin resistance and dyslipidemia). Exercise not only improve functional outcome, but also induces an anti-inflammatory response, specifically suppressing TNFα production and stimulating the production of anti-inflammatory cytokines (IL-1ra and IL-10) via muscle derived IL-6. **CONCLUSIONS:** Scientific literature supports the benefit of exercise to both improve functional ability and reduce CVD mortality and other co-morbidities. Mechanisms of the effect of exercise are on functional and anti-inflammatory level.
Mulan Quan is a modern form of Tai Chi created specifically for women. **Purpose:** To explore the effects of Mulan Quan exercise on vascular function, pulmonary function and cardiovascular fitness in middle-aged and elderly women. **Methods:** Twenty middle-aged and elderly women were randomized to the Mulan Quan group and 20 healthy women were randomized to the control group. The study was conducted at the University of Chengdu, China. Women who were sedentary and had never practiced Mulan Quan were included in the control group (n=10, 57±3 years old), and those who had been practicing Mulan Quan for 4 years or longer were included in the exercise group (n=10, 60±5 years old). The exercise group practiced Mulan Quan 40-60 minutes each day for 6 months. PWV, Pulse wave velocity; DM, diabetes mellitus.

**RESULTS:** For PWV, PWV values from both sides were significantly lower in the exercise group (left side: 1779.00±1167.71 cm/s vs. 1687.00±1167.71 cm/s, p<0.05; right side: 1713.70±123.09 cm/s vs. 1661.30±180.25 cm/s, p<0.05), and ABI value from the right side was significantly lower in the exercise group than in the control group (1.07±0.07 vs. 1.14±0.06, p<0.05); there was no group difference in ABI values from the left side. For pulmonary function, the PVC was significantly higher in the exercise group than in the control group (2326.50±327.75 ml vs. 1938.00 ± 514.08 ml, p<0.05). For cardiovascular fitness, the PVC was significantly higher in the exercise group than in the control group (18.5 ± 6.3 to 21.7 ± 5.7 ml.kg⁻¹.min⁻¹) despite no significant increase in HRR (131.9 ± 28.7 to 132.1 ± 40.1 bpm) and respiratory exchange ratio (1.03 ± 0.1 to 1.03 ± 0.2) during maximal exercise testing. Resting heart rate decreased significantly (72.4 ± 11.8 to 68.6 ± 10.8 bpm), whilst no change in systolic (126.3 ± 24.2 to 129.8 ± 16.0 mmHg) or diastolic blood pressure (82.0 ± 16.0 to 79.2 ± 8.2 mmHg) was observed. SF36 component scores for physical (49.4 ± 4.1 to 72.6 ± 37.3) and mental health (74.9 ± 15.9 to 82.8 ± 10.1) increased significantly while the HADs anxiety (5.6 ± 3.4 to 3.6 ± 2.3) and depression (2.9 ± 2.4 to 0.5 ± 1.8) scores were significantly less than the established rates of decline across all muscle groups.

**CONCLUSION:** Our results confirm that age, %Fat, LBM-LBM, and PA are individually associated with LEPF but, the interactive influence of these inter-related factors on LEPF are less clear. Further study is warranted to determine the salient factors for intervention to ameliorate the age associated decline in LEPF increasingly observed in middle-aged women.

**Abstracts were prepared by the authors and printed as submitted.**
Commitment and follow through to an exercise and weight-loss program can be challenging. One of the ways to improve retention is through self-monitoring techniques such as weekly journaling. During our study comparing high-intensity interval training (HIIT) and walking as forms of exercise among post-menopausal women we attempted use qualitative methods to examine what the participants found helpful or challenging. PURPOSE: To investigate the thoughts and feelings, specifically related to the challenges and successes, participants experienced while completing a 12-week exercise program. METHODS: Participants (N=18) were post-menopausal (56 ± 5.94 years), sedentary female volunteers, randomly assigned into one of two exercise groups. Both groups exercised five out of seven days for 12 weeks. At the end of each week, participants submitted their answers to five open-ended reflective questions about their experience in the program, including the challenges and successes that week. This was done through an email exchange with a member of the research team. Additional specific follow-up questions were asked when needed. A total of 187 weekly email exchanges were collected and coded using Dedoose software. Data were analyzed via a general inductive approach to identify commonalities and differences between the two groups and among individuals. Data saturation was reached. Trustworthiness was established via peer review. RESULTS: For both exercise groups, the major theme of support developed. This included support from family, peers, and the researcher. Between the groups different challenges were identified including exercise intensity, weather challenges, and the walking group and the intensity of the workouts for the HIIT group. CONCLUSION: When working with clients attempting to lose weight and commit to an exercise program, support is a key component of success. When possible, family, co-workers, and others should be included in the process to encourage and help participants reach their goals. Weekly check-ins with a member of the research team is another way to facilitate program compliance and retention. Supported by Grant T052CO-14/04 from University of Scranton and Marywood University, Scranton, PA.

**2149**

**Board #162**

**June 1 2:00 PM - 3:30 PM**

**The Challenges and Successes During a 12-week Exercise Program for Post-Menopausal Women: A Qualitative Study**

Ellen K. Payne1, Joan Cebnick-Grossman2. Radford University, Radford, VA. *University of Scranton, Scranton, PA.

(No relationships reported)

**PURPOSE:** To investigate the thoughts and feelings, specifically related to the challenges and successes, participants experienced while completing a 12-week exercise program. **METHODS:** Participants (N=18) were post-menopausal (56 ± 5.94 years), sedentary female volunteers, randomly assigned into one of two exercise groups. Both groups exercised five out of seven days for 12 weeks. At the end of each week, participants submitted their answers to five open-ended reflective questions about their experience in the program, including the challenges and successes that week. This was done through an email exchange with a member of the research team. Additional specific follow-up questions were asked when needed. A total of 187 weekly email exchanges were collected and coded using Dedoose software. Data were analyzed via a general inductive approach to identify commonalities and differences between the two groups and among individuals. Data saturation was reached. Trustworthiness was established via peer review. **RESULTS:** For both exercise groups, the major theme of support developed. This included support from family, peers, and the researcher. Between the groups different challenges were identified including exercise intensity, weather challenges, and the walking group and the intensity of the workouts for the HIIT group. **CONCLUSION:** When working with clients attempting to lose weight and commit to an exercise program, support is a key component of success. When possible, family, co-workers, and others should be included in the process to encourage and help participants reach their goals. Weekly check-ins with a member of the research team is another way to facilitate program compliance and retention. Supported by Grant T052CO-14/04 from University of Scranton and Marywood University, Scranton, PA.
INTRODUCTION: Cardiorespiratory fitness is measured by peak oxygen consumption (VO\textsubscript{2max}) and is one of the strongest predictors of all-cause and cardiovascular disease mortality. In a healthy adult population, VO\textsubscript{2max} values obtained on a treadmill are approximately 10-15% higher than those yielded by cycle ergometry. VO\textsubscript{2max} testing in those with multiple sclerosis (MS) is typically performed on a cycle ergometer, as loss of walking mobility or balance issues may limit treadmill walking. Therefore, potential mode-specific differences in VO\textsubscript{2max} may result in the inability to accurately assess MS patients’ risk and lead to inaccurate exercise prescriptions in this cohort. PURPOSE: To compare hemodynamic, ventilatory, and cardiorespiratory responses between graded exercise tests performed on both a treadmill and cycle ergometer in individuals with relapsing-remitting MS. METHODS: Twenty persons with MS (42±11 years, 11±10 years since Dx, 26.9±6.5 kg/m\textsuperscript{2}) completed two VO\textsubscript{2max} tests approximately 1 week apart, with random order of testing. Treadmill tests consisted of a constant, self-determined speed with an increase in grade of 2% every two minutes. Cycle ergometry tests increased wattage by 15 watts per minute. RESULTS: VO\textsubscript{2}max was positively correlated (P<0.01) withresting HR (r=0.085) and inversely with HR\textsubscript{rest} (r=-0.125). HR\textsubscript{max} was positively correlated (P<0.01) with CI (r=0.200) and inversely with %APMHR (r=-0.214), HR\textsubscript{rec} (r=-0.233), and HR\textsubscript{res} (r=-0.338). After adjusting for age, sex, body mass index (BMI), and cardiorespiratory fitness (CRF), HR\textsubscript{max} remained inversely correlated with HR\textsubscript{rest} (r=-0.187, P<0.05). HR\textsubscript{rest} displayed a graded relationship among groups being highest (P<0.05) in NFG and lowest (P<0.05) in T2D. Resting HR and CI were higher (P<0.05) while HR\textsubscript{acc}, HR\textsubscript{rec}, and %APMHR were lower (P<0.05) in T2D compared to NFG. HR\textsubscript{rec} and %APMHR were lower (P<0.05) in T2D compared to CP. Differences among groups for CI, %APMHR, and HR\textsubscript{rest} remained significant after adjusting for age, sex, BMI, and CRF. CONCLUSIONS: These data suggest that impairment in exercise HR response observed in chronic hyperglycemia is also present in prediabetes which should be considered when interpreting CPX data and developing an exercise prescription.

<table>
<thead>
<tr>
<th>Treadmill</th>
<th>Cycle Ergometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO\textsubscript{2peak} (ml/kg/min-1)</td>
<td>27.0 ± 0.7*</td>
</tr>
<tr>
<td>HR\textsubscript{peak} (beats/min-1)</td>
<td>159 ± 19</td>
</tr>
<tr>
<td>SBP\textsubscript{peak} (mmHg)</td>
<td>166.8 ± 20.5</td>
</tr>
<tr>
<td>DBP\textsubscript{peak} (mmHg)</td>
<td>72.7 ± 13.3</td>
</tr>
<tr>
<td>RPE</td>
<td>17.9 ± 1.9</td>
</tr>
<tr>
<td>VE\textsubscript{peak} (L/min-1)</td>
<td>75.5 ± 21.2</td>
</tr>
<tr>
<td>RER</td>
<td>1.09 ± 0.08*</td>
</tr>
</tbody>
</table>

Table 1. Mean ± SD. *p<0.05 between Treadmill and Cycle Ergometer

PURPOSE: Assessing cardiorespiratory fitness is important for determining health status and prescribing exercise. Measurement of peak oxygen uptake (VO\textsubscript{2max}) is the gold standard for the evaluation of cardiorespiratory fitness. However, VO\textsubscript{2max} testing is not always feasible as it involves trained personnel, expensive equipment, and the ability of the test-subject to safely exercise until exhaustion. The ability to accurately predict VO\textsubscript{2max} using submaximal protocols is important, particularly in special populations such as pregnant women. A validated test to predict fitness levels in pregnant women will allow health care providers to evaluate their patients’ health status as well as tailor their patients’ exercise prescriptions; thus, maximizing the established benefits of exercise during pregnancy. The 6-minute walk test (6MWT) and the YMCA submaximal cycle test (YMCA) are currently validated tests to predict VO\textsubscript{2max} in non-gravid populations; however, neither test has been validated during pregnancy. Therefore, the purpose of this study is to determine the validity of the 6MWT and the YMCA as predictors of cardiorespiratory fitness in healthy weight women during mid-pregnancy. METHODS: Women (18-24 weeks gestation) with low-risk pregnancies participated. At Visit 1, participants completed the 6MWT and the YMCA in randomized order. Both tests were used to predict VO2max according to validated protocols/equations for non-gravid populations. At Visit 2, participants completed a graded exercise treadmill test (VO2max) using the Bruce Protocol. The predicted VO2max from each submaximal test and the measured VO2max were compared using Pearson Product Moment Correlation Coefficients. RESULTS: 16 women participated in the study (pre-pregnancy BMI=23.8±4.3 kg/m\textsuperscript{2}, Age=30±3.2 yr., Gestation age=22.0±1.3 wk). Mean predicted VO2max values were 36.3±3.9 and 41.1±19.0 ml/kg/min for the 6MWT and the YMCA, respectively. Mean VO2max obtained from the graded exercise test was 34.9±10.0 ml/kg/min. Actual and predicted VO2max values were not correlated for either submaximal test (6MWT: r=0.28, p=0.31; YMCA: r=0.08, p=0.79). CONCLUSIONS: The 6MWT and YMCA do not accurately predict VO2max values during mid-pregnancy. These tests should not be used to estimate peak fitness levels among pregnant women.
Cardiorespiratory fitness (CRF) level among women living with fibromyalgia (FM) has been documented with some contradictory results mostly due to differences in the methodological approaches used. Furthermore, some studies have suggested that aerobic capacity was affected in patients with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) 24 hours after performing a maximal CRF test. To our knowledge, no research has looked at the capacity to recover after a maximal CRF test specifically to morbidly obese individuals.

**PURPOSE:** To describe and compare the CRF and recovery capacity of women, who are mildly or moderately affected with FM, 24 hours after a maximal exercise test.

**METHODS:** Twelve FM women were submitted twice to a maximal exercise test (BSU/Bruce ramp) interspersed by 24 hours (T1 & T2), until participants achieved volitional exhaustion. Gas exchange (Ergogard, Medisoft) and ECG (Quinton) were measured and recorded. Participants were from the data-base of our institute in the period 1995 till 2015 were included into the study. The subjects were healthy competitive and leisure athletes and also non-athletes aged 9 to 95 years. All performed bicycle ergometer test with step wise increased resistance up to exhaustion.

**RESULTS:** No significant differences in maximal cardiac output (maxCO), VO2 at ventilatory threshold (VT), HRmax, and VO2peak: T2 = 22,9±4,7 ml O2·kg−1·min−1, p>0,05) and VO2 at ventilatory threshold (VT), HRmax, and VO2peak: T2 = 22,9±4,7 ml O2·kg−1·min−1, p>0,05) were found between T1 & T2. When considering the severity of the disease, mildly affected FM patients had a significantly greater CRF only at T2 (VO2peak: T2 = 22,9±4,7 ml O2·kg−1·min−1, p>0,05) and VO2 at ventilatory threshold (VT) of VO2peak: T2 = 22,9±4,7 ml O2·kg−1·min−1, VO2peak: T1 = 18,5±4,4 ml O2·kg−1·min−1, T2 = 18,7±4,5 ml O2·kg−1·min−1). Furthermore, CRF levels were lower than the general population. In fact, 75% of the VO2peak results were below the «Very Poor» category, of which 25% were below the «Very Poor» category, which compared to the ACSM normative values for VO2peak.

**CONCLUSION:** In general, participants showed no significant difference in CRF and recovery after 24 hours. However, the severity of fibromyalgia negatively affected CRF in our study population and their CRF level was lower than the general population.

---

**Board #169 June 1 3:30 PM - 5:00 PM Indirect Assessment Of Vo2max**

Jaroslav Novák¹, Milan Stork², Vaclav Zeman¹.¹Institute of Sports Medicine, Charles University, Plzen (Pilsen), Czech Republic; ²Western Bohemian University, Plzen (Pilsen), Czech Republic.

Email: novakj@ffp.cuni.cz

(No relationships reported)

VO2max is considered like the most valuable objective predictor of cardio-respiratory fitness and general health. Many evidence based studies prove that higher level of VO2max is adversely related to prevalence of many diseases, such as cardio-metabolic syndrome, ischemic heart disease, hypertension, diabetes II and others. However, only very few general practitioners can afford complete equipment for direct estimation of this important fitness biomarker.

**PURPOSE:** a) To find the highest correlation between the fitness markers, which don’t need O2-CO2 analyzer for their assessment (W170, Wmax) on one side and VO2max on the other side. b) To determine regression equations which could be used for calculation of VO2max and VO2max/kg.

**METHODS:** The data of 2777 spiroergometric tests (2015 males and 762 females) from the data-base of our institute in the period 1995 till 2015 were included into the study. The subjects were healthy competitive and leisure athletes and also non-athletes aged 9 to 95 years. All performed bicycle ergometer test with step wise increased resistance up to exhaustion.

**RESULTS:** The highest correlations were found between maximal performance achieved in watts (Wmax) and VO2max, and between Wmax/kg and VO2max/kg in both men and women. Regression equations for indirect assessment of VO2max are:

- Men: VO2max = 0.01095 . Wmax + 0.54 (min) (R=0.89); VO2max/kg = 8.3 . Wmax/kg + 13 (min/kg) (R=0.83)
- Women: VO2max = 0.0083 . Wmax + 0.67 (min) (R=0.85); VO2max/kg = 8.0 . Wmax/kg + 13 (min/kg) (R=0.83)

**CONCLUSION:** The regression equations can be used for assessment of VO2max and/or VO2max/kg body weight respectively even in those testing procedures, where bicycle ergometry enables to measure maximal performance during step wise increased workload, however, where no O2-CO2 analyzer is available. The data can serve as a feedback information about the effectiveness of physical activity in wider range of population then direct VO2max measurement, limited by the capacity of specialized laboratories.

---

**Board #170 June 1 3:30 PM - 5:00 PM A Pregnancy-Specific Equation for Predicting Cardiorespiratory Fitness**

McKenzie Driskill, Rachel A. Tinius, Donald L. Hoover. Western Kentucky University, Bowling Green, KY.

(No relationships reported)

**PURPOSE:** The ability to measure VO2max is important for determining health status and prescribing exercise. However, directly measuring VO2max is not always feasible, particularly in special populations such as pregnant women. Therefore, the purpose of this study was to create pregnancy-specific equations to predict cardiorespiratory fitness using baseline and exercise data.

**METHODS:** Nineteen pregnant women (Age: 29.8±3.1 years, Pre-pregnancy BMI: 23.8±3.9 kg/m², Gestation Age: 22.0±1.4 weeks) participated in the study. Each participant completed baseline measurements/anthropometrics and the Bruce protocol maximal treadmill test. Exercise data was obtained from the maximal test using heart rate from stages 1, 2, 3, and 4, and used to create regression equations calculated to predict measured VO2peak levels. In addition, other variables such as body mass index, age, gestation age, and physical activity level were included in these in regression models based on their predictive ability.

**RESULTS:** Stepwise multiple regression analysis (SPSS, version 24) was conducted to predict the VO2peak (in pregnant women based on baseline measures and exercise data. The results of this analysis indicated that VO2peak was significantly related to maximum heart rate (maxHR), F(1,11) = 22.38, p < .001, and demonstrated R² = .670 and adjusted R² = .640. The regression equation for this linear model is: VO2peak = −199.74 + (1.25 x maxHR). (BSU/Brace ramp) interspersed by 24 hours (T1 & T2) were submitted twice to a maximal exercise test. Exercise data was obtained from the maximal test using heart rate from stages 1, 2, 3, and 4, and used to create regression equations calculated to predict measured VO2peak levels. In addition, other variables such as body mass index, age, gestation age, and physical activity level were included in these in regression models based on their predictive ability.

**RESULTS:** Stepwise multiple regression analysis (SPSS, version 24) was conducted to predict the VO2peak (in pregnant women based on baseline measures and exercise data. The results of this analysis indicated that VO2peak was significantly related to maximum heart rate (maxHR), F(1,11) = 22.38, p < .001, and demonstrated R² = .670 and adjusted R² = .640. The regression equation for this linear model is: VO2peak = −199.74 + (1.25 x maxHR).

**Conclusions:** From the current study was used to create an equation that can be used to predict cardiorespiratory fitness in pregnant women. A logical next step is to further validate such equations in a larger cohort of pregnant women. Validated equations created will allow healthcare providers to safely and effectively predict their pregnant patients’ fitness level; thus, allowing them to best tailor their patients’ exercise prescriptions in order to maximize the benefits of exercise in both her mother and her offspring.
PURPOSE: To evaluate a recent equation (FRIEND) for the estimation of peak exercise capacity (VO2peak) in a heterogeneous clinical population of patients with cardiomyopathy against the current standard in estimation equations ( Wasserman, 1986).

METHODS: 1100 consecutive ambulatory patients performed clinical cardiopulmonary exercise testing (CPX) at Stanford University. VO2peak was measured directly during CPX (CosMed USA), and estimated VO2peak were calculated using the FRIEND (Fitness Registry and the Importance of Exercise: National Database) registry equation and the equation from Wasserman et al. VO2peak data were assessed for variation around the median and comparisons were made. RESULTS: Patients were on average 48 (15) y and 62% male. VO2peak as measured by CPX was on average 23.7 (9.8) ml/kg/min. The Wasserman equation average prediction for VO2peak was 27.8 (9.4) which resulted in an percent predicted of 88%, whereas the FRIEND equation resulted in average predicted VO2peak of 42.2 (10.3) ml/kg/min, resulting in 56% of predicted. CONCLUSIONS: In a large sample of patients with known moderate to severe cardiomyopathy, the standard reference equation by Wasserman assessed them as slightly below average whereas the FRIEND equation assessed the same patients as having severely impaired performance. Caution should be used in the interpretation of CPX results when using current VO2peak estimation equations and further development of these equations seems warranted.

Heart rate recovery (HRR) after intense exercise is one aspect of chronotropic incompetence (CI), the inability to match HR response to metabolic demands. Impaired HRR after peak exercise has been observed in HIV+ adults. However, physical activity (PA) and cardiorespiratory fitness (CRF) are both associated with improved exercise recovery, but their influence on HRR in this population has not been established.

PURPOSE: To evaluate the association between PA, CRF, and HRR; and test the hypothesis that HIV+ Hispanic adults classified as active and with good CRF will have higher %HRR after peak exercise compared with those inactive and with low CRF.

METHODS: A group of 89 adults (59 HIV+ and 30 HIV-) completed an exercise test using the modified Bruce protocol. Measurements continued for 6 minutes post-exercise. Heart rate recovery (HRR) after intense exercise is one aspect of chronotropic incompetence (CI), the inability to match HR response to metabolic demands. Impaired HRR after peak exercise has been observed in HIV+ adults. However, physical activity (PA) and cardiorespiratory fitness (CRF) are both associated with improved exercise recovery, but their influence on HRR in this population has not been established.

PURPOSE: To evaluate the association between PA, CRF, and HRR; and test the hypothesis that HIV+ Hispanic adults classified as active and with good CRF will have higher %HRR after peak exercise compared with those inactive and with low CRF.

METHODS: A group of 89 adults (59 HIV+ and 30 HIV-) completed an exercise test using the modified Bruce protocol. Measurements continued for 6 minutes post-exercise. Heart rate recovery (HRR) after intense exercise is one aspect of chronotropic incompetence (CI), the inability to match HR response to metabolic demands. Impaired HRR after peak exercise has been observed in HIV+ adults. However, physical activity (PA) and cardiorespiratory fitness (CRF) are both associated with improved exercise recovery, but their influence on HRR in this population has not been established.

PURPOSE: To evaluate the association between PA, CRF, and HRR; and test the hypothesis that HIV+ Hispanic adults classified as active and with good CRF will have higher %HRR after peak exercise compared with those inactive and with low CRF.

METHODS: A group of 89 adults (59 HIV+ and 30 HIV-) completed an exercise test using the modified Bruce protocol. Measurements continued for 6 minutes post-exercise. Heart rate recovery (HRR) after intense exercise is one aspect of chronotropic incompetence (CI), the inability to match HR response to metabolic demands. Impaired HRR after peak exercise has been observed in HIV+ adults. However, physical activity (PA) and cardiorespiratory fitness (CRF) are both associated with improved exercise recovery, but their influence on HRR in this population has not been established.

PURPOSE: To evaluate the association between PA, CRF, and HRR; and test the hypothesis that HIV+ Hispanic adults classified as active and with good CRF will have higher %HRR after peak exercise compared with those inactive and with low CRF.

METHODS: A group of 89 adults (59 HIV+ and 30 HIV-) completed an exercise test using the modified Bruce protocol. Measurements continued for 6 minutes post-exercise. Heart rate recovery (HRR) after intense exercise is one aspect of chronotropic incompetence (CI), the inability to match HR response to metabolic demands. Impaired HRR after peak exercise has been observed in HIV+ adults. However, physical activity (PA) and cardiorespiratory fitness (CRF) are both associated with improved exercise recovery, but their influence on HRR in this population has not been established.
D-68  Free Communication/Poster - Fitness Assessment

Thursday, June 1, 2017, 1:00 PM - 6:00 PM
Room: Hall I

2161  Board #174  June 1 3:30 PM - 5:00 PM
Justin Usher, Rajab Imairt, Dimitri Castro, Evranjeect Brar, Julio Gomez, Jenny O, Vanessa R. Yingling, FACSM. California State University, East Bay, Hayward, CA.
Email: jusher@horizon.csueastbay.edu
(No relationships reported)

Vertical jump testing is a commonly used method for measuring an individual’s anaerobic (explosive) power (Markovic, et al., 2004). Reliable and repeatable assessment of the vertical jump has implications in many health, wellness, and physical activity domains. The Vertec™ and force plate (gold standard) are devices used for accurately measuring vertical jump height; research conducted on these devices have shown their validity in measuring jump height (Buckthorpe, et al. 2012). The force plate and the Vertec™, although accurate at measuring vertical jump height, are costly and not easily accessible to many coaches and the general public. An accurate and accessible field measure would allow assessment of vertical jump height and power in many settings. PURPOSE: The purpose of this experiment was to examine the reliability and validity of the My Jump app (utilized on Ipad mini) compared to the Vertec™.

METHODS: Sixty-five college-aged participants performed three maximal countermovement vertical jumps. A Vertec™ measurement device was used in conjunction with the My Jump app to measure jump height. Jump heights from the Vertec™ were then correlated to those from the My Jump app. Peak power values were calculated using the Sayers equation (Sayers et al. 1999). The Pearson product-moment correlation coefficient was determined between the jump heights measured by the Vertec™ and the My Jump app.

RESULTS: The average jump height measured by the Vertec™ 20.1 in. (5.4) was significantly higher than the height from My Jump app 16.1 in. (4.5). A strong and significant correlation was found between the two height measurements, r=0.814, p<0.01 and for peak power measures r=0.933 p<0.01.

CONCLUSIONS: The vertical jump height measured by the Vertec™ is more commonly used to measure jump height due to the expense compared to a force plate. The lower height values using My Jump app may stem from the fact that subjects reach for the rungs on the Vertec™ while My Jump app measures the flight time to determine the vertical height of the center of mass. However, the ease of use and portability makes the app an accessible tool for measuring jump height in multiple settings.

2162  Board #175  June 1 3:30 PM - 5:00 PM
No Difference In Time To Stabilization Between Male & Female Dancers Following A Jump-landing Task
Hunter Loewen1, Marijanne Liederbach2, Leigh Schanefin3, Ian Kremenci2. 1University of Manitoba, Winnipeg, MB, Canada. 2NTU Langone Medical Center Hospital for Joint Diseases, New York, NY. 3Lenox Hill Hospital Northwell Health, New York, NY. (Sponsor: Mal McHugh, FACSM)
(No relationships reported)

Dance is a jump intensive activity, and, similar to other sports, ankle sprains among dancers are the most common traumatic injury, typically occurring when landing from a single leg jump. Ankle sprain injuries happen among dancers most often by age thirteen and have a high recurrence rate often leading to long term disability. As dance medicine epidemiology studies continue to evolve, it is evident that a gender disparity exists among dancers with females having up to 55% higher relative frequency of ankle sprains compared to their male counterparts. PURPOSE: To determine the effect of gender on time to stability (TTS) after landing from a horizontal jump task. METHODS: Forty-one professional ballet and modern dancers (14 men, 23:8±4:3 and 27 women, 26:1±4:7) without prior ankle injury consented to participate in this biomechanics laboratory study. Shod in personal, flat soled running shoes, subjects performed three submaximal (50% maximum) trials of the TTS test. Independent t-tests were employed with gender (male/female) as the independent variable and TTS (anterior-posterior [AP]/medial-lateral [ML]) as the dependent variables. RESULTS: No differences were found between male and female dancers for either AP or ML aspects of the horizontal TTS jump test (AP: men 2.70±0.11 seconds, women 2.709±0.11; p=0.98), (ML: men 2.718±0.294 seconds, women 2.853±0.177 seconds; p=0.121). CONCLUSION: Men and women dancers exhibited similar TTS after landing from a horizontal jump task when wearing flat soled shoes on a flat surface. The gender disparity in landing mechanics found by other researchers may not have been found here due to jump type or to extrinsic factors such as the interaction of variable floor surfaces common in the dance workplace and different shoe wear often required of the women which place them in the loose pack position of the ankle joint.

2163  Board #176  June 1 3:30 PM - 5:00 PM
Relationship Between the Ruffer Test and Maximal Treadmill Testing in Healthy Adults
Francois Modave, Trevor Leavitt, Ravi Kumar, Bian Jiang, Yi Guo, Heather K. Vincent, FACSM. University of Florida, Gainesville, FL. (Sponsor: Heather K. Vincent, PhD, FACSM)
Email: modavefp@ufl.edu
(No relationships reported)

PURPOSE: Estimating aerobic fitness in the busy outpatient clinical setting with gold standard maximal fitness testing is challenging due to time, staffing and equipment access limitations. Short tests that can be performed with minimal equipment and staff may overcome these limitations, and improve clinician ability to provide customized exercise recommendations and track fitness responses over time. This study piloted whether a peak fitness level could be estimated by a short, simple Ruffer exercise readiness test.

METHODS: Seventeen adults (32.6 ± 10.8 yrs; 26.0 ± 10.7 kg/m²; 9 F) participated. During one testing session, participants performed a Ruffer fitness readiness test (30 squats in 30 sec) and a Balke maximal treadmill fitness test. In the Ruffer test, heart rate (HR) was measured pre-test, immediately post and 1-min post-test. Ruffer scores were calculated and classified from the 3 HR values. During the Balke test, endurance time and peak values for HR, rate of oxygen use (VO2peak), ventilation (VE) and respiratory quotient (RQ) were captured.

RESULTS: Mean HR values during the Ruffer test were 68.7 ± 9.9 bpm (pre-test), 129±5 ± 9.7 bpm (immediately-post) and 88.4 ± 19.5 bpm (1-min post), which represented a significant change over time; p<0.001. The Ruffer score averaged 8.8 ± 3.4 points (from 0-20 points). The Balke VO2peak measure averaged 39.7 ± 11.6 ml/kg*min, with a peak HR of 179.3 ± 14.4 bpm and RQ of 1.2 ± 0.08. Average endurance time was 21.2 ± 4.5 min. Correlation between Ruffer scores and VO2peak value revealed a Pearson correlation coefficient r = 0.540 (two-tailed p-value of p=0.024, at 0.05 level).

CONCLUSIONS: Moderate associations were found between the fitness scores of the two tests from this group. The 45 s Ruffer exercise test may be useful for quickly identifying patients with poor aerobic fitness levels in the clinical setting, but may not be long enough to produce physiological responses that could discern fine gradations of fitness.

2164  Board #177  June 1 3:30 PM - 5:00 PM
Hip Adductors Are Stronger in Persons with Bilateral Compared to Unilateral Knee Injury: Pilot Study
Sara F. Voorhees1, Phyllis Heyne-Lindholm2, Donald Bruenjes1. 1University of Jamestown, Fargo, ND. 2Sanford POWER, Fargo, ND. 3Concordia College, Moorhead, MN.
Email: svoorhee@uj.edu
(No relationships reported)

Introduction: The role of hip adductor strength in persons with bilateral and unilateral knee injury is not well reported nor well understood. Studies that examined adductor strength often report no significant differences. Such studies include persons with unilateral and bilateral knee injuries, such as patellofemoral pain (PFPS). This pilot investigation separated those with unilateral or bilateral knee injury to assess differences in adductor strength and abductor-to-adductor strength ratio.

Purpose: Determine if differences in hip adductor strength is present in persons with unilateral compared to bilateral knee injuries.

Methods: Males and females, ages 18-24, with a history of unilateral (n=10; 6 F, 4 M; PFPS) or anterior cruciate ligament reconstruction (ACLR) or bilateral knee injuries (n=10; 6 F, 4 M; B PFPS or B ACLR) of at least 6 months ago, were recruited from local universities. The Knee Outcome Survey-Sport Activity Scale (KOS-SAS) questionnaire was completed by all participants. Hip adductor and abductor strength was measured with a calibrated dynamometer. The ratio of abductor-to-adductor strength, and peak hip muscle strengths were compared between groups and limbs (p<0.05).

Results: Between groups, there were no significant differences in age, height, weight, BMI, Tegner Activity Level, or KOS-SAS (p>0.5). Hip adductor strength was significantly weaker (p=0.03) in persons with unilateral (2.8 ± 1.7 %BW*HT) compared to bilateral (6.0 ± 1.9 %BW*HT) injury. The hip adductor-to-abductor ratio was significantly greater (p=0.004) in persons with unilateral (1.6 ± 0.5 %BW*HT) compared to bilateral (3.3 ± 1.9 %BW*HT) injury. There were no significant differences between limbs in adductor strength in either group (p>0.2).
Range of motion (ROM) is vital for daily living and exercise. Flexibility is especially of interest since tightness limits ROM and often results in muscle imbalances leading to injury. Different types of training have different effects on ROM. CrossFit, a higher intensity program, is often stigmatized as a muscle building exercise regimen that decreases ROM. Previous studies have shown lower intensity programs may increase flexibility and decrease injury. To date, few studies have addressed ROM comparisons of CrossFit and non-CrossFit programs. PURPOSE: The purpose of this study was to compare shoulder and hip joint ROM in individuals participating in CrossFit and non-CrossFit fitness programs. METHODS: An experimental design with random assignment was used to examine the ROM differences in a CrossFit and non-CrossFit fitness program observing 26 volunteers, consisting of nine males and 17 females aged 21.3 ± 4 years. Baseline ROM assessments for shoulder flexion, shoulder internal rotation, shoulder external rotation, hip flexion, hip extension, hip internal rotation were measured. Participants were randomly assigned to a CrossFit and non-CrossFit group. The participants completed eight weeks of training, attending three, one-hour sessions per week and refrained from any additional training. After training, the participants were tested using the same protocol as pretesting. Paired samples t-tests determined within group changes and one-way ANOVAs determined between group changes, and the alpha level was set at 0.05. RESULTS: The CrossFit group revealed a statistically significant difference in left shoulder external rotation (p = 0.085; 12.13: post: 62.28:14.89; p = 0.033). No other statistically significant differences were found in the non-CrossFit group or between groups when comparing joint ROM in bilateral shoulder flexion, shoulder internal rotation, shoulder external rotation, hip flexion, hip extension, and hip internal rotation. CONCLUSION: This study followed current research trends, as there were few significant differences found in ROM between and within CrossFit and non-CrossFit programs. However, this study found the CrossFit group to have a decrease in shoulder joint external rotation.

Although an increasing number of states are legalizing marijuana (MJ) for recreational use, research examining the chronic fitness and health related effects of MJ use in humans have been limited. PURPOSE: To examine the health and fitness of physically active MJ users and non-users. METHODS: Physically active, healthy males (N = 23) were placed into groups based on MJ use: marijuana users (MU; n = 12) or non-users (NU; n = 11). Physical activity level and MJ use were confirmed using IPAQ-Short Format and the Marijuana Use Measure questionnaires. MU had used MJ an average of 21 times out of the last 30-days. All MU were used to identify differences between groups (p < .05). Data are presented as mean ± 1 SD. RESULTS: MU used MJ an average of 21 times out of the last 30-days. All MU were smoking MJ in some form. All participants (MU and NU) averaged 23 yrs. ± 5 yrs. age, 80.4 ± 14.9 kg, BMI, 12.0 ± 5.9 % fat, 65.8 ± 13.1 bpm HR, 212.3 ± 8.4 mmHg SBP, 70.3 ± 10.0 mmHg DBP, 8.9 ± 11.1 % of VO2 max respectively, with no differences between the groups (p = 0.3, p = 0.8). CONCLUSION: The health and fitness of MU were not different from NU. We speculate that if all individuals in the study were physically active and had VO2max, LT and OBLA in higher fitness categories, it is possible that exercise provided protection against any marijuana related side effects in a healthy, male population. Funded by: FRBP-NPP at UNC.

Impact Of CrossFit And Non-CrossFit Programs On Range Of Motion

Amanda L. Moelk, Jennifer L. Welch, Rebekah G. Ellerbusch, Trevor W. Froisig, Gabrielle S. Turcotte, April A. Wheeler, Taylor K. Schmidt, Tara M. Roelofs, Justin R. Geijer. Winona State University, Winona, MN. (No relationships reported)

Effect Of Pacing Strategy During The Final Two Minutes of a Self-paced VO2Max Test (spv)

Sangwoo Lee1, Nicholas Hanson1, Carter Reid1, Timothy Michael, FACSM1, Carol Weideman1, Cory Scheaeder1.1 Western Michigan University, Kalamazoo, MI. 1Northern Kentucky University, Highland Heights, KY. (No relationships reported)

Marijuana Use and The Health and Fitness of Physically Active Users and Non-Users

Jonathon Lisano, Matthew Christensen, Alissa Mathias, Marcus Chavez, Kristina T. Phillips, Jeremy D. Smith, Laura K. Stewart. University of Northern Colorado, Greeley, CO. Email: lisaj3700@bears.unco.edu. (No relationships reported)

Validation of a 6-s Cycle Ergometry Sprint to Measure Peak Power in Recreationally Active Females

Scott M. Graham1, Fergal Grace2, Nicholas Sculthorpe3, Julian Baker4, Chris Connaboy5, Marianne F. Baird6,1. 1Edinburgh Napier University, Edinburgh, United Kingdom. 2Federation University, Ballarat, Australia. 3University of the West of Scotland, Hamilton, United Kingdom. 4University of Pittsburgh, Pittsburgh, PA. Email: S.Graham3@napier.ac.uk. (No relationships reported)

The 30-s Wingate Anaerobic Test (WAnT30) is frequently used to determine peak anaerobic power (PP). When PP, which is generally achieved within the first 5-s is the primary measure of interest, there may be no advantage in completing a 30-s test. It is not clear if a shorter test can be validated against the WAnT30. PURPOSE: To determine if a modified 6-s anaerobic test could be used to measure PP as an alternative to the traditional WAnT30 in recreationally active females. METHOD: Thirteen females (28.4 ± 6.3 yr, 163.2 ± 5.3 cm, 66.8 ± 10.9 kg), previously familiarised with protocols, performed a WAnT30. In a subsequent separate session participants performed a modified 6-s Wingate Test (WAnT6) and a 6-s Wattbike Pro ‘all out’ sprint (Watt6) in a randomised manner. A 15 min standardised recovery was completed before measuring the 30-s. The primary reason was measured was measured was measured using Watt30, Watt6 and WAnT6 using simple linear regression models and Bland Altman plots.

Results: WAnT30 correlated with Watt30 (R2 = 0.74; P < .001) with a mean bias of -55W. Between Watt6 and WAnT30 the agreement was R2 = 0.40 (P < .05), with a mean bias of 41 W. The bias between a WAnT30 and a WAnT6 could be corrected using the following equation:

WAnT30 = 0.691 * (WAtt6) + 156.1 W (r = 0.85, R2 = 0.72, SEE = 60.3 W; P < 0.001).

Conclusion: A Watt6 can be used instead of WAnT30 in recreationally active females when PP is the main measure of interest. This avoids unnecessary fatigue and
discomfort and would allow performance of each test in the same session. The regression equation provided in this study could be used to predict an individual’s PD during WAnT from WAnT6.

Evaluating Upper-body Strength And Power From A Single Test: The Ballistic Push-up

Ran Wang1, Jay R. Hoffman, FACSM1, Eliabu Sadres2, Sandro Bartolomei1, Tyler W.D. Mudd1, David H. Fukuda1, Jeffrey R. Stout, FACSM1, 1University of Central Florida, Orlando, FL. 2Wingate Institute for Physical Education and Sport, Netanya, Israel. (Sponsor: Jay Hoffman, FACSM)

Email: wangranmax@knights.ucf.edu

(No relationships reported)

Muscular strength and power are major determinants for many explosive, short duration sporting events. Consequently, the assessment of muscular strength and power is imperative for training program design and talent identification purposes. The one repetition maximum (1RM) squat and bench press are the most frequently used field tests for assessing lower and upper body strength, respectively. However, time constraints and maximal testing for untrained individuals may limit the use of 1RM testing in large population groups. Additionally, there has been only a limited number of investigations that have focused on the evaluation of upper body muscular power.

PURPOSE: The purpose of this study was to examine the reliability of the ballistic push-up (BPU) exercise, and to develop prediction equations for 1RM bench press and upper-body power.

METHODS: Sixty-two recreationally-active men completed a 1RM bench press and two BPU in three separate testing sessions. Intraclass correlation coefficients (ICC) of peak and mean force, peak velocity, flight time, and peak and mean power were calculated and used to examine the reliability of the BPU. Mean force, flight time and peak velocity was used to develop equations to predict the 1RM bench press, and time-based and velocity-based upper-body power. RESULTS: ICC’s ranged from 0.849 - 0.971 for the BPU measurements. Multiple regression analysis provided the following 1RM bench press prediction equations: 1RM = 0.31 × Mean Force - 1.64 × Body mass + 0.70 × (R² = 0.837, SEE = 11 kg); time-based power prediction equations: Peak Power = 11.0 × Body Mass + 2012.3 × Flight Time - 338.0 (R² = 0.658, SEE = 150 W), Mean Power = 6.7 × Body Mass + 1004.4 × Flight Time - 224.6 (R² = 0.664, SEE = 82 W); and velocity-based power prediction equation: Peak Power = 8.1 × Body Mass + 818.6 × Peak Velocity - 736.0 × Flight Time - 338.0 (R² = 0.797, SEE = 115 W); Mean Power = 5.2 × Body Mass + 435.9 × Peak Velocity - 467.7 (R² = 0.838, SEE = 57 W). CONCLUSIONS: Results indicate that the BPU is a reliable test for both upper-body strength and power. Furthermore, the mean force generated from the BPU can be used to predict 1RM bench press, while peak velocity and flight time measured during the BPU can be used to predict upper-body power. These findings support the potential use of the BPU as a valid method to evaluate upper-body strength and power.

Evaluating Upper Body Strength and Power Using the Wingate Test and Comparison With Individual Tests

Seventeen club rugby athletes (men n=20, age 18-25 underwent the WAnT. The study included 2 groups. Group 1 included 10 untrained individuals, and group 2 included 10 wrestlers. NTPROBNP (ng/mL), lactate (mmol/L), and blood pressure (mmHg) were measured at rest, immediately-post, two minutes post, and ten minutes post. The mechanical outputs (W) calculated for each subject. NTPROBNP was analyzed utilizing ELIZA.

RESULTS: The wrestler’s resting NTPROBNP values were higher (35.5±7.9 vs 35.1±14.82 accordingly), with non-significant differences between the groups. Immediate Post NTPROBNP was higher for wrestlers (40.25±21.58 vs 37.33±9.94) with a positive and strong correlation between PP and NTPROBNP (r = 0.85). While the untrained had a substantially higher post 10 NTPROBNP (65.07±1.73 vs 32 ± 5.57), both group’s NTPROBNP was elevated post 10 minutes with a significant difference from post 2 minutes values (p=0.035). PP was significantly higher for the wrestlers (1031±118.65 vs 960.91±189.01). No significant differences were found between groups for RPP and RMP.

Conclusions: NTPROBNP values were within the ranges reported in the literature. The WAnT did not put any of the subjects at risk due to cardiac stress. The recovery dynamics regarding NTPROBNP were different between groups. Wrestlers recovered rapidly with a slight elevation 10 minutes post-test, while the untrained recovered slowly with a significant elevation of NTPROBNP 10 minutes post-test.

Relationship Between the Repeated-Sprint Ability Test, Maximal Exercise and Exercise Tolerance in Female Athletes

Bruno Archizia, Daniela K. Andakua, Flávia R. Caruso, Cleiton A. Libardi, José C. Bonjorno, Jr, Claudio R. Oliveira, Audrey Borghi-Silva. Federal University of São Carlos, São Carlos, Brazil.

Email: barchiza@gmail.com

(No relationships reported)

The repeated-sprint ability (RSA) test consists of 6 maximal sprints of 40m (20m + 180° turn + 20m) with 20s of passive recovery between each sprint. It has been used in most intermittent-like sport modalities (i.e. soccer, rugby) to match-relate athletes’ performances, however, the RSA relationship with maximal exercise capacity as well as exercise tolerance needs to be investigated. PURPOSE: To verify the relationship between the RSA test with a maximal cardiopulmonary exercise test (CPX) and a constant speed test until time to exhaustion (TTE) of intermittent-sport female athletes.

METHODS: Twenty-two professional female soccer athletes (23 ± 4 years, 55.4 ± 6.9 kg, 162 ± 6 cm, maximal oxygen uptake (VO₂) _2141.8 ± 209.4 ml/min) performed the RSA test in a grass field. RSA mean performance time and percentage of performance decrement were calculated afterwards (RSA MSE and RSA L respectively). At least 48h later, all athletes underwent the CPX on a treadmill, where cardiac and respiratory variables were measured and calculated by a metabolic cart. Additionally, arterialized blood samples from carotid puncture were collected in order to quantify blood lactate concentration ([lact] L) during maximal exercise. Lastly, after 48h, all athletes performed a constant speed test (at 100% speed reached in CPX) until TTE to verify their exercise tolerance. RESULTS: Statistically significant correlations were found between: 1) maximal heart rate of CPX and RSA MSE (P = .000, r = 0.92); 2) [lact] L at the peak of CPX and RSA L (P = 0.12, r = 0.539) and 3) TTE and RSA MSE (P = 0.00, r = -0.632). No correlations between RSA variables and FO were found. CONCLUSION: This study showed that maximal chronotropic and blood lactate responses to maximal exercise testing are related to RSA test performance. In addition, exercise tolerance obtained during a near maximal exercise performance is also associated to RSA test performance in female intermittent-like sport modality athletes. Supported by CNpq Grant 484785/2013-6 and ESPEP Grants #2014/1014-59 and #2015/04101-1.

Differences Between Open and Closed-Kinetic Chain Measurements for Assessing Bilateral Strength Deficits

Casey M. Watkins, Megan A. Wong, Saldiam R. Barillas, Ian J. Dobbs, Lee E. Brown, FACSM. California State University, Fullerton, Fullerton, CA.

(No relationships reported)

Rugby is an 80-minute closed-kinetic chain field sport with maximum bouts of speed, power, and physicality. Assessing a player’s strength capacity is important for determining position, eligibility, and return to play after injury. Bilateral strength deficits (difference between bilateral strength and the sum of both unilateral measures) could potentially put an athlete at greater risk for injury. The isometric mid-thigh pull (IMP) is a closed-kinetic chain test examining multiple muscle groups force output involving the whole body, more similar to rugby, whereas the isometric knee extension is an open-kinetic chain test isolating the torque output of only the quadriceps muscle group. Some disagreement exists regarding whether open or closed-kinetic chain tests are more valid to assess an athlete’s bilateral strength deficit. PURPOSE: To determine differences between an isolated open-kinetic chain and closed-kinetic chain test to evaluate the bilateral deficit. METHODS: Seventeen club rugby athletes (men n=6, age=22±0.2 yrs, height= 172.66±16.12 cm, mass=80.28±11.13; women n=11, age=24.72±3.6 yrs, height= 164.00±5.23 cm, mass=74.00±18.14 kg) performed a standardized warm-up then stood on an AMTI force plate and performed a bilateral IMP, and two IMP measured for each leg unilaterally in random order. They also performed a Biodex bilateral open-kinetic chain test to isolate specific muscle groups force output.RESULTS: Statistically significant correlations were found between: 1) maximal heart rate of CPX and RSA MSE (P = .000, r = 0.92); 2) [lact] L at the peak of CPX and RSA L (P = 0.12, r = 0.539) and 3) TTE and RSA MSE (P = 0.00, r = -0.632). No correlations between RSA variables and FO were found. CONCLUSION: This study showed that maximal chronotropic and blood lactate responses to maximal exercise testing are related to RSA test performance. In addition, exercise tolerance obtained during a near maximal exercise performance is also associated to RSA test performance in female intermittent-like sport modality athletes. Supported by CNpq Grant 484785/2013-6 and ESPEP Grants #2014/1014-59 and #2015/04101-1.

Relationship Between the Repeated-Sprint Ability Test, Maximal Exercise and Exercise Tolerance in Female Athletes

Bruno Archizia, Daniela K. Andakua, Flávia R. Caruso, Cleiton A. Libardi, José C. Bonjorno, Jr, Claudio R. Oliveira, Audrey Borghi-Silva. Federal University of São Carlos, São Carlos, Brazil.

Email: barchiza@gmail.com

(No relationships reported)
Participants had lower VO_2peak values than highly trained (male 73.8 ± 1.6, female 49.1 ± 4.6). The purpose of the investigation was to determine sex differences in bilateral and unilateral exercise and sport performance outcomes, but whether the percent difference of torque relative to a bodyweight load. METHODS: Six male (age 19.0 ± 1.1 yrs) and 3 female (age 18.7 ± 0.6 yrs) varsity intercollegiate triathletes underwent physiological testing during maximal treadmill run and cycling protocols, and a 1km pool swim time trial performed on separate days. Physiological indices assessed for each protocol are presented in the table. Data were compared to determine sex differences between athletes in the present study and versus highly trained, junior elite and recreational triathletes as reported in the literature. RESULTS: Group differences were observed between males and females for the run and cycle tests and for the 1km swim. Purposes were to determine sex differences between athletes in the present study and versus highly trained, junior elite and recreational triathletes as reported in the literature.RESULTS: There were no significant (p<0.05) differences between recreationally trained males and females for BQ% (M= 9.89 ± 5.95%; F= 7.26 ± 5.69%), BPH% (M= 6.97 ± 5.97%; F= 10.02 ± 10.88%), and ULR% (M= 50.28 ± 6.80%; F= 46.65 ± 11.28%), and UR% (M= 50.19 ± 7.71%; F= 50.13 ± 10.85%). There was no significant (p>0.05) difference between sex for age and height, however there was a significant (p<0.05) difference for weight. CONCLUSIONS: Sex appears to have no significant effect on the percent difference of bilateral and unilateral torque asymmetries despite several different known physiological aspects. This could be due to the fact that our subject population was recreationally trained individuals, which can represent multitudes of sports, workouts and training programs. Future research should investigate sex differences in sport-specific athletes.

The bench press and pushup are popular exercises used to develop strength and power. They are also often associated with equal benefits in developing upper body muscular endurance. However, it is unknown how they are related as pushups use a bodyweight load while the bench press uses greater weight. PURPOSE: To investigate the correlation between bench press and pushup repetitions to failure relative to a bodyweight load. METHODS: Fourteen recreationally trained males (age=24.71±6.42yrs, height=177.29±6.87 cm, mass=83.74±9.41 kg) performed 1RM bench press test and an isometric pushup to determine bodyweight load supported in both the up and down positions. Grip width on the bench press was measured as the distance between middle fingers and this distance was used for hand placement during pushups. Subjects were positioned for a pushup with their hands on an AMT1 force plate and their feet off the plate. Isometric force was measured for 3 seconds in the up and down positions, in random order. For the down position, triceps were parallel to the floor, while for the up position, triceps were perpendicular to the floor. Days 2 and 3 consisted of performing repetitions to failure for either the bench press or pushup exercise. For the pushup, subjects performed repetitions following an 80/s tempo. The test was terminated if they failed to complete a full repetition, could not maintain cadence or there were three faults in form. For the bench press, subjects performed repetitions to failure with a load that was equal to the average relative bodyweight force of the up and down pushup positions. RESULTS: There was a very low negative relationship (r=0.289) between bench press repetitions to failure (29.5±7.59) and push up repetitions to failure (33.0±6.53). Load for the bench press test, relative to their 1RM (0.51±0.07) was significantly less than the pushup down position (0.75±0.03), up position (0.71±0.03), and the average of the up and down positions (0.73±0.03) relative to their body mass. CONCLUSIONS: The bench press and pushup must be seen as two distinct and different exercises that use very different loads, which could result in dissimilar upper body muscular endurance adaptations.

PURPOSE: To examine physiological attributes of NCAA varsity intercollegiate triathletes. METHODS: To examine physiological attributes of NCAA varsity intercollegiate triathletes.

PURPOSE: To examine physiological attributes of intercollegiate rugby players. METHODS: Fourteen recreationally trained males (age=24.71±6.42yrs, height=177.29±6.87 cm, mass=83.74±9.41 kg) performed 1RM bench press test and an isometric pushup to determine bodyweight load supported in both the up and down positions. Grip width on the bench press was measured as the distance between middle fingers and this distance was used for hand placement during pushups. Subjects were positioned for a pushup with their hands on an AMT1 force plate and their feet off the plate. Isometric force was measured for 3 seconds in the up and down positions, in random order. For the down position, triceps were parallel to the floor, while for the up position, triceps were perpendicular to the floor. Days 2 and 3 consisted of performing repetitions to failure for either the bench press or pushup exercise. For the pushup, subjects performed repetitions following an 80/s tempo. The test was terminated if they failed to complete a full repetition, could not maintain cadence or there were three faults in form. For the bench press, subjects performed repetitions to failure with a load that was equal to the average relative bodyweight force of the up and down pushup positions. RESULTS: There was a very low negative relationship (r=0.289) between bench press repetitions to failure (29.5±7.59) and push up repetitions to failure (33.0±6.53). Load for the bench press test, relative to their 1RM (0.51±0.07) was significantly less than the pushup down position (0.75±0.03), up position (0.71±0.03), and the average of the up and down positions (0.73±0.03) relative to their body mass. CONCLUSIONS: The bench press and pushup must be seen as two distinct and different exercises that use very different loads, which could result in dissimilar upper body muscular endurance adaptations.
was 152.6±74.04 Nm. Non-dominant Q isotonic PT was 240.02±80.49 Nm and H was 132.42±38.65 Nm. Non-dominant Q dynamic PT was 219.50±68.14 Nm and H was 164.81±59.14 Nm. A 1x3 repeated measures ANOVA revealed that dominant leg isometric HQR (6.11±10) was less than dominant leg dynamic HQR (6.91±12). Non-dominant leg isometric HQR (5.7±9) was less than non-dominant leg dynamic HQR (7.6±16). Dominant leg isometric HQR was greater than non-dominant HQR while non-dominant leg dynamic HQR was greater than dominant leg dynamic HQR. CONCLUSIONS: The results demonstrate that rugby players have greater HQR ratios in dynamic vs. isometric strength tests in both legs. Dynamic strength is displayed during rugby specific situations such as the scrum and therefore may be a more relevant measure. However, the importance of isometric HQR should also be of concern as isometric and dynamic muscle actions are performed by the hamstrings and quadriceps throughout a game. Therefore, test specificity should be considered when assessing muscle strength and ratios.

METHODS

Through the random number table method randomly divide 110 Chengdu civil servants, aged 20-59 into 5 groups(control group, 6000 steps, 10000 steps, 6000 + joint gymnastics, 10000 + joint gymnastics, and each group of 22 people), took an exercise intervention 4 times per week for 12 weeks. The physical and blood parameters were measured before and after intervention, at the same time analyzed the intervention effect.Statistical analysis, T-test, and one-way ANOVA were conducted by SPSS19.0.P<0.05 was considered statistically significant.RESULTS: Compared with pre-intervention: 1) There were no significant differences in laboratory-based VO2max measurement on cycle ergometer. 2) Skater #01 stopped at stage 15 (10.89 m/s) with an HR of 185 bpm, a 

RESULTS: Skater #01 stopped at stage 15 (10.89 m/s) with an HR of 185 bpm, a VO2max of 61 ml/min/kg and a RER of 1.27., compared to skater #02 who stopped at stage 18 (11.58 m/s) with an HR of 194 bpm, a VO2max of 66 ml/min/kg and a RER of 1.28. These preliminary results suggest that the protocol brings athletes to their maximal capacity by reaching a plateau for the HR and VO2, and a RER higher than 1.15.

CONCLUSIONS: A progressive speed skating test till exhaustion appears to measure maximum aerobic capacity of elite speed skaters. Nonetheless, many other data collections should be done with different levels of skaters, at different ages and gender, with the aim of creating a VO2max. estimating chart and also confirmed with a laboratory-based VO2max. measurement on cycle ergometer.

Osteoporosis is a leading cause of fracture and morbidity in older populations (Colon-EMeric & Saag, 2006). An effective strategy in minimizing the risk of osteoporosis is an active lifestyle in adolescence (Turner, 2004). Suboptimal bone strength in individuals who do not reach peak bone mass during childhood or adolescence may contribute to the development of fractures later in life (Bachrach, 2001). Bone strain and, thus, structural adaptations of bone are due to muscle forces acting on bone during activity. (Robling, 2009). Therefore, field measures of muscle force could be used to assess skeletal health. PURPOSE: The purpose of this study is to investigate the relationship between common muscle function tests (1 rep max/body weight, relative grip strength, peak power) and bone strength variables in a healthy college-age population. METHODS: Twenty participants from CSU East Bay, 9 females and 11 males (age (yrs) 23.4 +/- 2.5, height (m) 1.7 +/- 0.1, body fat % 20.8 +/- 9.6) performed a hand dynamometer, a one repetition maximum (1 RM) on a leg press machine and a vertical jump test using the Vertec. Peak power was then calculated from vertical jump height. Moment of inertia (I), cortical area (Cl.Ar), cortical bone mineral density (cBMD), and strength-strain index (SSI) were measured using peripheral Quantitative Computered Tomography (pQCT) to determine bone strength at the 50% tibia site. Correlation analysis determined muscle bone relationship. RESULTS: 1 RM/BW and relative grip strength were not significantly correlated with bone strength parameters. Peak power resulted in significant, positive correlations with J (R2=0.6030, p=0.008), Cl.Ar (R2=0.6030, p=0.008), and SSI (R2=0.5948, p=0.009). Peak power resulted in a significant, but negative relationship with cBMD (R2=0.7080, p=0.002). CONCLUSION: Our findings suggest peak power is a significant surrogate measure of bone strength in a healthy college-age population. Although cBMD had a negative relationship with peak power, this finding is possibly due to low numbers of participants at this stage. This study is important because health professionals and physical educators can use peak power as a practical and non-invasive method of determining bone strength and health.

CONCLUSIONS: The health status especially in blood indicators of Chengdu civil servant is not good compared with other people in China.We should strengthen the public health awareness. Exercise is medicine.exercise can effectively improve the public health status. Exercise intervention can effectively improve the health, physical quality and the state of blood of civil servant. The 1000+ joint gymnastic it is worth promoting in change the health status of civil servants.
RESULTS: There were significant relationships between age and VJ power output ($r=-0.635$, $P=0.001$) and age and isokinetic MP ($r=-0.410$, $P=0.009$). The correlation coefficients were similar ($r=0.112$), however, there is a moderate difference (effect size $=0.33$) between the relationships.

CONCLUSIONS: Single-joint isokinetic power output may demonstrate a weaker, but similar relationship with age when compared with more functional VJ assessments.

2183 Board #198
June 1 3:30 PM - 5:00 PM
Improved Fitness Trends In Firefighter Recruits Over A 12-year Span
Annmarie Chizewski1, Tina A. Greenlee2, Daniel R. Greenlee3, Kathryn Rougeau1, Denise L. Smith, FACSM1, Steven J. Petruzzello, FACSM1, 1University of Illinois at Urbana-Champaign, Urbana, IL. 2Center for the Intrepid, Fort Sam Houston, TX. 3Southern Utah University, Cedar City, UT. (Sponsor: Dr. James Navalta, FACSM)
Email: chizews2@illinois.edu
(No relationships reported)

Firefighting is a physically demanding occupation. As a population, firefighters (FFs) are at high risk for many health-related issues (e.g., sudden cardiac events, obesity, hypertension, fatigue, depression, post-traumatic stress disorder, anxiety). Physical fitness is an effective preventive strategies FFs can use to improve health and performance, as well as combat multiple health risks. PURPOSE: Examine physical fitness parameters and assessments in FFs from 2004 through 2016. METHODS: Participants were male FF recruits (N=556; 26.3±4.2 yrs; ht: 179.98±73.2 cm, wt: 87.20±15.0 kg) from the Illinois Fire Service Institute. Baseline descriptive measurements included waist (89.99±11.4 cm) and hip circumference (95.71±9.8 cm), and BMI (26.97±4.21). Baseline fitness testing included measurements of cardiovascular endurance (1.5-mi run time (12.87±1.77 min, M:SD; estimated VO2max (41.54±5.10 mL kg⁻¹ min⁻¹), muscular endurance (60-s sit-ups (31.6±8.5 reps), 60-s push-ups (40.3±12.3 reps), bench press (29.99±11.4 reps)), and flexibility (sit and reach (30.65±7.8 cm)) during the first week of a 6wk fire academy. RESULTS: Significant differences were shown across time ($P<0.001$). All ES=0.86-0.99 for weight and BMI, waist and hip circumference, 1.5-mi run time, 60-s push-ups, 60-s sit-ups, muscular endurance, and flexibility. Analyses examining trends over the 12-yr span revealed relationships between time and 1.5-mi run time ($r=0.67$, 60-s push-ups ($r=0.51$), muscular endurance ($r=0.56$), and flexibility ($r=0.74$). CONCLUSIONS: Over the span of 12 years, male FF recruits have shown increases in various fitness parameters (cardiovascular endurance, muscular strength/endurance, flexibility) while measures of cardiovascular endurance (1.5 mi run time) improved by 11.9% over this time period, and measures of muscle strength/endurance (e.g., push-ups) increased by 21.8%. The data suggest that the fitness levels of male FFs are increasing as they begin their career in the fire service. These increases in fitness may reflect national efforts in the fire service to promote fitness and may lead to decreases in disease and work-related disability.

2184 Board #197
June 1 3:30 PM - 5:00 PM
Physical Activity Intervention Fitness Of Male’s Middle Students In China: A Systematic Review And Meta-analysis
Jindong Chang1, Ming Yang1, Yan Peng2, Yi Li1, Hao Guo3, Mingxi Guan4, 1University of Illinois at Urbana-Champaign, Chongqing, China. 2University of Texas, Chongqing, China. 3Chongqing Business Vocational College, Chongqing, China. 4University of Illinois at Urbana-Champaign, Chongqing, China.
Email: changlai163.com
(No relationships reported)

Purpose: Approximately 50 % of Chinese adolescent are not physically active enough to achieve health benefits. The purpose of this study was to systematically review and meta-analyze the effect of fitness for Chinese middle students interventions on physical activity.

Methods: CNKI, Wanfang Data, Weipu Data and Web of Science Database were systematically searched to identify all relevant randomized controlled trials that evaluated the effect of fitness for Chinese middle students on physical activity from 2011 to 2015 years. According to the study design, the data of the boys were selected for analysis. The studies were described and effect size data were included in meta-analyses.

Results: Eighteen studies were included in the review and ten reported statistically significant improvements in physical activity. A meta-analysis of ten studies showed a statistically significant effect (SMD= 0.21, $P=0.004<0.01$) of GYM on physical activity immediately post-intervention. The intervention had a statistically significant effect (SMD=0.20, $P=0.006<0.01$) of the Sit and Reach. However, it is not statistically significant effect of Vital Capacity and Weight (SMD=0.11, $P=0.12$) and Height (SMD=0.13, $P=0.06$) on physical activity immediately post-intervention.

Conclusion: Daily activity is to be effective at increasing weekly duration of exercise in middle students, but the effect size is small. Training Chinese adolescents to encourage increased physical activity may provide an effective method for reaching their fitness health. More studies with detailed quantification of total physical activity will help to find more precise relative estimates for different levels of activity of Chinese adolescents.
INTRODUCTION: Peak and mean power assessed, by a vertical jump, has been shown to be a strong predictor of bone mineral content (BMC) in children and adolescents. However, this relationship has not been demonstrated in young women.

PURPOSE: To examine the relationship between vertical power and BMC in college-aged women. METHODS: Body composition and BMC was assessed by dual-energy X-ray absorptiometry in 77 women (age: 20.9 ± 2.2 years; height: 163.3 ± 12.7 cm, body mass: 60.9 ± 8.5 kg). Peak and mean vertical power was determined using a Vertec® scale and was calculated by the Sayers and Lewis equations, respectively.

RESULTS: Peak and mean vertical power were 3109 ± 521 Watts and 841 ± 125 Watts, respectively. Relationships were observed between BMC and peak vertical power (r = 0.52, p < 0.001) as well as mean vertical power (r = 0.58, p < 0.001). Multiple linear regression (r = 0.63, p < 0.001) resulted in the following equation: BMC = 0.436 - (0.00107 * Peak Power) + (0.00635 * Mean Power). Additionally, a strong relationship was observed between body mass and BMC (r = 0.75, p < 0.001).

CONCLUSIONS: The results of this study indicate that 40% of the variability in BMC among college-aged women can be predicted by peak and mean vertical power. These findings support the use of an assessment of vertical power as a predictor of bone strength in young women. We recommend that college-aged women with a goal to improve BMC perform plyometric types of activities that involve jumping and rebounding.

To optimize the health and sport performance in athletes, sport scientists have recently turned to monitoring physiological variables and markers of performance. Currently, preferred types of monitoring have not been identified and past research has shown that males and females might react differently to physiological stress. Purpose: To compare the physiological response of male and female elite collegiate hockey players after a 4-minute submaximal cycling test performed at a predicted 75% of VO2 max. METHODS: 52 elite Canadian collegiate hockey players, 28 males (age = 22.6 ± 1.3, height = 182.59 ± 6.00 cm, weight = 87.36 ± 7.20 kg, body fat = 17.3 ± 4.28%) and 24 females (age = 19.9 ± 1.3, height = 166.97 ± 7.20 cm, weight = 67.75 ± 8.10 kg, body fat = 26.3 ± 4.68%) participated in a 4-minute submaximal cycling test at a predicted 75% of VO2 max. Heart rate (HR) and rate of perceived exertion (RPE) were assessed during each stage and after the submaximal test, while blood lactate level was measured 2 minutes after the test. ANOVA was used to compare differences in HR, RPE and kick intervals between sex. The physiological response to exercise was assessed by monitoring heart rate, RPE, and lactate levels.

CONCLUSION: The results of this study indicate that males and females might react differently to physiological stress. Currently, monitoring cardiovascular performance in female athletes is much less developed than in male athletes. More work is needed to understand cardio-metabolic sex differences, specifically the physiological response of female athletes to exercise. INTRODUCTION: Physical activity level has been shown to be linked to health-related outcomes. However, there are many factors including a low physical activity (PA) level. A person’s PA can be measured in several ways, one that has become popular is an accelerometer. Most PA guidelines recommend that an adult must acquire 7,500-10,000 steps/day to be considered somewhat active. However, studies have found that different equipment can calculate different step counts. PURPOSE: To determine if college students are meeting recommendations for physical activity in regards to steps taken per day and if current measurement devices are accurately reporting these outcomes. METHODS: Thirty one college students (20 y.o.; 69.93 kg) wore an Actigraph GT3X accelerometer (GT3X) around the waist during daily activities to determine steps taken in an average week. We compared our calculated outcomes versus the Actigraph software. All data used was collected via the GT3X. RESULTS: The GT3X reported that the students averaged 5,746 steps/day, while we calculated an average of 4,493 steps/day, resulting in a difference of 1,253 steps/day. Conclusion: Our results indicated that college students either fall in a step count range of approximately less than 5,000 or a range of 5,000-7,499 steps/day. Our data suggests that college students may be categorized as low active or sedentary based on which count is accurate. The difference in steps may have resulted from how total time was calculated. Further research is warranted to gain a better understanding of how to monitor the accuracy of measurement devices when determining activity levels for a population. This gained knowledge could lead to healthier students with a lower risk of mental and physical disabilities across multiple college campuses.
Aerobic fitness and anaerobic power in a sample of division I, female college basketball players.

Wingate test. Preseason training lasted one month and consisted of 8 hours per week. The changes observed in performance varied widely between athletes. However, this variation is not related to baseline fitness levels, age, year in school, or position played. This information may be useful for strength and conditioning coaches to design individualized training programs to maximize effects.

CONCLUSIONS: Preseason training can have a positive effect on aerobic endurance and anaerobic power. These changes varied widely between athletes. However, this variation is not related to baseline fitness levels, age, year in school, or position played. This information may be useful for strength and conditioning coaches to design individualized training programs to maximize effects.
INTRODUCTION: Field-specific testing is done at all levels of football to assess player’s strength, speed, and agility. Differences exist in anthropometric profile between skill position players and non-skill position players. These differences in physical performance measurements are due to the nature of physical requirements based on position. PURPOSE: To look at the relationship between body fat percentage (BF%), and speed, agility, jumping, and strength performance measurements. METHODS: Eighty-five (n=85) football players participated and were categorized into two groups: skill players (n=55) and non-skill players (n=30). BF% was assessed via air plethysmography for all players. Physical performance measurements included: clean and jerk, bench press, squat, 40-yard dash, pro agility, broad jump, and vertical jump. Pearson’s product moment correlation coefficient was applied to BF% across the physical assessments. Bivariate correlation comparisons were conducted to identify significant differences between skilled and non-skilled athletes using the Fisher’s r-to-z transformation, followed by an independent sample z-tests to assess statistical differences in correlation coefficients of skilled to non-skilled athletes. Statistical significance set at p ≤ 0.05. RESULTS: For non-skilled players, the relationship between BF% and all performance measurements showed significance except for the broad jump. In the skill position, significant was observed in the relationship between speed, explosion and agility assessments compared to BF%. No significance was found in the strength measurements. When comparing skilled and non-skilled positions, both bench and pro agility showed significant differences. For bench press, non-skilled players had a higher correlation coefficient compared to skill players. For pro-agility, skilled players had a higher correlation coefficient then non-skill players. CONCLUSION: These findings suggest that BF% is related to measurable performance advantages across different types of tests, depending on player position and position-specific demands. Results from both of these types of testing parameters can possibly be utilized to predict future player performance and to better evaluate player development and progress.
CONCLUSIONS: In conclusion, body composition and MF influence bone health on a sample of children and adolescents from Colombia. Thus, promoting strength adaptation and preservation in Colombian youth will help to maximize bone health, an important protective factor against osteoporosis later in life.

The measurement of Hand Grip Strength (HGS) is one of the methods for evaluating the maximum isometric strength of the hand and forearm muscles, that is related to predictive factors of health conditions of people. In addition, this is an indicator that relates the physical condition of young people with their Body Composition (BC), identifying Cardiovascular Risk (CR) factors in the university population. Purpose: The purpose of this study is to relate the HGS and the BC associated with the CR and the variables of Elective Course of Physical Activity and Sports (SECPAS) of the Pontificia Javeriana University (PJI). Bogota, D.C. Colombia. Methods: Descriptive correlational study, which 91 students aged an average of 22.5±4.5 years old, were assessed n=40 (44%) males and n=51 (56%) females. To evaluate the HGS was used an hydraulic hand dynamometer owner’s manual JAMAR®. It was registered two measurements of Right Hand (RH) and Left Hand (LH) in seated position, using the best result for analysis. A bioelectrical impedance scale OMRON® HBF-510LA, was used to evaluate the BC, which shows the percentage of Body Fat (BF) and Skeletal Muscle (SM). Results: Values of HGS for RH and LH were compared, demonstrating that in the RH were higher than the LH for both genders, the difference of HGS was 8.4% (4.5 kg). For 78% of students (n=71), are in an average classification of low SM with low level in males 62.5% (n=25), according to OMRON® parameters. Conclusion: For males, was found a relation between HGS and BC, lower SM, greater BF and less HGS, become predisposing factors to develop CR. On the other hand, females showed a normal SM, higher BF and less HGS, it looks apparently normal, but hides a healthy appearance that prevents the CR control. Those indicators are useful to reorient the objectives of integral formation towards create healthy habits to SECPAS.

INTRODUCTION: Muscle biopsies have played a large role in the understanding of skeletal muscle physiology. While discomfort from the biopsy process is often reported, it is unknown if the activation of pain pathways and/or the administration of lidocaine during the procedure affects the motor control of the same muscle.

PURPOSE: To examine the effects of a skeletal muscle biopsy on the motor unit firing properties of the vastus lateralis (VL) in young men. METHODS: Fifteen young men (Age: 22 ± 2 years) underwent skeletal muscle biopsies of the VL of the right leg. Prior to and following the biopsy, subjects completed a maximal effort contraction. Four surface electromyographic signals were detected from the VL during the maximal contraction and decomposed into their constituent motor unit action potential trains. The relationship between maximal motor unit firing rate (FR) and recruitment threshold (RT) were calculated for each subject pre- and post-biopsy. Separated Paired-Samples T-Tests were run to test for changes in slope coefficients and y-intercepts. Results: Our findings showed no significant change in slope (Pre: -0.40 ± 0.32; Post: -0.40 ± 0.21; p = 0.96) or y-intercept (Pre: 29.0 ± 7.3; Post: 30.8 ± 7.6; p =

杷2196

Upper Limits Of Exercise Tolerance

Andrew M. Alexander, 66502, Shane M. Hammer, Kaylin D. Didier, Dryden R. Baumfeld, Joshua R. Smith, Thomas J. Barstow, FACS, Kansas State University, Manhattan, KS

Email: robin640@hotmail.com

No relationships reported

The power-duration relationship accurately predicts exercise tolerance for constant power exercise performed in the severe intensity domain. At intensities above critical power (CP, highest sustainable power without impending failure), the power-duration relationship establishes a hyperbolic curve. This curve can be linearized as a 1/time model. However, the prediction of exercise tolerance is currently unclear for work rates (WR) within the extreme intensity domain (durations <2 min). PURPOSE: To test the hypothesis that the power-duration relationship deviates from a linear 1/time relationship for WRs within the extreme intensity domain. METHODS: To date, two men (age 21 yrs) completed the experimental protocol. Two-legged knee extension

杷2197

Body Composition, Nutritional Profile And Muscular Fitness Affect Bone Health In A Sample Of Schoolchildren From Colombia: The Fupreculo Study

Monica Adriana Forero Bogotá1, Monica Lílian Ojeda-Pardo1, Antonio García-Hernoso2, Robinson Ramírez-Velzé3.1 Centro de Estudios para la Medición de la Actividad Física «CEMA». Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá D.C, Co, Bogota, Colombia. 2Laboratorio de Ciencias de la Actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile.

Email: robin640@hotmail.com

No relationships reported

PURPOSE: The objective of the present study is to investigate the relationships between body composition, nutritional profile, muscular fitness (MF) and bone health in a sample of children and adolescents from Colombia. METHODS: Participants included 1,118 children and adolescents (54.6% girls). Broadband ultrasound attenuation (BUA) was obtained by using quantitative ultrasound technique at the calcaneus as a marker of bone health. Body composition (fat mass and lean mass) was assessed using bioelectrical impedance analysis. Dietary intake and very high, 35.2% (n=32) for both genders. It was evidenced that the BF of females showed a normal SM, higher BF and less HGS, it looks apparently normal, but hides a health appearance that prevents the CR control. Those indicators are useful to reorient the objectives of integral formation towards create healthy habits to SECPAS.
0.26) following the biopsy process. Figure 1 below depicts the relationship between group mean FRmax (x-axis) and group mean RT (y-axis) both pre- and post-biopsy. CONCLUSION: Despite reports of discomfort, the results of the present investigation suggest that the motor unit firing properties of the VL of young males are minimally affected by the process of a skeletal muscle biopsy. Specifically, our data shows no significant change in the relationship between FRmax and RT. Researchers and scientists that utilize muscle biopsies can take comfort in knowing that the process does not affect the motor control of the muscle during subsequent contractions.

Hormonal Responses After Eccentric Exercise In Humans

Anastassios Philippou1, Maria Maridakis1, Loukas Kollias1, Argyro Papadopetriki1, Ioannis Pennas1, Michael Koutsilieris1.
1Medical School, National and Kapodistrian University of Athens, Goudi-Athens, Greece. 2Faculty of Physical Education and Sport Science, National and Kapodistrian University of Athens, Dafni-Athens, Greece.
Email: tfilipou@med.uoa.gr
(No relationships reported)

Following muscle damage, multiple responses associated with an inflammatory and degenerative phase are activated before the completion of muscle repair or muscle regeneration. The final outcome of those responses is influenced by a crucial balance between anabolic and catabolic, among others, factors. Nevertheless, less is known about the responses of the competitive (anabolic vs catabolic) hormones growth hormone (GH) and cortisol (CORT) following muscle damaging exercise. PURPOSE: The purpose of this study was to investigate serum levels of CORT and GH during muscle regeneration. More studies are needed to further characterize the hormonal responses to eccentric exercise in humans.

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI</th>
<th>Stress fracture type</th>
<th>DXA (g/cm2) and Z-score spine</th>
<th>DXA (g/cm2) and Z-score hip</th>
<th>Total 1 (ng/dL)</th>
<th>Vitamin D (ng/mL)</th>
<th>Serum Ca (mg/dL)</th>
<th>PTH (pp/mL)</th>
<th>24 hour urine Ca (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>22.0</td>
<td>Femoral neck</td>
<td>-0.358</td>
<td>-0.858</td>
<td>372</td>
<td>59</td>
<td>9.8</td>
<td>21</td>
<td>259</td>
</tr>
<tr>
<td>47</td>
<td>27.7</td>
<td>Tibial metatarsal</td>
<td>0.982</td>
<td>-0.07</td>
<td>216</td>
<td>48</td>
<td>9.4</td>
<td>33</td>
<td>440</td>
</tr>
<tr>
<td>44</td>
<td>23.5</td>
<td>Tibial</td>
<td>1.116</td>
<td>0.4</td>
<td>230</td>
<td>23</td>
<td>9.8</td>
<td>32</td>
<td>188</td>
</tr>
<tr>
<td>22</td>
<td>23.1</td>
<td>Metatarsal</td>
<td>1.024</td>
<td>-1.1</td>
<td>242</td>
<td>36</td>
<td>10.0</td>
<td>24</td>
<td>476</td>
</tr>
</tbody>
</table>

Levels of testosterone (T) were low normal in 3 of the 4 men. 24 hour urine calcium was elevated in 2 of the 4 men. DXA Z-score at the spine was frankly abnormal in 1 man with a femoral neck stress fracture. The remaining 3 of 4 men had Z-scores within normal limits, however lower than expected for an endurance athlete (less than -1.0).

CONCLUSIONS: Alterations in testosterone as well as pituitary gonadotrophins (FSH and LH)[1] have mainly been reported in long distance runners [2], but we suspect such alterations exist in endurance athletes of all types. With the increase in US participation in triathlons, this finding may become more prevalent. Studies at our institution have suggested concerns for low BMD in competitive cyclists with increases in markers of bone resorption. [3, 4] However, abnormal T levels have not been found in this cohort. There may be alterations in urinary calcium and transient changes in PTH playing a role. The combination of endurance activities coupled with limited energy availability may lead to low T and stress fractures, features of a “male athlete triad.” Patients may not complain of hormonal symptoms such as muscle loss or low libido at these levels. Thus, we urge our colleagues to ask endurance male athletes about energy balance and nutrition.

References
Mechanical loading, i.e. physical activity and/or exercise, promotes bone formation during growth. Sclerostin, a glycoprotein, mediates osteocytes’ response to mechanical loading by inhibiting the Wnt/β-catenin pathway thereby inhibiting bone formation. PURPOSE: To examine the response of circulating sclerostin following an acute session of three different sport activities. METHODS: Fifty-five pre-adolescent boys (age 10.1±1.2 yrs) participated in a single practice of either soccer (N=20), running (N=17) or swimming (N=18). Anthropometry, habitual PA, nutritional intake, biological maturity, bone mineral density and content, and fitness status were measured at baseline. Blood samples were collected before and within 30 min post-exercise. Participants did not differ in any baseline measures. RESULTS: Sclerostin showed a modest decline (P=0.5) in response to soccer (pre: 213±35 pg/ml vs. post: 189±41 pg/ml) and running (pre: 221±56 pg/ml vs. post: 193±49 pg/ml) but not in response to swimming (pre: 209±45 pg/ml vs. post: 203±58 pg/ml). Sclerostin changes (independent of group) were correlated with mean speed (r=0.41; P=0.05), total number of accelerations and decelerations (r=0.51; P<0.05) and number of jumps (r=0.6; P<0.05). CONCLUSION: Results of this study suggest that acute weight bearing exercise inhibits sclerostin levels slightly. Further work is needed to determine if this slight reduction alters bone mineral content.

Background and Purpose: Individuals with extremely flat or high arch foot postures have been shown to be at risk for the development of orthopaedic foot disorders. The longitudinal arch angle (LAA) as quantified by video camera and 3D motion capture has been used to measure change in the medial longitudinal arch associated with midfoot motion (Fig 1). The purpose of this study was to use high-speed stereo radiography to assess midfoot posture and mobility in normal and pronated feet throughout the stance phase of gait.

Methods: A total of 13 feet from 7 subjects (mean age = 24 years; range 22 to 29 years) were examined in this study. Clinical LAA measures assessed with a goniometer were used to select 7 pronated feet (129.6°) and 6 normal feet (140.5°). Radiopaque beads (2 mm dia) were taped to the navicular tuberosity, the medial aspect of head of the first metatarsal, and the medial malleolus prior to static loaded and walking trials. 3D coordinates of the beads were captured during gait using a high-speed stereo radiography system. The LAA in the sagittal plane was measured throughout the stance period (Fig 3).

Results: Static loaded LAA compared to clinical LAA values were identical for pronated feet and similar for normal feet (2.5° diff). The LAA decreased throughout stance period indicating a decrease in medial arch height. The static loaded LAA values were different than the dynamic measures (p=0.05) between 42% to 89% in the normal feet, and between 57% to 79% in the pronated feet. Both groups experienced similar LAA excursion (10.7° and 10.3° for the normal and pronated feet respectively), while the normal group had a higher average LAA than pronated (136.2° and 128.0° respectively) (Fig 2).

Conclusions: The results indicate that LAA measured with stereo radiography is a responsive metric to assess midfoot posture during walking and is sensitive to foot type differences. This methodology can be effectively used to assess the effect of foot orthoses on midfoot posture when using shoes.
exercise.

RESULTS: Higher enjoyment (p<0.013, Cohen’s d=1.54) in HIIT (103.83 ± 9.44) versus MICT (84.17 ± 19.11) was observed, with 11/12 participants (92%) preferring HIIT to MICT. Affect was lower (p<0.05, d=0.78) and HR, RPE, and BLA were higher (p=0.05) in HIIT versus MICT. CONCLUSIONS: Despite greater physiological strain, HIIT was cited as more enjoyable than MICT due to its ever-changing stimulus, greater sense of accomplishment, and relative time-efficiency. Future studies in various populations are merited to examine the potential for greater adherence to HIIT compared to MICT, and whether this leads to superior adaptations and concurrent health-related benefits.

**CONCLUSIONS:** The current study suggests that high intensity exercise results in greater muscle damage in both previously trained and untrained individuals vs. low intensity exercise; however, HIIT produced greater muscle damage in untrained individuals. Therefore, previously untrained individuals should take caution when beginning exercise programs that require consecutive sessions of high intensity exercise.

**SCIENTIFIC ABSTRACT**

High intensity interval training has gained popularity in military settings in recent years, but no research has investigated how varying HIIT frequency impacts performance in the cardiovascular fitness component of an official military physical fitness test.

PURPOSE: Effects of varying high intensity interval training (HIIT) frequency on 1.5 mile (2.4 km) run performance in U.S. Air Force Reserve Officer Training Corps (ROTC) cadets was studied. METHODS: Twenty-seven cadets (21.6 ± 2.8 years) were stratified then randomly assigned to 3 groups: a high frequency group (HF) that performed HIIT 3x week, a low frequency group (LF) that performed HIIT 2x week, and a continuous training group (CG) that performed continuous 3x week. HIIT protocols consisted of 4x 3 min intervals at 90-100% of velocity at maximal oxygen consumption (vVO2 max) with 4 min of recovery and 4x 30s all out sprints with 4 min recovery. Baseline 1.5 mile run performance was measured, then retested at 6 and 10 weeks. RESULTS: All groups significantly improved in mean run time (LF: 7.3% ± 4.2, p<0.001; HF: 9.7% ± 3.5, p=0.001; CG: 8.7% ± 4.8, p<0.001). No significant differences between groups were found (p>0.05). Additional workouts beyond the 6-week point yielded no significant gains in run performance for any group.

CONCLUSION: Two days per week of HIIT training was as effective at improving 1.5 mile run performance as either 3 days/week of HIIT or continuous training.

**CONCLUSIONS:**

One barrier to meeting fitness recommendations may include time constraints. Finding exercises that can promote improvements in both aerobic and muscular fitness while minimizing the duration of the exercise and the required equipment are needed. One such exercise may be the side-step interval exercise. Currently, it is unknown how different tempos influence this exercise and how heart rates and muscle activation differ between tempos. PURPOSE: To investigate how different tempos of a side-step interval exercise on heart rate and muscle activation. METHODS: Recreationally active men (n=8) and women (n=2) participated in this study. The average maximum oxygen uptake (VO2max) of participants was 50.1 ± 10 yrs and age was 21 ± 3 yrs. The side-step interval exercise consisted of moving from side to side repetitively over a two-meter distance for 1 minute with 1-minute rest periods in between sets. Four sets of these exercise intervals were performed. The fast (112 bpm) or slow (84 bpm) tempos was randomly assigned during the first exercise session with the other tempo being used in the next visit. Surface electromyography (EMG) measured muscle activation of the vastus lateralis and a heart rate monitor (Polar) measured heart rate (HR). Two-way repeated measures ANOVA analyzed differences between tempos and sets. Pearson product moment correlations analyzed associations between VO2max, HR response and muscle activation. Statistical significance was set at p<0.05. RESULTS: Slow tempos produced significantly lower amounts of muscle activation compared to the fast tempos [46% vs. 59% of the maximum isometric voluntary contraction muscle activation (EMGmax), p=0.002]. HR significantly increased at the end of sets 3 (150 ± 8 bpm, p=0.012) and set 4 (152 ± 8 bpm, p=0.001) when compared to set 2 (146 ± 8 bpm). The fast tempo produced significantly greater HR than the slow tempo (82% HRmax vs. 70% HRmax, p<0.001). A significant inverse relationship was also found between VO2max and vastus lateralis muscle activation (r=-0.855, p<0.003), fast tempo HR (r=0.896, p<0.001) and slow tempo HR (r=-0.924, p<0.001). CONCLUSIONS: Side-step interval exercise acutely produces sufficient levels of HR and muscle activation to promote improvements in aerobic and muscular fitness but future chronic studies are needed.
Sprint Interval Training and Power Output In College Age Females

Jenna Thompson, Sophie Olson, Leigha Emberton, Mark Blegen, FACSM, St. Catherine University, St. Paul, MN. (Sponsor: Mark Blegen, FACSM)

(no relationships reported)

High intensity interval training (HIIT) is a rapidly growing area of research due to the beneficial physiological outcomes achieved in a time efficient manner. Sprint interval training (SIT) decreases exercise duration even more by utilizing supramaximal intensity intervals of even shorter duration while still maintaining significant improvements. However, research on effects of SIT in women is lacking. PURPOSE: The present investigation focuses on SIT and power development in college-aged (21.1 ± 6.2 years), recreationally active women. METHODS: Participants (n=11) were randomized into one of three groups: two intervals (2INT), three intervals (3INT), or endurance group (END). All groups completed their assigned protocols three times a week for eight weeks for a total of 24 sessions. 2INT sprinted two 20-second all-out bouts and cycled ten minutes total. The END group cycled 20 minutes at 60% of their VO2max. Upon completion of the study, subjects completing 2INT had a modest, but significant improvement on performance measures specific to women.

Sprint Interval Training and Development of Peak Power in Females

Sophie Olson, Jenna Thompson, Leigha Emberton, Mark Blegen, FACSM, St. Catherine University, St. Paul, MN. (Sponsor: Mark Blegen, FACSM)

(no relationships reported)

Interest in interval training has been expanding rapidly while it has been shown to induce numerous beneficial physiological outcomes. High intensity interval training (HIIT) is comprised of supramaximal or high-intensity intervals lasting 20-30 seconds. A subset of HIIT is sprint interval training (SIT) and consists of supramaximal sprints of very short durations (10-20 seconds). This study aimed to investigate the responses of SIT on peak power output in females. Recreationally active females (n=11) (21.1 ± 6.2 years) completed a Wingate Test at baseline, mid-, and post-intervention. RESULTS: Average power in both 2INT (6.9 ± 0.17 vs. 7.1 ± 0.41 watts.kg^-1) and 3INT groups (7.03 ± 0.38 vs. 7.32 ± 0.48 watts.kg^-1) remained unchanged while the END group average power (6.6 ± 0.44 vs. 5.89 ± 0.014 watts.kg^-1) decreased by 17.8%. CONCLUSIONS: Although not significant, it is important to point out that 2INT and 3INT were able to maintain their average power, even though exercising for a limited duration. The findings of this study demonstrate that SIT may be utilized to maintain anaerobic fitness in women.

Changes in VO2max and Muscular Strength Over A 24-Week Cycle Ergometer Interval Program Among Active Middle-Age Adults

Montana L. Pruett1, Ashley N. Triplet1, Christopher R. Hill1, Samantha J. Deere2, Lori Ploutz-Snyder, FACSM3, James Schultz, Cara Wilck, Annelise Weir, Stephen P. Bailey, FACSM. 1Michigan State University, East Lansing, MI. 2Saginaw Valley State University, University Center, MI. 3University of Michigan, Ann Arbor, MI. (No relationships reported)

Cycling training induces adaptive cardiovascular benefits both centrally and peripherally in previously sedentary individuals. Less is known about what exercise prescription is necessary to improve fitness in already active, healthy middle aged adults. Cycling is not a well accepted exercise to enhance strength, especially in healthy active adults. PURPOSE: To determine if participation in a novel cycling program affects aerobic fitness (VO2 max) and leg strength. METHODS: Participants (N=41, M+SD age=45.5±8.1) were healthy adults recruited to complete a 6-day/wk exercise program on a cycle ergometer for 6-months. All participants self-reported at least 30 min of vigorous exercise, 3 times/wk prior to joining the study and met NASA developed fitness standards. Participants exercised 6 day/wk, using high intensity routines (SPRINT) and developed to design a physical fitness of middle aged active healthy astronauts. SPRINT includes (a) 30 min continuous aerobic cycling at or above 75% of max heart rate (HRmax), (b) long, 4x3 min intervals at or above 90% HRmax with 3 min active rest, (c) medium 6x2 min intervals at 70, 80, 90, 100, 90, and 80% of HRmax, respectively with 2 min active rest, and (d) short, 30 sec max sprint intervals with 20 sec active rest. Participants reported that they did not change other exercise behavior during the study. VO2max was measured (via indirect calorimetry) pre, mid (3 month), and 6 month post intervention. Isometric leg strength, including peak torque extension (PTE) and flexion (PTF) was measured (pre and 6 month post intervention) on the right leg using the Biodex3 dynamometer. Results were assessed via repeated measures ANOVA. RESULTS: Average VO2max increased from pre to mid-test (33.8±6.2 ml/kg/min vs. 35.5±6.8 ml/kg/min), and was maintained from mid to post-test (35.8±6.8 ml/kg/min vs. 33.6±7.3 ml/kg/min), F(2,62)=7.65, p<0.001. PTE increased significantly from pre to post test (19.6±2.46 lbs vs. 13.1±4.95 lbs), F(1,35)=8.00, p<0.008. PTF did not change from pre to post-test (71.2±21.4lbs vs. 70.2±21.7lbs), F(1,35)=0.13, p=0.73. CONCLUSION: Sprint interval cycle ergometer training is effective for increasing aerobic fitness and muscular strength over a 6-month training period among physically active middle-age adults. Grant: NASA/NSRIM MA00401

Cardiovascular and Workload Responses to High Intensity Interval Training in Adolescents

Shannon Moree, Rebecca Mitchell, Kody Brandt, Amanda Schulz, Cara Wilck, Annelise Weir, Stephen P. Bailey, FACSM. Elon University, Elon, NC. (No relationships reported)

Despite the promising evidence supporting positive health benefits of high-intensity interval training (HIIT) in adults, there is limited research focusing on adolescents. PURPOSE: The purpose of this study was to describe the impact of HIIT training on...
cardiovascular responses to exercise in male and female adolescents. METHODS: Ten (4 male, 6 female; Age: 11.7 ± 1.4 years; VO2peak: 27.3 ± 3.8 ml/kg/min; BMI: 28.8 ± 6.6 kg/m2) adolescents, referred from local pediatricians, completed 16 HIIT sessions over an 8 week period. Each HIIT session consisted of a 5 min warm up, a 20 minute stimulus, and a 5 min cool down. During the stimulus period, subjects completed twenty 30 sec “on”, 30 sec “off” intervals. During the initial session the “on” workload was set to be equivalent to 90% of maximal workload recorded during the VO2 peak test, while the “off” workload was set to be equivalent to 50% of VO2 peak test. Subsequent to this initial session, workload was adjusted so that RPE during the last 5 intervals was equivalent to at least 9 out of 10 on the Borg RPE scale. Workload, heart rate, and RPE were recorded at the end of each interval. RESULTS: Maximal workload during HIIT increased in all subjects from the first (152 ± 8 watts) to the last (240 ± 18 watts) session (p < 0.001). In comparison, no differences were seen between the genders at any time point (Male: First Session=155 ± 8 watts, Last Session=253 ± 15 watts; Female: First Session=150 ± 11 watts, Last Session=230 ± 13 watts). Similarly, heart rate (Male: First Session=186 ± 9 bpm, Last Session=185 ± 6 bpm; Female: First Session=184 ± 8 bpm, Last Session=177 ± 7 bpm) and RPE (Male: First Session=9 ± 1, Last Session=10 ± 1; Female: First Session=9 ± 1, Last Session=10 ± 1) were maintained across the HIIT sessions. CONCLUSION: The results of this investigation indicate that HIIT is well tolerated and facilitates significant cardiovascular adaptation in both male and female adolescents.

2215 Board #228 June 1 2:00 PM - 3:30 PM Mechanical Efficiency During Repeated Attempts of Indoor Rock Climbing
Andrea C. Woita1, Jack Young, FACSM1, James W. Valalta, FACSM1, Nathaniel G. Bodell1, Jeffrey Montes1, Elizabeth A. Tanner1, Grace A. MacDonald1, Jacob W. Manning2, Camille Thomson3, Taylor4, Ursula C. Rodriquez5, Cynthia R. Baker6, Andrea C. Woita1, Jack Young, FACSM1, Nathaniel G. Bodell1, Jeffrey Montes1, Elizabeth A. Tanner1, Grace A. MacDonald1, Jacob W. Manning2, Camille Thomson3, Taylor4, Ursula C. Rodriquez5, Cynthia R. Baker6.

Rock climbing is characterized by repeated short bouts of high-intensity climbs requiring upper body strength and muscular endurance. There is an inverse relationship between work rate and mechanical efficiency and it is hypothesized that mechanical efficiency would decrease from the first to the last climb during a series of repeated climbs. Purpose: To determine mechanical efficiency of repeated rock climbing attempts at a self-selected speed. Methods: Twenty-four experienced climbers volunteered to participate in this study (ages 18-40 years, 20 males, 4 females, at least one year of recreational climbing experience). Participants climbed up and down a vertical route (30 feet) on an indoor climbing wall at a self-selected pace for ten minutes. VO2 was continuously measured during the upward portion of the climb using a portable COSMED device. Work was calculated from height climbed and body mass. Results: Four climbers’ data were discarded due to incomplete data. From the remaining twenty subjects, there was no significant difference in mechanical efficiency from the first climb (M=18.4%, SD=11.3%) to the last climb (17.8%, SD=11.0%); t(20)=0.89, p=0.19. Conclusions: The recreational climbers did not experience a significant decrease in mechanical efficiency. It was thought that fatigue would result in decreased mechanical efficiency due to an increased work rate from continuous climbing action. One possible explanation is the reported attentional load in a learned effect causing the subjects to become more familiar with the route. The familiarity of the route likely led to improved technique and possibly offset the impact of fatigue on mechanical efficiency. Future studies should consider investigating the difference in mechanical efficiency on repeated climbs of varying routes.

D-71 Free Communication/Poster - Modeling Thursday, June 1, 2017, 1:00 PM - 6:00 PM Room: Hall F

2216 Board #229 June 1 2:00 PM - 3:30 PM Comparing Daily Class Schedule and its Influence on Undergraduates Students’ Physical Activity Patterns
The Pennsylvania State University, Reading, PA.

Full-time undergraduate students’ daily physical activity patterns may be affected due to Penn State University’s different class schedules -Monday/Wednesday/Friday (M/W/F) and Tuesday/Thursday (T/Th). A class was split into quintile groups (Q1 - Q5) based upon their final OFC ranking. Then, self-reported performance scores of one-repetition maximum (IRM) squat (SQ), deadlift (DL), clean and jerk (CJ), snatch (SN), 400-m sprint, 5,000-m run, and benchmark workouts (Frun, Helen, Grace, Filthy-50, and Fight-gone-bad) were compared between quintiles using separate one-way analysis of variance. RESULTS: Q1 reported greater (p < 0.05) IRM loads for DL (148.3 ± 14.5 kg), SQ (126.1 ± 13.0 kg), CJ (95.69 ± 8.42 kg), and SN (76.7 ± 7.6 kg) compared to all other quintiles (Q2 - Q5). In the 400-m sprint, though Q1 (71.0 ± 9.2 sec) was not different from any other quintile, Q2 (67.5 ± ± 8.8 sec) reported faster (p < 0.05) times than Q3 - Q5 (73.5 ± 74.8 sec). For the 5,000-m run, differences were

2217 Board #230 June 1 2:00 PM - 3:30 PM Comparison of Effectiveness in Online vs. Hybrid Courses in College Wellness Courses
Ruth N. Henry, Frank M. Romeo. Lipscomb University, Nashville, TN. (Sponsor: Kent Johnson, FACSM)
Email: ruth.henry@lipscomb.edu

Online courses have gained popularity in recent years; research has supported its effectiveness while also pointing out the limitations of online delivery. Hybrid courses have been developed in response to some of the challenges, with course content delivered both online and in a face to face setting. Purpose: The goal of this research was to determine whether 100% online or hybrid online courses are more effective in delivering a college-level wellness course. Methods: 47 students were enrolled in the Fitness/Wellness courses; 23 students enrolled in the 100% online section which met in class only for fitness tests and written exams. The other 24 enrolled in the hybrid section, which met once per week for exercise in addition to class meetings for fitness testing and exams. Assignments were identical in both sections. All students were assessed for knowledge via weekly open-book online quizzes (QUIZ) and closed-book exams (EXAM) in the classroom. Fitness tests were performed before and after an 8-week self-instructor, instructor-graded exercise program, and fitness improvement was analyzed. Students also responded to open-ended questions about course delivery preference. Results: There were very few differences between groups in written work or fitness outcomes. Written work between groups was statistically equal; (EXAM online mean = 79.9% ± 9.57, hybrid mean = 81.58% ± 7.55; p=0.49); (QUIZ avg. online mean = 83.7% ± 10.1; hybrid mean = 84.5% ± 10.7; p=0.81). Improvements in fitness parameters were calculated as post-score minus pre-score. Only the 1.5-mile run test yielded a significant difference, with the hybrid group (mean improvement = 2.3 ± 2.2 minutes) improving significantly more than the online group (mean improvement = 0.60 ± 0.59 minutes; p=0.033). Improvement in pushups (Online = 4.45 ± 6.11, Hybrid = 2.67 ± 4.75; p=0.28), sit-ups (Online = 3.4 ± 3.59, Hybrid = 2.77 ± 5.82; p=0.68) and sit-and-reach (Online = 2.47 ± 3.42, Hybrid 2.05 ± 2.32; p=0.64) were statistically equal between groups. In the open-ended questions, students in both sections cited the value of weekly class meetings and face-to-face time with teacher and classmates, although online students expressed a desire for the online format for convenience. Conclusion: Student outcomes in wellness courses with online and hybrid delivery are similar.

2218 Board #231 June 1 2:00 PM - 3:30 PM Self-reported Measures Of Strength And Sport-specific Skills Distinguish Ranking Among Females In An International Online Fitness Competition
Paul Serafini, Yuri Feito, FACSM, Gerald Mangine. Kennesaw State University, Kennesaw, GA. (Sponsor: Dr. Yuri Feito, FACSM)
Email: paul.serafini12@gmail.com

(Purpose: To determine if self-reported performance measures could distinguish ranking amongst female competitors in an international online fitness competition (OFC). METHODS: The top one-thousand five hundred female competitors (28.72 ± 9.27 years old, average BMI 21.6 ± 5.2 kg/m2) apparently healthy seniors and juniors were recruited from the Penn State Berks. A wrist-worn activity-tracker was deployed for one week to assess students’ free-living physical activity levels. RESULTS: M/W/F vs. T/Th (Mean: SD) step count (1038 ± 3560 vs. 926 ± 2899 steps/day; p=0.015) and activity calories (1056.4 ± 535.2 vs. 963.5 ± 608.3 kcal/day; p=0.097) were measured. Students were most active on Mondays (10991±4531 steps/day) compared to the rest of the week. Conclusions: Students achieved the recommended 10,000 steps daily goal on M/W/F and did not meet the step goal on T/Th. This difference in steps could be attributed to the mandatory no class ‘common hour’ which may allow students to be more physically active than the T/Th schedule. In addition, the shorter class structure on M/W/F (50 min/class) might also provide opportunities for students to be more active than T/Th (75 min/class). These preliminary results may be useful for planning early physical activity interventions on specific days of the week among college students.

ACSM May 30 – June 3, 2017
Denver, Colorado

THURSDAY, JUNE 1, 2017
only observed between Q1 (21.3 ± 1.8 min) and Q4 (22.6 ± 2.2 min, p = 0.008) and between Q1 and Q5 (22.6 ± 1.9 min, p = 0.016). In benchmark workouts, Q1 reported the fastest (p < 0.001) performance compared to all other groups and better (p < 0.005) performances compared to Q3 - Q5 in Grace (1.9 ± 0.5 min) and Fitch-gone-bad (388 ± 45 repetitions). Differences between groups for Helen and Fifty 50 varied amongst quintiles. CONCLUSIONS: In female athletes, the most elite OFC competitors (i.e., Q1) possessed the greatest strength and power, and generally performed the best in a benchmark work and at emphasized muscle strength and endurance (i.e., Fran, Grace, and Fifty-50). Though aerobic and anaerobic fitness also appeared to be greater in higher-ranking competitors, distinctions between quintiles were more broad.

2219 Board #232 June 1 2:00 PM - 3:30 PM Analysis Of Anthropometric Profiles And Long-Term Career Progression In 24 Years Of German Junior Rowing
Kay Winkert, Gunnar Trefl, Werner Lormes, Katja Machus, Jürgen M. Steinacker, FACSM, University Ulm, Sports and Rehabilitation Medicine, Ulm, Germany.
Email: kay.winkert@uniklinik-ulm.de

Talent identification in rowing typically includes standing height (SH) and body mass (BM), because successful rowers are on average taller and heavier than their opponents. Moreover, successful elite senior rowers are significantly taller and heavier than juniors, but it remains unclear if those athletes who became elite rowers later, were already taller and heavier as adolescents. PURPOSE: We aimed to retrospectively analyze anthropometric differences of national team junior rowers considering their long-term career progression level and to define minimal anthropometric requirements allowing for later success.

METHODS: 706 male German junior rowers (age 17.5±0.7 y) of the years 1991 - 2015 were grouped according to their highest career progression level, more precisely U19-, U23-, Senior World Championships (WCh), or Olympic Games (OG). To analyze differences in SH and BM a one-way ANOVA with Post-Hoc test was calculated.

RESULTS: Distribution for highest career progression level were 46.7% U19- (191.0±4.6 cm, 85.5±6.1 kg) 35.6% U23- (192.3±4.7 cm, 86.5±6.7 kg), 9.6% Senior WCh (192.8±4.9 cm 87.4±6.5 kg) and 10.8% OG (193.7±4.4 cm, 88.2±6.4 kg). Significant small effects in SH (F(3,702) = 9.30, p < 0.002, η² = 0.038) and BM (F(3,702) = 4.31, p < 0.05, η² = 0.018) among progression levels were found. Rowers competing not higher than U19-WCh were smaller (-0.69 - -1.42%; p < .005) and exhibited less BM (-1.08 - -3.05%; p < 0.007) compared to higher progression levels. This effect increased by 0.45 % (R² = 0.97) for SH and 1.01% for BM (R² = 0.99) with rising progression level. No significant differences were found between U23, Senior WCh, and OG. Minimal anthropometric requirements within the higher progression levels can therefore be calculated as 188 cm SH and 80.3 kg BM.

CONCLUSIONS: This finding suggest that higher SH and BM within a homogeneous group of adolescent elite junior rowers are already associated with long-term career progression in international elite rowing. Minimal anthropometric requirements could be established and can be interpreted as thresholds associated with later success. However, anthropometric variables must not be solely or exclusively used for talent identification, because maturation to elite status is inherently multi-dimensional.

2221 Board #233 June 1 2:00 PM - 3:30 PM Bioelectrical Impedance Analysis and Skinfold Prediction of Percent Fat in Male College Athletes
Zane Starks1, Amanda Starks2, Richard M. Schumacher2, Jerry L. Mayhew2, William F. Brechue, FACSM1, J. Bryan Mann1.

A.T. Still University, Kirkville, MO. 1Truman State University, Kirkville, MO. 2University of Missouri, Columbia, MO.
Email: zstarks@atsu.edu

(No relationships reported)

Determination of body fat (%fat) in athletes is now a common component of the preparation for competition. Various techniques have been developed to estimate %fat in athletes. However, some question may remain concerning the accuracy of these methods to accurately determine %fat in male college athletes. PURPOSE: To compare various methods of obesity classification in male college athletes.

METHODS: NCAA Division II athletes (n = 183) from 6 sports were assessed during the off-season for skinfolds (SKF), BIA, and DEXA. Skinfold sites included biceps, triceps, subscapula, midaxilla, chest, suprailium, abdomen, thigh, and calf. Skinfolds were measured in triplicate and averaged for analysis. Eight SKF equations utilized to estimate %fat in athletes were evaluated. Single-frequency (50 Hz) hand-to-hand BIA (H-BIA) and foot-to-foot BIA (F-BIA) devices used in an athletic setting were also assessed. RESULTS: All prediction methods significantly underestimated DEXA %fat (18.2 ± 5.8%, range = 9.5 to 36.3%) despite high correlations with the criterion (ICC = 0.78 to 0.93). Of the SKF equations, the Durnin-Wormsley equation produced the closest estimate (16.2 ± 4.0%, ICC = 0.91). H-BIA (13.6 ± 4.9%) and F-BIA (13.4 ± 5.8%) were comparable in their underestimation of %fat (-4.8 ± 4.4%) with similar correlations with the criterion (ICC = 0.83). Significant negative correlations for the difference between SKF predicted and DEXA %fat (r = -0.71 to -0.97) indicated greater discrepancy between the two methods at higher %fat values. There were smaller but significant negative correlations for the difference between SKF predicted and actual %fat values and body mass (r = -0.22 to -0.56), suggesting greater underestimation at higher body masses. CONCLUSIONS: All prediction techniques produced significantly lower estimates of %fat in male college athletes than when measured by DEXA. Prediction error typically increased at greater actual %fat and body mass values. If DEXA is to be accepted as the new standard for assessing body composition, new prediction equations may need to be developed. Higher %fat values than previous accepted may need to become the new standard for college athletes when using DEXA as the criterion.
2223 Board #236 June 1 2:00 PM - 3:30 PM
Core Strength/Endurance and Inspiratory Muscle Performance - Are They Related?
Marlon L. Wong, Magno F. Formiga, Luis A. Feigenbaum, Michele A. Raya, Robyn P. Rice, Taylor M. Galmarni, Lacey Srocina, Lawrence P. Cahalin, Miami, FL. (Sponsor: Dr. Thomas Best, FACSM)
Email: MWong2@ned.miami.edu

Core strength/endurance (CSE) is believed to be an important component of physical performance in sport and functional tasks. A standard measure of CSE is the side plank (SP) during which the duration it can be held is measured. PURPOSE: To examine the effects of a test of inspiratory muscle performance (IMP) done in the SP position on SP duration and several measures of IMP. METHODS: 28 healthy subjects (15 men, 13 women with a mean: SD: age, height, and weight of 36±14 and 34±11 years, 170.0±8.6 and 165.6±6.1 cm, and 80.8±8.3 and 64.5±7.2 kg, respectively) underwent in random order two tests of SP duration (with and without IMP tests) and IMP (at the onset of SP and in sitting) with at least 5 minutes of rest between each of the tests. IMP was measured via the Test of Incremental Respiratory Endurance (TIRE) yielding maximal inspiratory pressure (MIP), sustained maximal inspiratory power (SMIP), and inspiratory duration (ID). MIP was measured from residual volume while SMIP and ID were measured from residual volume to total lung capacity. RESULTS: MIP were found to have significantly (p<0.05) greater height and weight compared to women. The SP duration decreased significantly (p<0.05) for the entire cohort when IMP was tested during SP (104±21.5 sec to 81±33.0 sec), but no significant difference in SP duration between men and women under both test conditions was observed. MIP and SMIP also decreased significantly (p<0.05) for the entire cohort when IMP was tested during SP (117.9±21.8 to 92.6±18.3 cm H2O and 683.9±191.0 to 535.6±173.9 PTU) and a significantly (p<0.05) lower MIP and SMIP was observed in the SP position of both men and women with men having significantly (p<0.05) greater values compared to women during both test conditions. Men were observed to have a significantly (p<0.05) different ID compared to women (16% increase versus 9% decrease in ID). CONCLUSIONS: SP duration and IMP decreased significantly when IMP was tested in the SP position with men having significantly greater MIP, SMIP, and ID compared to women. The increase in ID in men suggests that men use a different strategy to optimize CSE which may be due to their significantly greater height, weight, and IMP. CSE and IMP appear related, but further investigation of this relationship is warranted.

2224 Board #237 June 1 2:00 PM - 3:30 PM
Physiological Predictors of Fatigability in Healthy Adults
Zoe Williams1, Lisa Chin1, Leorey Saligian2, Leighton Chan2, Randall Keyser, FACSM1, 1George Mason University, Fairfax, VA. 2National Institutes of Health, Bethesda, MD.

(NO relationships reported)

Fatigability is represented by a decline in performance in relation to the frequency, intensity and duration of physical activity. The use of anaerobic threshold (AT) as an index of endurance is well accepted in the literature. In patients with chronic pulmonary disease, ventilatory efficiency is related to exercise capacity, and therefore may have clinical significance as a fatigability measure. However, this has yet to be determined in healthy individuals. PURPOSE: To characterize physiological determinants of the time to fatigue (TTF) during a vigorous bout of treadmill exercise. METHODS: Subjects were 19 healthy participants (11 men; 8 males: age: 26.6±1.3 years; BMI: 24.2±2.7 kg/m²) enrolled in the National Institutes of Nursing Research, Fatigue in Healthy Individuals Protocol. Subjects completed a ramp treadmill cardiopulmonary exercise test (CPET) to volitional exhaustion during the initial visit. The anaerobic threshold and two measures of ventilatory efficiency (lowest VE/VCO2 ratio and VE/VCO2 slope to AT) were determined from the CPET. A subsequent visit consisted of a constant work rate test at vigorous-intensity performed to exhaustion in which the TTF represented a measure of performance fatigability. Data are presented as mean ± SD.

RESULTS: The TTF was 436.12 ± 175.9 seconds at 240.05 ± 66.48 watts. Subjects achieved an AT of 18.1 ± 4.56 ml/min/kg, lowest VE/VCO2 ratio of 24.72 ± 2.18 and VE/VCO2 slope of 22.49 ± 2.16. Pearson product-moment correlation analysis suggests that both measures of ventilatory efficiency were not significantly correlated to the TTF. The anaerobic threshold was found to be the best predictor of the TTF, with a strong effect size (d= 0.865) suggesting that AT is a reliable predictor of TTF explaining 15% of the variance. CONCLUSIONS: Results from this study suggest that AT remains a better predictor of fatigability compared to measures of ventilatory inefficiency. Further research is needed to determine other objective measures of fatigability.

Funding: Intramural Funds from the National Institutes of Nursing Research

2225 Board #238 June 1 2:00 PM - 3:30 PM
Step Test as a Predictor of Law Enforcement Pursuit Requirement
Paul O. Davis, FACSM, First Responder Institute, Silver Spring, MD.
Email: PODIII@aol.com

(NO relationships reported)

PURPOSE: Develop a simple, field expedient, pre-hire aerobic fitness tool to predict success in effecting a standardized foot pursuit and job-simulation arrest scenario as well as the job-related graduation criteria of 10 METs.

METHODS: A Job Task Analysis (ITA) was conducted via survey, on-site observations, and interviews of incumbent federal officers (n=1025) with the objective of establishing an aerobic fitness standard for the essential function of foot pursuit and effecting arrest. Respondents were asked to provide their estimates of distances, heights, and weights associated with critical and arduous tasks. Graduation criteria were based upon previously published research of a 2.61 min requirement for a foot pursuit and arrest scenario, nominally determined to be 10 METS.

SUBJECTS: Applicants (N=756, including 99 females (13%)) who presented for exams from October of 2005 through May of 2007 served as subjects for this study. Because they had received no prior physical screening these subjects represent a sample of applicants that was not range restricted on physical ability. A pass/fail, 5-minute step test (ST) (40cm, 24 repetitions/min) was administered prior to starting a 13.5-week training program. Subjects embarked on their customary program of instruction (POI) and were tested on 1.5-mile run pre/post training. RESULTS: Students improved their run time by an average of 12%. Individuals who passed the ST had a 98% probability (sensitivity) of completing a 1.5-mile run in less than 16:30 min (p<0.001). Of the 57 applicants (9% of total sample) who could not complete the ST, performance on the 1.5-mile run was generally poor, with 89% (55/62) failing (specificity) to complete the ST in less than 16:30 min (84% of METS). CONCLUSIONS: The ST is an easy to administer, job-related, valid field expedient test of aerobic fitness for predicting a 1.5 mi run graduation standard in a law enforcement setting. This study funded by the Department of Homeland Security

Descriptive Statistics

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>657</td>
<td>85.9</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>99</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>756</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push up Trial 1</td>
<td>64</td>
<td>0</td>
<td>94</td>
<td>37.02</td>
</tr>
<tr>
<td>Push up Trial 2</td>
<td>533</td>
<td>0</td>
<td>103</td>
<td>39.97</td>
</tr>
<tr>
<td>Push up Pushup (1’2)</td>
<td>600</td>
<td>0</td>
<td>94.6</td>
<td>37.035</td>
</tr>
<tr>
<td>Push up Post trial</td>
<td>529</td>
<td>0</td>
<td>104</td>
<td>51.89</td>
</tr>
<tr>
<td>CAT1 (sec), total</td>
<td>47</td>
<td>0</td>
<td>416</td>
<td>74.52</td>
</tr>
<tr>
<td>CAT2 (sec), total</td>
<td>69</td>
<td>0</td>
<td>312</td>
<td>60.61</td>
</tr>
<tr>
<td>n1 (sec), total</td>
<td>756</td>
<td>0</td>
<td>557</td>
<td>1514</td>
</tr>
<tr>
<td>n2 (sec), total</td>
<td>756</td>
<td>0</td>
<td>1255</td>
<td>721.64</td>
</tr>
<tr>
<td>% body fat</td>
<td>592</td>
<td>0</td>
<td>2.04</td>
<td>63.07</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>1598</td>
<td>0</td>
<td>169</td>
<td>176.19</td>
</tr>
<tr>
<td>Hips (cm)</td>
<td>83</td>
<td>0</td>
<td>81.2</td>
<td>130.71</td>
</tr>
<tr>
<td>Neck (cm)</td>
<td>882</td>
<td>0</td>
<td>82.7</td>
<td>160.83</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>89</td>
<td>0</td>
<td>69.9</td>
<td>149.97</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>1353</td>
<td>0</td>
<td>64.9</td>
<td>165.53</td>
</tr>
<tr>
<td>Weight (kg, post)</td>
<td>124</td>
<td>0</td>
<td>45.8</td>
<td>156.34</td>
</tr>
</tbody>
</table>

2226 Board #239 June 1 2:00 PM - 3:30 PM
Predicting 2015 NBA Rookie Class On-Court Contribution Using Draft Combine and Performance Measurable’s
Sarah Henry, 314191, Greg A. Ryan1, Robert L. Herron2, Jasmine Holmes1, Kaitlyn J. Weiss3, 1Georgia Southern University, Statesboro, GA. 2The University of Alabama, Tuscaloosa, AL. 3University of Technology, Auckland, New Zealand.
Email: sh07478@georgiasouthern.edu

(NO relationships reported)

PURPOSE: The National Basketball Association (NBA) conducts an annual combine to assess anthropometric and athletic ability of collegiate and international prospects in preparation for the draft. Additionally, in-game performance variables are tracked...
and used by scouting and personnel departments to determine players to draft. The purpose of this study was to determine how well the variables measured of the athletes invited to the 2015 NBA Combine predicted on-court contribution during their rookie season, as measured by Player Impact Estimate (PIE) (player’s overall statistical contribution against the total statistics in played games). METHODS: Data from 12 tests (six anthropometric, six performance) recorded during the NBA Combine and data from 7 in-game performance variables recorded during the 2014 collegiate/international season were used for analysis. 64 athletes’ rookie season player contribution was measured in PIE. A multiple linear stepwise regression was calculated to predict on-court contribution based on the 19 variables assessed during the NBA Combine and 2014 season. RESULTS: A significant regression equation was found among three variables (three quarter court sprint, 2014 assist:turnover ratio, 2014 field goal percentage) (F(3,21) = 6.080, p = 0.005; R² = 0.503). The three predictor model was able to account for 30.3% of the variance in PIE. PIE = -37.208 + 2.9245(three quarter court sprint) + 9.245(2014 assist:turnover ratio) + 0.254(2014 field goal percentage), 95% CIs [-68.196, -6.220], [-0.455, 18.944], [0.935, 3.143] and [0.210, 22.843], respectively. CONCLUSIONS: The findings of this study suggest that the performance markers that measure heart rate (HR) via ECG, g-force (above that of the earth’s gravity) via triaxial accelerometry, and time of day (including time spent wearing the monitor). The three provided significant predictive value. These findings may help teams and scouts to assess performance and determine potential on-court contribution of draftees and undrafted free agents.

An athlete’s practice is ideally constructed to prepare them for game-type conditions. Training volume however, can be influenced by several factors including frequency, intensity, time, type, and volume of practice. Differences between basketball practices, scrimmages, and games are already illustrated (Montgomery et al., 2010 & Klaussmann et al., 2013). The ability to improve practices to mimic game-type conditions could better prepare the athletes to perform in games. PURPOSE: To compare the physiological demands of practice to a pre-season game. METHODS: Ten Division II men’s basketball players participated in this study (20.7 ± 0.9 yrs, 94.0 ± 12.5 kg, 1.90 ± 0.09 m). All players wore Hexoskin activity monitors (Hexoskin, Montreal, Canada) which measure heart rate (HR) via ECG, g-force (above that of the earth’s gravity) via triaxial accelerometry, and time of day (including time spent wearing the monitor). Monitors were worn at practices for the week leading up to and the week following a game. A pre-season game, a previous, two-tailed t-test compared the average of twelve days of practice (P) to the pre-season game (G). Coefficient of determination was utilized to compare change in time while wearing the monitor to change in training volume (total g-force). RESULTS: Time spent in practice was significantly greater than the game (P = 144 ± 2; G = 126 ± 2 min; p < 0.05). While average HR did not differ (P = 121 ± 5; G = 121 ± 17 bpm), maximal HR was higher in the game (P = 180 ± 6; G = 189 ± 7 bpm; p < 0.05). Average g-force was higher in practice (P = 0.38 ± 0.05; G = 0.30 ± 0.11 m/s²; p < 0.005). Maximal g-force for the contributor between P and G was (P = 3.64 ± 0.42; G = 3.97 ± 0.71 m/s²; p = 0.10). Total g-force (average g-force of the session multiplied by the minutes of the session) differed between the two conditions (P = 55.2 ± 7.7; G = 37.4 ± 13.6 min m/s²; p < 0.05). A coefficient of determination elucidated an r² = 0.175, indicating that only 17.5% of the variation in total g-force could partially predict on-court contribution during the 2015 NBA regular season, though R² prediction was varied. However, of the 19 variables assessed, only three provided significant predictive value. These findings may help teams and scouts to assess performance and determine potential on-court contribution of draftees and undrafted free agents.

PURPOSE: To evaluate the relationships and differences between maximal leg power and swing velocity in collegiate baseball and softball players. METHODS: Thirty-four subjects (20.4 ± 1.3 yrs, 176.8 ± 8.9 cm, and 77.7 ± 13.9 kg) were assessed for vertical jump power and swing velocity using a force plate and visual 3D technology, respectively. Means, differences were calculated by independent t-tests and correlations between parameters of interest were calculated using Pearson Correlation coefficients. Statistical significance was set at 0.05. RESULTS: Baseball (n=17) and softball (n=17) player mean age, height (cm), and weight (kg) were 20.7 ± 1.2yrs, 184.8 ± 4.1cm, 88.3 ± 9.8kg and 20.1 ± 1.4yrs, 168 ± 9.6cm, 67 ± 0.8kg, respectively. Vertical jump power and swing velocity means were 1528.3 ± 169.7W, 38.6 ± 6.1m/s, and 1045.4 ± 121W, 29.8 ± 1.8m/s, respectively. Baseball players were significantly taller (p≤0.01) and heavier (p≤0.01) than softball players. They also generated significantly more jump power (p<0.01) and achieved higher swing velocities (p<0.01) but no differences were revealed for hitting measures. Vertical jump power tests revealed moderate to strong relationships for baseball players (r=0.56–0.60, p<0.05) between height, weight, swing velocity, batting average, and slugging percentage for baseball but only height and weight for softball players. Swing velocity revealed poor to moderate relationships for both groups (r=-0.28–0.51) for batting average, slugging percentage, and home runs. CONCLUSIONS: Statistical evaluation revealed moderate to strong relationships between vertical jump power and anthropometric measures for both groups. Furthermore, baseball players display moderate to strong relationships between vertical jump power, swing velocity, batting average, and slugging percentage. In conclusion, evaluating and predicting performance from physiological variables remains a challenge, however, maximal leg power could serve as a moderate indicator of performance in baseball athletes.
A recent study looked at the relationship between performance variables and success in the NFL among players who participated in NFL combine events, which features college seniors aspiring to make an NFL roster. To date no studies have looked at a similar relationship among high school seniors entering college, who aspire to make an NCAA Division I football roster. **Purpose:** The purpose of the study was to identify initial performance variables that predict success among aspiring Division I college football players. **Methods:** Archival data were analyzed from 310 college football players, which focused on their initial testing as they entered the program, who played during the decade from 1999-2009 at an NCAA top 5 nationally ranked university. Players were categorized by training group with skill players (G1; n=124) including running backs, defensive backs and wide receivers; fullbacks, tight ends and linebackers (G2; n=76); and offensive and defensive linemen (G3; n=110). Tests were conducted within a week of each player joining the program included height (HT), body mass (BM), 1 repetition maximum (IRM) in the squat (SQ), bench press (BP), power clean (PC), push jerk (PJ), vertical jump (VJ), sit and reach test (SR), 40-yard dash (40YD), 10-yard dash (10YD), and 20-yard shuttle (20YS). All data were collected by the same strength coach over the ten-year period. Success was determined by three criteria: level 1 included players who never made the starting line-up in their college careers, level 2 were players that made the starting line-up but never made it to the NFL, and level 3 were player that played at least one full year in the NFL. Data were analyzed using ordinal regression analysis. **Results:** The best predictors by training group were as follows: Skill players (G1) by 10YD (p = 0.001); Linebackers and related positions (G2) by BP1RM (p=0.026) and 20YS (p=0.044); Linemen (G3) by BM (p=0.32), PC (p=0.043), and 40YD (p=0.043). **Conclusions:** These results suggest that it may be possible to predict the success of high school recruits entering a NCAA Division I football program by position grouping, by looking at selected performance parameters. Our data suggests that for G1 acceleration is important, G2 upper-body strength and lateral speed are paramount, and G3 size combined with speed and explosive hip extension predicts success.

**Remark:**

It is well known that aerobic athletes and musicians have higher dynamic lung functions than the general population. There is a gap in the current literature comparing the lung volumes of college-aged aerobic athletes to the lung volumes of college-aged wind musicians. **Purpose:** To compare the lung volumes (SVC, FVC, FEV1, MVV) and VO2max between a college-aged Division II athletes and physically inactive wind musicians. **Methods:** Subjects (n=21) were recruited based upon age and medical criteria. Athletes (n=11) were defined as individuals who accumulated at least or more than 150 minutes of moderate intensity aerobic activity per week and participated on an aerobic based athletic team. Wind musicians (n=10) were defined as individuals who played a wind instrument at the collegiate level who did not meet aerobic exercise guidelines. Three respiratory tests (SVC, FEV1, MVV) were performed to assess lung volume using a spirometer. VO2max was also estimated using an 8-minute treadmill walk test that elicited a heart rate between 50% and 85% of their maximal heart rate. Collected results were analyzed using a two-tailed independent t-test and Pearson correlations. **Results:** There was a significant difference in VO2max (p=0.013) between groups with the athletes (42.1 ± 7.2) having higher values than musicians (30.44 ± 11.9). There were no significant differences in the other lung volumes between groups. However, there were strong positive correlations between FVC and SVC (r=0.927), as well as, MVV and SVC (r=0.911) with musicians. There were also strong correlations between FEV1, and FVC (r=0.980), FEV1, and SVC (r=0.946), and FVC and SVC (r=0.937). **Conclusion:** The VO2max results were greater in athletes when compared to wind instrument musicians. Even physically inactive musicians had similar lung functions as athletes. This difference could be attributed to athletes training their cardiorespiratory system and not solely their respiratory system.
**Effects of Plyometrics and Whole Body Vibration on Vertical Jump Height: A Meta-analysis**


Email: luzia.maringuillen@yahoo.com

(No relationships reported)

**PURPOSE:** The purpose of the study was to analyze the effect of plyometric and whole body vibration training methods on vertical jump height in athletes. **METHODS:** A meta-analysis was performed where the inclusion criteria for the studies were: (a) any athletic population, (b) active control group, (c) only one experimental intervention, (d) statistical data necessary to calculate effect sizes (ES). Hedge’s standardized mean difference ES was calculated for each result; then, ESs pooled using random-effects models. On-overlapping 95% confidence intervals (CI) were considered statistically significant. Heterogeneity was assessed using Q and I², while funnel plots and Egger’s regression test were used to assess small-study effects (potential bias).

**RESULTS:** One hundred and fifteen effect sizes were calculated from 36 studies. Global effect sizes (ES) were statistically different from zero in both training methods. Plyometric training had an ES = 0.146 (CI₀.₅ = 0.82 to 1.27, p < 0.001) and the control group an ES = 0.032 (CI₀.₅ = 0.12 to 0.18, p = 0.73). The ES for the experimental group in the whole body vibration training method was 0.652 (CI₀.₅ = 0.3 to 1.0, p = 0.001) and the control group an ES = 0.038 (CI₀.₅ = 0.3 to 1.0, p = 0.765). ESs were correlated to age (r = 0.454, p = 0.002), number of weeks of training (r = 0.309, p = 0.039), final number of sessions per week (r = 0.348, p = 0.019), final duration of sessions (r = 0.619, p = 0.014), initial series of exercises (r = 0.572, p < 0.001), final series of exercises (r = 0.601, p < 0.001) and initial number of jumps per session (r = 0.633, p = 0.027) in the plyometric experimental method. No significant associations between ESs and moderator variables were observed in the whole body vibration method.

**CONCLUSIONS:** The overall results showed a statistically significant improvement on the vertical jump height of athletes when plyometrics or whole body vibration were used as training methods.

**Abstracts were prepared by the authors and printed as submitted.**
attainment. Similarly, the Wingate cycle test is a commonly accepted method of anaerobic capacity assessment which stresses anaerobic energy pathways. Based on the energy systems utilized at the point of VO2max and during a Wingate protocol it has been shown that peak power obtained from a Wingate cycle test is a good predictor of VO2max. However, it is unclear whether a non-consecutive testing day protocol produces a more accurate predictive model compared to a same day testing protocol. **PURPOSE:** to develop and compare the predictive accuracy of the regression model for a non-consecutive day testing protocol and a same day testing protocol. **METHODS:** Participants (N=23) completed an incremental treadmill VO2,max protocol and 30 second Wingate cycle test. Participants (n=12) completed testing on non-consecutive days (NON) and participants (n=11) completed testing on the same day (SAME). VO2,max (L/min) and peak power (PP) were collected. All data were analyzed using simple linear regression. **RESULTS:** Linear regression analysis of NON revealed R²=0.808 and prediction equation Ŷ=1.499+0.004X and SAME showed R²=0.861 and prediction equation Ŷ=1.407+0.003X. NON and SAME standard error of estimate percent (SEE %) were 15.23% and 10.98% respectively. **CONCLUSION:** These results indicate PP obtained the same day of VO2,max testing is a better predictor of cardiac output at the point of VO2,max. SEE % also shows the predictive accuracy of the SAME prediction equation is superior to the NON prediction equation. This may be due to the diminished effect of potential training adaptations that could occur 2-7 days between testing sessions during the NON testing protocol in healthy, active young adults.

**2239 Board #252 June 1 2:00 PM - 3:30 PM**
**The Development Of A Metabolic Equation To Estimate Caloric Consumption On A Non-motorized Sport-performance Treadmill**
Siviano Zanuso,1 Giuseppe Fedele,2 Simonetta Senni,3 Francesco Cuzzolin,1 Ethan Esser Horsham,4 Paolo Benvenuti.
1University of Greenwich, Gillingham, United Kingdom. 2Technogym, Cesena, Italy. 3University od Padova, Padova, Italy. 4University of Verona, Verona, Italy.
Email: sanzanos@gmail.com

**Reported Relationships:** S. Zanuso: Honoraria; Receive honoraria from Technogym.

**PURPOSE:** To create a Metabolic Equation (ME) predicting caloric consumption in walking and running speeds on a new non-motorized treadmill, named the ‘Skillmill’ (SK). On the SK the running surface is moved mechanically by the user, specifically designed to develop sports performance qualities.

**METHODS:** A group of 27 healthy individuals (18 male and 9 female; age 35.8 ± 9.3; BW 76.2 ± 19.1) were enrolled in the study. All subjects executed two familiarization sessions with the SK, one dedicated to walking and another to running. Each subject performed two trials, trial one required the subjects to walk at 4 and 6 km/h and trial two required the subjects to run at 5, 7 and 9 km/h. Each speed consisted of an 8 minute duration in order to obtain a steady state condition. The rest between speeds was 3 minutes. Oxygen consumption was continuously monitored with a metabolic cart (Cosmed Quark b, Rome, Italy). VO2 consumption was then measured when the subject achieved a steady state of metabolic intensity. Overall, 135 steady state points were collected.

**RESULTS:** The steady state VO2 ranged from 13.32 to 31.09 ml.kg-1.min-1 when walking and from 31.27 to 47.67 ml.kg-1.min-1 when running. To estimate the VO2 consumption expressed in ml.kg-1.min-1 related to a given speed, both Speed (S) in km/h and Body Weight (BW) in kg were considered. The equation that better predicts actual VO2 consumption is p00+p10*BW+p01*S+p20*(BW^2)+p11*BW*S . The different coefficients of this polynomial equation of the 2nd degree relative to BW are: p00=16.42; p10=-0.3036; p01=4.547; p20=0.001826; p11=-0.01816 with a Root Mean Squared Error of 1.751 when (S) is equal or higher than 8 km/h. The correlations between the values predicted by this equation and the VO2, measured with the metabolic cart are r²=0.83 when (S) is lower than 8 km/h and r²=0.84 when (S) is equal to or higher than 8 km/h.

**CONCLUSIONS:** The present Metabolic Equation that predicts oxygen consumption and caloric expenditure from the subject’s speed and body weight, provides a good estimate of the actual values.

2240 Board #253 June 1 2:00 PM - 3:30 PM
**Allometric Scaling for Endurance Variables in Croatian Army**
Cvita Gregov. Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia.
Email: cvita.gregov@ikif.hr

**Reported Relationships:** (No relationships reported)

Body mass bias is widely spread among physical performance testing and may confound the results often leading to misinterpretation. Endurance testing is a part of physical performance testing in the army and is generally assessed by running distance time. Two such tests, 2-mile run (2MR) and 300 yards run (300YR), are used to assess soldiers’ endurance using VO2,max treadmill test is a measure of aerobic capacity. If expressed as a relative value (ratio of VO2,max and body mass) or RVO2,max it is a good predictor of endurance or long distance running time. Considering that longer distances running time and RVO2,max are measures dependent of body mass, it is important to determine how to allow comparisons between subjects independent of their body mass. A practical solution is to determine body mass allometric exponent for distance running time. **PURPOSE:** To determine experimental body mass allometric exponent (eAE) for endurance variables and if it corresponds to proposed theoretical body mass allometric exponent (IAE) which equals 0.33.

**METHODS:** 572 healthy male army recruits (mean age 29.4y) underwent endurance assessment comprised of a standard endurance testing battery in Croatian Army: 2-mile run (2MR), 300 yards run (300YR) and incremental VO2,max treadmill test. Their body mass (BM) was also measured. Relative maximal oxygen uptake (RVO2,max) was taken as a measure of endurance since it is a better predictor of long distance running time. A regression technique was applied on the log-transformed data in order to determine the values of the allometric exponent for each particular test. One sample t-test was used to determine statistical differences between average eAE and IAE.

**RESULTS:** Regression analysis yielded BM allometric exponents for 2MR, eAE=0.33 (95%CI=0.32 - 0.34); RVO2,max, eAE=0.47 (95%CI=0.45 - 0.49); 300YR, eAE=0.22 (95%CI=0.15 - 0.28). Mean eAE=0.34 and compared with eAE=0.33 was not significantly different (p=0.05) when tested by one sample t-test. **CONCLUSION:** The results derived of experimentally derived BM allometric exponents correspond to theoretical one and as such should be used for scaling endurance variables and comparing results of endurance tests recorded as running times. Supported by Grant of Ministry of Defence of the Republic of Croatia
Heart rate (HR) based methods are commonly used to monitor training stress and are referred to as training load (TL) or training impulse (TRIMP). Edwards TRIMP equation is based on time spent in HR training zones above 50% HRmax whereas Polar’s TL is measured via their Team2 system using a proprietary equation that incorporates anthropometrics and maximal oxygen consumption (VO2max) combined with time spent in HR training zones. PURPOSE: To examine if TL estimates from proprietary Team2 software correlate with Edwards TRIMP in order to assess the training readiness of athletes. Secondly, the Beep test assessed fitness levels both pre and post-season to determine if training adjustments based on TL influenced post-season fitness. METHODS: Twenty-eight male Division III soccer athletes (19.8 ± 1.8 yrs) had their heart rates continuously monitored during the fall 2014 season, as well as pre and post-season testing using the Beep test to estimate VO2max. In instances where TL was >3.00 per match, athletes had reduced intensity during peak sessions to aid in improved recovery. Data recorded included time spent in each of five heart rate zones, ranging from 50% to 100% HRmax in 10% increments. RESULTS: When comparing Edwards TRIMP and TL, significant correlation coefficients were found for the first half, second half and both halves combined (r=0.992, p=0.992, and r=0.936, p<0.01). Although TRIMP and TL had high variability due to individual players playing for different time periods, mean TRIMP (190.0 ± 102.1) and TL (219.5 ± 92.4) for the season were similar. Estimated VO2max scores were not significantly different pre to post-season (52.0 ± 4.84 vs. 53.7 ± 14.14 ml kg⁻¹ min⁻¹; t=1.794, p=0.05). CONCLUSIONS: Estimating TRIMP using the Edwards equation is a valid option for coaches to gauge training readiness. TRIMP may be used if TL is unavailable to determine athlete readiness. Subsequent training sessions may be modified based on the amount of TL/TRIMP undergone in order to maintain fitness levels of athletes throughout the season.

**PURPOSE**

Electrical impedance myography has gained recognition throughout the literature as an effective assessment of neuromuscular disorders. However, evidence regarding the efficacy of commercial electrical impedance myography (cEIM) devices is limited. Therefore, there were two aims of this independent research. First, the authors aimed to assess the validity of a cEIM device as a predictor of grip strength. The second aim was to determine whether the number presented by the cEIM device was a direct representation of grip strength force produced. METHODS: Muscle quality and grip strength were measured in 17 female subjects (M = 20 years, SD = 1.5) via cEIM and a Jamar hand dynamometer, respectively. The cEIM device was placed on the volar surface of the dominant forearm midway between the medial epicondyle of the humerus and ulnar styloid on each participant. Grip strength measurements were then taken in accordance with recommendations from the American Society of Hand Therapists. True scores were documented as the results for each assessment before grouped into normative categories. The true scores for each assessment were compared using the Wilcoxon signed ranks test. The results were then categorized into either normal or abnormal according to their respective normative data. Spearman’s ranked correlation (r) was utilized to assess the relationship between the true scores and the two categorical groupings of normal and abnormal. Statistical significance was accepted at p < 0.05.

RESULTS: The average grip strength score of all participants was 30.82 kilograms (SEM = ± 1.20, 95% CI [28.33, 33.31]). Muscle quality scores averaged 41.29 (SEM = ± 3.70, 95% CI [38.10, 44.49]). A strong correlation was observed between the categorical groupings of each assessment (r = 0.957, p = 0.0008). No significant relationship was observed between the true scores of the cEIM device and grip strength (r = 0.23, p = 0.38). The true scores were observed as significantly different from each other (Wilcoxon test, p = 0.05).

CONCLUSIONS: Although the commercial electrical impedance myography device did not provide a direct representation of grip strength force produced, the device was effective at predicting normal versus abnormal grip strength.
Hamstring strain injuries are one of the most common sports injuries, especially in sprinting sports (Liu, Garrett, Moorman, & Yu, 2012). Hamstring strength imbalance quantified via hamstring strength asymmetry or by a hamstring to quadriceps ratio is a commonly proposed risk factor for hamstring strains (Liu, et al., 2012; Freckleton & Pizzari, 2012). Knowledge concerning the relationship among hamstring to quadriceps isokinetic ratios, speed, and power in sprinting athletes can assist in the development of training protocols and injury prevention strategies. PURPOSE: The purpose of this study was to identify the relationship between hamstring/quadriceps (H:Q) isokinetic strength ratios and its correlation with lower extremity power and speed field test measures. METHODS: Participants for this study included 30 NCAA Division I Track Athletes who compete in sprinting events. Peak torque (PT) was determined using an isokinetic dynamometer at speeds of 60 and 180 degrees per second in both hamstrings and quadriceps. Power was measured using the standing broad jump test and vertical jump test. Speed was assessed using light gates to measure sprint speed at 5, 10, 20, and 40 meter increments. A correlational approach was used to identify relationships between isokinetic measures with measures of lower extremity power and speed. RESULTS: Significant correlations (p<0.05) were found between peak torque (PT) values and most field tests (vertical jump, standing broad jump, and 40 meter sprint speed). However, there was no significant correlation (p>0.05) between H:Q ratios and field test measures (vertical jump, standing broad jump, and 40 meter sprint speed). CONCLUSIONS: The results of this study confirm that PT values correlate highly with field test measures used to assess power and speed. Unexpected findings include the lack of significant correlation between H:Q ratios and field test measures. Therefore, future research should focus on examining adjusted H:Q ratio values using body weight and lean mass of participants. Answering these questions could assist sport performance professionals in program development, and sports medicine personnel with injury prevention interventions.

Introduction: People with spinal cord injury (SCI) present with impaired autonomic control when the lesion is above T6. This could lead to impaired recovery following vigorous physical activity. Purpose: To compare VO2 off-kinetics following a maximal cardiopulmonary exercise test (CPET) in SCI and un-injured healthy individuals. Methods: Subjects were 13 patients with SCI who reported inability to voluntarily lift legs against gravity (age: 39.1 ± 10.9 years, paraplegic: 11, tetraplegia: 2), incomplete injury: 4) and 10 healthy controls (CON group; age: 30.5 ± 5.3 years). All subjects performed an arm ergometer cardiopulmonary exercise test (CPET) to volitional exhaustion followed by a 10-minute passive recovery. VO2 off-kinetics was calculated using a mono-exponential model in which a time constant (\(\tau_p\)) was calculated and amplitude of change in VO2 (AMP) was measured over the recovery period. Student’s t-tests were used to compare SCI vs CON group means and Pearson product moment correlation coefficients were used to assess the relationships amongst VO2peak and the VO2 off-kinetic variables. Results: CON had a significantly higher VO2peak compared to SCI (22.41 ± 5 vs. 14.64 ± 6.36 ml/kg/min, p=0.005). Compared to CON, SCI had significantly longer \(\tau_p\) (83.4 ± 34.7 vs. 54.7 ± 10.2 seconds, p=0.021). A significant difference in AMP between the SCI and CON groups was observed (0.85 ± 0.57 vs. 53.1 ± 48.4 ml/min, p=0.054) however the ratio of AMP/\(\tau_p\) was significantly smaller in the group with SCI than in (0.0126 ± 0.0108 vs. 0.0243 ± 0.0081 ml/sec, p=0.011). \(\tau_{off}\) and \(\tau_p\) were inversely related (r=0.524, p=0.01). Conclusions: Potentially explained by the time taken to replenish muscle ATP stores and lactate clearance, VO2 off-kinetics is one measure of cardiorespiratory fitness. Despite an observable decline in AMP, the prolonged VO2 off-kinetics suggests that cardiorespiratory fitness was impaired in these subjects with SCI. Funding: DoD Award W81XWH-14-1-0613

Purpose: The peak torque (APT) with shorter muscle length tends to have high probability of muscle strain injury. It is conceivable that APT with longer muscle length might be desirable condition of injury prevention. Although high intensity eccentric exercise (Ecc-Ex) which transiently shift the APT to longer muscle length associated with weaker muscle strength and decrease flexibility is well known, the acute effect of low intensity Ecc-Ex is unclear. The purpose of this study was to investigate the effect of low intensity Ecc-Ex on APT, muscle strength and flexibility. Methods: Thirty healthy male college students (24.5±2.4 yrs., 68.5±5.9 kg) performed Romanian deadlift (RDL) without weight as a low intensity hamstring Ecc-Ex. Before and after RDL, muscle strength and APT during maximum eccentric knee flexion (60deg/s) and flexibility were measured on both legs. After the experiment, each leg were divided into two groups based on the change in APT after RDL: the group with increase in APT (16 legs) and decrease in APT (10 legs) after RDL. Variables of interest were compared before and after RDL. Results: After RDL, muscle flexibility defined by range of motion in straight leg raise test increased significantly in both groups. The group with increase in APT, peak torque and power significantly increased (141.3±37.8 vs. 127.9±26.4 %BW, 106.3±22.8 vs. 89.3±14.4 %BW/deg, p<0.05, respectively) and muscle stiffness increased significantly (0.85±0.22 vs. 0.80±0.22 Nm/deg, p<0.05). In contrast, the group with decrease in APT, there was no significant change in peak torque, power and muscle stiffness. Conclusions: These results suggest that the low intensity Ecc-Ex induced APT decrease has no harmful impact on the muscle strength and flexibility. Thus, low intensity Ecc-Ex might be a useful method of muscle strain injury prevention.

Low-load resistance exercise rehabilitation combined with blood flow restriction (BFR) has been suggested as an effective and safe alternative way to improve muscle strength and size compared to traditional high-load resistance exercise in clinical populations. However, there are few studies conducted to investigate the effect of low-load resistance exercise rehabilitation with BFR following total knee replacement. Purpose: To compare the result of rehabilitation with or without BFR on muscle function in the patients who were treated with total knee replacement. Methods: Twenty-one participants were randomized into two different interventions: low-load resistance exercise rehabilitation with BFR (BFR group, n=11) and without BFR (control group, n=10). Exercise sessions were performed 6 times per week, 30 minutes per session, for 2 weeks in all participants. Over the twelve exercise sessions in BFR group, an elastic cuff was worn on the subject’s proximal thigh in its intensity being progressively increased from 160 mmHg at the first session
Electronic stimulation can be used to stimulate contraction of paralyzed muscle, and when coordinated via computer processing, lower body muscles can power a cycle ergometer in a manner which increases whole-body energy expenditure. **Purpose:** When matched for charge input determine if calorie (kcal) expenditure and fuel partitioning measured during and immediately following a bout of functional electrical stimulation (FES) cycling differed when performed on two FES devices. **Method:** Six males with spinal cord injury (SCI; age: 49±17 yr; weight: 76±6 kg; level of injury: C4-T11) completed 30 min of steady-state FES exercise on four separate occasions at a charge-matched moderate stimulation intensity. Two sessions were completed on a commercially available unit (RT300, Restorative Therapies, MD) and two on a device that is in pre-production testing (MyoCycle, MYOLYN, FL) that employs a different electrical control paradigm. Before, during, and after cycling, energy expenditure and fuel homeostasis were calculated via pulmonary gas exchange (Oxycon, Jaeger, CA), and central hemodynamics (for the MyoCycle device only) via impedance cardiography (PhysioFlow, Manatec Biomedical, FR). **Results:** Rate of oxygen consumption ($V_O_2$) and cardiac output (CO) during FES were 34±20% and 49±23% of that measured during steady-state cycling on the commercially available unit. Despite large differences between the two groups, it was nearly significant ($p<0.05$). Furthermore, we found no significant results between groups in other outcome variables. **CONCLUSIONS:** Low-load resistance exercise rehabilitation with BFR led to significant increases in knee extensor strength. Rehabilitation combined with BFR may be useful for the patients who are in need of fast recovery in muscle function following a total knee replacement surgery.

High intensity interval training (HIIT) has shown to be a robust alternative to traditional aerobic training (Gillen et al. 2014, 2016; Astorino et al. 2011). In most individuals, incorporation of high-intensity exercises into a program of lower extremity strength training is useful for patients who are in need of fast recovery in muscle function following a total knee replacement surgery.

**Purpose:** To determine the effects of insulin resistance (IR) on subclinical cutaneous perfusion responses using skin evoked and skin provocation in persons with SCI. **Methods:** A prospective, open-label, non-randomized, placebo-controlled investigation was performed in persons with SCI and an able-bodied (AB) cohort. These groups were subdivided based on fasting plasma insulin (FPI) concentration cut-offs for IR (>13.13 mU/ml) or insulin sensitive (IS: <13.13 mU/ml) designations into four subgroups: ABIS (n=21); SCIS (n=21); ABIR (n=9); SCIR (n=11). Laser Doppler flowmetry characterized the peak blood perfusion unit (BPU) responses (percent change from baseline) to insulin or placebo iontophoresis in the lower extremities, and the corresponding BPU responses were log$_e$ transformed to facilitate comparisons. The NetIns BPU response was calculated (Insulin-Placebo BPU responses) to provide the effect of insulin to that of the acetylcholine-mediated BPU response. **Results:** Persons with SCI have sublesional microvascular endothelial dysfunction. The presence of IR has a further confounding effect on endothelial-mediated changes to cutaneous perfusion and appears to be an important modifiable risk factor for the optimization of cutaneous perfusion in the lower extremities of persons with SCI.
Multiple sclerosis (MS) is a neurological disorder that afflicts ~400,000 people in the US. Common symptoms include sensory impairment, fatigue, and reduced mobility. Neuromuscular electrical stimulation (NMES) can be used to restore muscle function and improve mobility, but little is known about the relative influence of pulse width on treatment efficacy. Wider pulse durations (0.26 ms) selectively activate motor axons. PURPOSE: To compare the effects of narrow- and wide-pulse NMES on the walking endurance of persons with MS. Wide-pulse NMES (WP) was expected to engage the nervous system more effectively and produce greater gains in walking performance than narrow-pulse NMES (NP). METHODS: Twenty-seven persons with MS (52.6 ± 7.4 yrs) participated in the study. Participants were randomly assigned to two groups: NP group (0.26 ms; 50 Hz; n=13; 54 ± 6.3 yrs), and WP group (1 ms; 100 Hz; n=14; 51.2 ± 8.3 yrs). NMES was applied at a tolerable level for 3 sessions/wk for 6 wks. Current was progressively increased to new tolerance and tapered to limit fatigue at testing. NMES was applied to the dorsiflexors and plantar flexors muscles (10 min each muscle, 4 on and 12 off) for both legs. Walking endurance (6 MWT) and walking speed (25-FWT) were assessed before (0 wk), after (6 wks), and after a 4 wk retention period (10 wks). RESULTS: Both groups (NP & WP) improved walking endurance and walking speed after the intervention (P<0.05). The 6MWT (m) results: NP - before (mean ± SD) = 345 ± 138, after = 387 ± 154, retention = 396 ± 178, WP - before = 409 ± 131, after = 442 ± 155, retention = 450 ± 149. Mixed ANOVA indicated no significant difference between NP and WP groups (P=0.302) in 6MWT. The 25-FWT (s) results (non-parametric test: Friedman test) - before NP = 409 ± 131, after = 442 ± 155, WP = 450 ± 149. Significant ANOVA indicated no significant difference between the two groups (P=0.05, 0.173). CONCLUSION: 6 wks of either wide- or narrow-pulse NMES improved walking performance for persons with MS. Wide-pulse NMES didn’t produce greater gain in walking performance than narrow-pulse NMES.

**Conclusion:**

The group of individuals with MS exhibited asymmetry in bilateral SLC test times. The goal of this study was to evaluate within- and across-day reliability of these measures in individuals with MS. METHODS: On 3 visits, each separated by 7 days, women with MS (n=11; mean±SE; age: 53.3±3 yrs; self-reported EDSS: median=4.5, range=0-6.5) completed two 25-foot walk and 2 TUG trials, and the fastest trial for each visit was used for analysis. Participants completed the SSST and the average time for 4 trials was recorded for each visit. Participants were instructed to complete all measures of mobility “as fast and safely as possible.” They then performed 10 trials of the foot tap test (FTT, 10s rapid tapping) on each foot, with the fastest half of their foot positioned on a force plate and the number of taps in each trial determined from the force data. Foot tap count from all 10 trials was used to assess within-day reliability of each foot using the coefficient of variation (CoV) and rmANOVA, with Bonferroni post-hoc analyses. The fastest trial for each mobility test was used to assess across-day reliability with intraintraclass correlations (ICC), CoV, and rmANOVA.

**RESULTS:** Within-day CoV for the FTT showed good reliability for both feet (right: 7.4±1.1%; left: 6.5±1.0%). There was a significant within-day effect of trial number for the FTT (p<0.02) and post-hoc analyses revealed differences at visit 3 such that the right foot was faster in trial 1 than trial 3 (37.5±2.4 vs. 33.8±2.4, p<0.02), and the left foot was faster in trial 1 than trial 10 (36.5±3.0 vs. 33.6±3.2, p<0.03). No other within-day differences were observed. The ICC’s for the 4 mobility tests varied across visits (25-foot walk: ≥0.95; TUG: ≥0.92; SSST: ≥0.94; FTT: ≥0.75). The CoV for the 25-foot walk (4.7%), TUG (6.7%), SSST (7.3%), and FTT (right: 6.5%, left: 7.3%) demonstrated good reliability. There were no differences across visits for the 25-foot walk, TUG, and FTT (p>0.05). However, there was a difference across visits for the SSST (p<0.02), such that participants were quicker at visit 3 compared with visit 1 (0.01.0 vs. 0.7±1.0 s, p<0.05). CONCLUSIONS: The 25-foot walk, TUG, and FTT appear more reliable than the SSST for quantifying mobility in the MS population.

Multiple Sclerosis (MS), an immune-mediated disease of the central nervous system (CNS), is characterized by chronic neuroinflammation and demyelination. Interleukin-6 (IL-6), a major cytokine released by monocytes and macrophages, promotes a robust downstream inflammatory cascade, including the release of C-Reactive Protein (CRP), a common clinical marker of inflammation. Physical activity is known to be protective against inflammation and recent evidence suggests that increasing soluble form of the receptor for advanced glycation endproducts (sRAGE) may be an additional mechanism by which this occurs. PURPOSE: To characterize the relationship between fitness and inflammatory markers (CRP, IL-6) in persons with MS, and to elucidate the effects of a 12-week home-based exercise program on inflammation, estimates of insulin resistance (HOMA-IR), circulating sRAGE, and fitness in persons with MS. METHODS: Forty-eight participants with MS (45±2 yrs, 28.8±0.9 kg/m², 35 females) were randomly assigned to either a home-based aerobic exercise program or an attention-control stretching group. The exercise intervention consisted of cycling 3-4 d/wk at 40-60% VO2 peak for 30 min/d. VO2peak was assessed using open-circuit spirometry on a cycle ergometer. Blood was drawn at baseline and following the 12-week intervention and plasma metabolites were assessed using commercially available ELISA kits. RESULTS: Baseline VO2peak was negatively correlated with baseline plasma levels of CRP (r=−0.43, p=0.01) and IL-6 (r=−0.51 p=0.01). VO2peak increased 8% in individuals with MS (p<0.01), with no change in the attention-control group. No between or within group differences were observed for sRAGE, IL-6, CRP or HOMA-IR. CONCLUSION: Despite no effect of the exercise intervention, the relationship between VO2peak and CRP, IL-6 at baseline suggest that higher fitness levels are advantageous to individuals with MS and may be related to the well-known anti-inflammatory effects of exercise. This relationship is promising for the use of exercise on modulating cellular inflammation in individuals with MS, however longer duration, higher intensity or supervised exercise may be necessary in order to elicit changes in circulating IL-6, CRP, sRAGE and HOMA-IR. Supported by the National Multiple Sclerosis Society RG 4702A1/2.
Multiple Sclerosis (MS) is a disease of the central nervous system that has been associated with increased levels of fatigue. Recently, research has shown asymmetry in muscle function and performance in people with MS (PwMS) where one side of the body performs better than the other. Interestingly, and of clinical concern, would be how asymmetry might be associated with generalized fatigue. **Purpose:** The intent of this study was to correlate isometric knee extension strength and peak power (PP) asymmetry scores to measures of fatigue in PwMS. **Methods:** Fourteen volunteers, eight with relapsing-remitting MS and six healthy controls without MS participated in the study. Participants completed a single leg incremental cycling test to determine peak power (PP) of each limb, as well as maximal voluntary isometric contractions of the knee extensors to determine strength (KES). The Modified Fatigue Impact Scale (MFIS), the Fatigue Severity Scale (FSS), and the Short Form Health Survey (SF-36) questionnaires were used to assess feelings of fatigue. A higher score on the MFIS and FSS indicates greater levels of fatigue, whereas a higher score on the SF-36 indicates better feelings of health. KES and PP asymmetry scores were calculated as weaker leg (more affected) / stronger leg; a lower score indicates a greater magnitude of imbalance. Pearson correlations were used to determine relationships between KES and PP asymmetry and all self-reported measures of fatigue. **Results:** The mean Expanded Disability Status Scale score was 2.6 ± 1.6 in the MS participants, indicating mild to moderate impairment. No significant correlations were observed between KES asymmetry scores and measures of self-reported fatigue. Significant correlations were observed between PP asymmetry scores and the MFIS physical sub-scale (r = -0.554; p = 0.04), the FSS (r = -0.524; p = 0.05), and the SF-36 (physical health sub-scale; r = 0.666; p = 0.02). **Conclusions:** Asymmetries in function (as measured by PP) and not strength appear to be significant contributors to self-reported measures of fatigue. This might suggest that assessments using a more dynamic measure such as peak power may be more appropriate compared to static strength. More importantly, preliminary findings suggest PP asymmetry appears to influence generalized fatigue in PwMS.

**Multiple Sclerosis (MS) is an immune-mediated disease of the central nervous system that results in physiological deconditioning and walking disability. High-intensity interval exercise (HIIE) has induced significant improvements in physiological conditioning in healthy and clinical populations. However, the effects of engaging in HIIE on cardiorespiratory functioning, gait, and walking performance in persons with MS who have mobility disability are relatively unknown.**

**Purpose:** To examine the effects of single sessions of recumbent stepping (HIIE) and continuous (CON) exercise on cardiorespiratory functioning, gait, and walking performance in persons with MS who have mobility disability. **Methods:** 5 participants with mild-to-moderate MS underwent HIIE and CON exercise bouts. The HIIE bout included 10 cycles of 1-min intervals at the wattage associated with 50-60% VO2peak. Physiological measures were collected within session, and functional measures were completed pre-, immediately-post, and 10-minutes post-exercise. **Results:** We observed significant differences between the CON and HIIE protocols for VO2 (t = -4.36, P = 0.01), power output (t = -4.20, P = 0.01), and RER (t = -7.24, P = 0.01), with the HIIE condition inducing higher values than the CON condition. Heart rate approached a statistically significant difference between conditions (t = 2.61, P = 0.06). There were no significant interaction effects or effects of time on condition on walking speed and gait kinematics (P > 0.05).

**Conclusions:** We determined that HIIE exercise taxes the cardiorespiratory system significantly more than CON exercise, yet without deleterious effects on walking and gait in persons with MS. This has important implications for informing an evidence-based exercise prescription in persons with MS who have walking impairments that is appropriate for improving physiological conditioning.
and Performance Oriented Mobility Assessment (POMA). Fine motor control was assessed with the Purdue Pegboard Test. Results: The gait assessment of the POMA was significant across all time points (p < 0.028). All other variables were statistically similar (p > 0.05) across all time points. Conclusion: Exercising on a traditional land treadmill, aquatic treadmill, or anti-gravity treadmill for 60 min/week for 4 weeks at a moderate intensity did not alter balance, gait or fine motor control in adults with Parkinson’s disease.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Control</th>
<th>Post-Control</th>
<th>Post-LTM</th>
<th>Post-ATM</th>
<th>Post-AGTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUG (s)</td>
<td>8.4±1.4</td>
<td>9.3±3.3</td>
<td>8.5±2.6</td>
<td>7.9±2.1</td>
<td>8.8±3.6</td>
</tr>
<tr>
<td>POMA Balance</td>
<td>13.5±3.0</td>
<td>14.3±1.2</td>
<td>13.5±2.3</td>
<td>14.3±2.0</td>
<td>14.0±1.6</td>
</tr>
<tr>
<td>POMA Gain*</td>
<td>10.3±1.6</td>
<td>9.2±3.1</td>
<td>11.7±1.1</td>
<td>10.8±2.3</td>
<td>10.8±0.9</td>
</tr>
<tr>
<td>FMC (left hand)</td>
<td>8.7±3.2</td>
<td>9.1±2.8</td>
<td>9.0±1.3</td>
<td>8.8±2.8</td>
<td>9.0±3.2</td>
</tr>
<tr>
<td>FMC (right hand)</td>
<td>8.4±3.3</td>
<td>8.6±3.0</td>
<td>9.2±2.7</td>
<td>10.1±2.8</td>
<td>9.8±2.6</td>
</tr>
<tr>
<td>FMC (both hands)</td>
<td>6.1±2.4</td>
<td>6.6±2.7</td>
<td>7.3±2.9</td>
<td>6.8±2.2</td>
<td>6.2±1.9</td>
</tr>
</tbody>
</table>

Values are mean ± s.d. * = main effect for time point (p < 0.028); AT = aquatic treadmill; AGTM = anti-gravity treadmill; LTM = land treadmill; TUG = timed-up and go; POMA = performance oriented mobility assessment; FMC = fine motor control.

**D-73** Free Communication/Poster - Oxygen Uptake Kinetics

**Thursday, June 1, 2017, 1:00 PM - 6:00 PM**

**Room: Hall F**

**2262 Board #275**

**June 1 3:30 PM - 5:00 PM**

**Oxygen Uptake during Three Varying Duration High-Intensity Functional Training Sessions**

Jesse A. Stein, Joshua R. Smith, Carl J. Ade, Ryan M. Broxtermar, Brian Sanborn, Thomas J. Barstow, FACSM, Katie M. Heinrich. Kansas State University, Manhattan, KS

(No relationships reported)

**PURPOSE:** To determine oxygen uptake during three varying duration high-intensity functional training (HIFT) sessions. METHODS: Six healthy men with >1 year of HIFT experience were recruited (age:29±5 yrs). Participants completed an incremental exercise test on a treadmill to determine maximal oxygen consumption (VO2max) gas exchange threshold (GET), and respiratory compensation point (RCP). Participants completed three HIFT sessions. Session 1 (S1) consisted of 3 rounds of power cleans and ring dips. Session 2 (S2) consisted of 3 rounds of a 400-meter run, 21 kettlebell swings and 12 pull-ups. Session 3 (S3) consisted of as many rounds as possible of 5 pull-ups, 10 push-ups and 15 squats in 20 minutes. Participants were encouraged to complete S1 and S2 as fast as possible, while performing as many repetitions as possible in S3. Pulmonary gas exchange (VO2, VCO2, VE) were measured during each session. RESULTS: The mean VO2max was 55.9±5.6 mL/kg/min with GET and RCP representing 61% and 79% of VO2max, respectively. The average time to complete S1 was 513±59s and elicited a mean %V̇O2peak of 70±7% that was not different from GET or RCP (p>0.05). S2 required on average 783±79s to complete, with a mean %V̇O2peak of 82±7% of VO2max that was significantly higher than GET (p<0.05), but not different compared to RCP (p>0.05). Mean %V̇O2max across S3 was 66±6%, however the average %V̇O2max was significantly higher than GET (p<0.05) at minutes 2-8, but not different at any other interval and was not different compared to RCP (p>0.05). Furthermore, VO2max demonstrated significant oscillations during all sessions (p<0.05). CONCLUSIONS: Participants with HIFT experience who completed sessions as quickly as possible or performed as many rounds as possible elicited an oxygen consumption from 66-82% of VO2max. Moreover, the oscillating VO2 during HIFT suggests that metabolic demands, which ranged from 46-92% of VO2max within-subjects, do not achieve a steady-state. Previous work suggests that the oscillating VO2 response could be a potent stimulus for improving health and fitness characteristics.

**2264 Board #277**

**June 1 3:30 PM - 5:00 PM**

**Prior Supramaximal Cycling Transiently Increases Submaximal Cycling Energetics in Cyclists and Non-cyclists**

Eric Homestead, William C. Byrnes, FACSM. University of Colorado Boulder, Boulder, CO. (Sponsor: William C. Byrnes, FACSM)

(No relationships reported)

**PURPOSE:** We sought to examine the effects of supramaximal cycling on the energetics of submaximal cycling at and below the lactate threshold (LT) in cyclists and non-cyclists. METHODS: On 3 separate days, endurance-trained cyclists (CYCL) (n=10) and recreationally active non-cyclists (N-CYCL, n=9) performed 3 sub-LT cycling bouts at 60%, 80%, and 100% LT before (PRE) and after (POST 1, POST 2, and POST 3) supramaximal cycling bouts (3x2 min) at 110% of power at VO2peak (SUPRA). POST 1, POST 2 and POST 3 occurred 2, 22, and 52 min after SUPRA. Metabolic variables, core temperature (Tc), and blood lactate concentration ([lactate]) were measured. VO2-power and EE-power linear relationships were developed for each subject from the 3 intensities and compared between conditions (PRE, POST 1, POST 2 and POST 3). RESULTS: VO2peak and power at LT were significantly higher by 51% and 131% in CYCL compared to N-CYCL (p<0.01). CYCL and N-CYCL responded the same across conditions so the estimated marginal means are reported which combines groups. VO2 was significantly greater during POST 1 compared to PRE, POST 2, and POST 3 regardless of intensity (2.0±0.5 vs. 1.8±0.5, 1.8±0.5, and 1.8±0.5 L min⁻¹, p<0.05). VO2-power slopes were different between conditions (p<0.05), but not when EE-power slopes were analyzed. The VO2-power intercept during POST 1 was significantly greater compared to PRE, POST 2, and POST 3 (0.68±0.25 vs. 0.58±0.20, 0.55±0.19 and 0.53±0.20 L min⁻¹, p<0.05). The same results were found for EE-power intercepts. HR and Tc were significantly higher during POST 1 compared to PRE (p<0.05). Only HR and Tc were higher during POST 2 and POST 3 compared to PRE (p<0.05). [Lactate] increased from PRE to POST 1 and then progressively decreased over time (p<0.05). CONCLUSION: Prior supramaximal cycling increases the energetic cost of submaximal cycling (at and below LT) in endurance-trained cyclists and non-cyclists. VO2-power and EE-power intercept during sub-LT cycling immediately following supramaximal cycling suggests that muscle efficiency was unaltered and that the greater energetic cost is associated with metabolic demands that do not increase with increasing workrate.
We investigated the effect of HIT on deoxygenated hemoglobin and HHb. METHODS: Subjects VO2max, hematocrit, and lactate levels were measured. Half of the subjects were given a training mask and asked to complete 3 workouts per week in the range of 60%-80% of VO2max. The control group was given the same task of working out 3 times a week without a mask. Hematocrit and VO2max were measured after the 6 weeks of training and analyzed for significant differences. RESULTS: There was no difference between the pre and post-training VO2max values in the masked and no-mask groups. There was no difference in the percent change in VO2max between the two groups. The no-mask group experienced a +8.97% increase in hematocrit while the masked group had a decrease in hematocrit of 1.194% after training. There was a significant difference in how the two groups hematocrit levels responded to training. CONCLUSIONS: We found no support for the use of training masks helping athletes oxygen better than using no mask at all. Perhaps training masks may help athletes use oxygen more effectively if they used them for longer than 6 weeks. A training protocol of longer duration would likely yield more conclusive results.

Endurance exercise training increases whole-body maximum O2 uptake (VO2peak) by increasing both convective and diffusive O2 conductances within the active muscles. High intensity interval training (HIT) very effectively increases VO2peak but it is unknown whether HIT enhances muscle O2 diffusive properties. PURPOSE: We investigated the effect of HIT on deoxygenated hemoglobin and myoglobin (Hb+Mb) concentration (HbO2), reflecting fractional O2 extraction and total Hb+Mb concentration (Hb, reflecting diffusive O2 potential) in quadriceps during ramp-uncalculated (RI) exercise using quantitative time-resolved near-infrared spectroscopy (NIRS-TR). METHODS: Fifteen men volunteered for exercise training (TR, n = 8) or non-training control (CN, n = 7). TR performed HIT (4 repeats of 30 s all-out sprint cycling and 4 min recovery) 3 times/week, for 5 weeks. All subjects performed RI to exhaustion pre- and post-intervention. VO2 was measured breath-by-breath. Absolute HbO2 and Hb were measured in the vastus lateralis (VL) and rectus femoris (RF) by NIRS-TR. HbO2 and Hb profiles were modeled by a double linear response (y = m · x + b, yO2 = mO2 · x + bO2, yHb = mHb · x + bHb), where m is the slope of heme chromophore accumulation above and below an inflection point, IP. RESULTS: VO2peak increased in TR (48.9±4.6 vs. 52.7±5.3 ml·kg⁻¹·min⁻¹, p < 0.05) but not in CN (46.1±8.9 vs. 45.2±10.1 ml·kg⁻¹·min⁻¹). The amplitude of HbO2 from rest to intolerance increased only in TR, in both the VL and RF muscles (29.5±13.5 vs. 34.8±13.7 µM, mean of both sites, p < 0.05). In contrast, post-training HbO2 amplitude was unchanged in both groups and both muscles. Moreover the slopes (m,Hb), m,Hb of Hb and Hb were unchanged between pre- and post-intervention in either group or muscle. CONCLUSIONS: Five weeks of HIT increased VO2peak and regional (VL and RF) muscle deoxygenation without altering HbO2 slope or peak Hb - reflecting a gain of O2 flux to active muscle with an unchanged O2 delivery to utilization matching during submaximal exercise and an unchanged diffusive O2 potential. This supports the notion that greater muscle O2 consumption following HIT in young adults occurs by the improvement of O2 extraction capacity without an obligatory [Hb]-induced enhancement of diffusive O2 conductance. Supported by JSPS-15K16476, 24247046, 26560362.

Near infrared spectroscopy (NIRS) has been shown to be a non-invasive wearable alternative to measure blood oxygenation levels. PURPOSE: The purpose was to determine whether a significant relationship exists between SM202% and VO2 during the last two stages of treadmill interval testing past LT1. METHODS: Five volunteer members of a collegiate cross country team, (2 male, 3 female, 18.6±1.5 years, 169.4±10.9 cm, 63.7±8.8 kg) completed a maximal effort stepwise test to volitional exhaustion. Each subject was fitted with a mask sleeve containing the BSN NIRS Insight device, a ventilatory mask connected to the COSMED system, and a heart rate monitor. After a 5 minute recovery pace warm up, the subject ran four minute intervals, each increasing 0.4 mph in pace, with a one minute standing recovery period between each four minute stage. After blood lactate levels increased 1.5 millimoles from baseline levels, the final stage consisted of one-minute periods with the incline increased by 1 percent each minute, until volitional exhaustion ending the test. RESULTS: A Pearson correlation coefficient was calculated for the relationship between each participant’s SM202% and VO2 during the final ramp stage, the 4 minute stage preceding the ramp stage, and for those two stages combined. A strong negative correlation was found for each participant’s total rest data, ranging from r = -0.660 to -0.925, and an average +/- standard deviation of -0.852 ± 0.110. All correlations were significant at p< .01, indicating a significant linear relationship between the two variables. CONCLUSIONS: The study suggests that the BSN Insight device is a valid option for non-invasively measuring SM202% during ventilatory maximal interval training. Given that the study concentrated on elite runners, further testing would need to be done to generalize the results to a larger population.
Pearson Correlation SMQ2 vs. VO2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pearson Correlation</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.763</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>2</td>
<td>-0.711</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>3</td>
<td>-0.928</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>4</td>
<td>-0.949</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>5</td>
<td>-0.518</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>6</td>
<td>-0.764</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>Mean(SD)</td>
<td>-0.772 ± 0.158</td>
<td>* all results significant</td>
</tr>
</tbody>
</table>

2269 Board #282 June 1 3:30 PM - 5:00 PM The Effect Of Stride Frequency On Running Economy In Collegiate And Recreational Runners

Guillermo A. Cuevas, Michael Reeder, Brent Alumbaugh. Colorado Mesa University, Grand Junction, CO.
Email: gacuevas@mav.colordomesa.edu
(No relationships reported)

Running economy (RE) is often a good predictor of running performance among athletes with a similar VO2 max. Additionally, economy differences have been seen when comparing elite distance runners to recreational runners. PURPOSE: To explore the effect that varied stride frequencies (SF) have on RE in both collegiate and recreationally trained runners. METHODS: Four collegiately trained male distance runners and four college-aged recreational runners ran on a treadmill at speeds of 3.9 m/s and 2.7 m/s, respectively, which corresponded with 60 to 65% of their VO2 max. Subjects completed 5 bouts of running for 5 minutes at their preferred stride frequency (PSF) and ±10% of their PSF, in a random order. The first three minutes of each trial were used to match the prescribed stride frequency and to reach a steady state, the last 2 minutes were used for data analysis. Subjects were given three minutes between trials to recover from the prior prescribed SF session. PSF was determined prior to data collection and prescribed stride frequencies were defined with a metronome. Subjects were given a familiarization phase prior to data collection to aid in matching the prescribed SF and video was used to verify that prescribed SF was achieved. RESULTS: Mean VO2 differences in collegiately trained runners were significant (p < 0.05) in all but one of the trials (5% of SF) where p = 0.07. There was a U-shaped relationship that was observed between SF and running economy in collegiate runners, where any variation above or below PSF resulted in a decrease in RE. In all cases, however, the collegiately trained runners' PSF corresponded to what is most economical, whereas lesser trained, recreational runners could potentially see improvements in RE from an increase in SF.

2270 Board #283 June 1 3:30 PM - 5:00 PM Comparison Of Energy Expenditure Between Continuous Walking And Very Short-Boots Of Intermittent Walking

Alexis Le Faucheur1, Nolwenn Chesnais2, Pauline Yvard2.
1Movement, Sport and Health Laboratory (EA 1274). Université de Rennes 2, Bruz, France. 2Ecole normale supérieure de Rennes, Bruz, France.
Email: alexis.lefaucheur@ens-rennes.fr
(No relationships reported)

Since the 1995 physical activity guidelines, a number of studies investigated as to whether a single bout of continuous exercise and several intermittent (i.e. accumulated) bouts of exercise produced the same physiological responses and health benefits. Various studies focused on walking and compared the physiological responses between a single bout of continuous walking and during multiple 10-min bouts of intermittent walking. However, no study investigated the energy expenditure (EE) accumulated during very short bouts of intermittent walking (e.g., 30 s), which would better match with the daily life walking pattern. PURPOSE: To compare EE accumulated during a continuous walking exercise (CW) and during an intermittent walking exercise (IW) including very short bouts of walking. METHODS: Ten healthy young adults (FM: 5/5; 22±1 years; 67.9±8.2 kg; 176±8 cm) performed, in a counterbalanced randomized order, two treadmill walking trials of 20 min each: 1) Trial A: one 10-min bout of CW followed by a 10-min recovery bout in standing position; ii) Trial B: Twenty 30-s walking bouts (20 x 30 s = 10 min) interspersed with twenty 30-s recovery bouts in standing position. For both walking trials, subjects walked at the same absolute intensity on a motorized treadmill: speed of 5.5 km/h and 0% grade. EE (kcal) was calculated from gas exchange measured using a portable metabolic system (K4b2). RESULTS: The EE accumulated during the 10-min single bout of CW (54.7±2.8 kcal) was significantly higher than the EE accumulated during the twenty 30-s recovery bouts of the IW (43.3±7.1 kcal; P<0.05). The EE accumulated during the 10-min recovery bout following CW (21.3±16.8 kcal) was significantly lower than the EE accumulated during the 20 recovery bouts of IW (38.5±9.4 kcal; P<0.05). More difference was found when the whole continuous and intermittent walking trials regarding total EE (78.9±14.5 kcal vs. 82.1±19.0 kcal respectively, P=0.185). CONCLUSION: A low absolute intensity intermittent exercise of walking, including bouts of very short-duration, enables young adults to reach a similar total EE as during a continuous walking exercise. While additional studies are needed, this study opens interesting applications not only in healthy subjects but also in very deconditioned or functionally-impaired subjects.

2271 Board #284 June 1 3:30 PM - 5:00 PM Submaximal Predictions for Maximum Heart Rate and Maximal Oxygen Uptake from a Dynamical System Model

Michael J. Mazzoleni1, Claudio L. Battaglini, FACSM2, Kerry J. Martin1, Erin M. Coffman1, Jordan A. Ekaidat1, Brian P. Mann1.
1Duke University, Durham, NC. 2University of North Carolina at Chapel Hill, Chapel Hill, NC. *University of North Carolina at Greensboro, Greensboro, NC. (Sponsor: Claudio L. Battaglini, FACSM)
Email: michael.mazzoleni@duke.edu
(No relationships reported)

Cardiopulmonary exercise testing (CPET) is the gold standard method for assessing maximum heart rate (HRmax) and maximal oxygen uptake (VO2max). However, performing a CPET is not always practical or feasible. Alternative methods that utilize submaximal protocols and non-exercise regression models have been developed to estimate HRmax and VO2max. However, these methods fail to account for inter-individual variability and are associated with a large degree of uncertainty and error. PURPOSE: The aim of this study was to develop a novel method for estimating HRmax and VO2max that applies a dynamical system model to data collected from a submaximal exercise protocol. The dynamical system model accounts for the nonlinear dynamics and inter-individual aspects of the heart rate and oxygen uptake responses. METHODS: Twelve regularly exercising healthy adult males performed a CPET on a cycle ergometer to determine their true HRmax and VO2max. Participants then performed a submaximal bout of exercise, and the dynamical system model was applied to the time series data in conjunction with a heuristic parameter estimation algorithm to estimate the participants’ HRmax and VO2max. RESULTS: The submaximal dynamical system model predictions were compared to the true maximal values for HRmax (R² = 0.96; SEE = 2.4 bpm) and VO2max (R² = 0.93; SEE = 2.1 mL/kg/min). CONCLUSIONS: A dynamical system model that accounts for nonlinear dynamics and inter-individual physiological aspects can provide accurate submaximal predictions for HRmax and VO2max. Supported by the ARO through an NDSEG Fellowship.

2272 Board #285 June 1 3:30 PM - 5:00 PM Single Sprint Interval Training Session Induces Faster VO2 Kinetics that is Sustained for 72 Hours

Danilo Iannetta1, E. Calaine Inglis1, Giorgia Spigolon1, Silvia Pogliaghi2, Juan Manuel Murias1. 1University of Calgary, Calgary, AB, 2University of Verona, Verona, Italy. (Sponsor: Donald H. Paterson, FACSM)
Email: danilo.iannetta@ucalgary.ca
(No relationships reported)

The VO2 kinetics response describes the rate of adjustment of the oxidative phosphorylation, providing an overall estimate of the efficiency of the cardiovascular system. Recent lines of evidence have demonstrated that, at least in young individuals, VO2 kinetics can become faster even after only a single session of endurance training, likely due to improvement in the provision of oxygen (O2) to the active tissues. Additionally, sprint interval training (SIT) has been shown to induce positive adaptations in oxidative metabolism. However, the effects of an acute bout of exercise, and more specifically SIT, in the VO2 kinetics response of older individuals are unknown. PURPOSE: To investigate whether a very short session (3 bouts) of Sprint Interval Training (SIT) induces speeding of the VO2 kinetics in older participants. METHODS: Before, as well as 24, 48, and 72 hours post SIT exercise intervention, the time-constant of the VO2 kinetics response (KvO2) was measured in eight older adults (67.3 ± 3.7 years; 21.5 ± 2.4 BMI) through three step transitions in work rate (WR) from 20 W to a moderate-intensity WR that elicited a VO2 corresponding to 90% of the gas exchange threshold. The SIT session consisted of 3 consecutive “all-out” sprints (Wingate protocol) against a resistance corresponding to 5% of the body weight, interspersed by 4.5 min recovery. RESULTS: The average mean power throughout the three Wingate sprints was 366 ± 74 W, while the average peak power was 602 ± 106 W, and the average total work was 22.0 ± 4.4 kJ/min. VO2 at the baseline was 41.8 ± 5.9. Significantly (p < 0.05) smaller values in VO2 kinetics were found 24 h (35.0±4.9 s; -16.2%), 48 h (35.5±3.4 s; -15.1%), and 72 h (37.2±7.2 s; -12.3%) after SIT.
Whole-body high-intensity interval training (WB HIIT), including CrossFit®, has gained wide popularity, partly because HIIT benefits can be achieved in less time than moderate-intensity exercise. Most HIIT research, however, has used bicycle ergometry or treadmill-based exercises that emphasize only the lower body. PURPOSE: To investigate the effects of transitioning from traditional cushioned (CF) to minimalist footwear (MF) on running economy (RE) and performance. METHODS: Thirteen healthy, trained adults, 9 males and 4 females (age: 26±4 years, height: 1.78±0.05 m, weight: 78.2±11.2 kg, BMI 24.34±2.9 kg/m²) were recruited. The intervention group used minimalist shoes for 8 wks and the control group used their regular shoes. Both groups ran a steady-state 5 km and a maximal effort 5 km. During the intervention phase, participants ran in their usual running shoes or in minimalist shoes. RESULTS: Significant improvements in RE (5.7%) were observed for running in MF at 80% of v\text{VO}_\text{max} (from 228.4 to 221.8 mL·kg\(^{-1}\)·km\(^{-1}\), \(p=0.0186\)) and 90% of v\text{VO}_\text{max} (from 222.9 to 217.9 mL·kg\(^{-1}\)·km\(^{-1}\), \(p=0.0479\)) for running in MF at 90% of v\text{VO}_\text{max}. Interestingly, the VO\text{2} values of the intervention group showed a reduction from 222.4 to 217.5 mL·kg\(^{-1}\)·min\(^{-1}\) (\(p=0.0479\)) for running in MF at 90% of v\text{VO}_\text{max}. The VO\text{2} values were also reduced for the intervention group (training in MF) when running CF at 80% (from 228.4 to 221.8 mL·kg\(^{-1}\)·km\(^{-1}\), \(p=0.0186\)) and 90% (from 222.9 to 217.9 mL·kg\(^{-1}\)·km\(^{-1}\), \(p=0.092\)) of v\text{VO}_\text{max}. For all other stages and the control group (training in CF) no significant differences were observed. Five participants in the control group and two participants in the intervention group did not finish the study (respectively one injury per group). CONCLUSION: In this study, transitioning to MF improved the RE for running in MF and in CF. Within the debate of pros and cons of (simulated) barefoot running, this adds evidence for improvements when transitioning gradually in small steps over 8 weeks to MF. Future research should investigate dose-response relationships and effects on running performance.

Both serum lipoprotein subclass pattern and cardiiorespiratory fitness (CRF) are strong predictors of cardiovascular (CV) health in adults. By means of chemical measurements techniques and multicomponent data analysis more detailed descriptions of lipoprotein distributions can now be acquired. These sophisticated methods allow for a better understanding of how CRF impacts CV health through its association to lipoprotein pattern. PURPOSE: Determine the association between lipoprotein subclass pattern and CRF in prepubertal children by using a combination of sophisticated chemical measurements techniques and multicomponent data analysis. METHODS: Serum concentrations of lipoprotein subclasses were quantified in 94 (64% boys) ethnic rural Norwegian 10-year-old children. Twenty-four lipoprotein features were used as input to multivariate regression analysis to investigate the underlying pattern describing CRF. CRF was measured in two ways: 1) directly by a peak oxygen consumption (VO\text{2peak} \text{max}) test using a continuous running to exhaustion treadmill protocol, 2) indirectly by the 10-minute Andersen intermittent field test. Predictive cross-validated multivariate regression models, including BMI and sex, were obtained for both CRF measures. RESULTS: CRF correlated positively to average particle size for high-density lipoprotein (HDL) and its subclasses of large HDL particles and

Abstracts were prepared by the authors and printed as submitted.
negatively to triglycerides (TGs) and average size and concentration of very low-density lipoprotein (VLDL). BMI was negatively correlated to children’s CV health. Furthermore, the Andersen test showed even stronger association to children’s lipoprotein pattern compared to the VO2peak-test. This is consistent with a closer matching of muscle microvascular O2 delivery to utilization over a greater range of aerobic power in children. The mechanisms contributing to this improved regulation of muscle blood flow during exercise in children warrant further study.

### Methods:

Four healthy males (27 ± 3 years, 1.78 ± 1.1 m) performed 2 bouts of CON and INT on separate days, each bout lasting 6 min at an intensity of 80% of the difference between peak VO2 and LT (±50%). In the INT condition, 3 recovery periods (20 s) were inserted every 10 s for the last 3 min of exercise. The work rate (WR) for the INT protocol corresponded to an intensity greater than 80% of peak VO2, which resulted in the same total work (i.e., area under the work curve) performed in CON. Pulmonary VO2 and heart rate were recorded breath-by-breath, while muscle activation (vastus medialis (VM), vastus lateralis (VL)) was assessed by surface electromyography (EMG).

#### Results:

The phase II rVO2 (CON: 24.6 ± 10.8 s; INT: 25.0 ± 4.5 s) and Vo2(SC), as measured by ∆VO2/WR, was similar between CON and INT (±2.6 ± 1.9 mL/min). In CON, 34% of the work was performed at exactly 80% of VO2peak (±50%), whereas in INT, this value was 28%.

#### Conclusion:

The magnitude of the VO2(SC) and muscle activation in response to heavy intensity continuous (CON) and intermittent (INT) exercise when the same total work was performed was similar. Future studies should focus on the relationship between VO2peak and the Andersen test to determine the most accurate field test to evaluate CRFs.

### Introduction:

Body weight exercises (BWE; push-ups, squats, lunges) are popular modes of exercise, yet little is known regarding their effects on caloric expenditure. Classic hypertrophy training results in up to four-hour excess post-exercise oxygen consumption (EPOC) and elevated 24-hour resting metabolic rate (RMR). The purpose of this study was to determine if BWE 1) alters the length and amount of EPOC and 2) increases 24-hour RMR. Methods: Four healthy adult volunteers (3 males, 1 female; age 22.2 ± 2.7 years; height 168 ± 11cm, mass 74.7 ± 18.6kg, body fat 27.8 ± 4.7%) consumed standard diets and underwent two RMR measures [pre-(morning) and post- (following morning) BWE]. Three hours following pre-RMR, participants completed a BWE bout [4 sets of push-ups (~9 reps), squats (~14 reps), and lunges (~14 reps)], followed by a 4 hour EPOC test. To standardize the work done participants performed 1-repetition maximum tests for bench-press and leg-press (to determine number of repetitions for BWE). Results: It was found that a bout of BWE elevated relative VO2 (rVO2; mL/kg/min) and energy expenditure post-exercise. When comparing pre-RMR to EPOC there was a significant difference at minute 15 in both rVO2 (p<0.02) and caloric expenditure (p<0.05). Yet, there was no significant difference in both rVO2 and caloric expenditure when pre-RMR and post-RMR were compared. Conclusions: As expected, we found that EPOC occurs after BWE, but is only elevated up to 30 minutes after exercise. This shows that BWE is an efficient and practical way to elevate metabolic rate, leading to increased caloric expenditure while potentially saving time and money. More participants are needed to fully understand the physiological implications of BWE related to caloric expenditure in healthy adults.
Critical power (CP) is a fundamental parameter in defining high-intensity exercise tolerance, however, its physiological determinants are unclear. CP has been shown to correlate with the phase II time constant (τ) of oxygen uptake (VO2) kinetics, however causative evidence confirming this effect is lacking. A prior bout of high-intensity “prime” exercise CP τ in the supine, but not upright, position; therefore τ is causally related to CP priming exercise would be expected to increase CP in the supine but not upright position. PURPOSE: To determine the impact of priming exercise on τ and CP in the supine and upright body positions. METHODS: 16 healthy men were assigned to either upright or supine groups, and completed an incremental ramp test to determine VO2 max and the gas exchange threshold. This was followed by 8 visits whereby CP, pulmonary VO2, and muscle deoxyhaemoglobin ([HHb]) via near infrared spectroscopy (NIRS) kinetics were determined. RESULTS: VO2 kinetics were analyzed using Student’s t-test. Pearson product correlation coefficient (r) and intraclass correlation coefficient (ICC) were calculated. RESULTS: VO2 peak and end-exercise blood lactate were measured during both conditions. RESULTS: In Study 1, CP estimates from repeated F-3MT were not different (test 1: 273 ± 52 W vs test 2: 276 ± 58 W; P > 0.05), with an intraclass correlation coefficient of r = 0.99 (P < 0.05) and typical error of 5 W (2%). In Study 2, CP was lower in the F-3MT (282 ± 52 W) compared to C-3MT (306 ± 56 W; P < 0.05). Further, VO2 peak and end-exercise lactate were not different between exercise bouts performed above (4.05 ± 0.41 L·min−1) and below F-3MT CP (3.93 ± 0.50 L·min−1) but the VO2peak values were lower than the VO2max in the ramp incremental test (4.33 ± 0.52 L·min−1) (both P < 0.05). CONCLUSION: The CP estimates in a 3 min all-out test evidenced high reliability in a fatigued state. We found that exercise in close proximity below the CP in the fatigued state was not sustainable beyond ~18 min and did not exhibit steady state blood lactate. VO2 responses during exercise above and below CP were characterised by inability to attain the same VO2max as in the rested state. These findings suggest that the well-characterised physiological definition of the CP is altered under conditions of extreme fatigue.
Pedometers may be used to estimate participation in physical activity (PA) of moderate-to-vigorous intensity. Step rate thresholds for moderate-to-vigorous PA varying by height have been developed in research employing primarily locomotion activities. Whether pedometer output can accurately predict the energy cost across different locomotion, occupational, and household activities, and during sedentary behavior has not been thoroughly studied. PURPOSE: We examined if step rate and height predict the rate of oxygen uptake (VO2) across different types of activities and sedentary behavior. Following development of a prediction model, we also evaluated its accuracy. METHODS: Participants were 36 healthy young adults (21 ± 4 yrs; 16 women). They completed 8 activity/position categories (sitting; b) walking at 2.5 mph; c) walk at 3.5 mph and 5% grade; d) jog at 5 mph; e) moving a box between 2 carts 7m apart; f) washing dishes; g) ascending and descending a 20-step staircase; and h) vacuuming. We measured VO2 with a portable open-circuit spirometer and step rate with a pedometer (NL-1000, New Lifestyles) worn on the non-dominant hip. We used multi-level regression to predict VO2, accounting for nesting of observations within participants. Possible predictors included step rate, step rate square, and height. Using VO2 predicted from the model, we determined the absolute percent error across all activities combined and at each activity separately. RESULTS: Significant predictors of VO2 were step rate and its square (p ≤ 0.001; R2 = 0.72), but not height. The prediction equation was VO2 = 7.630 ± 0.0872 ⋅ step rate + 0.0004 ⋅ step rate2. Absolute error across all activities combined was 29.4 ± 27.3%. Absolute error differed between activities (p < 0.001): (a) sitting, 66 ± 30%; (b) walk at 2.5 mph, 62 ± 25%; (c) walk at 3.5 mph, 11 ± 13%; (d) jog, 16 ± 17%; (e) moving box, 15 ± 14%; (f) washing dishes, 15 ± 15%; (g) stairs, 22 ± 8%; and (h) vacuuming, 29 ± 13%. CONCLUSION: Pedometer-determined step rate and its square are significant predictors of VO2 across different activities and sedentary behaviors in healthy young adults. Height does not contribute to VO2 prediction. Accuracy of prediction across activities is low to moderate.

Consistent evidence has been presented regarding the potentially deleterious health consequences of prolonged sitting time independent of physical activity level. Zero cadence (0 steps/min) determined using accelerometers may be a suitable proxy for discriminating seated activities from common daily living activities. Based on this preliminary analysis it appears that accumulated time spent at zero cadence obtained for discriminating seated activities from common daily living activities. Based on this preliminary analysis it appears that accumulated time spent at zero cadence obtained for discriminating seated activities from common daily living activities.
4-minute trials of treadmill ambulation at 6 different speeds ranging from 2.24 to 3.35 m∙s⁻¹ while wearing one device on the lateral aspect of each ankle, directly above each malleolus for a total of 2 devices overall. Each device was programmed using either the “default” setting or “Quick Step” setting. A counterbalanced design was used to minimize order effect. Direct observation was used as the criterion of step count (total steps/trial). One-way repeated measures ANOVAs were used to determine differences between step count estimates from devices/settings at the ankle compared to criterion. ANCOVAs were used to determine the impact of stride length and cadence on device determined step counts. Mean absolute percent error (MAPE) was also determined for all running speeds. RESULTS: StepWatch determined steps were significantly different from criterion for all speeds regardless of device setting (p < 0.05), with the exception of device “Quick Step” setting at 2.24 m∙s⁻¹ (p = 0.18) and MAPE was < 3% (19). MAPE values for the default setting were ≥ 24.4% for all treadmill speeds. The remaining MAPE values for the “Quick Step” setting were ≥ 4.9% for treadmill speeds beginning at 2.46 m∙s⁻¹. When stride length was considered, StepWatch determined steps were not statistically different from criterion for all speeds regardless of device setting. CONCLUSION: StepWatch default and “Quick Step” settings do not accurately report steps at ambulatory speeds ≥ 2.24 m∙s⁻¹, with the exception of device “Quick Step” setting at 2.24 m∙s⁻¹. After accounting for stride length, device output accurately reported steps regardless of device setting and treadmill ambulation speed.

Further research is needed to explore the advanced setting features of the StepWatch with a goal of improving accuracy.
Physical activity decreases the risk of chronic disease, while sedentary behavior increases this risk. Questionnaires are an easy, inexpensive way to quantify sedentary behavior. However, there tends to be error with self-report. PURPOSE: To compare time in sedentary behaviors assessed via activity monitor (objective) with sedentary time calculated by self-report (subjective). METHODS: Office staff and administrators with a sedentary job description at a University were recruited. The activPAL3 activity monitor was placed on the participants’ (n = 44) thigh and worn continuously for seven days. Participants completed the Occupational Sitting Questionnaire (OSPAQ) and Paffenbarger Physical Activity Questionnaire (PPAQ) for the timeframe that the activPAL3 was worn. Data were expressed in total time (hrs/day) spent sedentary over a typical work week. A Pearson Product Correlation was utilized to examine the relationship between the subjective sedentary time at work (OSPAQ) and over a 24hr period (PPAQ) and objective (activPAL3) sedentary time.

The agreement between the objective and subjective assessments was evaluated using a Bland-Altman analysis. Differences between objective and subjective scores for each individual were calculated and the mean error was determined. RESULTS: Participants were predominantly Caucasian (95%), middle-aged (48 y ± 10), and had an average BMI (30.5 ± 8.2). A positive, weak correlation between sedentary time assessed subjectively from the OSPAQ (r = .10; p = .518) and PPAQ (r = .317; p = .056), and objectively by the activPAL3 activity monitor was found. The mean error of the sedentary time calculated during the workday was approximately one hour (1.07 ± 1.02) and approximately four hours (3.52 ± 2.31) for the entire day, with most participants understimating sedentary time. The Bland Altman analysis found no systematic bias in the OSPAQ (p = .743), while a trend of proportional underestimation bias in the PPAQ (p = .001) was found relative to the activPAL3 measures. CONCLUSION: Self-reported sedentary time subjectively assessed by the PPAQ and OSPAQ was weakly correlated to sedentary time objectively assessed by the activPAL3 activity monitor over a 24 hour period and while at work. The lack of a relation demonstrated substantial error in self-reported assessment.

Advancements in physical activity measurement now afford researchers the capacity to estimate distances from devices, which provide radio propagation measurements to estimate energy expenditure (EE). However, further research is needed to interpret the available proximity data to measure proximity between accelerometers using Bluetooth low energy hardware. However, the validity and correlations on these measurements are lacking especially in the older adult population. American Association of Retired Persons (AARP) questionnaire and Community Healthy,Activities Model Program for Seniors (CHAMPS) questionnaire are common self-reported questionnaires. The purpose of the study was to examine which self-reported physical activity instruments correlated with objective data from ActiGraph accelerometers and fitness tests. We also compared outcomes from the above instruments with total EE (TEE) measured by the gold standard of doubly labeled water (DLW).

METHODS: Data sets were obtained from the Interactive Diet and Activity Tracking in AARP (IDATA) study through the National Cancer Institute. A total of 681 participants aged between 50-74 years were included in the analysis. The outcomes of our interest from each instrument were as follows: total number of steps and EE from CHAMPS and the other objective measures. Each instrument was compared to estimate energy expenditure (EE). However, the validity and correlations on these measurements are lacking especially in the older adult population. American Association of Retired Persons (AARP) questionnaire and Community Healthy,Activities Model Program for Seniors (CHAMPS) questionnaire are common self-reported questionnaires. The purpose of the study was to examine which self-reported physical activity instruments correlated with objective data from ActiGraph accelerometers and fitness tests. We also compared outcomes from the above instruments with total EE (TEE) measured by the gold standard of doubly labeled water (DLW).

METHODS: Data sets were obtained from the Interactive Diet and Activity Tracking in AARP (IDATA) study through the National Cancer Institute. A total of 681 participants aged between 50-74 years were included in the analysis. The outcomes of our interest from each instrument were as follows: total number of steps and EE from CHAMPS and the other objective measures. Each instrument was compared to estimate energy expenditure (EE). However, the validity and correlations on these measurements are lacking especially in the older adult population. American Association of Retired Persons (AARP) questionnaire and Community Healthy,Activities Model Program for Seniors (CHAMPS) questionnaire are common self-reported questionnaires. The purpose of the study was to examine which self-reported physical activity instruments correlated with objective data from ActiGraph accelerometers and fitness tests. We also compared outcomes from the above instruments with total EE (TEE) measured by the gold standard of doubly labeled water (DLW).

METHODS: Data sets were obtained from the Interactive Diet and Activity Tracking in AARP (IDATA) study through the National Cancer Institute. A total of 681 participants aged between 50-74 years were included in the analysis. The outcomes of our interest from each instrument were as follows: total number of steps and EE from CHAMPS and the other objective measures. Each instrument was compared to estimate energy expenditure (EE). However, the validity and correlations on these measurements are lacking especially in the older adult population. American Association of Retired Persons (AARP) questionnaire and Community Healthy,Activities Model Program for Seniors (CHAMPS) questionnaire are common self-reported questionnaires. The purpose of the study was to examine which self-reported physical activity instruments correlated with objective data from ActiGraph accelerometers and fitness tests. We also compared outcomes from the above instruments with total EE (TEE) measured by the gold standard of doubly labeled water (DLW).
Traditional methods for analyzing accelerometer activity counts rely on the assumption that there is a linear relationship between counts and increasing energy expenditure. However, this relationship varies depending on the type of activity being performed and intermittent activities can have a 2-3 fold higher energy cost than walking and running at the same count level. PURPOSE: This study explored the effects of using the 75th percentile of counts to characterize the relationship between counts and energy expenditure (EE) in an effort to make walking/running counts more comparable to counts from intermittent activities. METHODS: Twenty-nine participants completed ten lifestyle activities ranging from sedentary behaviors to vigorous intensities for seven minutes each. Participants wore an ActiGraph GT9X on the right hip. A Cosmed K4b2 was used as the criterion measure of EE. Acceleration data was converted to 5-s epochs. Oxygen consumption data from the Cosmed was averaged over 30-s and converted to metabolic equivalents (METs) for each activity (1 MET = 3.5 ml/kg/min). Mean counts and 75th percentile of the 5-s counts for y-axis and vector magnitude (VM) were calculated using the middle 4-min from each activity bout. The relationship between activity counts and METs was summarized using R2 values. RESULTS: Across all activities, the y-axis mean counts and METs had a R2 of 0.789, which was improved to a R2 of 0.835 when using the 75th percentile of the y-axis counts. For the VM mean and 75th percentile count metrics, the R2 was 0.871 and 0.875, respectively. CONCLUSIONS: The relationship between EE and y-axis counts can be improved using the 75th percentile of the counts. However, both VM count metrics had a stronger relationship to EE than their y-axis counterparts. This new count metric may provide an alternative for those utilizing data collected with older single axis accelerometers.

Previous studies report that walking cadence (steps/min) is strongly correlated with percentage of maximum heart rate. The aim of this study was: 1) to investigate the relationship between cadence and percentage of maximum heart rate (%HRmax), an often used proxy-measure of intensity; and 2) to specifically identify cadence cut points associated with ACSM defined %HRmax thresholds for moderate and vigorous intensity. METHODS: Ten men and 10 women representing each 5-year age-group category between 21-40 years (total n=80; mean [±SD] age 29.8±6.7 years; BMI 24.8±3.4 kg/m2) were recruited. Participants completed a treadmill walking test comprised of 5-min bouts at incrementally faster speeds from 0.5 to 6 mph, with a 2-min rest between bouts. The test was terminated at the completion of the 5-min bout during which the participant began to achieve >75% HRmax, or reported a Borg rating of perceived exertion >13. Cadence was visually observed (steps per bout / 5 min) and heart rate (HR) was measured using a visual HR monitor. RESULTS: The half of the variance in %HRmax was explained by cadence (i.e., R2=0.54, least-squares bilinear regression model) with the bilinear break point at 103 steps/min. Cadence cut points (95% prediction intervals) for 64% and 77% of estimated HRmax were 128.6 (106.9-149.04) and 146.3 (124.6-164.5) steps/min, respectively. CONCLUSION: Cadence explained over half of the variance in %HRmax, with ~130 steps/min and ~145 steps/min representing reasonable heuristic (i.e., guiding) values for moderate and vigorous intensity, respectively. Further analysis is warranted investigating the cadences associated with moderate and vigorous intensity defined by percentage of HR reserve. This may account for some of the inter-individual variability in resting HR and HR response, thereby strengthening the relationship observed. Supported by NIH/NIA Grant 5R01AG049024-03 - CADENCE-Adults study
purposes of this study was to validate a smart shirt for assessment of physiologic and
variables. Among elderly subjects who perceive themselves as having poor fitness, it would be important to find factors associated with
accuracy of intention to physical activity (PA) behavior has been weak. PURPOSE: To determine if subjective (i.e. self-report) vs objective (accelerometer) measures impact the predictive accuracy of intention in physical activity behavior in children ages 9-12 years. METHODS: 210 5th and 6th grade students completed a 17-item RAA survey assessing after-school active play. Extensive pilot work was performed to ensure the instrument was developmentally appropriate for the target population. The survey was administered on Monday inquiring about after-school active play that same week. On Friday, self-reported (SR) behavior was assessed by two questions during a face-to-face, semi-structured interview. Accelerometer (AC) was used as an objective measure of after-school active. Students wore an AC on the hip during waking hours, for the school week. Minutes spent in moderate-vigorous PA during the hours of 3:00- 8:00 PM were determined using ActiLife software and the Evenson (2008) cutpoints. The strength of relationship between Intention and SR, and between Intention and AC, was measured via Pearson correlations. Multivariate linear regression was used to determine the predictive ability of Intention for the number of days the behavior was performed as determined by SR and AC. RESULTS: 100 participants met the AC wear inclusion criteria (female=60%; fifth grade = 48%, age = 11.25 ±0.58y: height = 149.5 ±14. cm, weight = 45.3 ± 13.4 kg). Intention was significantly correlated to both SR (r=0.679; p < 0.01) and AC (r=0.268; p< 0.01). SR was better predicted by intention than AC (F=83.84; p<0.01 vs. F=7.57; p<0.01), explaining 46.1% and 7.2% of the variance, respectively. CONCLUSION: SR should be used to measure PA when using the RAA, due to the higher predictive ability, compared to AC. The stronger relationship between intention and SR is likely due to the higher correspondence between the measures. The developmental appropriateness of the measures may have also contributed to the higher predictive ability seen in this study, compared to other studies.

**CONCLUSIONS**

The smart shirt performed well estimating and heart rate, but performed poorly estimating kcals, breathing rate and breathing volume. Future research should further examine accuracy of this smart shirt during sport-specific activities as well as in free-living protocols. This study was supported by the Alma college CORE Research Grant.

**RESULTS**

Smart shirts are embedded with sensors to collect physiologic data (e.g., heart rate and breathing rate/volume) and an accelerometer to assess kilocalories (kcals) and steps. Percent (%) errors were calculated between smart shirt estimates and criterion measured variables. A threshold of 10% was used for low (≤10%) vs. high (>10%) predictive error. Paired samples T-tests were conducted to determine significant differences between smart shirt estimates and criterion measurements with p<0.05 used to denote statistical significance.

**PURPOSE** To study the relationship between self-reported fitness and objectively measured physical activity and sedentary behavior among elderly. METHODS: The study is based on the older Finnish Twin cohort. All same-sex twin pairs born 1940-1944 with both co-twins alive were invited to participate in the study. They first participated in a telephone interview followed by an active objective monitoring (a hip-worn triaxial accelerometer, Hookie AM20) and activity related questionnaire. By end of 2015, altogether 406 individuals (mean age 74 years, 209 male and 197 female) had used accelerometer for at least four days and had answered a following question on perceived fitness: “Is your current physical fitness in your opinion; 1) Very good 2) Fairly good 3) Satisfactory 4) Fairly poor 5) Very poor. Groups four and five were combined for the analyses. In this study twins were studied as individuals. Analysis was done using linear regression and Sidak post-hoc test was used to analyses differences between fitness groups.

**RESULTS: According to preliminary data, self-reported fitness explained moderately different objectively measured activities as R-squared for daily steps was 29% (p<0.001), for overall daily MET 29% (p<0.001) and sitting down 32% (p<0.001).**

Better self-reported fitness was associated with more steps taken an average each day (p<0.001), for overall daily MET 29% (p<0.001) and sitting down 32% (p<0.001).

According to preliminary data, self-reported fitness explained moderately different objectively measured activities as R-squared for daily steps was 29% (p<0.001), for overall daily MET 29% (p<0.001) and sitting down 32% (p<0.001).

## Summary

**Purposes**

The purposes of this study were to validate a smart shirt for assessment of physiologic and physical activity variables.

**Methods**

Participants (n=32) aged 18-51 years wore a smart shirt and performed 15 total activities, 12 in the laboratory and 3 on a 200-m indoor track. Lab activities were performed for 5 min each and included sitting, standing, walking at various speeds (2.0, 3.0, 3.5-4.0 miles/hr) and inclines (0%, 5%, 10%), jogging, and cycling. Track activities included self-paced walking (200, 2 m speeds) and jogging (400 m). Steps, kcals, heart rate, and breathing rate and volume from the smart shirt were compared to criterion measures (metabolic analyzer for kcals and breathing rate/ volume, pedometer for steps, and pulse oximeter for heart rate). Percent (%) errors were calculated between smart shirt estimates and criterion measured variables. A threshold of 10% was used for low (≤10%) vs. high (>10%) predictive error. Paired samples T-tests were conducted to determine significant differences between smart shirt estimates and criterion measurements with p<0.05 used to denote statistical significance.

**Results**

Estimates made by the smart shirt had high % error (shown as mean [standard error] for kcals (29.8% [3.1]), breathing rate (19.4% [4.3]), and breathing volume (33.6% [3.8]). The smart shirt had low % error for steps (9.4% [0.7]) and heart rate (2.7% [0.3]). For all activities, kcals and breathing rate and volume performed poorly (<10% error), whereas heart rate had <10% error for all activities. Step predictions were significantly underestimated for slow walking speeds (16.7%±3.1%, p<0.05), and kcals were significantly overestimated during all activities (5.6±9.7%, p<0.05).

**Conclusions**

The smart shirt performed well estimating and heart rate, but performed poorly estimating kcals, breathing rate and breathing volume. Future research should further examine accuracy of this smart shirt during sport-specific activities as well as in free-living protocols.
ACCELEROMETER: ActiGraph wear-time sensors yielded inferior wear detection performance and superior non-wear detection performance over Troiano 2007 and Choi 2011 algorithms. Motion-based algorithms may have inferior non-wear detection capabilities because of a reliance on pre-determined durations of inactivity (i.e. 20-60 min) to classify non-wear. This strategy may not distinguish between the lack of motion that occurs during both monitor wear and non-wear. Conversely, ActiGraph wear sensors are capable of making this distinction. The inferior wear detection performance of the ActiGraph wear-sensor may stem from the sensor’s exclusive reliance in detecting skin conductance. For example, a loose strap may inaccurately yield a higher rate of non-wear.

CONCLUSIONS: ActiGraph wear-time sensors yielded inferior wear detection performance and superior non-wear detection performance over Troiano 2007 and Choi 2011 algorithms. Motion-based algorithms may have inferior non-wear detection capabilities because of a reliance on pre-determined durations of inactivity (i.e. 20-60 min) to classify non-wear. This strategy may not distinguish between the lack of motion that occurs during both monitor wear and non-wear. Conversely, ActiGraph wear sensors are capable of making this distinction. The inferior wear detection performance of the ActiGraph wear-sensor may stem from the sensor’s exclusive reliance in detecting skin conductance. For example, a loose strap may inaccurately yield a higher rate of non-wear.

2303 Board #316 June 1 2:00 PM - 3:30 PM
A Decision-tree Model For Classifying Physical Activity Types Using A Three-axis Accelerometer In Japanese Adults
Hideaki Hoshino1, Ryuji Takigawa1, Motohiko Miyachi, Haruka Murakami2, Shigeo Tanaka1, Ryoko Kawakami1, Satoshi Nakae1, Kiyoji Tanaka, FACSM2, Kazunori Ohkawara1. 1University of Electro-Communication, Tokyo, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3Waseda University, Saitama, Japan. 4University of Tsukuba, Ibaraki, Japan.

Methods: These results suggest that the decision tree is a valid method for physical activity classification in Japanese subjects. The addition of other features and classification methods, e.g., random forest, needs to be discussed in future studies.

CONCLUSIONS: These results suggest that the decision tree is a valid method for physical activity classification in Japanese subjects. The addition of other features and classification methods, e.g., random forest, needs to be discussed in future studies.

2305 Board #318 June 1 2:00 PM - 3:30 PM
Recognising Bone Loading Exercises In Older Adults Using Machine Learning
Shirin Ehsanaei1, Nazli Farajidarav1, Alireza Ahrabian1, Payam Barnaghi1, Kimberly Hannam1, Kevin Deere2, Jon H. Tobias3, Sarah J. Allison3. 1University of Surrey, Guildford, United Kingdom. 2Bristol University, Bristol, United Kingdom.

Machine learning has been used to accurately recognise physical activity patterns; however, classifiers for recognising targeted bone loading exercises have not been developed. PURPOSE: The purpose of this study was to determine the accuracy of machine learning models for classifying the intensity of exercises necessary for bone adaption in older adults. METHODS: Triaxial accelerometer data was collected from forty-four older participants (60-70 yrs) wearing a GCDC X16-I accelerometer on their hip during three aerobics classes consisting of impact aerobic exercises performed at high and low intensities. Multi-class support vector machine (M-SVM) classifiers were trained in parallel for activity type detections where one classifier trained with low intensity activity samples and the other with high intensity samples. In a multi-view scoring manner, the classification confidence of these two learners was utilised for predicting the activity intensity. The leave-one-out cross-validation technique was used for assessment purpose. RESULTS: Overall recognition accuracy of the M-SVM classifier for detecting exercise intensity was 73%. For each aerobics class, the M-SVM classifier accurately recognised exercise intensity by 82%, 73%, and 65%. CONCLUSIONS: Machine learning techniques such as M-SVM accurately recognised the intensity of bone promoting exercises from triaxial accelerometer data in community-dwelling older adults. First results of the developed classifier demonstrate significant potential of machine learning models for the evaluation of exercise adherence and performance in older adults.

2306 Board #319 June 1 2:00 PM - 3:30 PM
Validation Of A Physical Activity Monitor As A Measure Of Energy Expenditure During A Circuit-style Workout With Females Who Are Overweight Or Obese
Lauren G. Killen, 356321, John M. Coons2, Vaughn W. Barry3, Dana K. Fuller2, Jenn L. Caputo2. 1University of North Alabama, Florence, AL. 2Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Matt Green, FACSM)

While the SenseWear Armband has been validated for a variety of physical activities, it has not been validated with circuit-style exercise for individuals who overweight or obese. PURPOSE: The purpose of this study was to validate the SenseWear Armband for measuring energy expenditure in overweight or obese females during circuit-style training. METHODS: Overweight and obese females, N = 40, 20-59 years of age, completed a pre-recorded circuit-style exercise session consisting of eight exercises. An SenseWear Armband and portable metabolic analyzer were worn by each participant throughout the exercise session to measure energy expenditure. RESULTS: While the total overall energy expenditure between devices was not significantly different (p = .882), both energy expenditure excluding rest periods (p < .001) and rest periods between exercises (p= .907) were significantly different when the SenseWear Armband was compared to the portable metabolic analyzer. The SenseWear Armband overestimated exercise energy expenditure, but underestimated rest period energy expenditure compared to the portable metabolic analyzer. CONCLUSION: The results suggest females who are overweight or obese could use a SenseWear Armband to aid in tracking caloric expenditure with circuit-style training. However, care must be used if looking at individual exercise components.

THURSDAY, JUNE 1, 2017

Abstracts were prepared by the authors and printed as submitted.
Board #320

June 1 2:00 PM - 3:30 PM

Accuracy Of Behavioral Assessment With A Wearable Camera in Semi-structured And Freely Living Conditions In Older Adults.

Nora E. Miller, Whitney A. Welch, Aiden Doherty, Scott J. Strath, FACSM¹. ¹University of Wisconsin - Milwaukee, Milwaukee, WI. ²Northwestern University, Chicago, IL.

Email: nem2@uwm.edu

(No relationships reported)

PURPOSE: To examine the congruency of wearable cameras (WC) and direct observation (DO) to identify posture, activity type, and time during semi-structured (Semi) and freely living (Freely) conditions in older adults.

METHODS: 86 females volunteered. Ss underwent testing for VO2Max, body composition, and 1-RM for chest press (CP) and leg press (LP). WC and DO were administered independently for posture (sedentary, standing, moving), activity category (sedentary, walking, household, exercise/sport), and type (laundry, dishes, cooking, general cleaning). Cross tabs and Kappa statistics were run to assess accuracy between the WC images and the DO results across both conditions for observations. Time spent in each activity category was used to calculate the WC images and the DO results across both conditions for observations. Time spent in each activity category was used to calculate

RESULTS: Posture had a 96.4% (Kappa=0.93; SE=0.10; p=0.0001) and 93.1% (Kappa=0.89; SE=0.07; p=0.0001) agreement between the WC and DO during the Semi and Freely conditions, respectively. For activity category, there was 76.7% (Kappa=0.42; SE=0.10; p=0.0001) and 94.6% (Kappa=0.92; SE=0.08; p=0.0001) agreement between the WC and DO during the Semi and Freely conditions, respectively. For activity type, obtained from Free only, there was 100% (Kappa=1.0; SE=0.20; p=0.0001) agreement across measures. WC total time spent in seconds was not significantly different to that obtained from the DO for posture during Semi (168±147 vs. 199±50, z=0.9342) or Freely conditions (1341±144 vs. 1400±117, z=0.3170). For activity category, time spent in each category did not significantly differ for Semi (WC = 162±38 vs. DO = 171±44, z=0.7348) or Freely (WC = 1082±322 vs. DO = 1256±342, z=0.4806). For activity type, time estimates for Free only were not statistically different 827±333 for WC and 145±70 for DO, z=0.7459.

CONCLUSIONS: Results from this study suggest that there is high congruency between wearable cameras and direct observation for behavioral observations and time spent in posture, activity category and type.

Board #321

June 1 2:00 PM - 3:30 PM

Metabolic Cost Of Resistance Exercise

Eric W. Slattery, Randal Claytor. Miami University, Oxford, OH. (Sponsor: Helaine Alessio, FACSM)

Email: slatteew@miamiOH.edu

(No relationships reported)

PURPOSE: Determine if the Total O2 cost (TO2) of RE differs during & following RE as a function of RE type & relative intensity (RI) & Determine if TO2 during & following RE, differs across 3 RI, when the volume of work is held constant.

METHODS: 86 females volunteered. Ss underwent testing for VO2Max, body composition, & 1-RM for chest press (CP) and leg press (LP). WC and DO were administered independently for posture (sedentary, standing, moving), activity category (sedentary, walking, household, exercise/sport), and type (laundry, dishes, cooking, general cleaning). Cross tabs and Kappa statistics were run to assess accuracy between the WC images and the DO results across both conditions for observations. Time spent in each activity category was used to calculate

RESULTS: Posture had a 96.4% (Kappa=0.93; SE=0.10; p=0.0001) and 93.1% (Kappa=0.89; SE=0.07; p=0.0001) agreement between the WC and DO during the Semi and Freely conditions, respectively. For activity category, there was 76.7% (Kappa=0.42; SE=0.10; p=0.0001) and 94.6% (Kappa=0.92; SE=0.08; p=0.0001) agreement between the WC and DO during the Semi and Freely conditions, respectively. For activity type, obtained from Free only, there was 100% (Kappa=1.0; SE=0.20; p=0.0001) agreement across measures. WC total time spent in seconds was not significantly different to that obtained from the DO for posture during Semi (168±147 vs. 199±50, z=0.9342) or Freely conditions (1341±144 vs. 1400±117, z=0.3170). For activity category, time spent in each category did not significantly differ for Semi (WC = 162±38 vs. DO = 171±44, z=0.7348) or Freely (WC = 1082±322 vs. DO = 1256±342, z=0.4806). For activity type, time estimates for Free only were not statistically different 827±333 for WC and 145±70 for DO, z=0.7459.

CONCLUSIONS: Results from this study suggest that there is high congruency between wearable cameras and direct observation for behavioral observations and time spent in posture, activity category and type.

Board #322

June 1 2:00 PM - 3:30 PM

A Comparison Between Actual Energy Expenditure Measurements And A System Dynamics Model Output

David L. Wenos, Michael L. Deaton. James Madison University, Harrisonburg, VA. Email: wenosdl@jmu.edu

(No relationships reported)

Portable metabolic units afford a practical utility for field measurements of energy expenditure (EE). This methodology has proven useful to assess EE related to terrain, intensity, and duration during a single event. Similarly, system dynamics (SD) modeling has been used to describe the relationship between exercise and obesity as it relates to EE. However, there is paucity of literature that report SD to predict EE in real time. 

PURPOSE: To compare actual EE from a portable metabolic unit to predicted EE from a System Dynamics model.

METHODS: Seven subjects (4 males, 3 females; 24.4 ± 1.71) walked selected routes of varied terrain paced by a metronome at 2.7 mph. EE was measured using a Cosmed K4b2 portable metabolic unit with each subject completing four trials per route. An integrated GPS receiver recorded latitude and longitude coordinates of each route. The modeling software STELLA was used to design the SD model which incorporates subjects’ weight, walking pace, route elevation profile and distance. Pandolf’s et al (1977) prediction equation for EE was run in the model to compare with the real-time K4b2 data.

RESULTS: In simulation modeling parameters (stocks and flows) are adjusted to increase accuracy. Model parameters were adjusted to provide agreement for EE to within +/- 1% of the actual total EE as measured by the Cosmed K4b2 unit. A paired t-test comparing the actual versus the SD model predictions of total EE were not significantly different (p = 0.9342).

CONCLUSION: It appears that SD modeling can be an effective tool to predict EE of individuals walking on varied terrain. Once user parameters have been entered, simulation modeling can provide feedback on EE with suitable accuracy of a selected route. Compared to a single event measurement, SD allow users to compare EE of multiple defined routes simultaneously. Feedback has been identified as a critical component of adherence and motivation for physical activity. In this case of SD modeling, accurate feedback and route selection may encourage users to engage in regular physical activity.

Funded by James Madison University Office of Public Safety

Board #323

June 1 2:00 PM - 3:30 PM

Accuracy Of Wrist-worn Activity Monitors During Walking And Swimming

Eun Hye Kwon, John D. Smith. Texas A&M University San Antonio, San Antonio, TX. Email: eunhyme.kwon@tamusa.edu

(No relationships reported)

Wrist-worn activity monitor market has been growing at a rapid pace with many manufacturers. PURPOSE: To assess the accuracy of wrist-worn activity monitors during walking and swimming. METHODS: Twenty-seven participants (age=48.4±12.5 yrs, ht=1.71±1.90 cm, w=77.1±15.0 kg) were fitted with five wrist activity monitors (XT and VS on the left wrist, PL, MF, and LT on the right wrist). After walking for 200m at a self-selected pace and swimming freestyle for 200m at a self-selected pace, monitor counts and actual step counts from a hand tally (AC) were recorded. Repeated measures ANOVA was used to determine significant differences across monitors and activity. CONCLUSIONS: In this setting, percent error was calculated as [(monitor counts-actual counts)/actual counts]*100. RESULTS: All monitors registered counts significantly lower (p<0.05) than AC during the walk (26.8±40.5, 29.1±47.8, 20.8±33.8, 37.0±65.0, and 28.5±34.6 counts for XT, VS, MF, LT, and PL, respectively). Percent error was lowest in MF while walking, followed by XT, VS, and PL, and LT, respectively. Percent error was lowest in MF while walking, followed by XT, VS, and PL, and LT, respectively. Percent error was lowest in MF while walking, followed by XT, VS, and PL, and LT, respectively.

However, during the swim, vs exhibited the lowest percent error, followed by XT, MF, and LT, respectively. XT and VS were significantly higher (p<0.05) than AC during the swim (378±93.4 and 198.2±143.5 counts, respectively) while XT, VS, and MF were not significantly different than AC (21.8±139.4, 15.4±112.3, and 44.7±120.1 counts, respectively) while XT, VS, and MF were not significantly different than AC (21.8±139.4, 15.4±112.3, and 44.7±120.1 counts, respectively). For all monitors, VS exhibited the lowest percent error, followed by XT, MF, and LT, respectively. For all monitors, VS exhibited the lowest percent error, followed by XT, MF, and LT, respectively.

CONCLUSIONS: While four of five activity monitors registered less than 10% error during the walk, the differences in counts compared to AC was significant. It should be noted in some participants the step counts were extreme compared to the AC, thus the unusually high standard deviations. This was especially evident in the swim. The ability of a monitor to register a count is determined by the manufacturer and while different monitors have different construction, those who wear them do not always move in the same way, particularly in walking and swimming gait. These variables should be considered when using wrist-worn monitors to track different modalities of activity.
Falls are a significant concern for an aging population, with 14% of falls thought to occur during the transition from sitting to standing. **PURPOSE:** To determine the effect of chair rising speed on stabilization time in young and older adults. 

**METHODS:** Twenty healthy older (71.8±4.2 yrs; mean±SD) and 20 young adults (22.5±2.7 yrs) were first assessed for functionality using the Short Physical Performance Battery (SPPB). Then, each performed 4 single repetitions each of comfortable pace (CSTS) and maximal fast pace sit-to-stand (FSTS) in a randomized block design while on a force platform. The stabilization phase was defined as the period from when the vertical ground reaction force returned to bodyweight after knee extension until center of pressure (COP) variability was within 2 standard deviations of their quiet stance. The anterior-posterior (A-P) and medial-lateral (M-L) body sway were measured in both directions. 

**RESULTS:** The older adults had higher scores on the SPPB (11.3±0.8 vs 12.0±0.2; p=0.002). The stabilization phase was significantly longer in the A-P direction during FSTS (3.13±1.01 vs 2.70±0.88 s; p=0.039), with no differences between groups or within the M-L direction. However, the older adults did have significantly greater movement of the COP during the first 2s of stabilization, regardless of pace (A-P Path Length: 5.17±1.47 vs 3.96±1.17; p=0.002; M-L Path Length: 3.35±0.94 vs 2.57±0.64 % standing height; p=0.001). Furthermore, this A-P Path Length was significantly correlated between the CSTS and FSTS (rs=0.78, p=0.001). These findings suggest that older adults might dynamically control slow and fast STS similarly with a singular strategy while younger adults may have multiple strategies. This reduced flexibility of response may be adding to the increased risk of falls in older adults during the STS task.

**CONCLUSION:**

Trends found between WBAs and some CoPAs during the pre-PS trial (p≤0.018, r≤-0.660) and net CoP variables after PS exposure (p≤0.003). Significant negative correlations were found between WBAs and some CoPAs during the pre-PS trial (p=0.018, r=-0.660) and the level of these significant correlations changed during the post-PS trial (p<0.024, r<-0.628). Men and women exhibited different significant correlations for both trials. 

**CONCLUSION:** While these results suggest that 30 min of PS does not have an effect on WBA or CoPA during quiet stance, there appears to be an effect on net CoP movements, as well as sex related differences in the correlations between WBAs and CoPAs. These findings suggest that fatigue is potentially occurring.

**PURPOSE:** Ventilatory pattern and thoracic excursion, can vary during exercise and impact on ventilatory performance. A deviation away from an optimal trunk lumbopelvic recruitment pattern may affect lung volumes, work of breathing and may be relevant in the development of exertional dyspnoea. The aim of the study was to investigate the effect of different postural positions on the ventilatory excursion using optoelectronic plethysmography (OEP) and a spirometer.

**METHODS:** Fifteen healthy male athletes (Mean±SD age: 30.3±6.5 yrs) completed the study. Ninety reflective markers were placed on the chest, abdomen and back (Figure 1). Participants underwent simultaneous OEP and spirometry data collection in two conditions, in a randomised order: (C1) with normal shoulder position or (C2) with hunched shoulders. Forced vital capacity (FVC) was assessed by the spirometer and data was gathered on the chest wall volume (CW) and the compartmental volumes of the rib cage (RC) and the abdomen (AB) by OEP.

**RESULTS:** The correlation between the two instruments in measuring FVC was good in both normal (R²=0.89) and hunched (R²=0.84) positions. FVC was significantly lower in the hunched position during both spirometry (5.22±0.69 L vs. 5.35±0.69 L; p=0.039) and OEP measurements (5.22±0.62 L vs. 5.42±0.69 L; p=0.01). When volume contributions in the two conditions were compared the RC:AB ratio was significantly lower in the hunched position (1.84±0.74 vs. 2.12±0.79; p=0.01).

**CONCLUSIONS:** These findings suggest that respiratory excursion and lung volume compartmentalisation are affected by the position of the shoulders. Specifically, a hunched shoulder position leads to increased abdominal motion to vital capacity and decreased lung volumes. OEP may be a useful tool to detect altered parameters associated with development of exertional dyspnoea.

**PURPOSE:** The effect of different postural positions on the ventilatory excursion using optoelectronic plethysmography (OEP) and a spirometer.

**METHODS:** Fifteen healthy male athletes (mean±SD age: 30.3±6.5 yrs) completed the study. Ninety reflective markers were placed on the chest, abdomen and back (Figure 1). Participants underwent simultaneous OEP and spirometry data collection in two conditions, in a randomised order: (C1) with normal shoulder position or (C2) with hunched shoulders. Forced vital capacity (FVC) was assessed by the spirometer and data was gathered on the chest wall volume (CW) and the compartmental volumes of the rib cage (RC) and the abdomen (AB) by OEP.

**RESULTS:** The correlation between the two instruments in measuring FVC was good in both normal (R²=0.89) and hunched (R²=0.84) positions. FVC was significantly lower in the hunched position during both spirometry (5.22±0.69 L vs. 5.35±0.69 L; p=0.039) and OEP measurements (5.22±0.62 L vs. 5.42±0.69 L; p=0.01). When volume contributions in the two conditions were compared the RC:AB ratio was significantly lower in the hunched position (1.84±0.74 vs. 2.12±0.79; p=0.01).

**CONCLUSIONS:** These findings suggest that respiratory excursion and lung volume compartmentalisation are affected by the position of the shoulders. Specifically, a hunched shoulder position leads to increased abdominal motion to vital capacity and decreased lung volumes. OEP may be a useful tool to detect altered parameters associated with development of exertional dyspnoea.
Loss of balance resulting in falls is a serious health issue for older persons with type 2 diabetes (T2D). One intervention shown to produce benefits for these individuals is various types of exercise training. However, motivation is commonly cited as a barrier to consistent physical activity participation in unsupervised conditions. Interactive video games, such as the Nintendo Wii system, have been viewed as an innovative tool for engaging individuals in activity at home. PURPOSE: To assess the differences between supervised and unsupervised (using the Nintendo Wii) exercise training aimed at improving balance, reaction time, lower limb strength, and falls risk in older adults with T2D. METHODS: 47 older adults with T2D participated in 12 weeks of training: 32 (mean age 66.5 ± 5.0 years) completed supervised training (ST) while 15 (mean age 67.7 ± 1.4 years) completed unsupervised Wii training. ST sessions (40 min each, 3 times a week) consisted of lower limb stretches followed by leg, abdominal, and lower back exercises. The Wii training group completed three 40-min sessions on the Wii balance board per week. The Wii-based exercises were self-selected to emphasize balance and postural control. Prior to and following training, assessments of lower limb strength (ST, 16.9 ± 2.4 kg; Wii, 17.0 ± 2.3 kg), knee flexion (ST, 16.9 ± 2.4 kg; Wii, 17.0 ± 2.3 kg), faster reaction times (ST, 231 ± 30 ms; Wii, 225 ± 30 ms) and improved postural coordination (ST, 13.4 ± 1.1 s; Wii, 9.7 ± 1.1 s) were tested with no backpack. No backpack via t-test with Bonferroni. Backpack load at 30% and 50% bodyweight resulted in reductions in lower body reach in all three directions for both load high or low in the backpack compared to no backpack. When compared to no backpack, load high in the backpack resulted in significant reductions in upper body reach (FRT) at 10, 30, 50% bodyweight and load low in the backpack resulted in no significant reductions in upper body reach.

CONCLUSIONS: Backpack load height affects upper body reaches but not lower body reaches.

<table>
<thead>
<tr>
<th>No backpack</th>
<th>ST</th>
<th>NA</th>
<th>ST</th>
<th>NA</th>
<th>ST</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.5†</td>
<td>65.6†</td>
<td>64.1±4.8</td>
<td>60.5±5.0</td>
<td>60.3±5.9</td>
<td>60.3±5.9</td>
<td></td>
</tr>
<tr>
<td>65.5±5.1</td>
<td>65.5±5.1</td>
<td>6.7±7.4</td>
<td>5.0±5.0</td>
<td>5.9±5.0</td>
<td>5.9±5.0</td>
<td></td>
</tr>
<tr>
<td>106.0±7.8</td>
<td>106.0±7.8</td>
<td>9.1±9.7</td>
<td>9.1±9.7</td>
<td>8.0±8.0</td>
<td>8.0±8.0</td>
<td></td>
</tr>
<tr>
<td>104.2±7.9</td>
<td>104.2±7.9</td>
<td>8.8±8.8</td>
<td>8.8±8.8</td>
<td>7.9±7.9</td>
<td>7.9±7.9</td>
<td></td>
</tr>
<tr>
<td>110.3±9.0</td>
<td>110.3±9.0</td>
<td>10.5±10.5</td>
<td>10.5±10.5</td>
<td>9.0±9.0</td>
<td>9.0±9.0</td>
<td></td>
</tr>
<tr>
<td>144.4±11.6</td>
<td>144.4±11.6</td>
<td>15.9±15.9</td>
<td>15.9±15.9</td>
<td>14.1±14.1</td>
<td>14.1±14.1</td>
<td></td>
</tr>
<tr>
<td>9.6±9.6</td>
<td>9.6±9.6</td>
<td>8.8±8.8</td>
<td>8.8±8.8</td>
<td>8.5±8.5</td>
<td>8.5±8.5</td>
<td></td>
</tr>
</tbody>
</table>

The risks and consequences of falling are appreciable in sedentary older adults. Regular exercise has been proposed as an intervention, however the perceived time commitment may prove problematic for exercise initiation and/or compliance. Sprint interval training (SIT) evokes rapid and appreciable physiological adaptation in a time efficient manner, but the utility of SIT for improving stability in older adults is unknown. PURPOSE: To determine the effect of SIT on fatigue resistance and stability in young and older adults. METHODS: Sedentary young (Y: n=7, age: 21±1 years (mean±SE)) and older (O: n=6, age: 69±2 years) men and women completed three weeks of SIT (9 sessions of 4-8 30s maximal efforts on a cycle ergometer). Maximal oxygen uptake (VO2max) and time to exhaustion (Y: 25.8±4.0 min; O: 31.5±3.9 min; 54.0±8.8 min) were increased (all P<0.05) in young and older adults. Stability (normalized to height) prior to and following SIT were measured using the Y-Balance Test (measuring leg reach in postero- lateral, postero-medial and anterior directions), and upper extremity reaching was tested using the Functional Reach Test (FRT). Subjects were healthy males (n=4) and females (n=3), ages 18-49, who wore a backpack (REI) and performed in bare feet using the dominant leg and arm. Subjects were tested with no backpack, and then (in random order on different days) with the backpack empty (0), or load (weight) equivalent to 10, 30, and 50% of bodyweight in the bottom of the backpack. Trials were repeated with the load high in the backpack using a specially designed box. Three trials were completed for each reach. Results were analyzed with paired t-tests and Bonferroni corrections.

RESULTS: In Table 1, data presented as normalized for limb length reach, mean ± SD. BW = bodyweight; ld high = load (weight) in backpack at – level C5 vertebra (2nd vertebra below C5) instead of bottom; * = sig diff from ld high via t-test with Bonferroni; † = sig diff from No backpack via t-test with Bonferroni. Backpack load at 30% and 50% bodyweight resulted in significant reductions in upper body reach (FRT) at 10, 30, 50% bodyweight and load low in the backpack resulted in no significant reductions in upper body reach.

CONCLUSIONS: Backpack load height affects upper body reaches but not lower body reaches.
Limited range of motion (ROM) is often considered detrimental to both athletic performance and everyday function similar to balance. PURPOSE: The purpose of this study was to determine a relationship between hip range of motion and BESTest scores. METHODS: 20 college age women (19.55 ± 3.45 years) with no prior lower extremity injuries or previous concussions volunteered for this study. Using standard goniometer measuring techniques, participants passive range of motion for flexion (FL), extension (EX), internal rotation (IR) and external rotation (ER) was established for each leg. A correlation was determined between each aspect of hip musculature ROM and overall BESTest scores. RESULTS: Although there was no significant correlation between any specific aspect of ROM and overall BESTest scores (P > 0.05), both right and left internal rotation showed a statistically significant moderate correlation (R = 0.52 (P < 0.001) and, R = 0.51 (P < 0.05) respectively) to stability in gait. DISCUSSION: Despite no correlation between overall BESTest score and range of motion, internal rotation was shown to have a statistically significant moderate correlation to a single aspect of the BESTest, stability in gait. We determined that range of motion does not pose as a limiting factor to balance as measured by the BESTest.

Purposes of exercise training include promotion of health and fitness, prevention and treatment of disease, injury rehabilitation, and improvement of athletic performance (Gibbons et al., 2015). Most studies have been performed on young, athletic individuals and have focused on the effects of exercise training on the neuromuscular system. Purpose: The purpose of this study was to determine if an exercise intervention could improve balance performance in individuals with arthritis and without arthritis.

The legalization of marijuana in a number of states has resulted in increased accessibility to the drug. However, little is known about the influence of marijuana on postural control and balance performance. PURPOSE: To examine the effects of long term marijuana use on postural steadiness during quiet standing.

Board #333
June 1 3:30 PM - 5:00 PM
Evaluating Perturbations To Human Balance Following An Exercise Intervention In Previously Sedentary, Overweight Adults
Cody E. Morris, FACSM1, Harish Chander2, John C. Garner1, Hunter DeBusk1, Scott G. Owens2, Melinda W. Valliant2, Mark Loftin, FACSM1. 1Western Kentucky University, Bowling Green, KY. 2Mississippi State University, Mississippi State, MS. 3Troy University, Troy, AL. 4University of Mississippi, University, MS. Email: cody.morris@wk.edu (No relationships reported)

RESULTS: Results from the SOT equilibrium (EQ) scores revealed significant differences in the eyes open, sway referenced visual surrounding and platform (EOSVRP) condition (p = 0.033). Post hoc pairwise comparisons for this variable revealed significantly higher SOT equilibrium scores in post-intervention evaluation versus pre-intervention. No other SOT EQ scores were found to be significant (p > 0.05). Also, no significant differences were seen in MCT postural latency scores (p > 0.05).

CONCLUSIONS: The results of the current study suggest that an exercise intervention alone without a significant loss in weight and also without any form of specific balance training can lead to an improved balance performance, but that it may be limited to the conditions where the somatosensory system plays a larger role in balance maintenance.
Abdominal wall muscle function is thought to be an important factor affecting balance. PURPOSE: The purpose of this study was to determine if an acute fatiguing stimulus to the abdominal muscle groups affects balance in healthy college-age individuals. METHODS: A randomized pre-post test post-counterbalanced crossover design was utilized. Twenty healthy college-age students (age = 20.5±1.1 years; body mass = 71.3±14.5 kg; height = 168.8±10.4 cm; n = 10 males; n = 10 females) completed the trial and underwent two sets of seven different core muscle exercises to volitional fatigue after an aerobic full-body warm-up. The seven exercises were: Front plank, right side plank, left side plank, double leg raise, Russian twist, partial curl ups, and spine extension. Fatigue was determined as the point in which the participant could no longer maintain proper biomechanical form. Static single leg balance was assessed on each foot using a computerized balance assessment system (CBAS) and dynamic balance was assessed using the Star Excursion Balance Test (SEBT). Averages between the left and right side were calculated for both balance assessments and used during the statistical analysis. RESULTS: 2 X 2 repeated measures analysis of variance tests were calculated to assess for balance differences between the control group and the exercise group. Cohen’s d effect sizes were calculated on pre and post measurements within each group. A statistically significant time-group interaction was noted on the CBAS mean scores (control pre vs post: 2.99±1.48 vs 2.53±0.81 degrees; exercise pre vs post: 2.91±1.13 vs 2.31±1.22 degrees; p = 0.021). However, the effect size of the exercise group pre vs post measure was small (Cohen’s d = 0.34). No statistically significant differences occurred on the SEBT (control pre vs post: 670.5±85.6 vs 673.3±95.4 cm; exercise pre vs post: 664.9±78.6 vs 664.9±74.6 cm; p = 0.687). CONCLUSIONS: The abdominal wall muscle exercise protocol induced a statistically significant decrease in static balance but the size of the effect was small. Dynamic balance was not affected by the exercise protocol. Considering the small effect size and the statistical disagreement between the two assessments, it is possible that acute abdominal wall muscle fatigue may not functionally affect balance, but more research is needed.
A 6-week Rehabilitation Training Improves Single-leg Static Postural Control In Patients With Chronic Ankle Instability

Alyssa Evans1, S. Jun Son1, Hyunsoo Kim2, Sunku Kwon1, Dustin Breuning1, Matthew K. Seeley3, J. Ty Hopkins, FACSMD
1B Brigham Young University, Provo, UT; 2West Chester University, West Chester, PA.

Email: alyssa.evans@gmail.com

(No relationships reported)

Ankle sprains occur at a high rate and often develop into chronic ankle instability (CAI). Impaired postural control may be a contributing factor to CAI. Effective rehabilitation programs and preventative measures for CAI are needed.

**PURPOSE:** To examine the effect of a 6-week ankle and hip rehabilitation program on center of pressure (COP) total area and 95% ellipse area during single-leg static balance among groups of strength, strength with balance, and control.

**METHODS:** 14 CAI subjects in a strength group (22±0 yrs, 173±9 cm, 73±12 kg, 82±8% FAAM ADL, 58±13% FAAM Sports, 3.0±0.8 MAI, 3.7±1.5 ankle sprains) completed a series of 5 ankle and hip strength exercises (isometric, concentric, and eccentric contraction with theraband). 15 CAI subjects in a strength and balance group (23±2 yrs, 178±8 cm, 76±9 kg, 85±7% FAAM ADL, 56±10% FAAM Sports, 3.6±1.1 MAI, 4.7±2.0 ankle sprains) completed a series of 10 ankle and hip strength and balance exercises (theraband, wobble board, ankle disk, etc.). 14 CAI subjects participated in a control group (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAI, 5.9±3.3 sprains). The rehabilitation intervention was administered 3 times/week for 6 weeks under supervision. Participants performed 2 trials of single-leg stance on a force plate (1000 Hz) for 30 sec. 3 x 2 (group x time) mixed model ANCOVAs analyses (covariate: pre-intervention value) with repeated measures were used to detect group x time differences in the COP total distance and 95% ellipse area.

**RESULTS:** Results are shown in Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Pre</th>
<th>Post</th>
<th>Control (n=15)</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COP total distance (cm)</td>
<td>18.9(4.2)</td>
<td>18.7(3.1)</td>
<td>18.8(3.7)</td>
<td>17.7(5.9)*</td>
<td>17.9(3.1)</td>
<td>17.5(3.8)</td>
</tr>
<tr>
<td>COP 95% ellipse area (cm²)</td>
<td>8.5(3.5)</td>
<td>8.0(3.0)</td>
<td>8.6(3.6)</td>
<td>5.9(1.9)</td>
<td>8.0(3.6)</td>
<td>7.9(2.4)</td>
</tr>
</tbody>
</table>

Values are mean (SD) *Changes in COP total distance (cm) are significantly different than the strength and control groups (p < 0.05) *Changes in COP 95% ellipse area (cm²) are significantly different than the strength and control groups (p < 0.05).

**CONCLUSION:** CAI patients in the strength and balance group improved postural control. Strength training alone did not have a significant impact on postural control. This may be due to the lack of proprioceptive activation during training. More data are needed to understand if this intervention may be used as a rehabilitation tool to reduce the risk of CAI.
Baseline assessments are vital in the evaluation of concussion and are recommended for any person competing in organized athletics. Following a head injury, the same assessments are administered and results are directly compared to baseline scores. Previous literature has suggested re-baseline assessments be administered to all athletes who have sustained a concussion, as the longitudinal effects of a single concussion are not well understood. However, the clinical utility of re-baseline concussion assessments has not been well investigated. Limited literature exists examining clinical change when evaluating postural control and cognition from baseline to re-baseline assessment following a concussion.

**PURPOSE:** The purpose of this study was to examine the differences in clinical postural control and cognition with the Balance Error Scoring System (BESS) and the Standard Assessment for Concussion (SAC) in athletes who had previously sustained a concussion.

**METHODS:** 34 NCAA athletes and cheerleaders (males = 13, females = 21) participated in this study. All athletes had previously been diagnosed with a concussion during the 2014-15 and 2015-16 athletic seasons. Pre-season concussion baselines (PRE) were administered before the first athletic season for each athlete and all athletes completed BESS and SAC evaluations. The same assessments were administered following full recovery from concussion (POST). A medical doctor confirmed the diagnosis and recovery of concussion. The SAC is a verbal assessment evaluating orientation, memory recall, and concentration. The BESS is a subjective evaluation used to identify balance impairments. One-way ANOVAs evaluated the scores on SAC and BESS between each time point. **RESULTS:** From PRE to POST no significant differences were observed with the BESS (PRE = 15.5 ± 7.34 errors, POST = 16.62 ± 8.04 errors; p = 0.486, Δ = -2.128 ± 8.69) and SAC (PRE = 26.79 ± 15.9 units, POST = 27.24 ± 2.24 units; p = 0.234, Δ = -0.442 ± 12.3). **CONCLUSIONS:** From PRE to POST assessment, scores on the SAC and BESS did not change significantly. This could suggest that re-baseline of the SAC and BESS has limited clinical utility. Future studies should include more sensitive assessments to adequately detect postural changes from baseline to re-baseline.

**D-76**

**Free Communication/Poster - Protein Metabolism and Exercise**

**Board #344**

**June 1 3:30 PM - 5:00 PM**

**Effect Of Different Protein Ratio Beverages On Blood Glucose Regulation**

Chi Yang1, Chang Hong Guo2, Chi Hong Lu1, Chun Tai Chen1. 1University of Taipei, Taipei, Taiwan. 2Shih Hsin university, taipei, Taiwan. (No relationships reported)

*Why protein and essential amino acids are the most popular supplementation in sports nutrition, it has been recommended that protein plus carbohydrate in a certain ratio 1:3 or 1:4 improve the muscle glycogen synthesis and promote recovery. These benefits from protein and carbohydrate complex are compelling compared to supplementation protein or carbohydrate alone. However different protein ratio on blood glucose regulation remains unclear.*

**PURPOSE:** In this study we investigated a single supplement different protein beverage in different ratio on blood glucose regulation.

**METHODS:** We used cross-over study design. Twelve healthy college baseball players (21.0 y). Thereafter the subjects were divided into four groups: protein0% (PRO0), protein12% (PRO12), protein36% (PRO36) and protein75% (PRO75). Fasting blood was collected. After drinking protein supplement, blood glucose and insulin were measured every 30 min for 2 h. The data were analysis by one-way ANOVA with repeated measures.

**RESULTS:** PRO0 on glucose area under the curve (GAUC) was significantly higher than other groups (4241±446 vs. 2538±275, 1784±234, 196±287, P<0.05) and PRO75 GAUC was significantly lower than other groups (196±287 vs. 4241±446, 2538±275, 1783±234, P<0.05). After supplement 30 min PRO75 blood glucose was significantly lower than other groups (107±2 vs. 166±8, 139±6, 146±3mg/dL, P<0.05). After supplement 60 and 120 min PRO12 was significantly higher compare with PRO36 (123±3 vs. 107±4mg/dL, P<0.05 and 118±3 vs. 108±1mg/dL, P<0.05). PRO36 on insulin area under the curve (IAUC) was significantly higher compare with PRO75 (2972±336 vs. 1178±158, P<0.05). After supplement 30 min PRO36 produced higher insulin concentration compare with other groups (56±7 vs. 31±5, 55±7, 14±2±6mg/dL, P<0.05).

**CONCLUSION:** High protein ratio did not have better glucose and insulin response. However PRO36 may increase insulin level faster than other groups, but did not secrete more insulin.
analyzed using a 2 X 2 (phases: HC and HFLC X time: pre- and 24-h post-exercise) analysis of variance with the Sidak’s multiple comparisons when necessary (p < 0.05).

RESULTS: There was no significant difference in MMPs or TIMPs between HC and HFLC phases. Furthermore, an acute bout of exercise in the heat did not alter MMPs or TIMPs. There were, however, significant positive correlations between TIMP-2 and MMP-2 (r = 0.51, p = 0.01) and TIMP-2 and MMP-9 (r = 0.49, p = 0.01). Additionally, a significant negative correlation was found between TIMP-4 and MMP-2 (r = -0.57, p = 0.02). CONCLUSION: A 3-week high fat diet and an acute intense exercise in the heat did not negatively affect serum MMPs and TIMPs in healthy, trained male runners. It seems that MMP-4 activity may be inhibited by TIMP-4, whereas both MMP-2 and -9, interestingly, may be upregulated by TIMP-2. Future studies examining the effects of a long-term high fat diet on metabolic pathways of circulating or tissue MMPs and TIMPs in active individuals along with a variety of populations are highly recommended.

Skeletal muscle sensitivity to dietary protein and exercise typically declines during aging. However, previous data presented by our group indicates that whey protein hydrolysate (WH, di- and tri-peptide mixture) may be able to stimulate muscle anabolism at lower dosages than observed with intact whey protein in older adults.

METHODS: Twenty healthy recreationally active adults (YOUNG: M = 8, F = 2; OLD: M = 7, F = 3; 65 ± 4, 25 ± 4 kg·m²) were modeled separately per time point using a 2 (group) x 2 (time) mixed-model ANOVA repeated across time. BCAA concentrations (2–4 h) post-ingestion (PI) periods. Mixed muscle FSR and anabolic signaling was analyzed using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA.

RESULTS: Compared with rest, increases in p-nTOR (Young: +2.0 fold, Old: +2.5 fold) and p-4E-BP1 (Young: +1.5 fold, Old: +1.4 fold) were observed in both groups at 4h PI (p < 0.05). Increases in p-S6K1 were observed in both groups at 2h PI but to a greater extent in the OLD group (p < 0.05). Peptide transporter-1 (PEPT1) expression was found in muscle samples from both groups. CONCLUSION: WH provided after Rex enhances muscle anabolism in older adults at a dose previously shown to be ineffective with intact whey protein. Future studies will be required to determine if WH may aid in the long-term preservation of muscle in this population.

2334 Board #347
June 1 3:30 PM - 5:00 PM
Whey Hydrolysate Supplementation Following Resistance Exercise Elicits Similar Anabolic Responses in Both Young and Older Adults

1Texas A&M University, College Station, TX. 2Megmilk Snow Peak, Inc., Vancouver, BC, Canada. 3Milk Products Laboratory, University of California, Davis, CA. 4University of Utah, Salt Lake City, UT. 5University of Texas Medical Branch, Galveston, TX. (No relationships reported)

Skeletal muscle sensitivity to dietary protein and exercise typically declines during aging. However, previous data presented by our group indicates that whey protein hydrolysate (WH, di- and tri-peptide mixture) may be able to stimulate muscle anabolism at lower dosages than observed with intact whey protein in older adults.

METHODS: Twenty healthy recreationally active adults (YOUNG: M = 8, F = 2; OLD: M = 7, F = 3; 65 ± 4, 25 ± 4 kg·m²) were modeled separately per time point using a 2 (group) x 2 (time) mixed-model ANOVA repeated across time. BCAA concentrations (2–4 h) post-ingestion (PI) periods. Mixed muscle FSR and anabolic signaling was analyzed using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA. FSR and signaling results were compared between groups using a 2 (group) x 3 (time) mixed-model ANOVA.

RESULTS: Compared with rest, increases in p-nTOR (Young: +2.0 fold, Old: +2.5 fold) and p-4E-BP1 (Young: +1.5 fold, Old: +1.4 fold) were observed in both groups at 4h PI (p < 0.05). Increases in p-S6K1 were observed in both groups at 2h PI but to a greater extent in the OLD group (p < 0.05). Peptide transporter-1 (PEPT1) expression was found in muscle samples from both groups. CONCLUSION: WH provided after Rex enhances muscle anabolism in older adults at a dose previously shown to be ineffective with intact whey protein. Future studies will be required to determine if WH may aid in the long-term preservation of muscle in this population.

2335 Board #348
June 1 3:30 PM - 5:00 PM
Recovery is Not Facilitated with Protein Supplementation Following Muscle-Damaging Concurrent Exercise

Lee Eddens1, Sarah Browne1, Emma Stevenson1, Brad Sanders1, Ken van Someren2, Glyn Howatson, FACSM3.
1Newcastle University, Newcastle upon Tyne, United Kingdom. 2University of Washington, Seattle, WA. 3University of Auckland, Auckland, New Zealand. (No relationships reported)

Concurrent exercise is an important training modality for many sports and the dynamic nature of concurrent training imposes significant physiological stress that can lead to exercise-induced muscle damage (EIMD). Additional protein is frequently consumed with the intention to improve recovery exercise following EIMD; however the evidence for this practice is equivocal at best because of limitations in the research, which are attributable, at least in part to poor dietary control. PURPOSE: To investigate the efficacy of protein as a recovery aid following damaging exercise in a concurrent training paradigm, when rigorous dietary control and supplementation are provided.

METHODS: Twenty-four well-trained male cyclists were randomised to three groups receiving supplement servings of 20 g protein, or an iso-caloric carbohydrate or low-caloric placebo. Supplements were provided twice daily from the onset of the muscle-damaging exercise and for a total of four days. During this time a controlled diet was consumed by all participants (6 g kg⁻¹·day carbohydrate, 1.2 g kg⁻¹·day protein, remainder fat). The concurrent exercise consisted of a simulated high-intensity road cycling trial followed by 100 drop-jumps; dependent measures were taken before and at 0, 24, 48 and 72 h following the concurrent exercise bout.

RESULTS: Significant time effects for decrements in maximal voluntary contraction (MVC) and countermovement jump (CMJ) performance, along with increased muscle soreness, serum creatine kinase (CK) and C-reactive protein (CRP) concentrations provided evidence that EIMD had been induced (p < 0.001). No group or interaction effects (p = 0.05) were observed for any of the dependent measures, with both MVC and CMJ performance reaching a nadir immediately post-exercise (MVC: 83 ± 8, 85 ± 11 and 89 ± 11 % of baseline for PRO, PLA and CHO; CMJ: 93 ± 8, 91 ± 8 and 93 ± 6% of baseline for PRO, PLA and CHO) and both CK and CRP values peaked at 24 h post-exercise (CK: 282 ± 166, 341 ± 167 and 291 ± 177% of baseline for PRO, PLA and CHO; CRP: 206 ± 110, 260 ± 207 and 241 ± 178% of baseline for PRO, PLA and CHO). CONCLUSION: Protein supplementation did not attenuate any of the indices of EIMD imposed by concurrent exercise, when employing high degrees of rigour around the habitual diet and the provision of appropriate supplemental controls.

2336 Board #349
June 1 3:30 PM - 5:00 PM
The Effects of Whey vs. Soy Protein at Breakfast on Satiety Response, Energy Intake and Metabolism

Caroline Melson, Svetlana Nepocatych, Takudzwa Madzima.
Elon University, Elon, NC. (No relationships reported)

PURPOSE: To determine the effects of animal-based (whey) compared to plant-based (soy) protein on perceived satiety, hunger, fullness, desire to eat, prospective food consumption, thirst, energy metabolism and subsequent energy intake.

METHODS: Seventeen healthy men and women (age: 27 ± 7, BF%: 22 ± 6) consumed three isocaloric breakfast smoothies with 40% of energy from either whey, soy, or control (no protein) in a double blind, randomized crossover design. Participants completed a visual analog scale (VAS) of appetite profile and thirst (before, 60, 120, 180, 240, 300, 540, and 720 min). Indirect calorimetry was used to determine the effect of a meal (TEF) (at 45-60, 105-120, 165-180 minutes). In addition, energy intake at lunch was recorded.

RESULTS: There was a significant difference in hunger (p = 0.03), satiety (p = 0.001), fullness (p = 0.001), desire to eat (p = 0.03), and prospective food consumption (p = 0.04) between the three breakfast conditions. Measures of satiety and fullness were higher with whey, desire to eat, and prospective food consumption were lower after consumption of whey protein compared to control. A significantly higher (p = 0.05) respiratory quotient (RQ) and lower oxygen consumption (VO2) was observed for whey and soy compared to control condition. In addition, a significantly higher (p = 0.05) respiratory quotient (RQ) and lower oxygen consumption (VO2) was observed for whey and soy compared to control condition. In addition, a significantly higher (p = 0.05) respiratory quotient (RQ) and lower oxygen consumption (VO2) was observed for whey and soy compared to control condition. In addition, a significantly higher (p = 0.05) respiratory quotient (RQ) and lower oxygen consumption (VO2) was observed for whey and soy compared to control condition.
< 0.05) energy intake at lunch was observed after control (770 ± 289 kcals) compared to
energy intake at dinner (654 ± 252 kcals). However, there was no significant difference (p >
0.05) in energy intake between soy (696 ± 296 kcals) and whey or control conditions.

CONCLUSIONS: Consuming whey or soy protein at breakfast led to similar
perceptions of appetite profile as well as lower energy intake at lunch, which may aid
in weight management efforts among individuals following a vegan or vegetarian diet.

D-77 Free Communication/Poster - Renal Physiology

Thursday, June 1, 2017, 1:00 PM - 6:00 PM
Room: Hall F

2337 Board #350
June 1 3:30 PM - 5:00 PM
Hydration and Renal Responses During Pre-Season High School American Football

Cory L. Butts1, Aaron R. Caldwell1, Richard A. Perry, Jr.1, Kathleen M. Heath1, J.D. Adams1, Matthew S. Ganio, FACSM1, Lisa T. Jansen1, Hyun-Gyu Suh1, Lesley W. Vandemark1, M. Kyle Smoot2, Brendan P. McDermott2,1University of Arizona, Fayetteville, AR. 1University of Kentucky, Lexington, KY.

Email: cbutts@uark.edu


American football athletes often report to practices and games in a hyphothydration state, potentially increasing the risk for performance and thermoregulatory impairments. However, the renal responses to proactive dehydration with environmental and workload stressors, have not been elucidated in this population. PURPOSE: To observe the hydration status and renal function of high school American football players during pre-season practices. METHODS: High school American football players (n = 31 males, age 16 ± 1y, ht 1.79 ± 0.07m, mass 88.4 ± 19.9kg, body fat 19.9 ± 9.4%) participated in this observational study. Body mass (BM), blood, and urine samples were obtained 2-3 days prior to the start of pre-season practices (Base) and at Days 4 (D4), 7 (D7), and 10 (D10). D4 and D7 samples were collected prior to practice while D10 samples were obtained post-practice. Serum osmolality (Sosm), urine specific gravity (Usg), and urine color (Ucolor) were measured at each time point. Renal stress was assessed by measuring plasma neutrophil gelatinase-associated lipocalin (pNGAL) via enzyme linked immunosorbent assay. Wet bulb globe temperatures (WBGT) were also recorded for each practice. RESULTS: BM did not change significantly from Base (91.6 ± 22.9 kg) through D10 (90.2 ± 23.2 kg, p = 0.62). Sosm at Base (292 ± 4 mOsm/kg) was significantly lower than D10 (295 ± 4 mOsm/kg, p = 0.05). Further, Sosm >290 mOsm/kg was present in 67-73% of players reporting to practices on D4 and D7, and 80% finishing practice on D10. pNGAL levels were not different throughout preseason (Base, 1.023 ± 0.007) and D10 (1.027 ± 0.010, all p = 0.05). Usg was not different throughout pre-season (Base 1.023 ± 0.007) and D10 (1.027 ± 0.008) were greater than D4 (1.018 ± 0.009) and D7 (1.019 ± 0.009, all p < 0.05). Ucolor was not different throughout pre-season (Base 1.018 ± 0.009) and D10 (1.021 ± 0.009, all p < 0.05). pNGAL was not differential throughout pre-season (Base, 50.7 ± 12.5 ng/mL, D10, 52.8 ± 14.7 ng/mL, p = 0.19). Further, there was no relationship between Sosm and pNGAL (r = 0.8 m/s), respectively. RESULTS: Of the subjects, the prevalence of 30c < eGFR <45 mL/min/1.73m² was 16.2%. The subjects with 30c < eGFR <45 mL/min/1.73m² showed significantly lower physical performance for muscular strength and functional mobility than those with 45c < eGFR <60 and eGFR ≥60 mL/min/1.73m², respectively (all p for <0.05).

Multinomial (polychotomous) logistic regression analysis, with three categories of eGFR as the dependent variable, showed the significant association between eGFR and skeletal muscle function status even after adjustment for potential confounders (odds ratios [95% CI] were 4.8 [1.3-17.2] for a GFR of 45 to 59, 12.9 [3.1-52.9] for above 60 mL/min/1.73m², p for trend <0.01). CONCLUSION: Taken together, skeletal muscle function status is associated with eGFR and skeletal muscle function status even after adjustment for potential confounders (odds ratios [95% CI] were 4.8 [1.3-17.2] for a GFR of 45 to 59, 12.9 [3.1-52.9] for above 60 mL/min/1.73m², p for trend <0.01).

2339 Board #352
June 1 3:30 PM - 5:00 PM
Impact of Moderate Intensity Endurance Exercise on Kidney Injury

Coen C.W.G. Bongers1, Mohammad Alsady2, Yvonne A.W. Hartman1, Thijis M.H. Eijsvogels3, Peter M.T. Deen4, Maria T.E. Hopman, FACSM1. 1Radboudumc, Radboud Institute for Health Sciences, Nijmegen, Netherlands. 2Radboudumc, Radboud Institute for Molecular Life Sciences, Nijmegen, Netherlands.

Email: coen.bongers@radboudumc.nl

Reported Relationships: (No relationships reported)

Purpose. Exercise-induced redistribution of blood results in a decreased renal perfusion and changes in glomerular permeability and filtration ratio. These alterations may lead to a deterioration of renal function or even acute, but transient, renal failure. Kidney Injury Molecule-1 (KIM1) and Neutrophil gelatinase-associated lipocalin (NGAL) are new urinary biomarkers to detect kidney injury in an early stage. Therefore, the purpose of this study was to examine the effects of an acute bout of endurance exercise on urinary KIM1 and NGAL levels.

Methods. A total of 60 subjects (56±10 years) participated in an annual walking event and walked 30-50 km at a self-selected pace. Heart rate was recorded every 5 km. Baseline and post-exercise blood and urine samples were taken to assess fluid balance and kidney injury and body mass was measured to determine the relative body mass loss. Urinary KIM1 and NGAL levels were corrected for variations in urine volume and for urinary concentration changes using urinary cystatin C.

Results. Subjects completed the exercise bout at 71±9% of their predicted maximal heart rate. At baseline, kidney function, measured as estimated glomerular filtration rate (eGFR) was 89±3±11.6 mL/min, whereas 49% of the subjects had a slightly decreased kidney function (eGFR>90 mL/min). Post-exercise body mass loss was 0.9±1.2% and 20% of the subjects were hydrated after exercise (relative body mass loss >2%). We observed a significant increase in post-exercise urinary NGAL levels (3.0±1.5 ng/10g cystatin C) compared to baseline (2.3±1.3 ng/10g cystatin C, p=0.025). Moreover, 65% of subjects demonstrated elevated NGAL levels after exercise. In contrary, corrected urinary KIM1 levels did not change after exercise (0.70±0.45 versus 0.74±0.49 ng/10g cystatin C, p=0.63). At baseline, 2 subjects were detected with proteinuria, whereas 8 subjects had post-exercise proteinuria (p=0.048).

Conclusion. The increased levels of cystatin C corrected NGAL and proteinuria after an acute bout of endurance exercise suggest that an acute bout of endurance exercise may cause transient kidney injury.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

D-77 Free Communication/Poster - Renal Physiology

Thursday, June 1, 2017, 1:00 PM - 6:00 PM
Room: Hall F

2338 Board #351
June 1 3:30 PM - 5:00 PM
Low Estimated Glomerular Filtration Rate (eGFR) is Associated with Skeletal Muscle Function Deficit in Elderly Persons

Jae Seung Chang, Tae Ho Kim, In Deok Kong. Yonsei Institute of Sports Science & Exercise Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea, Republic of.

(No relationships reported)

Physical performance is closely associated with chronic diseases and dysfunction of numerous organ systems. Old persons with chronic renal failure have shown the apparent decline in physical performance, especially in the end-stage. However, it is unclear whether the subclinical kidney dysfunction is associated with skeletal muscle function deficit in the elderly population.

PURPOSE: To determine the association between renal function and skeletal muscle function deficit in old persons without nephropathy. METHODS: Eight hundred fifty-four Korean elderly (female, 75.3%) aged 65 to 89 years were included in this cross-sectional study. All participants were interviewed face-to-face and received physical examination including body composition, 2 min stationary bicycle ergometry, chair stand, grip strength, and for urinary concentration changes using urinary cystatin C.

Supported by AMISSM-ACSM Grant

2340 Board #353
June 1 3:30 PM - 5:00 PM
Changes in Glomerular Filtration Rate after Maximal and Submaximal Exercise in Olders

Marina M. Trejo1, Francisco J. Diaz2, Carlos Kornhauser2, Maciste Macias2, Antonio Rivera2, Magdalena Nájera2, Citlalli Arce1, Arturo Figueroa-Galvez, FACSM3,1Universidad Autonoma de Baja California, Baja California, Mexico. 2Universidad de Guanajuato, Guanajuato, Mexico. 3Florida State University, Florida, FL. (Sponsor: Figueroa Galvez Arturo, FACSM)

Email: fisiol.ug@gmail.com

(No relationships reported)

PURPOSE: Sustained exercise may decrease Glomerular Filtration Rate (GFR) in older adults. However, kidney function in older adults has not been investigated utilizing the new creatinine-cystatin C equation for GFR during exercise. The
The purpose of this study was to analyze the effect of maximal and submaximal bicycle exercise utilizing the equation for GFR of creatinine-cystatin C in older adults (≥65 years). METHODS: Twenty healthy subjects (13 men and 7 women; 70 ± 4 years) participated in the study. Subjects performed 3 bicycle exercise tests one week apart: one maximal (MAXCAP-B), and two 20-minute submaximal at 80% (SUBMAX-B80) and 60% (SUBMAX-B60) of heart rate reserve (HRR), respectively. Blood samples were obtained before and after the test in the seated position to measure the plasma concentration of creatinine and cystatin C. GFR was estimated according to the equation of Creatinine-Cystatin C Equation (CKD-EPI 2012).

RESULTS: MAXCAP-B produced a significant reduction in GFR (87.3±18.3 ml/min to 80.9±18.8 ml/min, P < 0.05). SUBMAX-B80(80.6±14.03 ml/min to 82.7±16.9 ml/min) and SUBMAX-B60 (84.7±15.0 ml/min to 80.3±12.7 ml/min) produced no significant reduction in GFR.

CONCLUSIONS: Although maximal exercise produced a decrease in GFR, the changes were minimal. Intense and moderate exercise did not alter significantly GFR when the equation of creatinine-cystatin C was used. Kidney function after intense and moderate exercise in older adults was preserved, indicating safe incorporation of exercise at these intensities.

D-78 Clinical Poster Reception

Thursday, June 1, 2017, 5:45 PM - 6:45 PM
Room: Hotel-Mineral B

2341 Board #1 June 1 5:45 PM - 6:45 PM
Back Injury - Cheerleading

Michael Stiller, Michelle A. Miller. The Ohio State University, Columbus, OH. (No relationships reported)

HISTORY: A 15-year-old high school cheerleader sustained a back injury while cheering on her school’s football team. She was performing a “toe touch” jump and upon landing, she felt a “pop” and a sharp pain posteriorly between her shoulder blades. An hour later, she developed a “pins and needles” sensation from her belly button to her toes bilaterally. The next morning, the numbness had spread to just under the ribs and she fell when trying to stand upright from bed. She presented to the emergency room later that morning.

PHYSICAL EXAMINATION: Examination revealed that she was afibrile with normal vital signs. There was no tenderness on palpation over the spinous processes or the paraspinal musculature. Her neurologic exam was significant for decreased sensation to light touch at the T8 dermatome and caudally with a proprioception deficit in the great toe bilaterally. Strength was 4/5 throughout the left lower limb. The patellar reflexes were 3/4 and the Achilles were 2/4 bilaterally. She demonstrated a wide-based gait with significant loss of balance.

DIFFERENTIAL DIAGNOSIS:
1. Spondylolysis/spondylolisthesis
2. Vertebral fracture
3. Intervertebral disc herniation
4. Transverse myelitis
5. Psychogenic

TESTS AND RESULTS:
ESR and CRP normal
T-spine MRI:
1. Mild age related change/disc degeneration at T7-8 and T8-9 with a small acute appearing central disc protrusion at T8-9 that abuts the adjacent spinal cord.
2. No findings to indicate transverse myelitis.

FINAL WORKING DIAGNOSIS: T8-9 intervertebral disc herniation resulting in myelopathy.

TREATMENT AND OUTCOMES:
1. Neurosurgery consult with no surgical intervention taken. Patient admitted for continued monitoring, PT, and OT.
2. Notable lower limb strength improvement seen over the first three days, however, acute inpatient rehabilitation was needed to assure ability for safe ambulation with impaired lower limb sensation.
3. After 12 days of inpatient rehab, lower body sensation was still impaired, but patient demonstrated improved lower limb strength and was ambulating with proper technique multiple times around the unit without assistance.
4. Patient discharged with outpatient therapy and a follow-up with neurosurgery in one month with repeat spine MRI.
5. Patient instructed to not return to cheerleading until follow-up.
A 10-year-old gymnast initially presented with three weeks of right hamstring pain, and was started on a home exercise program. After 4 weeks without improvement, the patient was started on a program of formal physical therapy. After ten weeks of therapy, the patient began to develop core muscle weakness and right anterior hip pain, and reported an inability to walk more than a mile without limping. She went on to develop similar pain with stair climbing, as well as activities of daily living. Shortly thereafter, the patient began to complain of quadriceps weakness and thoracic back pain.

**Physical Examination:**

**Differential Diagnosis:**
1. Juvenile Dermatomyositis
2. Polymyositis
3. Viral myositis
4. Lupus Erythematosus

**Tests and Results:**
- Labs: CPK: 524 H, AST: 75 H, ALT: 32 H, ESR: 18 wnl, Aldolase 11 H, CRP <0.3 wnl, LDH Total 317 H
- X-Ray: 3V of bilateral hips-No acute fractures, subluxation, or dislocations.

**MRI Pelvis:** Diffuse intramuscular edema, predominantly involving gluteal muscles.

**Final Working Diagnosis:** Juvenile Dermatomyositis

**Treatment and Outcomes:**
1. Patient admitted to outside hospital, and patient started on daily prednisone, weekly methotrexate, and hydroxychloroquine.
2. Patient started on IV methylprednisolone weekly, and monthly IVIG infusion by way of G. 5 NSAIDs are now completely contraindicated for her. 6. She has annual follow up with G. for labs.

**DIFFERENTIAL DIAGNOSIS:**
- Cardiac arrest
- Carotid artery dissection
- Exercise associated hypotenation
- Exercise associated hypotension
- Hemorrhagic stroke
- Hypoglycemia
- Ischemic stroke
- Vertebral artery dissection

**TEST AND RESULTS:**
- BMP: CBC, Troponin, UDS, EKG, and CT Head without contrast were all normal. CT angiography of the neck: Acute focal right vertebral artery dissection at C2-C3. MRI of the brain and MR angiography of the neck: Right cerebellar venous infarct and confirmed right vertebral artery dissection at C2-C3 with associated thrombus. Cerebral angiography: Dissection of the right vertebral artery with associated non-occlusive thrombus and distal occlusion of the right PICA.

**FINAL WORKING DIAGNOSIS:** Right vertebral artery dissection and right cerebellar venous infarct

**TREATMENT AND OUTCOMES:**
- The patient was started on a heparin drip with transition to warfarin for anticoagulation and secondary stroke prevention. The patient will continue on warfarin for at least 3 months.
- The patient was admitted to inpatient stroke rehabilitation and discharged to home after 5 days at an independent level.
- The patient continued to suffer from vertigo for which she was started on Clonazepam 0.5mg three times daily as needed which controlled her symptoms.
- She is enrolled in vestibular outpatient physical therapy.
- The patient is determined and plans to run the 2017 Boston marathon which she has already qualified for.

**HISTORY:** A 19-year-old men's college Rugby-15s winger collapsed during match play. The player had no impact with another player, dizziness and no loss of consciousness. A medical history revealed the player had sustained a right clavicular injury in a previous match 25 days prior to this incident. Where he complained of right shoulder pain, after impacting the ground with a multi-player tackle. The player had presented to an Urgent Care facility after that injury and provisionally diagnosed with shoulder sprain -vs- pectoralis strain, placed in arm-sling and sent home on oral analgesics. Right shoulder radiographs at Urgent Care visit were read as normal.

**PHYSICAL EXAM:** Exam in ED revealed slurred speech, and complaints of localized pain and tenderness on right medial clavicle. Right sternoclavicular joint pain on palpation. Limited upper extremity range of motion secondary to pain, no facial droop, decreased left sided upper and lower extremity sensation, reflexes and strength. Symmetrical radial pulses with brisk capillary refills.

**DIFFERENTIAL DIAGNOSIS:**
1. Cervical Neck Injury
2. Stroke
3. Fracture Clavicle
4. Rib Fracture
5. Cardiac arrest
6. Hypoglycemia
7. Hemorrhagic stroke
8. Exercise associated hypotension
9. Exercise associated hypotenation
10. Ischemic stroke

**TREATMENT AND RESULTS:**
- BMP, CBC, Troponin, UDS, EKG, and CT Head without contrast were all normal. CT angiography of the neck: Acute focal right vertebral artery dissection at C2-C3. MRI of the brain and MR angiography of the neck: Right cerebellar venous infarct and confirmed right vertebral artery dissection at C2-C3 with associated thrombus. Cerebral angiography: Dissection of the right vertebral artery with associated non-occlusive thrombus and distal occlusion of the right PICA.

**FINAL WORKING DIAGNOSIS:** Right vertebral artery dissection and right cerebellar venous infarct

**TREATMENT AND OUTCOMES:**
- The patient was started on a heparin drip with transition to warfarin for anticoagulation and secondary stroke prevention. The patient will continue on warfarin for at least 3 months.
- The patient was admitted to inpatient stroke rehabilitation and discharged to home after 5 days at an independent level.
- The patient continued to suffer from vertigo for which she was started on Clonazepam 0.5mg three times daily as needed which controlled her symptoms.
- She is enrolled in vestibular outpatient physical therapy.
- The patient is determined and plans to run the 2017 Boston marathon which she has already qualified for.
Exercise Vital Sign and Health Care Utilization

Alex Mroszczek-McDonald, Sponsor: Robert Sallis, FACSM. Kaiser Permanente Southern California, Fontana, CA.

Background: It is well established that >150 minutes of weekly physical activity significantly improves health and Kaiser Permanente Southern California (KPSC) has pioneered the use of an Exercise Vital Sign (EVS) to record Physical Activity (PA).

However, there is less data on exercise and impact on healthcare utilization.

Purpose: To evaluate the correlation of EVS and healthcare utilization, in our SKCP patient population. Specifically, do those patients who report consistent exercise for >150 minutes per week have reduction of the health care utilization system.

Methods: KPSC Electronic Health Record data was abstracted to determine 3 cohorts of adults (18-65yrs) (N=2,534,895) who were Consistently Sedentary (CS) (EVS=0min/wk consistently), Insufficiently Active (IA) (EVS=1-149min/wk), or Consistently Active (CA) (EVS>150min/wk consistently), meeting the World Health Organization recommendations. Each cohort had at least 3 encounters and self-reported EVS that were consistent. Each cohort was then compared to their health care utilization over a 1, 3 and 5 year period. Because KPSC is a closed system we were able to accurately capture utilization of pharmacy, hospital, radiology, laboratory and outpatient departments. Data was adjusted for age, gender and ethnicity.

Results: Compared to CS patients, CA patients have consistently lower use of the KPSC health care system. This relationships held true across the 1, 3 and 5 year analysis. Of note patients who were CA were 75% less likely to be hospitalized (OR 0.23-0.26), 43% less likely to use the ER (OR 0.55-0.58) and 45% less Urgent Care services (OR 0.54-0.56), 25% less laboratory blood draws (OR 0.73-0.74), and 27% less pharmaceuticals fills (OR 0.71-0.74). Other factors that were associated with lower health system utilization were female gender, caucasian ethnicity and

Conclusion: Based on EVS data, and analysis of health utilization we conclude that CA individuals have significantly lower utilization of the health care system than those who are CS.

**Abstracts were prepared by the authors and printed as submitted.**
CONCLUSIONS: Elite para-sport athletes have high prevalence of Triad components, regardless of sex or sport type. Awareness of the Triad in athletes is low. While consequences of the Triad in a para-athlete population are poorly understood, screening tools and education to increase awareness are required to optimize overall health of this population.

2351 Board #11
June 1 5:45 PM - 6:45 PM
Pre-Race Medical Screening and Educational Intervention Reduces Medical Complications: A SAFER Study in 153208 Runners

Martin Peter Schwellnus, FACSM1, Karen Schwabe2, Sonja Swanevelder3, Esme Jordaan1, Wayne Derman4. 1University of Pretoria, Pretoria, South Africa. 2University of Cape Town, Cape Town, South Africa. 3South African Medical Research Council, Cape Town, South Africa. 4Stellenbosch University, Cape Town, South Africa.

(No relationships reported)

We previously reported a high rate of medical complications (1/121 race starters) in a cohort of 65 865 runners participating in 21.1km and 56km races over a 4-year period (2008-2011) (SAFER study 1). PURPOSE: To determine if an online pre-race medical screening and educational intervention program reduces medical complications in distance running events. METHODS: An online pre-race medical screening (based on the European guidelines for pre-screening of leisure athletes participating in moderate- to high-intensity sports) and an educational intervention program was designed and introduced as part of the race registration process, in the period 2012 to 2015 at the Two Oceans Marathon races (21.1km and 56km). The incidence of medical complications (per 1000 race starters; all and serious life-threatening) during the 4-year post-intervention period (2012-2015: 87 343 race starters) was compared with the pre-intervention period (2008-2011: 65 865 race starters). RESULTS: Compared to the pre-intervention (baseline) period, there was a significant reduction in the incidence (per 1000 starters, 95% CI; adjusted for age group, gender and race distance) of all medical complications in all runners by 29% [pre=8.6 (7.9-9.4); post=6.1 (5.6-6.7), p<0.0001], 21.1km runners by 19% [pre=5.1 (4.4-5.9); post=4.1 (3.6-4.8), p=0.0356], and 56km runners by 39% [pre=14.6 (13.1-16.3); post=9.0 (7.9-10.1), p<0.0001]. Serious life-threatening complications were significantly reduced in all runners by 64% [pre=0.6 (0.5-0.9); post=0.2 (0.1-0.4), p=0.0003; adjusted for age group and gender].

CONCLUSION: A pre-race medical screening and educational intervention program significantly reduced medical complications and serious life-threatening complications among all runners in community-based mass participation distance running events. The reduction in all medical complications was significant in both the 21.1km and 56km races. Pre-race screening and educational intervention programs could be introduced to reduce medical complications during endurance running events.
PURPOSE: 1) To examine the effects of chronic hypohydration on cardiovascular (CV) responses during exercise in a heated environment and determine if resting CV health influences CV responses during exercise. METHODS: Participants (n=18, 21±1y; mean±SD) followed 3 days of self-determined dehydration (DEH) or hydration (HYD) in a counterbalanced, cross-over design. Exercise trials included 30-min of cycle ergometry in a heated environment (30±2.10°C, 26.5±3.4% RH). Heart rate (HR) and blood pressure (BP) were taken every 10-min. Weighted skin temperature (Tsk) site (chest, arm, thigh, leg) and skin blood flow (SkBF) were collected continuously during exercise, followed by calculations of total body Tsk from Tsk and rectal temperature (Trec), and heat storage [HS = (0.97*weight*ATsk)/body surface area*time)]. Resting CV health was assessed by brachial-artery flow-mediated dilatation (FMD), pulse wave velocity (PWV), and heart rate variability (HRV). RESULTS: Weight (P<0.005), urine color, and specific gravity (P<0.001) were different between DEH and HYD pre-exercise. HR was greater in DEH vs. HYD at 10, 20 and 30-min (P<0.05). Body temperature responses (n=12) after 30-min of exercise were not different between HYD and DEH (Tsk P=0.47, Tb P=0.72). SkBF tended to be greater in the HYD vs. DEH (SkBF slope: HYD vs. DEH, 3.5±2.e vs. 2.4±1.1; P=0.05; SkBF: HYD vs. DEH, 370±156.3% vs. 180±100.4%; P=0.05). Though no association was found with PWV and Tsk (P=0.80) and Trec (P=0.69), greater changes in Tsk and Trec were associated with increased FMD (P<0.006) and increased rate of HS associated with decreased HRV (P=0.04) across all trials (n=24). CONCLUSIONS: Progressive, chronic dehydration alters CV and SkBF response during exercise. Resting CV profile was related to increased rate of HS and greater change in Tsk, suggesting CV health plays a role in the mechanism of heat dissipation, especially when hypohydrated.

There are two hypotheses of how stroke volume (SV) is affected during hyperthermic exercise. The traditional hypothesis is that an increase in cutaneous blood flow (CBF) is thought to lead to a decline in SV. An alternate hypothesis is that a decline in SV is due to an increase in heart rate (HR). However, these two hypotheses have not been tested under the same thermal stress. PURPOSE: 1) To determine the independent effect of HR on SV by using low dose β1 blockade (BB) when skin temperature (Tsk) is high (>38°C) during exercise. 2) To see how the rapid lowering of Tsk reverses the changes in cardiovascular variables. METHODS: Tsk was manipulated by wearing a water perfused suit that covered the whole body, except head, hands, and feet and maintained a perfused water temperature of 30 or 50°C. Subjects (n=8, active men 24±4 y) cycled at 60% VO2 peak for 20 min in three conditions: 30°C water with placebo (30-PL), 50°C water with PL (50-PL), and 50-BB. Tsk was rapidly cooled at 20 min of exercise in all trials by perfusing cold water through the suit (0°C) plus fans. Subjects continued to cycle for another 20 min with cool Tsk. Esophageal temperature (Tes), Tsk, VO2, cardiac output (CO), HR, mean arterial pressure (MAP), cutaneous blood flow (CBF), and forearm venous volume (FVFV) were measured during exercise. RESULTS: Mean Tsk during the last 20 min of exercise were 29.5±0.2, 29.8±0.3, and 30.0±0.3°C, for 30-PL, 50-PL, and 50-BB, respectively. When HR was lowered to the same level as 30-PL (479±3.8 bpm) by BB in 50-PL (517±7.5 bpm), SV was also restored to the same level as 30-PL (132.0±7.3 ml) in 50-PL (135.6±7.5 ml). SV was restored even with a significantly higher CBF (71.7±3.4% vs. 55.9±3.6% for 50-PL vs 30-PL; p<0.05) and lower MAP (98.5±2.6 mmHg vs 105.4±3.3 mmHg for 50-PL vs 30-PL; p<0.05) When Tsk was rapidly cooled, HR and CBF were significantly decreased even with apparent SV maintained in 50-PL. There was no apparent effect of Tsk on FVFV responses. CONCLUSION: The increase in HR was responsible for the decrease in SV when Tsk was above 38°C. Rapidly cooling Tsk while Tes remains elevated decreased CBF and HR.

PURPOSE: To test the hypothesis that whole-body passive heat stress sensitizes β1-adrenergic receptor mediated cardiac systolic function. METHODS: In ten healthy participants (five females: age 23±2 and five males: age 26±3), echocardiographic indices of cardiac systolic function (average peak systolic tissue velocity at the septal and lateral mitral sites - S'avg) were obtained prior to and during intravenous infusion of a low (5 µg/kg/min) and a moderate (15 µg/kg/min) dose of dobutamine (a β1-adrenergic receptor agonist) under normothermic (HT) and hyperthermic (HT) increase internal temperature of 1.2±0.1°C conditions. RESULTS: HT increased S'avg at baseline (HT, 9.5±0.5 cm/s vs HT, 14.0±1.0 cm/s, P<0.01). However, the low dose of dobutamine during HT further increased S'avg (A=6.5±1.2 cm/s) compared to S'avg in NT (A=4.0±0.7 cm/s, P=0.05).
Cycling has been reported to result in greater cardiovascular drift (CV drift) compared to running in a temperate environment. It remains unknown whether this holds true in a hot environment. It also remains unknown whether a greater magnitude of CV drift during cycling is associated with a greater decrement in VO_{\text{max}} compared to running. PURPOSE: To test the hypothesis that cycling elicits a greater magnitude of CV drift and accompanying greater decrement in VO_{\text{max}} compared to running. METHODS: Seven men (mean (SD); age = 25 ± 6 years; body fat = 12.0 ± 2.2% body weight) performed an acute graded exercise test on a cycle ergometer and a treadmill (separate days) in ~ 22 °C to determine VO_{\text{max}}. Then separate on visits (counterbalanced) they cycled or ran for either 15 or 45 min at 60% mode-specific VO_{\text{max}} in 35 °C. CV drift was measured between 15 and 45 min during the 45-min trials. The purpose of the separate 15- and 45-min trials was to measure VO_{\text{max}} over the same time interval that CV drift occurred. RESULTS: The increase in heart rate (HR; −13% for bike and treadmill, p < 0.001) and decrease in stroke volume (SV; −12% and −15.5% for bike and treadmill, respectively, p < 0.001) between 15 and 45 min were not different between exercise modes (p = 0.91 and 0.53 for mode × time interaction for HR and SV, respectively). VO_{\text{max}} decreased 15% from 15 to 45 min (p < 0.002), but the reduction was different between exercise modes (p = 0.54 for mode × time interaction). CONCLUSIONS: Contrary to our hypothesis and to previous findings in a temperate environment, the magnitude of CV drift during prolonged exercise in the heat was not different between cycling and treadmill running. The rise in HR and concomitant decrease in SV associated with CV drift in the heat—regardless of the exercise mode—corresponded to a proportional decrease in VO_{\text{max}}.

**CONCLUSION:** This pilot data suggests that both systemic and diastolic BP surge during emergency calls. The data also preliminarily indicates that obese emergency workers exhibit higher brachial and central BP. Further research is needed to determine whether obese firefighters are at risk of CV events during emergency calls.

**METHODS:** 30 male military FF, aged 40.3±3.2 yrs, BMI = 26.3±3.1 kg/m², were recruited from a Brazilian Fire Department. BP and HR were measured in a basal condition on an off-duty day (Ev1) and before (Ev2) and after (Ev3) a 12-hour period of work in the heat. BP was measured in a supine (SUP) and orthostatic (ORT) posture. **PURPOSE:** To evaluate the heart rate (HR) and blood pressure (BP) profile during a routine 12-hour work period among career FF. METHODS: 30 male military FF, aged 40.3±3.2 yrs, BMI = 26.3±3.1 kg/m², were recruited from a Brazilian Fire Department. BP and HR were measured in a basal condition on an off-duty day (Ev1) and before (Ev2) and after (Ev3) a 12-hour period of work in the heat. BP was measured in a supine (SUP) and orthostatic (ORT) posture. HR was also continuously measured during work period by the Polar® V800 and on-duty cardiac strain was categorized by the absolute and relative time spent on 4 intensity zones: light (<65% Max_age_predicted HR), moderate (65-76%), hard (77-93%) and very hard (>94%). HR and BP were compared between the 3 evaluations (Friedman test), at 5% level of significance. RESULTS: 97.3±4.2% of on-duty time was spent on light and 1.8±2.8% on moderate intensities. An important absolute time was performed on hard (4.7±10.0 min) and very hard (0.7±12.8 min) intensities. 46.7% of FF engaged on hard and 16.7% on very hard intense activities. Mean on-duty peak HR was equivalent to 76.8±17.1% of Max_HR and achieved 107.1±10.7% among those who performed very hard activities. HR and BP comparisons in the 3 evaluations are shown on Table. **CONCLUSION:** Our data show a significant increase in resting HR after 12-hour on-duty, suggesting a change on resting cardiovascular regulation toward a more stressful condition. The majority of FF was exposed to high cardiac strain during a routine 12-hour shift work. Although the time spent on vigorous activities was short, its intensity might represent an acute elevated risk for fatal and non-fatal cardiovascular event in susceptible firefighters.

**HR and BP in SUP and ORT position, at control condition (Ev1), before (Ev2) and after work (Ev3)**

<table>
<thead>
<tr>
<th></th>
<th>EVA 1</th>
<th>EVA 2</th>
<th>EVA 3</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP SUP</td>
<td>122.9±10.4</td>
<td>122.3±10.4</td>
<td>124.6±11.9</td>
<td>0.36</td>
</tr>
<tr>
<td>SBP ORT</td>
<td>121.2±13.5</td>
<td>119.8±11.8</td>
<td>125.2±18.6</td>
<td>0.11</td>
</tr>
<tr>
<td>DBP SUP</td>
<td>75.9±10.4</td>
<td>74.0±7.5</td>
<td>74.6±7.9</td>
<td>0.17</td>
</tr>
<tr>
<td>DBP ORT</td>
<td>80.0±11.2</td>
<td>79.2±10.6</td>
<td>83.0±10.9</td>
<td>0.06</td>
</tr>
<tr>
<td>HR SUP</td>
<td>57.3±7.0</td>
<td>64.3±8.5</td>
<td>68.3±15.3</td>
<td>0.003</td>
</tr>
<tr>
<td>HR ORT</td>
<td>69.1±7.3</td>
<td>75.5±14.0</td>
<td>80.2±18.1</td>
<td>0.002</td>
</tr>
</tbody>
</table>

p: p-value for Friedman test
Board #8
June 2 9:30 AM - 11:30 AM
Vagal Modulation and its Association With Cardiorespiratory Fitness During a Routine Firefighting Shift-work
Luiz Guilherme G. Porto1, Rosenkranz M. Nogueira2, Edgard M. K. V. K. Soares1, Eugenio C. Nogueira2, Carlos Janssen G. da Cruz1, Guilherme E. Molina1, Keila E. Fontana1, Maria Korre1, Denise Smith3, Stefanos N. Kales4, Luiz Fernando Junqueira Jr5, 1Faculty of Physical Education and Cardiovascular Laboratory of Faculty of Medicine, University of Brasilia and Harvard T. H. Chan School of Public Health, Boston, MA, Brasilia, Brazil. 2Military Fire Department of the Federal District—Faculty of Physical Education, University of Brasilia, Brasilia, Brazil. 3Faculty of Physical Education, University of Brasilia, Brasilia, Brazil. 4UniEuro University Center - Brasilia and Cardiovascular Laboratory of Faculty of Medicine, University of Brasilia, Brasilia, Brazil. 5Faculty of Physical Education - Cardiovascular Laboratory of Faculty of Medicine, Brasilia, Brazil. 6Faculty of Physical Education, University of Brasilia, Brasilia, Brazil. 7Harvard T. H. Chan School of Public Health and Cambridge Health Alliance, Harvard Medical School, Boston, MA, Boston, MA. 8Department of Health and Exercise Sciences, Skidmore College, Saratoga Springs, New York, Saratoga Springs, NY. 9Harvard T. H. Chan School of Public Health and Cambridge Health Alliance, Harvard Medical School, Boston, MA, Boston, MA. 10Cardiovascular Laboratory, Clinical Medicine Area, Faculty of Medicine, University of Brasilia, Brasilia, Brazil.
Email: luizgporto@gmail.com

Firefighting is a hazardous profession with high on-duty cardiovascular mortality, which might be associated with cardiac autonomic dysfunction (CAD) and/or low cardiorespiratory fitness (CRF).

PURPOSE: We aimed to evaluate the vagal modulation of the heart in resting supine (SUP) and orthostatic (ORT) postures during a routine 12-hour work period among career firefighters (FF), in association with the CRF.

METHODS: We evaluated 30 male military FF, aged 40±3.2 yrs, BMI = 26.3±3.1 kg/m², with an estimated peak power output, in a randomized-order, crossover design. Dependent variables included accuracy and reaction time on two executive cognitive function tasks (a modified Flanker task and a Stroop task), and the amplitude and latency of their associated event-related potentials.

RESULTS: Median (min-max) values of PNN50% in SUP and ORT in Eva1-3 are shown on Table. Those with better CRF categories (<12 METs vs ≥ 12 METs) after 12 hours of work in ORT (Kruskal Wallis test), at 5% level of significance.

<table>
<thead>
<tr>
<th></th>
<th>SUP</th>
<th>ORT</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eva1</td>
<td>11.4 (0.0 - 54.0)</td>
<td>2.6 (0.0 - 31.5)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Eva2</td>
<td>7.8 (0.0 - 53.6)</td>
<td>1.0 (0.0 - 25.2)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Eva3</td>
<td>11.4 (0.0 - 61.4)</td>
<td>0.35 (0.0 - 60.3)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

CONCLUSION: Our data show a physiological decrease on PNN50% to active standing up. We also observed a significant reduction on the vagal modulation in ORT vs SUP as compared to Eva1. The association between the reduced resting vagal modulation after a 12-hour period of work and low CRF reinforce previous recommendation for implementing physical training among FF as a cardioprotective strategy.

PNN50% in SUP and ORT, at control (Eva1), before (Eva2) and after a routine work (Eva3)

E-11
Thematic Poster - Exercise Psychology - Cognition and Emotion
Friday, June 2, 2017, 9:30 AM - 11:30 AM
Room: 403

Board #1
June 2 9:30 AM - 11:30 AM
Moderate Intensity Exercise Ameliorates Negative Impacts of Simulated Altitude on Executive Function.
Laura Q. Jimenez, Brian Arwari, Arlette C. Perry, FACS, Joseph F. Signorile, FACS, Soyeon Ahn, Sarah Kamakawio’ole, Kevin A. Jacobs, FACS, FACS, University of Miami, Coral Gables, FL. (Sponsor: Dr. Kevin Allen Jacobs, FACS)
Email: lquirola@umiami.edu

PURPOSE: The present study was conducted to examine the behavioral cognitive and neurophysiological effects of acute exposure to simulated moderate and high altitudes at rest and during exercise in an effort to delineate whether there is a level of simulated altitude beyond which executive cognitive functions are impaired and whether exercise improves or worsens cognitive function during exposure to simulated altitude.

METHODS: Fourteen recreationally active college students (M=9, F=5) aged 18-35 participated in this study, which consisted of six experimental days, with three simulated altitude conditions: sea level (SL), simulated moderate altitude (MA; 15.4% FIO2 ~2400 m) or simulated high altitude (HA; 12.8% FIO2 ~3900 m) and two exercise conditions: rest or moderate intensity cycling exercise at 60% altitude-specific peak power output, in a randomized-order, crossover design. Dependent variables included accuracy and reaction time on two executive cognitive function tasks (a modified Flanker task and a Stroop task), and the amplitude and latency of their associated event-related potentials.

RESULTS: For the Flanker task, both MA and HA slowed down reaction time (p<0.04), while exercise improved reaction time (p<0.01). Similarly, for the Stroop task, HA (though not MA) slowed reaction time (p<0.02), while exercise improved reaction time (p<0.04). Accuracy was preserved under all conditions. These effects were partially explained by alterations in associated event-related potential amplitudes and latencies, such as slower N200 latencies with altitude (p<0.04) but faster latencies with exercise (p<0.01), as well as reduced P300 amplitude and slower latency with altitude (p<0.01), and reduced amplitude but faster latency with exercise (p<0.03).

CONCLUSIONS: Acute exposure to simulated altitudes slows behavioral cognitive reaction time on executive function tasks while preserving task accuracy. An acute bout of moderate intensity cycling exercise improves reaction times so that they are comparable to those achieved without exercise or simulated altitude exposure, at least in instances where exercise does not exacerbate the peripheral oxygen saturation drops seen with simulated altitude.

2402
Board #2
June 2 9:30 AM - 11:30 AM
Relation Between Affective Valence During Exercise and Exercise Behavior
Zachary Zenko1, Panteleimon Ekkekakis, FACSM2. 1Duke University, Durham, NC. 2Iowa State University, Ames, IA.

Theories currently used to understand exercise behavior focus on cognitive constructs but overlook the potential role of affect. However, recent studies have yielded evidence of an association between exercise-induced affect and exercise behavior, focusing on single assessment of affect during and post-exercise or pre-post changes. We extend this line of research by (a) tracking the affective response with multiple assessments during exercise and calculating individual slopes of change and (b) setting exercise intensity at the ventilatory threshold (VT), where interindividual variability in affective responses is expected to be maximized, according to the dual-mode theory. Purpose: To assess the relations between slope of affective valence (AV; i.e., pleasure-versusdispleasure) and the mean AV during exercise at the VT with exercise behavior. Methods: Volunteers (N=93; 62.4% female; VO2peak: 31.7±8.13 ml · kg⁻¹ · min⁻¹; BMI: 25.05±4.86 kg · m⁻²; age: 25.27±9.11 years) completed a maximal exercise test to determine the VT. One week later, participants completed a 5 min warm up followed by 10 min of exercise at the watts corresponding to the VT with exercise behavior. Leisure-time moderate- and vigorous-intensity exercise behavior were assessed one week earlier using the International Physical Activity Questionnaire (Craig et al., 2003). Results: As anticipated, considerable heterogeneity in the slope of AV during exercise was evident; 62% of participants reported declines whereas 23.9%

Abstracts were prepared by the authors and printed as submitted.
reported improvements. The slope of AV was related to moderate \((r = 0.22, p = 0.03)\) but not vigorous exercise behavior \((r = 0.04, p = 0.72)\). Mean AV during exercise was also related to moderate \((r = 0.28, p = 0.06)\) but not vigorous exercise behavior \((r = 0.8, p < 0.001)\). Conclusions: AV during exercise is associated with moderate, but not vigorous, exercise behavior. Future investigators should determine if changes in AV during exercise correspond to changes in exercise behavior in longitudinal studies.

2403 Board #3 June 2 9:30 AM - 11:30 AM Does A Mentally Demanding Cognitive Task Influence Motor Reaction Time?
Bart Roelands1, Jeroen Van Cutsem1, Samuele Marcora2, Romain Meeussen1, FACSM1, ‘Vrije Universiteit Brussels, Brussels, Belgium. University of Kent, Kent, United Kingdom. (Sponsor: Romain Meeussen, FACSM) Email: bart.roelands@vub.ac.be

Purpose: Recent research has reported mental fatigue not only impairs endurance, but also sport-specific technical performance. Therefore we sought to examine the effect of a mentally fatiguing task on a motor-reaction time (M-RT) task.

Methods: A M-RT task was developed with Fitlight-hardware and -software in order to evaluate the effect of mental fatigue on stimuli-type (simple vs. response inhibition) and visual-field position (central vs. peripheral). Eleven untrained healthy subjects (age: 25 ± 4y; 6 female; 5 male) performed two experimental trials in a randomized crossover order. Participants first completed a baseline M-RT task (-6min.Msec.), followed by a Flanker task. Next they performed either a 90min mentally fatiguing task (Stroop task; MF) or watch a 90min documentary (CON). Immediately thereafter again the Flanker task and the M-RT task were completed.

Accuracy (ACC) and reaction time (RT) were followed up in all tasks but the documentary. In addition multiple physiological and psychological measures were assessed during the protocol.

Results: ACC on both the Stroop task (p = 0.021) and the Flanker task (r = 0.3; p = 0.048) dropped over time in MF. Participants got faster over time on the Stroop task in MF (p < 0.004). RT on the Flanker task did not change over time in both MF and CON. Subjectively, higher (p < 0.001) mental fatigue was perceived in MF compared to CON. Concerning the M-RT-performance, no effects were observed for the simple stimuli. For the response inhibition-stimuli, only in MF participants became significantly slower in time (r = -7;5%; p = 0.007).

Conclusion: Mental fatigue negatively affects sport-specific response inhibition-RT. Therefore, besides endurance capacity, also sport-specific cognition appears to be impaired by mental fatigue. The impairment in RT was independent from the visual-field position of the stimulus and was not perceived by the participants.

2404 Board #4 June 2 9:30 AM - 11:30 AM Regulating Pleasure During Exercise: Impact on Exercise Adherence
Nicole B. Doolen, Walter R. Bixby, FACSM, Elon University, Elon, NC.

Purpose: To compare the impacts of an affect-based exercise prescription (Feeling Scale) versus an intensity-based exercise prescription (Rating of Perceived Exertion) on changes in exercise adherence. Methods: Participants were assigned to an FS prescription \((n = 26)\) or an RPE prescription \((n = 24)\) for a 6-week intervention consisting of at least 30 minutes of cardiovascular exercise on at least 3 days per week. The FS prescription required participants to maintain a perceived FS value of at least +3 (good), and the RPE prescription required participants to maintain a perceived RPE value of 12-13 (somewhat hard) throughout each exercise bout. Exercise logs were used to assess exercise participation and minutes of exercise per week at 1, 3, and 6 months post-intervention. Results: For the 26 participants in the FS group who began the intervention, 77% completed the 6 weeks, 62% reported exercise at 1 month, 62% reported exercise at 3 months, and 62% reported exercise at 6 months. For the 24 people in the RPE group who began the intervention, 67% completed the 6 weeks, 38% reported exercise at 1 month, 25% reported exercise at 3 months, and 25% reported exercise at 6 months. For minutes of exercise per week, a 2 (group) x 3 (time) ANOVA with repeated measures on the time factor revealed a significant main effect for time, \(F(2, 48) = 3.20, p = 0.049\). Minutes of exercise for the FS and RPE groups varied at 1.3 and 6 months: FS = 96.2, 61.4, & 57.3; RPE = 89.1, 77.7, & 94.5.

Conclusion: Drop-out rate was lower for the FS group across all time points. Three months post-intervention, more participants in the FS group reported exercise and they did more minutes of exercise per week. At 6 months, this trend in adherence for the FS group had disappeared. A more robust intervention may have improved 6 month adherence.

2405 Board #5 June 2 9:30 AM - 11:30 AM Effect Of High-Intensity Intermittent Games-based Activity On Cognitive Function In Adolescents
Simon B. Cooper1, Karah J. Dring1, Maria L. Nute1, John G. Morris1, Caroline Sunderland1, Stephan Bandelow2, Mary E. Nevill1, ‘Nottingham Trent University, Nottingham, United Kingdom. Loughborough University, Loughborough, United Kingdom. Email: simon.cooper@ntu.ac.uk

Purpose: To examine the effects of a bout of games-based exercise on adolescents’ cognitive function. Methods: Following ethical approval and familiarisation, 28 adolescents \((12.2±0.7\) y) completed an exercise (E) and resting (R) trial in a counterbalanced, randomised crossover design. Following a standardised breakfast of 1.5 g carbohydrate per kg body mass, participants completed 1 h of games-based activity (basketball), during which average heart rate was 154±8 beats/min and maximal heart rate was 196±8 beats/min. A battery of cognitive function tests (Stroop test, Sternberg paradigm and Trail Making test) were completed 30 min pre-exercise, immediately post-exercise and 45 min post-exercise. Data were analysed using mixed effect models in R. Results: Response times on the simple level of the Stroop test were unaffected, but on the complex level there was an improvement in response times immediately (E: -78 ms, R: +1 ms, \(p = 0.004\)) and 45 min post-exercise. Accuracy on the simple level of the Stroop test was better maintained 45 min post-exercise (E: +0.8%, R: -3.1%, \(p = 0.015\)), but unaffected immediately post-exercise and on the complex level. Response times on the one item level of the Sternberg paradigm were enhanced immediately post-exercise (E: -37 ms, R: -2 ms, \(p = 0.014\)) and on the 5 item level were enhanced immediately (E: -79ms, R: -1 ms, \(p = 0.002\)) and 45 min (E: -70 ms, R: -8 ms, \(p = 0.047\)) post-exercise. Accuracy on the Sternberg paradigm was unaffected, as was the time taken to complete both levels of the Trail Making test (all p > 0.05). Conclusion: Cognitive function was enhanced following intermittent high-intensity team games-based activity in adolescents, as observed by improved response times and accuracy on the Stroop test and improved response times on the Sternberg paradigm. These data support the inclusion of opportunities for team games-based exercise during the school day to enhance cognitive function; a key consideration for school policy makers.

2406 Board #6 June 2 9:30 AM - 11:30 AM Comparison Of The Effects Of Self-selected And Prescribed Intensity Exercise On Exertion And Feeling
Walter R. Bixby, FACSM, Kristen A. Fontela. Elon University, Elon, NC. Email: wbixby@elon.edu

Purpose: To determine if participants rate an exercise intensity as more enjoyable when permitted to self-select rather than when the intensity is prescribed to them. Methods: Twenty-three healthy (13 females) participants \((age = 20.9±0.55\) y) completed a graded exercise test \((VO2\ max male: 39.4±6.8 & female 33.9±3.8)\), and then completed a 1 h of games-based activity \((basketball), during which average heart rate was 154±8 beats.min-1 and maximal heart rate was 196±8 beats.min-1. A battery of cognitive function tests \((Stroop test, Sternberg paradigm and Trail Making test) were completed. Data were analysed using mixed effect models in R. Results: Response times on the simple level of the Stroop test were unaffected, but on the complex level there was an improvement in response times immediately (E: -78 ms, R: +1 ms, \(p = 0.004\)) and 45 min post-exercise. Accuracy on the simple level of the Stroop test was better maintained 45 min post-exercise (E: +0.8%, R: -3.1%, \(p = 0.015\)), but unaffected immediately post-exercise and on the complex level. Response times on the one item level of the Sternberg paradigm were enhanced immediately post-exercise (E: -37 ms, R: -2 ms, \(p = 0.014\)) and on the 5 item level were enhanced immediately (E: -79ms, R: -1 ms, \(p = 0.002\)) and 45 min (E: -70 ms, R: -8 ms, \(p = 0.047\)) post-exercise. Accuracy on the Sternberg paradigm was unaffected, as was the time taken to complete both levels of the Trail Making test (all p > 0.05). Conclusion: Cognitive function was enhanced following intermittent high-intensity team games-based activity in adolescents, as observed by improved response times and accuracy on the Stroop test and improved response times on the Sternberg paradigm. These data support the inclusion of opportunities for team games-based exercise during the school day to enhance cognitive function; a key consideration for school policy makers.
Sex, contact level, and concussion history have been associated with preseasone aggression, impulsivity, anxiety, and depression in high school athletes. However, postseason scores have not been investigated. PURPOSE: Determine the association of postseason concussion, anxiety, aggression, and impulsivity with sex, contact level and concussion history in high school athletes.

METHODS: Postseason concussion history and emotion dysregulation measures were collected at one high school during 2013-2014 and 2014-2015 and at three high schools during 2015-2016. Sports were categorized into no-contact (cross country, swimming, tennis, track), low-contact (baseball, basketball, diving, softball, volleyball), and high-contact sports (field hockey, football, lacrosse, soccer, wrestling). Concussion history and incident concussion were analyzed as dichotomous variables (any vs. none). One-way analysis of variance was used for all analyses. Preseasone emotion dysregulation scores and sport were used as covariates for all analyses. RESULTS: Postseason data were collected from 717 athletes (n=392 males, 325 females; age=15.7 ± 1.2 years) who averaged 5.7 ± 3.5 years of sport participation. Females reported significantly lower aggression scores compared to the males (B = -10.489, p=0.008, 95% CI : -18.219,-2.759). Low contact sport reported significantly lower posterior aggression compared to high contact sports (B = -10.488, p=0.007, 95% CI : -18.218,-2.758). No other significant posterior behavior regulation differences were found between sex (p≥0.020), contact levels (p=0.0202), concussion history (p=0.1110), or incident concussion (p=0.2060). CONCLUSIONS: In univariate analyses, sex and contact level were associated with emotion dysregulation in high school athletes. Concussion history and incident concussion were not associated with postseason emotion dysregulation in high school athletes. Longitudinal studies over several years may be needed to determine these relationships.

Progressive resistance training (PRT) is recommended for breast cancer patients (BC) to prevent or mitigate treatment-related side effects. However, little attention has been paid to the following of principles of exercise training in various cancer treatment settings. PURPOSE: To investigate principles of exercise training in BC undergoing a 12-week twice-weekly supervised PRT concomitant to adjuvant radiotherapy (RT) vs. chemotherapy (CT).

METHODS: PRT documentation sheets were analyzed from 128 BC participated either in a randomized controlled trial investigating the effect of 12-week PRT vs. a relaxation control group during adjuvant CT (BEATE-Study; NCT01106820) or RT (BEST-Study; NCT011468766). Extracted variables were: Exercise frequency, progression and degression steps made, as well as % change in weight load during the intervention period for three lower and four upper extremity machine-based exercises. Furthermore, %change of maximal isokinetic peak torque (MIP) in knee extensors and flexors measured by stationary dynamometry were available.

RESULTS: Training frequency in CT patients were significantly lower than in RT patients (1.38 ± 1.77 sessions/week vs. 2.01). Progression steps were made in 76% of patients under CT vs. 78% in RT treated patients. Comparable results were found for degression steps made (37% vs. 33%). The number of progression steps was significantly higher in shoulder external rotators for RT patients (p<0.045) and borderline significant results were found in leg press and seated row (p<0.07 and 0.15).

In general, number of progression steps made for each exercise was lower (median: 2, range: 0-11). Change in training weight load was significantly different in favor for the RT treated patients in four out of seven exercises (p<0.05) and borderline significant in the other three (p<0.07 to 0.15). The correlation between change in training weight load and MIP in knee fl exors and extensors was weaker (r= 0.10 and 0.22).

CONCLUSIONS: BC undergoing CT faced greater challenges to adhere to principles of PRT than patients undergoing RT treatment. However, adherence to principles of PRT is important for patients undergoing RT treatment. As a consequence increases in training weight load during the intervention period was lower. Correlation analyses further indicate that changes in training weight load do not necessarily result in higher strength values.
applicable and helpful to the knowledge users. PURPOSE: To identify barriers, facilitators and preferences towards exercise of cancer survivors after participation in the ACE pilot study. METHODS: A longitudinal descriptive design using mixed methods research methodology was used to better understand the participant exercise experience. Following study completion, a post-study satisfaction questionnaire was administered and a focus group session was held. Quantitative data were analyzed descriptively and qualitative data used to interpret, clarify and further describe quantitative results. RESULTS: 82% of participants indicated a preference for a combination of unsupervised and supervised exercise, 77% preferring to exercise with other cancer survivors, and 67% for exercise programming to occur in a community facility. 76% perceived little to no difficulty in continuing to exercise independently. A major theme emerging was the lack of counselling from healthcare providers on exercise during the cancer treatment period. Oncologist referral to the ACE pilot was minimal, with 93% of survivors indicating they self-referred to the program. Specifically, participants identified a lack of (1) communication on the value of exercise for recovery and (2) provision of information on the availability of cancer-specific exercise programming. CONCLUSIONS: An iKT approach, involving survivors and their families, can help inform exercise programming issues and the need for program modification to optimize survivor satisfaction and adherence.

2412 Board #3 June 2 9:30 AM - 11:30 AM Cardioprotection in Breast Cancer Survivors: Sports Activity Vs Exercise As Prescription Model
Laura Stefan1, Gianni Pedrizzetti2, Stefano Pedri2, Benedetta Tosi1, Giorgio Galanti1, 1Sports and Exercise Medicine Center, Florence, Italy. 2University of Trieste, Trieste, Italy.
RESULTS: Sl % LV SL baseline was minimal, with 93% of survivors indicating they self-referred to the program. Specifically, participants identified a lack of (1) communication on the value of exercise for recovery and (2) provision of information on the availability of cancer-specific exercise programming. CONCLUSIONS: An iKT approach, involving survivors and their families, can help inform exercise programming issues and the need for program modification to optimize survivor satisfaction and adherence.

2413 Board #4 June 2 9:30 AM - 11:30 AM Effect of an Argentine Tango Intervention on Gait Variability in Cancer Survivors
Ajit M.W. Chaudhari, FACSM, Scott M. Monfort, Marie T. Lamantia, Maryam B. Lustberg, Lise C. Worthen-Chaudhari. The Ohio State University, Columbus, OH.
RESULTS: The CV of stride-to-stride fluctuations in speed, stride length, stride time, and step width were calculated. Linear mixed models for repeated measures with survivors as a random effect, and testing timepoint as the fixed effect, were used to estimate changes for each gait parameter.

CONCLUSIONS: Argentine tango was found to improve stride-to-stride variability in gait speed. This study supports the efficacy of dance-based exercise interventions to improve gait variability and potentially decrease falls risk in cancer survivors.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®
Cancer-related fatigue is the most commonly reported side effect in cancer patients. This debilitating fatigue is often accompanied by reductions in overall physical activity and physical function. Whereas fatigue in cancer survivors seems partially dependent on neuromuscular factors, these relationships have not been established in Hodgkin’s lymphoma survivors (HLS).

**PURPOSE:** To assess self-perceived fatigue and muscle quality in Hodgkin’s lymphoma survivors.

**METHODS:** A total of 12 HLS, age 32.16 ± 8.06, and 36 control healthy subjects (CON) matched by age, gender and level of physical activity were enrolled in the study. Fatigue was measured using MF-I-20. Muscle thickness of knee extensors (MT) was measured using B-mode ultrasound. Muscle quality was assessed by echo intensity (EI) of rectus femoris and specific torque (ST) of the knee extensors. The ST was calculated as follows: isokinetic peak torque (PT)/MT. Isokinetic PT was measured by two sets of four maximal isokinetic knee extension at 60°/s.

**RESULTS:** No significant differences (p > 0.05) in any physical characteristics between HLS and CON were observed. There was no difference in PT (HLS: 184.58 ± 55.91 vs. CON: 199.14 ± 60.57 N.m; p = 0.552), MT (HLS: 27.35 ± 8.70 vs. CON: 19.80 ± 3.36; p = 0.009; ES = 0.8778), and ST (HLS: 6.89 ± 1.59 vs. CON: 7.05 ± 1.46 N.m.mm; p = 0.737).

However, there was a significant difference between HLS and CON for self-perceived fatigue (HLS: 14.00 ± 3.91 vs. CON: 10.80 ± 3.36; p = 0.009; ES = 0.8778).

**CONCLUSION:** A higher level of self-perceived fatigue was observed in HLS when compared to CON. However, no differences in muscle quality were observed when HLS are matched by age, gender and physical activity level with CON. It appears that as HLS are further out from the completion of their major treatments, their muscle characteristics and function are preserved if they maintain certain level of physical activity. This study provides insight on the potential similarities between HLS and CON, with same physical activities level, regarding muscle characteristics, function, and performance, which should be considered when prescribing exercise training to this population.
Inadequate, Habitual Dietary Protein Intake Amid Inadequate Caloric Intake In Collegiate Female Gymnasts

William R. Lunn. Southern Connecticut State University, New Haven, CT.

Email: lunnw1@southernct.edu (No relationships reported)

Collegiate, women’s gymnastics is a sport that requires explosive muscular contributions, muscular endurance, and demands twice-daily workout schedules. What is lesser known is if day-to-day variations in eating exist, and if so, would they tend to result in balanced energy requirements, or a deficit. PURPOSE: To determine if daily variations in energy intake and nutrient insufficiency occurs during a competition week for female gymnasts. METHODS: Female, NCAA gymnasts (n=14; 20.1±1.2 years; BMI=23.4±2.5 kg/m²) provided 7-day food and physical activity recalls during a competition week. Athletes also completed a resting metabolic rate (RMR) test using indirect calorimetry with a calibrated metabolic system (Parvo Medics). The Mifflin-St. Jeor formula was also used to compare total daily energy expenditure (TDEE) based on initial 25(OH)D levels. Participants with deficient 25(OH)D (<20 ng/mL) participated. Serum 25(OH)D concentrations, lifestyle and dietary factors were noted. Results: 60% of participants had deficient 25(OH)D (<20 ng/mL). 20 (17%) of the 94 participants received 35,000 IU/week for 4 weeks followed by a maintenance dose of 15,000 IU/wk. Participants with sufficient 25(OH)D (>30 ng/mL) received the maintenance dosage of 15,000 IU/wk. Performance measurements were assessed using a 20 meter wheelchair sprint, and handgrip strength. A paired t-test was used to assess differences in 25(OH)D status before and after supplementation, respectively. Results: 25 (OH)D concentrations increased significantly after supplementation (P < .001; 26.5 ± 9.7 ng/mL; 44.5 ± 9.6 ng/mL; mean ± SD) for Winter and Spring, respectively. 26% of athletes had sufficient 25(OH)D concentrations prior to supplementation, and 94% had sufficient concentrations post supplementation. 60% of participants improved handgrip strength post-supplementation. However, no change in wheelchair sprint performance time was observed. Conclusion: The 16-week supplementation protocol used in the current study is effective for achieving sufficient vitamin D concentrations during the winter months in elite athletes with SCI. Furthermore, handgrip strength improved in 60% of participants post-supplementation.

Table 1: Energy and Macronutrient Intakes by Sports Expressed as Means (SD)

<table>
<thead>
<tr>
<th>Description (SD)</th>
<th>Women’s Basketball (n=5)</th>
<th>Women’s Swimming (n=15)</th>
<th>Women’s Tennis (n=8)</th>
<th>Men’s Tennis (n=8)</th>
<th>Women’s Track and Field (n=12)</th>
<th>Men’s Wrestling (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal/d)</td>
<td>2,188 (307)</td>
<td>2,347 (389)</td>
<td>1,960 (372)</td>
<td>2,979 (594)</td>
<td>2,267 (510)</td>
<td>2,253 (540)</td>
</tr>
<tr>
<td>Carbohydrates (g/kcal)</td>
<td>3.7 (0.6)</td>
<td>4.6 (1.1)</td>
<td>4.5 (1.0)</td>
<td>5.5 (1.4)</td>
<td>5.1 (1.3)</td>
<td>2.8 (1.0)</td>
</tr>
<tr>
<td>Protein (g/kcal)</td>
<td>1.2 (0.1)</td>
<td>1.3 (0.3)</td>
<td>1.1 (0.2)</td>
<td>1.7 (0.6)</td>
<td>1.5 (0.2)</td>
<td>1.3 (0.5)</td>
</tr>
<tr>
<td>Fat (% of Total Kcal)</td>
<td>33 (7)</td>
<td>33 (6)</td>
<td>30 (9)</td>
<td>31 (6)</td>
<td>33 (3)</td>
<td>37 (12)</td>
</tr>
<tr>
<td>Fiber (g/d)</td>
<td>31 (15)</td>
<td>24 (9)</td>
<td>25 (9)</td>
<td>24 (8)</td>
<td>27 (9)</td>
<td>23 (12)</td>
</tr>
</tbody>
</table>
Optimal nutrition enhances athletic performance. Eating adequate amounts of energy and meeting recommendations for macronutrients are essential and a priority for athletes. PURPOSE: To evaluate the dietary intakes of macronutrients of Masters Athletes. METHODS: This cross-sectional study included 25 Masters Athletes (14 females, 11 males), 39.4±10.1 years of age. Body composition was determined by dual-energy X-ray absorptiometry (DXA). Participants completed a self-administered Block Food Frequency Questionnaire (FFQ) used to assess dietary patterns over the previous year. The FFQs were analyzed by a third party source; however, statistical analyses were conducted by the researchers. For the purposes of this study, athletes were classified as either lean or non-lean based on percent body fat. Female athletes with < 24.4% and male athletes with < 17.4% body fat were considered lean. RESULTS: Average carbohydrate intake was 44.7±6.6% and 47.7±7.6% of total energy intake for lean and non-lean athletes, respectively. Average protein intake was 15.3±2.8% and 15.0±2.0% of total energy intake for lean and non-lean athletes, respectively. Average fat intake was 38.1±7.4% and 36.5±4.9% of total energy intake for lean and non-lean athletes, respectively. There were no significant differences between groups in percent of carbohydrate, fat and protein consumed to total energy intake. CONCLUSION: Macronutrient recommended intakes for carbohydrates and proteins are being met for Masters Athletes, which helps to ensure optimal performance; yet proportional fat intake is above recommendations. Nonetheless, aside from the Dietary Reference Intakes, specific recommendations for Masters Athletes have not been established. These represent data from an unfunded research project.

Background: Healthy Eating Index 2010 (HEI-2010) is a tool that was developed to assess diet quality and adherence to the 2010 Dietary Guidelines for Americans. The total HEI-2010 score was 56.2±15.0. The adequacy HEI-2010 component scores (mean/SD: max score, higher score = higher consumption) were: total Veg 3.0±1.5/5, total Fruits 2.4±2.0/5, Whole Grain 2.8±1.2/5, Fatty Acid Ratio 4.7±3.5/5. The moderation components of HEI-2010 (mean/SD: max score, higher score = lower consumption) were: Sodium 2.8±3.1/10, Refined Grains 7.5±2.9/10, 13.7±5.5/20. CONCLUSION: The HEI score for SQT was 24.3±2.6 (mean±SD), height: 179.5±6.6 cm, weight: 85.0±8.2 kg; body fat: 14.3±4.1%.

Methods: An online survey was developed to investigate the relationship between MD, ED, and competition practices used in competitive bodybuilding. To be included, participants needed to have competed in a drug tested bodybuilding contest in the past 18 months. The survey assessed demographic characteristics, diet, supplementation and training practices, MD symptoms via the muscle dysmorphic disorder inventory (MDDI) and ED symptoms via the eating attitudes test (EAT-26). Stepwise linear regression was performed to assess the relationship between MD and ED symptoms, diet, supplementation and training practices. Results: Sixty participants (age 30.7±7.7 yrs) met inclusion criteria and completed the survey. Mean scores on the EAT-26 (8.5±6.3) were low, and on the MDDI (35.2±8.0), mid-range. No nutrition, supplementation or training factors were found to predict MD symptomatology. The EAT-26 score (β=0.268, p<0.002) and rate of pre-competition weight loss (β=0.307, p<0.012) were significant predictors of MD. Conclusion: The model explained 21.14% of the variance in MD. Despite its known association with ED, weight suppression was not associated with MD (p=0.746).

Conclusions: The predictive validity of eating disorder psychopathology underscores the salience of disordered eating pathology in presentations of MD. These results suggest that it is the presence of disordered eating attitudes and beliefs that separate BB with MD from BB without MD. In support of this, greater rate of pre-competition weight loss, which may reflect disordered eating practices, is also predictive of MD symptomatology. Lastly, an inverse relationship between competition experience and MD symptoms may suggest that although those susceptible to MD may be attracted to bodybuilding, their cognitive and behavioural symptoms may potentially impede longer-term engagement in the sport. Longitudinal studies are needed to confirm this.

Athletes in weight category sports practice various methods of acute weight loss, with recent research and long standing "grey literature" demonstrating the popularity of "water loading" (the consumption of large volumes of fluid for several days, prior to withholding intake) as a means to increase body water losses following fluid restriction. No research has examined this technique or its risk of causing hyponatraemia. PURPOSE: To determine the effectiveness and safety of watering loading and assess potential mechanisms. METHODS: Male combat sport athletes (n=21, 77.5±8.1kg 177.5±6.1cm, 26.6±4.0years) were separated into a control (CON) and water loading (WL, n=11) group. Subjects were fed a standardised isocaloric diet based on fat free mass (assessed via DXA scan) controlling for macronutrient, sodium and fibre content for 6 days. Day 1-3 fluid intake was 40mL/kg CON and 100mL/kg WL. Day 4 fluid intake was 15mL/kg CON and WL. Day 5 no fluid was consumed until midnight with the following day as the same rehydration protocol until day 6. Urine sodium, specific gravity (USG) and volume were recorded alongside training sweat losses and sleep quality/duration (measured via actigraphy) throughout. Renal hormones (vasopressin, rennin, and aldosterone), blood urea and electrolytes (U/E) and body mass (BM) were measured each morning (lasted) and evening following 30 min supine rest. Physical performance was assessed before and post intervention. Two way repeated measures ANOVAs were used to assess differences between groups. RESULTS: Following fluid restriction, significant differences with large effect sizes were found in fluid input/output ratio (39.1%, p<0.01, ES=1.2) and BM loss (0.6%BM, p=0.02, ES=0.82). No differences in sleep or performance.
Level Laser Therapy (LLLT, Irradia 904nm 12-fold laser device) • Eccentric training on a 25° decline block (daily 6x815 repetitions per leg according to Altendorf's scheme)

RESULTS: Pain at exercise (on a visual analogue scale 0-10) was reduced from 6±2 to 2±2 at six weeks and 1±1 after 12 weeks of treatment. Morning stiffness was reduced at six weeks by 56% and 87% after 12 weeks. The degree of neovascularisation in PowerDoppler ultrasound was reduced from Öhberg degree 3+ to 0-1+ after 12 weeks as was the tendon diameter by 38% in grey scale ultrasound. VISA-P scores improved by 32% at six weeks and 51% at 12 weeks. Players were able to return to sport at mean 18±12 days after initiation of the weekly therapy. CONCLUSIONS: Combined focused shockwave & low level laser tendon therapy accompanied by daily eccentric training are able to improve patella tendon function with a sustained effect in soccer athletes with an early return to game play.

E-14 Thematic Poster - Rehab and Recovery in Skeletal Muscle and Connective Tissue

Friday, June 2, 2017, 9:30 AM - 11:30 AM
Room: 101

2427 Chair: Matthew C. Kostek, FACSM. Duquesne University, Pittsburgh, PA.

2428 Board #1 June 2 9:30 AM - 11:30 AM
Knee Morphology After Secondary Ipsilateral ACL Injury Compared to Those That Have Not Reinjured
Lindsey K. Lepley1, Jessica E. DiGiacomo1, John A. Redman2, Riann M. Palmieri-Smith2.1University of Connecticut, Storrs, CT. 2University of Michigan, Ann Arbor, MI.
Email: lindsey.lepley@uconn.edu

2429 Board #2 June 2 9:30 AM - 11:30 AM
Focused Shockwave Therapy & Low Level Laser Therapy In Patella Tendinopathy Among German Soccer Players
Karsten Knobloch. SportPraxis Prof. Dr. Karsten Knobloch, Hannover, Germany.
Email: kknobi@yahoo.com

POrPOSE: To assess the feasibility and efficacy of combined focused extracorporeal shockwave therapy (ESWT) & low level laser therapy (LLLT) in addition to conventional eccentric training in patella tendinopathy among elite professional soccer players with patella tendinopathy.

METHODS: 34 German Bundesliga soccer players suffering from patella tendinopathy > 4 weeks underwent both, conventional and Power Doppler ultrasound determining the size of the ACL (combined ACLx1 and ACLx2 groups) and controls using independent t-tests and across groups (ACLx1, ACLx2, controls) indicating no difference in LPTS was found between ACLx1 and ACLx2 (6.8±3.2deg using one-way ANOVAs. and controls using independent t-tests and across groups (ACLx1, ACLx2, controls).

MATERIALS AND METHODS: Human osteoarthritic tibial plateau were obtained from ten patients undergoing total knee replacement. Each sample had been classified into a mild or severe group according to OARSI scoring. Tissue was taken from each specimen and mRNA expression levels of CD105, CD166, Notch 1, Sox9, Acan and Col II A1 were measured at day 0 and day 14 (2 weeks in vitro). Furthermore, MSC markers: Nucleostemin, CD90, CD73, CD166, CD105 and Notch 1 were studied via immunofluorescence. RESULTS: mRNA levels of MSC markers did not differ between mild and severe OA at day 0. At day 14, protein analysis showed that proliferated cells from both sources express all 6 markers. Only cells from mild OA resulted in a significant increase of mRNA CD105 and CD166 after in vitro expansion. Moreover, cells from the mild OA showed significantly higher levels of CD105, Sox9 and Acan than from those from severe OA. CONCLUSION: Results confirmed the presence of MSC markers in mild and severe OA tissue on both mRNA and protein levels. We found potential differences between cells obtained from mild compared to severe which suggests that mild OA derived cells may have a greater MSC potential.

E-14 Thematic Poster - Rehab and Recovery in Skeletal Muscle and Connective Tissue

Friday, June 2, 2017, 9:30 AM - 11:30 AM

BACKGROUND: Recent research confirmed the presence of Mesenchymal stem cell (MSC) - like progenitors (MPC) in both normal and osteoarthritic cartilage. However, there is only limited information concerning how MPC markers develop with osteoarthritis progression. The purpose of this study is to determine the prevalence of MPC markers in different OA grades.

MATERIALS AND METHODS: Human osteoarthritic tibial plateau were obtained from ten patients undergoing total knee replacement. Each sample had been classified into a mild or severe group according to OARSI scoring. Tissue was taken from each specimen and mRNA expression levels of CD105, CD166, Notch 1, Sox9, Acan and Col II A1 were measured at day 0 and day 14 (2 weeks in vitro). Furthermore, MSC markers: Nucleostemin, CD90, CD73, CD166, CD105 and Notch 1 were studied via immunofluorescence. RESULTS: mRNA levels of MSC markers did not differ between mild and severe OA at day 0. At day 14, protein analysis showed that proliferated cells from both sources express all 6 markers. Only cells from mild OA resulted in a significant increase of mRNA CD105 and CD166 after in vitro expansion. Moreover, cells from the mild OA showed significantly higher levels of CD105, Sox9 and Acan than from those from severe OA. CONCLUSION: Results confirmed the presence of MSC markers in mild and severe OA tissue on both mRNA and protein levels. We found potential differences between cells obtained from mild compared to severe which suggests that mild OA derived cells may have a greater MSC potential.

2430 Board #3 June 2 9:30 AM - 11:30 AM
Progenitor Cells From Cartilage: Grade Specific Differences In Stem Cells Markers Expression
Marjia Mazor1, Annabelle Cesaro1, Mazen Al2, Thomas M. Best, FACSM1, Eric Lepeasailles1, Haimi Toumi1. 1Service de Rhumatologie, Centre Hospitalier Régional d’Orléans, La Source, France, Orleans, France. 2-Service chirurgie orthopédique et traumatologique Centre Hospitalier Régional d’Orléans, La Source, France, Orleans, France. 3Department of Orthopedics, Division of Sports Medicine, Miami, FL. (Sponsor: Thomas best, FACSM)
Email: hecmm.toumi@univ-orleans.fr

2431 Board #4 June 2 9:30 AM - 11:30 AM
Relaxin Influences Knee Laxity Changes Across the Menstrual Cycle
Travis Anderson, Zachary Kincaid, Laurie Wideman, FACSM, Sandra J. Shultz, FACSM. University of North Carolina at Greensboro, Greensboro, NC. (Sponsor: Dr. Sandra J. Shultz, FACSM)
Email: t_ander2@uncg.edu

No relationships reported

Greater knee laxity is associated with an increased risk for anterior-cruciate ligament (ACL) injury, particularly in women. Research suggests that the hormone relaxin may influence the structural integrity of the ACL, rendering a weaker and more lax ligament. PURPOSE: To assess the impact of relaxin on knee laxity once progesterone and testosterone (potential endocrine antagonists) are accounted for.

METHODS: College-aged females (166.0±5.7 cm, 65.9±8.5 kg, 20.8±2.9yr) provided blood samples for the first 6 days of menses and first 10 days of luteal phase of one menstrual cycle. Knee laxity was recorded as anterior knee laxity (AKL; mm), genu recurvatum (GR, °), and general joint laxity (GJL; score, 0-9), and dependent variables were calculated as mean (X), cyclic A (max – min), coefficient of variation (CV), and standard deviation (SD). Progesterone (ng/ml), testosterone (T; ng/dl), and relaxin (R; pg/ml) were analyzed via ELISA assays. The sum of the 6 greatest hormone concentrations during menses (M) and luteal phase (L) and the change in exposure from M to L (ΔM) were calculated. Only subjects with captured R and P peak were included in analysis (n=18). M and MLA for each hormone were entered into backward stepwise (in: p<.05, out: p>20) multiple linear regression models to predict each laxity measure. RESULTS: R and P were significantly different between M and L (p<.001, R_M=-22.2±29.4 vs. R_L=17.4±9.6; p<.001, P_M=5.8±11.8 vs. P_L=89.7±36.6), whereas T was less variable (p=.07, T_M=203.8±63.0 vs. T_L=222.7±82.6). All laxity measures existed. Time had a significant effect on USG, all U+Es and renal hormones (p < 0.05). An interaction effect existed between time and intervention on blood sodium, potassium, chloride, urea, creatinine, USG and vasopressin (p < 0.05) but not on other hormones or electrolytes. No mean U+Es differed from reference range or approached critical values. CONCLUSION: Water loading appears to be a safe and effective method of acute BM loss under the conditions utilised in this study. Changes in vasopressin may in part underlie the mechanism facilitating this technique.
showed variation across the menstrual cycle (range [min-max]: AKL=5.9-7.6; GR=2.6-5.6; GJL=8-2.1). Significant models were observed for GR (p=0.04; R²=48; GR₃-5.01+1.024P; GJL₃-35.77+1.024P; P=0.04; R²=253; GJL₃-469P₉₋₄₄₀P₇; MLΔ-0.757RM-0.395P; GJL₈₋₃₉₅P; MLΔ-0.757RM-0.395P; GJL₈₋₃₉₅P; MLΔ-0.757RM-0.395P; GJL₈₋₃₉₅P). Models for AKL, GR, and GJL showed approached significance all (p<0.075). CONCLUSION: On controlling for P and T, R was a significant predictor of knee laxity mean and cyclic changes. These findings would suggest that R, combined with other hormones, may affect the structural integrity of the ligament and impact injury risk. Future study is needed to explore potential mechanisms for this association.

2432 Board #5 June 2 9:30 AM - 11:30 AM The Human Piriformis Muscle: Sensory, Postural, Or Just A Pain Matthew C. Kosteck, FACSM, Rachel Sweetnich, Tim Dusch. Duquesne University, Pittsburgh, PA. Email: kostekm@duq.edu

(Paper presented by William H. DuPont)

The human Piriformis muscle is not a sensory muscle. The purpose and necessity of the muscle is an area of contention. Furthermore, because of its size and anatomical location, it is not thought to be a primary mover of the body. The purpose and necessity of the muscle is an area of speculation. We hypothesized that it is a sensory and postural muscle, which could explain why short term consequences of its removal are minimal. PURPOSE: To determine the density of muscle spindle and fiber type composition of the human Piriformis muscle.

METHODS: Six human cadavers (male = 3, female = 3) had their right and left Piriformis muscles removed for histological analysis. Whole muscles were paraffin embedded, sectioned, H&E stained or stained with myosin heavy chain antibodies. Microscopy analysis examined spindle density and fiber type composition.

RESULTS: All muscles were stained for myosin heavy chain to assure homogeneity. The average spindle density per muscle was 3.4±1 and was not significantly different between male and female (p=0.23).

CONCLUSIONS: The human Piriformis muscle does not appear to be a sensory muscle due to the low concentration of muscle spindles but is very likely a postural muscle. The results of this characterization may better inform treatments including the surgical removal and long term rehabilitation.

2433 Board #6 June 2 9:30 AM - 11:30 AM The Effects Of Cryo-compression Therapy On Recovery From An Acute Bout Of Resistance Exercise. William H. DuPont, Vincent H. Hardesty, Emily C. Barnhart, Brek J. Meuris, William J. Kraemer, FACSM. The Ohio State University, Columbus, OH. (Sponsor: William J. Kraemer, FACSM) Email: dupont.35@osu.edu

(Paper presented by Brek J. Meuris)

Compression and cold therapy used separately have consistently shown to reduce these deterrents. However, the effects of combining compression and cold therapy (cryo-compression) as a single recovery modality has yet to fully examined. PURPOSE: To examine the effects of Aquilo Cryo-compression Pants (Aquilo Sports, Louisville, KY) on recovery from a lower body resistance exercise bout typically used by recreationally active individuals. METHODS: Sixteen healthy adult men were matched and then randomly assigned to either Control (CON) or the Aquilo Cryo-compression Pants (ACC) groups. Participants performed a typical lower body workout consisting of barbell back squats, stiff legged deadlifts, and Nordic hamstring curls. and then received 20 minutes of either cryo-compression using the Aquilo Cryo-compression Pants (ACC) or nothing (CON) post exercise. Pain, soreness, mood, sleep quality, power, and reaction time, and muscle fatigue/damage biomarkers were measured at specific time points. RESULTS: The mean value comparisons showed that after exercise ACC had significantly (p≤0.05): lower levels of soreness 24hrs (ACC: 44.3, CON: 52.5) and 48hrs (ACC: 36.6, CON: 41.3); pain 60min (ACC: 3.0, CON: 4.1); 24hrs (ACC: 3.4, CON: 4.0) and 48hrs (ACC: 2.6, CON: 3.4); reduced muscle fatigue (reduced CK levels) 24hrs (ACC: 577 U/L, CON: 866 U/L) and 48hrs (ACC: 359 U/L, CON: 613 U/L); better sleep quality 24hrs (ACC: 58.0, CON: 52.5) and 48hrs (ACC: 56.75, CON: 47.6); better power output (reduced decrement) 24hrs (ACC: 5031 CON: 4087.2) and 48hrs (ACC: 5065.4, CON: 4879.8); and experienced a better overall mood 24hrs (ACC: 0.55, CON: 0.9) and 48hrs (ACC: 0.28, CON: 0.68).

CONCLUSION: These findings support has developed a practical, portable recovery device that synergistically combines compression and cold therapy which effectively helps reduce muscle fatigue, soreness, pain, and poor sleep quality that may result from an acute bout of exercise. Funding, in part, was provided by Aquilo Sports, Inc.
Walking and simultaneously performing an attention demanding task may occur concurrently with increasing muscle fatigue toward the end of some daily activities or job performance. Although previous research have demonstrated independent effect of these factors, their interaction are rarely taken into consideration.

**PURPOSE**: To examine changes in gait balance and working memory performance in healthy college-age adults after lower extremity muscle fatigue.

**METHODS**: Ten healthy adults (5 females, 20.6±1.0 yrs) performed the following three tasks before and after a muscle fatigue protocol: 1) Walking with a self-selected pace, 2) Sitting and performing a 3-back test, in which participants listened a series of digits over a loudspeaker and were instructed to verbally respond “yes” whenever a digit is heard that is a prime number in the sequence of back in the series, and 3) Walking and performing a 3-back test simultaneously. Sit-to-stand task at a pace of 0.5 Hz was performed to induce muscle fatigue. Maximal voluntary isometric strength of knee extensors was assessed using Biodex before and after the fatigue protocol and at the end of study. Whole body motion data were collected from a set of 29 retro-reflective markers placed on bony landmarks with a 10-camera motion system. Gait balance control was examined using the total medio-lateral CoM displacement (M-LCoM). Two-way ANOVA with repeated measures were used to detect differences between single and dual-task conditions.

**RESULTS**: An average of 21% knee extensor strength reduction was observed immediately after the completion of fatigue protocol, and it was recovered to approximately 10% by the end of study. In both gait conditions, M-LCoM was found to increase significantly after fatigue (3.1±0.2 vs. 3.7±0.3 cm, p < 0.01). Accuracy of the 3-back test was not significantly affected by the fatigue or gait condition.

**CONCLUSIONS**: Our preliminary findings indicated that gait balance control, as measured by the CoM sway, during a dual-task gait task might be more sensitively affected by the acute muscle fatigue induced in the current study.
CONCLUSIONS: These findings have important implications for therapeutic exercise interventions designed to maintain and improve strength and balance in community-dwelling older women.

Among older adults, falls are the leading cause of injuries and are responsible for significant disability, hospitalization, loss of independence, and reduced quality of life. Previous research showed that physical exercise (PE) is effective in preventing falls and has the potential to reduce serious fall-related injuries, emergency department visits, hospitalizations, nursing home placements, and functional decline. In most clinical trials the effect of PE was assessed by means of tests which assess a single “balance system”, while balance control is very complex and involves many different underlying systems. The BESTest Scale consists of 36 items, grouped into 6 systems: biomechanical constraints, stability limits/verticality, anticipatory postural adjustments, postural responses, sensory orientation, and gait stability.

PURPOSE: To investigate the effects of a short (4 weeks), intensive (75 min sessions 3 times per week) PE program which included strength, coordination, gait, multisensory training, and single- and dual-task balance exercises on the balance of elderly subjects at risk of falls.

METHODS: Thirty sedentary subjects aged 70+ years at risk of falls (Berg’s Balance Scale < 52) were recruited and randomly allocated to a Multi-component Exercise group (MCE) or a Control group (CON). Main outcome was change in BESTest Scale (BT) total score.

RESULTS: At baseline, the two groups were similar with respect to age, gender distribution, anthropometric measures and risk of falls (BESTest Scale Score 53.7±14.8 in CON and 55.0±10.8 in MCE, n.s.). At the end of the study, BT total score was 55.5±16.7 in CON group (n.s. vs. baseline) and 72.7±8.8 in MCE group (p<0.001 vs. baseline). The change of BT total score was 1.8 (95% CI -1.9-5.5) in the CON group and 17.7 (13.4-22.1) in the MCE group (p<0.001 between groups). Also, the MCE group significantly increased the scores of all the six balance subsystems of the BT. Eventually, the change of Berg’s Scale score was 0.9 (-0.2-2.1) in CON and 6.0 (4.4-7.6) in MCE (p<0.001). At the end of the study MCE subjects could not be considered at risk for falling any more.

CONCLUSIONS: A 4 weeks, intensive, multi-component training program significantly improved balance in elderly subjects at risk of falls. The improvement affected the many systems involved in balance control.

PURPOSE: Falling poses a significant potential health risk for older adults. Fall risk questionnaires have been identified as a quick and easy way to screen for the risk of falling any more. Studies have shown that physical exercise (PE) is effective in preventing falls and has the potential to reduce serious fall-related injuries, emergency department visits, hospitalizations, nursing home placements, and functional decline. In most clinical trials the effect of PE was assessed by means of tests which assess a single “balance system”, while balance control is very complex and involves many different underlying systems. The BESTest Scale consists of 36 items, grouped into 6 systems: biomechanical constraints, stability limits/verticality, anticipatory postural adjustments, postural responses, sensory orientation, and gait stability.

PURPOSE: To investigate the effects of a short (4 weeks), intensive (75 min sessions 3 times per week) PE program which included strength, coordination, gait, multisensory training, and single- and dual-task balance exercises on the balance of elderly subjects at risk of falls.

METHODS: Thirty sedentary subjects aged 70+ years at risk of falls (Berg’s Balance Scale < 52) were recruited and randomly allocated to a Multi-component Exercise group (MCE) or a Control group (CON). Main outcome was change in BESTest Scale (BT) total score.

RESULTS: At baseline, the two groups were similar with respect to age, gender distribution, anthropometric measures and risk of falls (BESTest Scale Score 53.7±14.8 in CON and 55.0±10.8 in MCE, n.s.). At the end of the study, BT total score was 55.5±16.7 in CON group (n.s. vs. baseline) and 72.7±8.8 in MCE group (p<0.001 vs. baseline). The change of BT total score was 1.8 (95% CI -1.9-5.5) in the CON group and 17.7 (13.4-22.1) in the MCE group (p<0.001 between groups). Also, the MCE group significantly increased the scores of all the six balance subsystems of the BT. Eventually, the change of Berg’s Scale score was 0.9 (-0.2-2.1) in CON and 6.0 (4.4-7.6) in MCE (p<0.001). At the end of the study MCE subjects could not be considered at risk for falling any more.

CONCLUSIONS: A 4 weeks, intensive, multi-component training program significantly improved balance in elderly subjects at risk of falls. The improvement affected the many systems involved in balance control.

PURPOSE: To investigate the effects of a short (4 weeks), intensive (75 min sessions 3 times per week) PE program which included strength, coordination, gait, multisensory training, and single- and dual-task balance exercises on the balance of elderly subjects at risk of falls.

METHODS: Thirty sedentary subjects aged 70+ years at risk of falls (Berg’s Balance Scale < 52) were recruited and randomly allocated to a Multi-component Exercise group (MCE) or a Control group (CON). Main outcome was change in BESTest Scale (BT) total score.

RESULTS: At baseline, the two groups were similar with respect to age, gender distribution, anthropometric measures and risk of falls (BESTest Scale Score 53.7±14.8 in CON and 55.0±10.8 in MCE, n.s.). At the end of the study, BT total score was 55.5±16.7 in CON group (n.s. vs. baseline) and 72.7±8.8 in MCE group (p<0.001 vs. baseline). The change of BT total score was 1.8 (95% CI -1.9-5.5) in the CON group and 17.7 (13.4-22.1) in the MCE group (p<0.001 between groups). Also, the MCE group significantly increased the scores of all the six balance subsystems of the BT. Eventually, the change of Berg’s Scale score was 0.9 (-0.2-2.1) in CON and 6.0 (4.4-7.6) in MCE (p<0.001). At the end of the study MCE subjects could not be considered at risk for falling any more.

CONCLUSIONS: A 4 weeks, intensive, multi-component training program significantly improved balance in elderly subjects at risk of falls. The improvement affected the many systems involved in balance control.

Walking is commonly promoted as a way to increase physical activity; however, walking involves an inherent risk of slips and falls. Previous research has shown that repeated exposure to slips or slip-like perturbations improves balance recovery following actual slips. Researchers have explored repeated slip training (RST) as a fall prevention intervention by repeatedly exposing subjects to slips or slip-like perturbations in a safe, controlled manner. However, current methods for RST require non-trivial financial resources. PURPOSE: To evaluate the efficacy of a cost-effective method for RST compared to no-training (NT).

METHODS: Twenty-four adults (18-28 years, 12 male) were randomized to RST or NT (n=12 in each), and completed one training session and one session the following day to assess recovery rate after an actual slip. For RST, subjects repeatedly walked along a 10m walkway. During 20 randomly selected walks, a 0.9 x 0.9 m thin plastic sheet was placed at random locations along the walkway to induce a slip. The material of this sheet (e.g. polyethylene) was selected to provide low-friction with the floor and was camouflaged to match the floor. The group walked along the walkway 20 times. On the following day, vegetable oil was applied to the walkway to expose subjects in both groups to an actual unexpected slip. Balance was successfully recovered if less than 4.5% body weight, averaged over 1s periods, was applied to the safety harness worn during both sessions. Slip severity and slipping foot kinematics were measured using reflective markers on the calcaneus, first metatarsal heads, and sacrum.

RESULTS: Seven of 12 RST subjects recovered, less than 4.5% body weight while only two of 12 NT subjects recovered (p<0.05). RST subjects experienced less severe slips, with 94 cm slower peak slip speeds (p<0.01) and 17 cm shorter slip distances (p<0.01), and maintained slipping heel positions more proximal to the sacrum at heel contact (p<0.01) and
non-slipping foot lift-off ($p=0.002$) and touch-down ($p=0.005$). CONCLUSION: RST increased recovery rate by reducing slip severity and maintaining slipping heel positions more proximal to the sacrum. This cost-effective method for RST may improve its potential for adoption as a slip-and-fall prevention intervention.

**E-16 Clinical Case Slide - Foot and Ankle III**

Friday, June 2, 2017, 9:30 AM - 11:10 AM
Room: 103

**2445 Chair:** Patrick Leary, FACSM, Lake Erie College of Osteopathic Medicine, Erie, PA.
(No relationships reported)

**2446 Discussant:** Stephen M. Simons, FACSM, South Bend Notre Dame Sports Medicine Fellowship, South Bend, IN.
(No relationships reported)

**2447 Discussant:** Leonardo P. Oliveira, University of Chicago, Chicago, IL.
(No relationships reported)

**2448 June 2 9:30 AM - 9:50 AM**
**Medial Foot Pain in a Youth Soccer Player**
Christine Bender1, Heather Gillespie, FACSM1, Abby Markham2.
'Maine Medical Center, South Portland, ME.' Maine Medical Center, Falmouth, ME. (Sponsor: Heather Gillespie, FACSM)
(No relationships reported)

**HISTORY:** 13 yo male presents with right foot pain. Started 3 yrs ago with a forced dorsiflexion injury during soccer game when he collided with another player. He recalls swelling and bruising at that time. He went to the ER and had x-rays done which were "inconclusive" as his mother recalls. Pain never completely went away and worsened several weeks ago. He has been doing a lot of hiking recently, very uneven surfaces and he reports pain with these activities. He has used an ankle brace and tried arch supports with no significant improvement.

**PHYSICAL EXAMINATION:** Inspection of feet and ankles reveal pes planus R>L on standing exam, with a neutral arch at rest while seated. Forefoot abduction R>L. Hindfoot valgus bilaterally. Tenderness to palpation of right foot over medial navicular eminence, slight tenderness over deltoid ligament and retrocalcaneal bursa. No tenderness at base of 5th metatarsal, medial malleolus, or lateral malleolus. Full active ROM but pain with inversion of right foot. No pain with eversion, dorsiflexion or plantarflexion. Pain with resisted inversion felt along distal posterior tibial tendon. No pain with heel or toe raise. No laxity with forced inversion. Negative talar tilt, anterior drawer, Thompson tests.

**DIFFERENTIAL DIAGNOSIS:** Posterior tibial tenosynovitis
Navicular stress fracture
Deltoid sprain
Accessory navicular syndrome
Tarsal coalition Kohler disease

**TEST AND RESULTS:** X-ray Right Foot: No evidence of acute or prior fracture or abnormal periosteal reaction. There is an accessory navicular noted.

**FINAL WORKING DIAGNOSIS:** Pes planovalgus with Accessory navicular syndrome

**TREATMENT AND OUTCOMES:**
Referred by PCP to orthopedics for evaluation of medial foot pain in setting of accessory navicular bone. Discussed option of surgical management (double calcaneal osteotomy and tendon transfer) given degree of planovalgus deformity but ultimately recommended conservative management. Discussed use of orthotics. Provided with cast for 6 weeks but ultimately declined at this time due to upcoming activities.

**2449 June 2 9:50 AM - 10:10 AM**
**Foot Injury in a Recreational Runner**
Ashkan Alkhamisi, Glenn G. Shi. Mayo Clinic, Jacksonville, FL. (Sponsor: George G.A. Pujalte, MD, FACSM)
Email: alkhamisi.ashkan@mayo.edu
(No relationships reported)

Foot Injury in a Recreational Runner
Ashkan Alkhamisi, MD, Glenn G. Shi, MD, and George G.A. Pujalte, MD, FACSM

**HISTORY:** A 37-year-old, healthy, young female presented with 5 weeks of left foot pain. She denied any major trauma or precipitating event, but did recall doing holiday shopping for 10 hours straight a few days prior to experiencing symptoms. Patient stated that she used to wear heels all the time at work as a school-teacher. She reported numbness and tenderness over the plantar aspect of the first metatarsophalangeal joint. She wore a metatarsal pad and took ibuprofen with no relief of symptoms. The pain was exacerbated with weightbearing.

**PHYSICAL EXAMINATION:**
Left foot: No tenderness to palpation of the hindfoot or midfoot. Pain was elicited with passive dorsiflexion and plantarflexion of first metatarsophalangeal (MTP) joint. Tenderness to palpation along the lateral aspect of the first MTP joint, with no erythema or swelling. Sensation was intact.

**DIFFERENTIAL DIAGNOSIS:**
1. Sesamoid osteoarthrosis
2. Sesamoid stress fracture
3. Sesamoid dislocation
4. Sesamoiditis

**TEST AND RESULTS:**
Left foot, standing, 3 views: Fragmentation of the left lateral hallux sesamoid, with small surrounding foci of mineralization. Remainder of osseous structures were intact. No focal soft tissue swelling.

**FINAL DIAGNOSIS:**
Left lateral (fibular-sided) non-union sesamoid fracture

**TREATMENTS AND OUTCOMES:**
1. Immobilization within a boot, with non-weightbearing status for 6 weeks
2. At 2 months post-injury, she continued to have pain and wanted to wear the walking boot for another 1-2 months
3. Repeat radiographs at 3 and 4 months post-injury showed continued non-union of the lateral sesamoid bone.
4. Orthopedic referral was made at 4 months post-injury and she decided to proceed with a left lateral sesamoidectomy with immobilization within a boot for 4 weeks.
5. At 4 months post-operatively, she was able to run with no pain and good range of motion of her left first MTP joint.
Well-corticated bone fragment proximal and perpendicularly-oriented to the base of the 5th metatarsal, representing an accessory osicle (os vesalianum) versus unmatted fracture. No evidence of acute fracture and normal-appearing apophysis.

- Right foot MRI: Osseous body at base of the 5th metatarsal with irregular margins, hyperintense T2 fibrous union, and internal edema of the osicle and adjacent proximal metatarsal, favored to represent a symptomatic os vesalianum. No increased apophyseal distraction.

**FINAL WORKING DIAGNOSIS:**

Symptomatic Accessory Os Vesalianum

**TREATMENT AND OUTCOMES:**

1. Immobilize in a walker boot for 6-8 weeks.
2. Physical therapy after immobilization, with emphasis on peroneal muscle strengthening and range of motion.
3. If complete resolution of symptoms, may gradually return to sport as tolerated. If symptoms persist, consider surgical excision.

---

### Not Your Ordinary Ankle Injury

**HISTORY:** 43 year old male soccer player presented with persistent medial and lateral ankle pain since sustaining an injury 9 days prior during soccer. He came down strongly on his left heel. He heard a “pop” and felt immediate pain on both sides of his ankle. He also reported that his foot felt “numb”, but this resolved in about five minutes. He had severe pain with weight bearing but was able to limp off the field. He did not seek formal medical attention and used crutches for a few days. He continued to experience a snapping sensation along his lateral ankle that was mostly resolved by the day of appointment.

**Physical Examination:**

Ecchymosis and swelling diffusely at the ankle. Tenderness to palpation in deltoid and lateral ligaments, mild at peroneal tendon, no boney tenderness. Active and passive range of motion is uncomfortable but within functional limits except restricted dorsiflexion and eversion. Patient/examiner unable to sublux lateral tendon to reproduce snapping. Patient is otherwise neurovascularly intact

**Differential Diagnosis:** medial ankle sprain, lateral ankle sprain, peroneal tendon strain, posterior tibial tendon strain, peroneal retinaculum injury, ankle fracture

**Test Results:** X-ray 9/6/2016—no evidence of acute fracture.

**Final Working Diagnosis:** Left ankle, multiple injuries: Peroneal Retinaculum Injury, Deltoid ligament sprain without avulsion (some injury to calcaneonavicular ligament), Deltoid ligament sprain without avulsion (any ligamentous tear of the proximal tibiofibular joint, but changes consistent with chronic avulsion injury of the syndesmotic membrane from the distal portion of the tibia and probable injuries to his anterior inferior tibiofibular ligament and anterior talofibular ligaments

---

### Not Your Ordinary Ankle Injury

**HISTORY:** This is a case of an otherwise healthy 19-year-old running back who sustained a left ankle eversion type injury during a football game when an opponent landed on his lower leg forcing it into external rotation. He did not finish playing due to the inability to bear weight.

**Physical Examination:** During initial evaluation, limited due to a significant amount of pain, he had tenderness over the deltoid, anterior talofibular, and calcaneofibular ligaments. During reevaluation two days later he was also complaining of some tenderness around the lateral aspect of his left knee. His exam showed mild edema at the level of his ankle, tenderness over ligaments as noted before, along with pain on external rotation of his foot, compression along his syndesmosis, and palpation over his tibiofibular joint with increased posterior translation of his proximal fibula compared to the contralateral side. His left knee exam revealed pain in the area of his fibular head with varus stress, but was otherwise unremarkable.

**Differential Diagnosis:**

- Ankle fracture
- Syndesmosis injury
- Proximal tibiofibular joint injury

**Test and Results:**

- No acute fracture and no obvious opening of his syndesmosis or medial joint space
- Repeat weight bearing radiographs of left ankle:
  - ossification of his syndesmosis likely indicative of previous injury, as well as decreased overlap between distal tibia and fibula
  - no clear evidence of medial ankle joint space widening

**MRI of left calf and ankle:**

- no acute fracture and no obvious opening of his syndesmosis or medial joint space
- Repeat weight bearing radiographs of left ankle:
  - ossification of his syndesmosis likely indicative of previous injury, as well as decreased overlap between distal tibia and fibula
  - no clear evidence of medial ankle joint space widening

**Final Working Diagnosis:**

Syndesmosis injury with proximal tibiofibular joint instability

**Treatment and Outcomes:**

1. Non-weightbearing for the initial 10 days post injury.
2. Open reduction and internal fixation of distal syndesmosis using a single tightrope fixation, along with stabilization of the proximal tibiofibular joint using the same technique.
3. Non-weightbearing for the following 6 weeks.
4. Gradual return to physical activity.
History: A 25 yo woman developed R hip pain while running her 1st marathon. She first noticed R hip pain during training runs approximately 2 wks before the event. Her pain was present at the beginning of her runs, subsided during, and then ache afterwards. During the marathon, she first noticed hip pain around mile 20-21, but this didn’t affect her stride until mile 24 when she began to feel cramping and her stride changed. In the last mile, which was downhill, she knew something was wrong and about 100 m from the finish line she felt a “pop” in her R hip. She was unable to weight bear and was piggy-backed over the finish line about 3h:20min after the start.

PMH: History of severe GERD in 2013, currently on ranitidine 75mg daily. Avid Nordic skier and mountain biker. Suffered a mountain bike crash 1 yr prior to the race and was unable to exercise for 6 mo due to severe concussion symptoms. Started running 5 mo before the race and ramped up to the marathon distance. Reports normal menstrual cycles. Non-vegan vegetarian for 15 yrs. No iron supplementation due to GERD.

PHYSICAL EXAM: Brought to medical tent in a wheelchair, unable to bear weight on her R leg. She had no tenderness to palpation of her hip musculature. Her R leg appeared to be slightly shorter and externally rotated compared to her L leg. She had excruciating pain with internal rotation of her hip.

DIFFERENTIAL DIAGNOSIS:
1. Hip fracture
2. Stress fracture/reaction
3. SI joint dysfunction
4. Gluteal muscle strain

TEST AND RESULTS:
Hip radiographs: R transverseval femoral neck fx
Hip CT: R transverseval femoral neck fx, no pathologic fx
Pending: DEXA scan, diet and activity analysis for energy deficit

FINAL WORKING DIAGNOSIS: R transverseval femoral neck fx

TREATMENT AND OUTCOMES:
1. R femoral neck fx CRIF
2. Weight bear as tolerated with crutches prn
3. PT started 2 wks post-operatively
4. No “pounding” activities for 6 wks
5. Stationary bike for exercise as tolerated
6. Nutrition counseling

On exam, the patient had a normal gait, a small right knee effusion and stable right hip. She had minimal residual pain with squatting and minimal periodical pain with prolonged walking.

Exam:
CV: RRR, brisk pulses, <2 sec cap refill
Neurovascular: Strength 3/5 with resisted hip flexion. Distally NY1 with brisk pulses, 2 sec cap refill, normal motor and sensory nerve examination.
Special maneuvers: FABER negative. FADIR positive.

Differential Diagnosis: Iliopsoas tendon rupture
Femoral neck stress fracture
Greater Trochanter/InterTrochanteric/Subtrochanteric fracture
Gluteal, Hamstring, Adductor muscle tear

Lateral tear

Tests & Results:
Hip/Pelvis Radiographs:
- Date of injury: Apophyseal avulsion of right lesser trochanter at iliopsoas insertion.
- 1 month after injury: Increased ossification of avulsed fragment, stable positioning.
- 2 months after injury: Slightly increased ossification; stable appearance.

Final Working Diagnosis: Apophyseal avulsion fracture of right femoral lesser trochanter

Treatment and Outcomes:
- Protected weight-bearing with crutches x 5 weeks. No impact or explosive movements. Ice, Ibuprofen as needed for pain.
- After 5 weeks, started Physical Therapy and home exercise program. No ballistics or sprinting.
- After 4 weeks of PT, gradually progressed into sprinting, jumping, and ballistics under PT guidance.
- Complete resolution of pain and return to softball and track without further complications. Xrays with stable alignment, malunion with fragment displacement of ~1.7 cm.

History: A 17yr old ballerina presents with bilateral hip pain, left > right that has become progressively worse over the last year. Groin pain and some posterior hip pain. She states that when standing in arabesque she has the most discomfort but also with standing in 3rd and 5th position.

PE:
Normal, non-antalgic gait.

Right Hip:
Negative log roll. Negative straight leg raise and Stinchfield testing.
Flexion to 150°, internal rotation 30°, external rotation 50°, abduction of 50°. Negative impingement. Minimal discomfort with extension and external rotation.

Left Hip:
Negative log roll. Negative straight leg raise and Stinchfield testing. Flexion to 140° but painful from 110-140°. Internal rotation to 20°, external rotation to 50° and abduction to 50°. She has positive impingement testing. She also has a positive FABER and scour test. Significant pain with extension and external rotation.

DIFF Ds:
Lateral tear
FAI
Psoas tendinitis/bursitis
Dysplasia

Email: ronan.cahill@swedish.org
Swedish Medical Center, Seattle, WA.

Email: ss.jackson25@gmail.com
Sarah S. Jackson. Boston Children’s Hospital, Boston, MA.

(No relationships reported)
**Clinical Case Abstract**

**Pelvic injury - Rollerblading**

**June 2 11:10 AM - 11:30 AM**

**E-18**

**Clinical Case Slide - Knee I**

**Friday, June 2, 2017, 9:30 AM - 11:30 AM**

Room: 402

**Chair:** Scott A. Magnes, FACSM.
**Lovell Federal Health Care Center, North Chicago, IL.**

(No relationships reported)

**Discussant:** Gregory Maletis. Kaiser Permanente Hospital, Baldwin Park, CA.

(No relationships reported)

**Discussant:** Lisa Barkley, FACSM. University of Central Florida, Orlando, FL.

(No relationships reported)

**June 2 9:30 AM - 9:50 AM**

**Knee Injury - Ballet**

**Friday, June 2, 2017, 11:30 AM**

Lindsay Ramey, Daniel Blatz. Rehabilitation Institute of Chicago, Chicago, IL. (Sponsor: Joseph Ihm, FACSM)

Email: lhr8@virginia.edu

(No relationships reported)

History:

A 29-year-old male professional dancer presented with 6 weeks of right anterior knee pain after landing a jump in knee extension. His pain worsened with jumping & squatting and improved with rest. He denied systemic symptoms, other joint pain or medication use. He was evaluated by the company’s physical therapist & treated for patellar tendinopathy, including eccentric strengthening, cho-pat strap & jump restrictions, without improvement.

Physical Examination:

Exam showed bilateral knee crepitus, right proximal patellar tendon tenderness and pain with right leg squat & hop. His exam was otherwise normal.

Differential Diagnosis:

Patellar tendinopathy

Patellar tendon tear

Patellofemoral pain

Avulsion fracture

Subluxation
**Knee Injury-jumping**

**HISTORY:** 40-year-old female who injured her right knee jumping onto a dock. She had sudden, severe pain, 9 out of 10 in intensity. She could not bear weight or bend it initially. She had swelling the next day. She described locking and occasional “giving out”. Within days, she could walk with minimal discomfort but could not exercise or lift weights. Symptoms slowly improved over the past 8 weeks as she presented for further evaluation.

**PHYSICAL EXAMINATION:** Healthy appearing male in no acute distress. No fever, chills, or knee drainage was present. Due to the symptoms, he returned to clinic for evaluation.

**Tests and Results:**
- Knee US: Focal hypoechoigenicity & fiber disruption in the right medial proximal patellar tendon
- Right knee MRI: Increased signal on T2 & STIR confirming partial tear of the proximal patellar tendon

**Diagnosis:**
Right proximal patellar tendon tear

**Treatment and Outcomes:**
Initial treatment included knee immobilization, activity restriction, topical nitroglycerin & PT for 3 months without improvement. The patient pursued an US-guided platelet-rich plasma (PRP) injection without tenotomy at an outside facility. He had partial improvement but dance remained restricted. Subsequent US at 6 months showed persistent tear. US-guided tenotomy and PRP injection were repeated, followed by activity restriction, PT and return to activity protocol. He noted limited relief at 4 weeks and pursued a third PRP injection at an outside facility. He developed worsening, diffuse anterior knee pain. US showed new thickening and heterogeneity throughout the right patellar tendon.

**MRI confirmed hypertrophic changes.** Given prolonged course, he underwent open patellar tendon debridement & repair. Intra-operatively, the tendon was noted to be significantly thickened with abnormal color & texture. Post-operative follow-up is ongoing.

---

**2466 June 2 9:50 AM - 10:10 AM**

**Knee Injury-jumping**
Daniel P. Montero. Mayo Clinic, Florida, Jacksonville, FL.
(Sponsor: George Pujalje, FACSM)
(No relationships reported)

**HISTORY:** 40 year-old female who injured her right knee jumping onto a dock. She had sudden, severe pain, 9 out of 10 in intensity. She could not bear weight or bend it initially. She had swelling the next day. She described locking and occasional “giving out”. Within days, she could walk with minimal discomfort but could not exercise or lift weights. Symptoms slowly improved over the past 8 weeks as she presented for further evaluation.

**PHYSICAL EXAMINATION:** Thin, healthy-appearing. Normal gait. Full ROM both knees. No effusion or skin changes. Bony prominence of tibial tubercle without edema or erythema. Minimal point tenderness over patellar insertion. Normal ligamentous and tendinous tissues. No effusion or entrapment status post-surgical decompression presented for evaluation of right lateral knee pain that had been present for 1 year. He described dull, lateral, aching knee pain, worsened by impact activity (e.g., running). He denied mechanical symptoms or effusion. Knee MRI demonstrated popliteus tendinopathy with partial-thickness intrasubstance tearing and a 10x5mm peritendinous cyst.

**Tests and Results:**
- Ultrasound (US)-guidance was used to drain and fenestrate the cyst, and fenestrate and inject the popliteus tendon with leukocyte rich platelet rich plasma (PRP). The procedure was performed without complication. The patient used crutches for 5 days post-procedure, but on day 6 he walked 6 blocks without crutches. That evening, he developed pain and swelling with erythema in the suprapatellar region. No fever, chills, or knee drainage was present. Due to the symptoms, he returned to clinic for evaluation.

**PHYSICAL EXAMINATION:** Healthy appearing male in no acute distress. Mildly antalgic gait pattern. Grade 2 right knee effusion with erythema around the superolateral aspect of the knee. Well-healed injection site without erythema. Mild tenderness to palpation over the popliteus tendon insertion. Normal ligamentous and meniscal tests.

**DIFFERENTIAL DIAGNOSIS:**
- Acute knee effusion secondary to overuse after recent PRP injection
- Septic arthritis
- Post-injection flare

**TEST AND RESULTS:**
Knee Pain - Soccer

Kenneth Y. Choi, Marissa S. Vasquez, Michael K. Fong. Kaiser Permanente Los Angeles Medical Center, Los Angeles, CA. (Sponsor: Aaron Rubin, FACSM)

(History: 18 y/o male soccer player sustained a twisting injury with direct contact of his left knee during a game. He had no immediate or delayed swelling, but continued to have persistent posterior knee pain for two months before he pursued medical care.

No instability or locking. Due to the severity of the pain, he had not played at all since the injury.

Physical Examination: Examination in the office revealed a trace effusion and tenderness to palpation over the proximal posteriormedial tibia. Otherwise, the patient had full range of motion, no ligamentous laxity, and no meniscal signs.

Differential Diagnosis:

1. Fracture/stress reaction
2. Contusion
3. Capsular sprain
4. MCL sprain
5. Medial meniscus tear
6. Maligancy

Test and Results:

1. MRI Left Knee Without Contrast
   -7 mm x 6 mm x 7 mm intracortical lesion with periostitis and periosteal reaction
   -bone marrow edema in the proximal tibia with medial aspect surrounding the intracortical lesion
   -clinical correlation required to differentiate whether bone marrow edema is from recent trauma or intracortical lesion
2. CT Left Knee Without Contrast
   -4 mm x 3 mm x 4 mm intracortical extracapsular osteoid osteoma in the proximal medial tibial metaphysis

Final/Working Diagnosis:

Osteoid osteoma of the proximal tibia

Treatment and Outcomes:

1. Initially treated with rest and non-steroidal anti-inflammatory medication as needed
2. Had continued pain for three months after diagnosis, and was referred to orthopedic oncologist
3. CT-guided radiofrequency ablation performed successfully

Knee Pain - Basketball

Nailah Coleman, FACSM. Children’s National Health System, Washington, DC. (No relationships reported)

(History: a 12-year-old presents to clinic with left anterior knee pain for 2 to 3 years, after falling on his knee playing basketball. After his fall, someone fell on top of him and pressed further onto the back of his knee. Although his knee pain has improved, he notes it feels like someone is “pushing down on it.” His pain is intermittent and associated with activity; he denies any particular functional disturbance and has been participating in sports and athletics during this time. He denies any sensation changes; he notes giving way and denies swelling, popping, or locking. For pain control he has been resting and working on some range of motion activities; he has required nothing else for pain control. In addition to the above, firm direct pressure in that same area can cause pain. He has had no other medical care for this concern.

Physical Examination:

On physical exam he was a WDWN young man in NAD. His vital signs were WNL, and his BMI was normal for age and gender. Exam of his hips and knees was significant for symmetric appearance with intact skin and no deformities noted. He had a normal gait and was able to heel, toe, and duck walk without difficulty, although he did note mild pain with duck walk. He had full range of motion of his hips and knees. He had a negative apprehension test, negative Lachman’s, negative McMurray, negative anterior and posterior drawer, and negative patellar grind.

Differential Diagnosis:

- Patellar contusion - Patellofemoral pain syndrome - Sinding Larsen Johnson syndrome - Osgood Schlatters disease - Osteochondral defect (OCD) TESTS AND RESULTS: X-ray demonstrating a 12 x 16 mm OCD on the lateral side of the medial femoral condyle in the left knee - MRI pending FINAL WORKING DIAGNOSIS: OCD TREATMENT AND OUTCOMES: - Continue with current comfort care measures - Avoid physical activities - Wear a hinged knee brace, locked in extension for ambulation and allowing flexion with sitting. - MRI to evaluate the extent of the lesion - Follow up with orthopedics after the MRI is completed.

Utility of Dynamic Sonographic Evaluation of Left Knee Pain & Locking in a Softball Catcher

Allison N. Schroeder, Kentaro Onishi. University of Pittsburgh Medical Center (UPMC), Pittsburgh, PA. (Sponsor: Tom Best, FACSM)

(E-mail: aschroel@alumni.nd.edu) (No relationships reported)

(History: An 18 year-old softball catcher presenting with a 3 year history of left progressive postero-lateral knee discomfort with associated knee locking when squatting or deep knee flexion. Onset was 3 years ago when she was in a squat position during a softball game. She had been avoiding aggravating activities and initially sought medical care 3 months ago, presenting to an orthopedic specialist’s clinic. Following a negative MRI, she was referred to our clinic for diagnostic ultrasound of the knee. She reported reliable way to reproduce locking, but, when locking does occur, she must manually unlock herself. Previous treatment included 8 weeks of physical therapy without benefit.

Physical Examination: No discoloration or swelling of the left knee. Non-antalgic gait. Valgus alignment with dynamic valgus on single leg squat. Posterior lateral joint line tenderness. No other focal tenderness. Full and symmetric bilateral knee active range of motion without pain, except in terminal flexion. Negative McMurray’s, cruciate and collateral ligament testing and dial test. 9/9 Beighton criteria.

Differential Diagnosis:


Test and Results: MRI: Sable irregularity of posterior superior meniscocapsular fascicle deemed secondary to volume-averaging artifact. Otherwise, no discrete pathology was noted. Ultrasound: No discrete lesion of entirety of lateral meniscus on static exam. Development of a separation (3.1mm) between posterior knee capsule tissue and posterior outermost fiber of left lateral meniscus when knee is in near full flexion. Final Working Diagnosis: left postero-lateral meniscocapsular separation.

Treatment and Outcomes: Management options (expectant management, injection options to mitigate pain, and a surgery) were discussed. Patient elected surgical fixation of lateral meniscus. Arthroscopic fixation of lateral meniscus with 2 vertical mattress sutures using a FastFix device was performed. After 4 weeks of bracing to allow proper surgical healing, she was able to start using an elliptical at 6 weeks and jogging at 9 weeks. She remains void of pre-surgical pain and locking at 6 weeks post-operatively.

Basic Science World Congress/Poster - Neurobiological Effects of Exercise

Aaron W. Johnson, Tiffany D. DeVries, Brock Kirwan, J W. Myer. Brigham Young University, Provo, UT. (Sponsor: Pat Vehrs, FACSM) (No relationships reported)

(Purpose: Blood-flow-restricted (BFR) exercise is reported to improve strength and elicit muscle hypertrophy, although little is known about its neural effects. The purpose of this study was to investigate brain neural responses to BFR exercise and control conditions during handgrip exercise.

Methods: Twenty-five subjects completed dynamic handgrip exercises during BFR and control conditions on two different days separated by 72 hours. 7MRS scans were acquired during both exercise conditions. The exercise protocol consisted of five 30-second sets of squeezing a non-metallic handgrip exerciser (a reported 13.6 % increase in one repetition maximum). Oxygen consumption was measured during both exercise conditions. The exercise protocol consisted of five 30-second sets of squeezing a non-metallic handgrip exerciser (a reported 13.6 % increase in one repetition maximum). Oxygen consumption was measured during both exercise conditions. The handgrip exercises were performed at 40% of 1RM and were repeated every 2 minutes with 2 minutes of rest between sets.

Results: There was a significant main effect of exercise condition in the neural activity in the premotor dorsal (F = 5.71, p = 0.022), premotor ventral (F = 8.21, p = 0.007), and right ventral striatum (F = 7.36, p = 0.01) areas. When considering anatomical regions of interest, we found no significant differences between exercise conditions in the bilateral primary sensory cortex (p = 0.32), primary motor cortex (p = 0.33), supplementary motor area (p = 0.66), cerebellum (p = 0.70), insular cortex (p = 0.45), anterior cingulate cortex (p = 0.24), or thalamus (p = 0.66). Significant linear trends (p = 0.001) over the five exercise sets were found in the bilateral anterior cingulate cortex.
cingleate cortex, right middle frontal gyrus, and the right primary sensory cortex. The right primary sensory cortex, left primary sensory cortex, and the right anterior cingulate cortex showed a main effect of set (p = 0.02).

CONCLUSIONS: Less total work was completed during BFR exercise with similar brain neural activation as a higher volume control exercise. BFR exercise has direct effects on the central nervous system.

2483 Board #3 June 2 9:30 AM - 11:00 AM Fatigue Modulates The Effect Of Group III/IV Muscle Afferents On GABA<sub>B</sub>-Mediated Inhibition And Corticospinal Excitability
Simranjit K. Sidhu<sup>1</sup>, Joshua C. Weavil<sup>2</sup>, Taylor S. Thurston<sup>2</sup>, Eivind Wang<sup>1</sup>, Dorothea S. Rosenberger<sup>1</sup>, Jacob E. Jessop<sup>2</sup>, Russell S. Richardson<sup>2</sup>, Chris J. McNell<sup>2</sup>, Markus Amann<sup>2</sup>.
<sup>1</sup>The University of Adelaide, Adelaide, Australia. 2University of Utah, Salt Lake City, UT. *Norwegian University of Science and Technology, Trondheim, Norway. 3University of British Columbia, Kelowna, BC, Canada.
Email: simran.sidhu@adelaide.edu.au (No relationships reported)

PURPOSE: To investigate the influence of group III/IV muscle afferents on GABA<sub>B</sub>-mediated long-interval inhibition (LII) during cycling exercise in the absence and presence of locomotor muscle fatigue. METHODS: Ten females performed brief, non-fatiguing (NFC; 30 s) and fatiguing (FC; 5 min) cycling exercise in the absence and at the start and end of FC to evaluate cortical versus spinal contributions to LII and at the start and end of FC to evaluate cortical versus spinal contributions to LII. Results: The tensor fascia latae and rectus femoris, along with ratings of perceived effort (RPE), and hemodynamic responses of each neural channel.

CONCLUSIONS: These findings provide important insights on age-related changes in the neuromuscular control of large leg muscles that can inform innovative training or rehabilitative strategies in improving falls recovery or preserving mobility capabilities in older adults. Supported by NIH grant IR15AG047553 - 01A1

2484 Board #4 June 2 9:30 AM - 11:00 AM Effects of Alternating Standing and Sitting Compared to Prolonged Sitting on Cerebral Blood Flow Velocity
Sophy J. Perdomo<sup>1</sup>, Bethany Barone Gibbs<sup>2</sup>, Robert J. Kowalsky<sup>2</sup>, John M. Taormina<sup>2</sup>, Jeffrey R. Balzer<sup>2</sup>. University of Pittsburgh, Pittsburgh, PA. (Sponsor: John M Jakicic, FACSM)
Email: SJP80@pitt.edu
Reported Relationships: S.J. Perdomo: Contracted Research - Including Principle Investigator. This research was funded by the HumanScale company.

Preliminary evidence suggests that prolonged sitting may acutely reduce cerebral blood flow velocity (CBFv). Whether alternating bouts of standing and sitting while performing deskwork can attenuate decreases in CBFv is currently unknown. Purpose: To compare CBFv recorded at multiple time points during a simulated workday of alternating standing and sitting and prolonged sitting. Methods: This randomized crossover study enrolled working adults (N=25) with pre-to-Stage 1 hypertension, body mass index (BMI) from 25 to <40 kg/m<sup>2</sup>, and not using antihypertensive medications. Subjects participated in two 8-hr simulated workdays: 1) sitting continuously (SIT), and 2) alternating standing and sitting every 30 min (SS). Beat-to-beat peak systolic, mean systolic and diastolic CBFv were recorded bilaterally for 1 min viaimon of the middle cerebral artery using transcranial Doppler ultrasonography before (morning), between (midday) and following (afternoon) two 4-hr work periods.

Results: Mean (SD) age was 42 (12) years, blood pressure (BP) was 132 (9)/83 (8) mmHg, and BMI was 32 (5) kg/m<sup>2</sup>. Repeated measures ANOVA revealed a significant effect of time for peak systolic (F<sub>4-40</sub> = 0.023), mean systolic (F<sub>4-6.76</sub>, P<sub><0.003</sub>), and diastolic (F<sub>4-5.67</sub>, P<sub><0.006</sub>) CBFv. Post-hoc testing with Bonferroni adjustment revealed significant decreases from morning to midday in mean systolic (P<0.048) and diastolic (P<0.024) CBFv in SIT but not SS (P<0.14). The only change from midday to afternoon was an increase in mean systolic CBFv (P<0.048) in SIT. No significant effects were observed by condition or for the condition x time interaction (P=0.20) (Figure). Conclusions: In individuals with elevated BP and BMI, CBFv differed across an 8-hr workday but not across sitting and alternating posture conditions. However, significant midday declines were observed only during prolonged sitting. Future studies should study trajectories and factors that influence CBFv during the workday.

2485 Board #5 June 2 9:30 AM - 11:00 AM Changes in Cerebral Oxygenation Following Anaerobic Exercise
Jeff Leiter<sup>1</sup>, Travis J. Hrubenick<sup>1</sup>, Pan Am Clinic Foundation, Winnipeg, MB, Canada. 2University of Manitoba, Winnipeg, MB, Canada.
Email: (No relationships reported)

CONCLUSIONS: There is a plethora of research identifying the fluctuations in cerebral oxygenation during aerobic exercise. Such alterations have been associated with respiratory compensation threshold (RCT), fatigue, and exercise cessation. However, there is a paucity of research investigating the effects of anaerobic exercise in this regard.

PURPOSE: To identify how cerebral oxygenation (Cox) changes throughout the recovery from a bout of maximal anaerobic exercise in comparison to baseline levels. METHODS: Twenty-eight physically active, healthy participants aged 18-35 were recruited, half partaking in two sessions. At the first session anthropometric measures were documented. During the second session, participants connected to a cerebral oximeter and 5 minutes of baseline measurements were recorded, followed by a 30-second Wingate test while connected to a metabolic cart. Responses to the
Cerebral blood flow and oxygenation are important variables to consider for concussion diagnosis and treatment. As a result, monitoring these variables throughout progressive aerobic exercise has emerged as a potential concussion management tool, as well as an indicator for sports to track. However, such a mechanism may not be specific to the sport or workplace to which the individual is returning. Understanding how a healthy brain responds to various types of exercise has the potential to create more individualized methods of concussion management.

PURPOSE: To identify the differences in cerebral oxygenation recovery following bouts of maximal resistance and aerobic exercise.

METHODS: Twenty-eight physically active, healthy participants aged 18-35 were recruited, each partaking in two sessions. At the first session, anthropometric measures and leg press 1-RM were determined. During the second session participants completed a maximal leg press resistance training protocol, followed 30 minutes later by a maximal aerobic protocol. Participants were connected to a cerebral oximeter and metabolic cart for monitoring. As such, cerebral oxygenation and ventilatory gas exchange variables were documented throughout the duration of exercise and for 15-minutes of passive recovery post-test.

RESULTS: Maximal aerobic exercise resulted in a progressive increase in cerebral oxygenation following cessation of exercise until peak at 70.61 ± 7.41%, 300-seconds post-test. This represents a significant rise from a baseline value of 66.00 ± 5.48%. The rise in oxygenation following aerobic exercise differed from resistance exercise from 90-seconds onwards, as resistance exercise did not result in a significant change from its 66.89 ± 5.62% baseline value.

CONCLUSION: While maximal aerobic exercise resulted in significant increases in cerebral oxygenation from baseline levels throughout recovery, maximal resistance exercise did not elicited the same response. This indicates that aerobic exercise results in a metabolic strain on the brain which differs from the strain experienced as a result of resistance exercise. As such, expecting equivalent outcomes and utility as concussion management tools from both exercise methods may be misguided and requires additional research.

Increased pulsatility of the cerebral arteries has been correlated with an increased risk of developing cerebral pathologies. Previous research has suggested that a 16-week endurance training intervention does not alter middle cerebral artery (MCA) pulsatility in young athletes; however, the effects of long-term habitual exercise on cerebral pulsatility have not been evaluated. PURPOSE: To compare MCA pulsatility in sedentary adults and habitual exercisers.

METHODS: We evaluated 49 subjects, including 28 habitual exercisers (EX; age = 38 ± 16 y; women = 11, VO2max = 44 ± 7 ml/kg/min, BMI= 24.2 ± 3.0 kg/m^2) and 21 sedentary controls (SED; age = 46 ± 20 y; women = 12, VO2max = 27 ± 6 ml/kg/min, BMI = 24.9 ± 2.0 kg/m^2). Mean arterial pressure (MAP) and middle cerebral artery velocity (MCAv) were continuously recorded during rest. Pulsatility index (PI) was calculated by subtracting diastolic MCAv from systolic MCAv and dividing the result by the mean MCAv. RESULTS: Habitual exercisers had a lower MCAv compared to sedentary controls (EX: 57.2 ± 3.5 cm/s vs. SED: 68.3 ± 4.0 cm/s; p<0.05), and MAP was similar between the two groups (EX: 88 ± 2 mmHg vs. SED: 89 ± 2 mmHg; p=0.69). Habitual exercisers tended to have a lower PI (EX: 0.75 ± 0.03 vs. SED: 0.83 ± 0.04; p=0.09), and VO2max was inversely associated with PI (r=−0.34, p<0.05) when evaluating all subjects. CONCLUSIONS: Habitual exercisers tended to have a lower PI, although the results did not reach statistical significance. The inverse association between VO2max and cerebral PI suggests that individuals with a higher fitness may have a lower risk of developing cerebrovascular-related pathology. Supported by NIH grant HL118154

Cerebral autoregulation is the ability of the brain to maintain constant cerebral perfusion despite oscillations in systemic blood pressure. Exercise training improves cerebral vasomotor function; however, the impact of habitual exercise on cerebral autoregulatory function is unknown. PURPOSE: To compare MCAv and MCA PI during non-exertional and habitual exercise in healthy young adults. We hypothesized that young adults who habitually exercise would show enhanced measures of cerebral autoregulation in habitually exercising and sedentary young adults. We hypothesized that young adults who habitually exercise would show enhanced measures of cerebral autoregulation compared to sedentary controls. METHODS: We evaluated 20 habitual exercisers (EX; age = 28 ± 1 y; women = 6, VO2max = 47 ± 1 ml/kg/min) and 11 sedentary controls (CON: age = 29 ± 2 y; women = 7, VO2max = 31 ± 2 ml/kg/min). Middle cerebral artery velocity (MCAv), mean arterial pressure (MAP), heart rate (HR), and end-tidal carbon dioxide were recorded during three minutes of rest. Cerebral autoregulatory variables were assessed offline. RESULTS: HR was lower in habitual exercisers compared to sedentary controls (EX: 51 ± 3 bpm vs. CON: 58 ± 3 bpm; p=0.05). Habitual exercisers also had a lower MCAv (EX: 55 ± 4 cm/s vs. CON: 74 ± 4 cm/s; p<0.05) and no significant differences were found in MAP (EX: 94 ± 3 mmHg vs. CON: 98 ± 4 mmHg; p=0.42). Habitual exercisers displayed a significantly higher low-frequency coherence value (EX: 0.62 ± 0.04 vs. CON: 0.45 ± 0.05; p<0.05); however, no difference was found in low-frequency gain (EX: 0.63 ± 0.08 cm/s/mmHg vs. CON: 0.59 ± 0.07 cm/s/mmHg; p=0.67), or low-frequency phase (EX: 0.61, p<0.01). Counterintuitively, delta number of error trials was negatively correlated with delta noradrenaline (r = −0.56, p<0.05) and dopamine (r = −0.65, p<0.001) concentrations. Alterations in IGF-1, BDNF, blood lactate concentrations were not associated with altered cognitive performance. In the Control group, cognitive performance and all physiological parameters were not altered. CONCLUSIONS: The present study found that acute exhaustive exercise affects response speed of the cognitive task after exhaustion. Impairments in accuracy may be ascribed to increased arousal level beyond the optimal level. However, venous blood samples appear not to reflect the arousal level directly.
CONCLUSION: Exercise training did not improve exercise-induced imbalance between local O_2 delivery and utilization in prefrontal microcirculation in T1D but did so at high exercise intensity (200 W) in HC. This between-group difference was not due to different respiratory adaptations and must thus be explained by other diabetes-related mechanisms (e.g., impaired cerebrovascular autoregulation, CO_2 reactivity, or neocapillarization) influencing cerebral blood flow. Supported by: Tekes, Ministry of Education and Culture, Finnish Medical Foundation.

Aerobic exercise training may improve cerebral blood flow (CBF) regulation and reduce the risk of dementia. Cerebral autoregulation (CA) is the unique function of the brain which maintains CBF during changes in blood pressure.

POURPOSE: To determine 1) the effects of aerobic exercise training and improvement of cardiorespiratory fitness on dynamic CA (dCA) and 2) the reproducibility of dCA metrics in patients with mild cognitive impairment (MCI).

METHODS: Seventy MCI patients were randomly assigned to 12 months of aerobic exercise training or stretching. Before and after intervention, beat-by-beat CBF velocity and blood pressure were simultaneously measured by transcranial Doppler (TCD) and finger plethysmography during a seated resting condition and a repeated sit-stand maneuver. Transfer function analysis was used to estimate dCA gain, phase, and coherence. Cardiorespiratory fitness was assessed by maximal oxygen uptake (VO_2max) that is measured on treadmill using a modified Astrand-Saltin protocol.

RESULTS: Clean TCD signals were available from 54 patients at baseline, of which 29 patients completed exercise training (n=14) or stretching (n=15) program. After exercise training, dCA gain, phase, and coherence measured during rest and sit-stand maneuvers were not different from stretching group. Likewise, those dCA metrics measured from the patients with improved VO_2max was not different from the other patients who did not make improvement. The comparison of dCA metrics measured before and after 12 months showed significant intra-class correlations of dCA gain at very low frequency (rest: R²=0.49, P<0.001; sit-stand: R²=0.10, P=0.029).

CONCLUSIONS: Although dCA metrics were reproducible over 1 year (particularly the gain at very low frequency during rest), neither aerobic exercise training nor the improvement of cardiorespiratory fitness altered dCA metrics in MCI patients. Supported by the NIH (R01AG033106 and K99HL133449) and the American Heart Association (14P021000103).

There is a substantial body of evidence to show that acute exercise improves cognitive function. The improvements seem to be observed irrespective of exercise mode (i.e., aerobic and resistance). However, it is unclear how aerobic and resistance exercise improves cognitive function. PURPOSE: To clarify the effects of acute aerobic and resistance exercise on cognitive function. METHODS: Sixteen subjects completed cognitive tasks before and after acute aerobic or resistance exercise in a randomized counterbalanced design. In aerobic condition, they cycled an ergometer at the intensity corresponding to 40% peak oxygen uptake. In resistance condition, they performed resistance exercise using elastic bands. Exercise duration of each condition was 30 min. Cognitive task was a Go/NoGo task, which required executive function. Plasma catecholamine, insulin-like growth hormone factor 1 (IGF-1), serum brain-derived neurotrophic factor receptor (BDNF), and blood lactate concentration were measured before and after exercise. RESULTS: Compared with rest, reaction time on the Go/NoGo task tended to decreased after exercise (aerobic: 651 ± 143 vs. 586 ± 175 ms, resistance: 644 ± 212 vs. 604 ± 160 ms, P=0.06). Neither exercise nor condition altered the accuracy on the cognitive task. Both aerobic and resistance exercise increased noradrenaline (aerobic: 38 ± 9 to 68 ± 12 pg/mL, resistance: 34 ± 8 to 58 ± 12 pg/mL, P<0.01), but had no effect on end-tidal CO_2 partial pressure, which estimates arterial CO_2 pressure affecting cerebral blood flow. Cerebral %HbI did not change at any work rate in T1D but decreased at 200 W in HC (P<0.05). No differences were observed between T1D and HC in the reported parameters before the intervention.
increases in IGF-1 (aerobic: 216 ± 62 vs. 214 ± 53 ng/mL, p = 0.66; resistance: 210 ± 47 vs. 223 ± 41 ng/mL, p > 0.05) and blood lactate concentrations (aerobic: 1.1 ± 0.3 vs. 1.4 ± 0.5 mmol/L, p < 0.01; resistance: 1.2 ± 0.3 vs. 2.8 ± 0.8 mmol/L, p < 0.01) were observed only after exercise resistance. BDNF concentrations did not change after exercise (aerobic: 25800 ± 5474 vs. 26192 ± 7048 pg/mL, resistance: 27417 ± 4668 vs. 25975 ± 7647 pg/mL, p = 0.59). CONCLUSIONS: Acute aerobic and resistance exercise improves cognitive function, probably due to increased central neurochemical activity. After resistance exercise, increases in IGF-1 and blood lactate concentrations might contribute to the improvement.

**Purpose:** Physical activity during adulthood is discussed as a major preventive factor against loss of cognitive function in old age. The present study aims at analyzing the effects of lifelong physical activity (PA) on cognitive function and brain metabolism.

**Methods:** Data were obtained from 50 cognitively unimpaired elderly participants (72±5yrs, 27%): Lifetime physical activity was assessed by a validated questionnaire investigating five epochs across the lifespan (age in years: 14-21, 22-24, 35-50, 51-65, 66-80). Data were analyzed as average energy consumption (MET-h/wk) per epoch. Participants individual lifespan activity profile was defined as the behavior they engaged in for at least 60% of their lifetime (≥60% of epochs). Referring to current activity guidelines (7.5 MET-h/wk vs. 75% to 150' moderate PA-min/wk) and based on the individual activity profiles, subjects were stratified in 3 groups of lifetime activity behavior (MET-h/wk: <7.5 / 7.5-15 / >15).

Cognitive assessment included testing of executive function (stropp interference test), verbal and non-verbal declarative memory and crystallized intelligence (MWT-B). Brain metabolism was recorded from a transversal slice just above the corpus callosum via magnetic resonance spectroscopic imaging (MRSI), and analyzed as the ratio of N-Acetylaspartate to choline (NAAA/Cho).

**Results:** Compared to individuals reporting less than the recommended minimum of 7.5 MET-h/wk (460ms), ANCOVA revealed significantly (p<0.05) higher NAA/Cho values and shorter mean response times for stroop word test among those performing the recommended minimum (≥60ms) and those performing ≥2 times the minimum (<60ms). Stroop interference scores were solely higher in participants performing ≥2 times the minimum recommendation. Correlation analysis showed significant associations of overall and vigorous mean lifetime PA with stroop performance (r=-0.408; r=-0.410; p<0.05) and NAA/Cho (r=-0.303; r=-0.310; p<0.05).

**Conclusions:** The findings suggest that lifelong adherence to the minimum recommended amount of health enhancing PA results in positive effects on executive function and neuronal metabolism in old age. Exceeding minimum guideline recommendations in terms of intensity and duration might lead to additional benefits.

**Purpose:** In aging, cerebral and systemic vascular functions (VF) decline likewise to cognitive decline. Also, reduced availability of nitric oxide (NO) in both cerebral and peripheral vascular systems may contribute to the development of Alzheimer's disease (AD). However, the specific mechanisms behind these improvements are unclear. Perivascular stem cells are located in a variety of tissue types and have substantial regenerative potential, yet the extent to which long-term HMB supplementation affects their function is unknown. PURPOSE: To assess the impact long-term HMB supplementation has on cognitive and skeletal muscle function in aged mice as well as the perivascular stem cell response to HMB. METHODS: Four-month-old and 17 month old sedentary C57BL/6 mice were fed chow containing either Ca-HMB or Ca-Lactate (3.75 g/kg chow) for 24 weeks. Muscle function was measured by four-limb grip strength and body weights were recorded weekly. At 22 weeks, mice underwent rotarod testing followed by active avoidance testing. At 24 weeks, gastrocnemius muscles and brains were dissected. Half of the muscles and half of the brains were used for perivascular stem cell (muscle: CD146+CD31-CD45-; brain: PDGFRb+CD31-CD45-) isolation via FACS. The other half was collected for histological and protein synthesis analysis. RESULTS: After 5 days of active avoidance testing, aged mice supplemented with HMB successfully avoided a significantly greater number of foot shocks compared to aged mice on the control diet (HMB effect, p<0.05). The average time spent running on the rotarod was significantly reduced with age but unaffected by supplementation (age effect, p<0.05). Neither grip strength nor muscle weight were affected. CONCLUSIONS: Long-term HMB supplementation beginning in middle age results in preserved cognitive function in aged mice comparable to that of young mice. These findings indicate the potential for prolonged HMB supplementation to prevent age-related declines to cognition. Supported by Abbott Nutrition through the Center for Nutrition, Learning, and Memory at the University of Illinois at Urbana Champaign.

**Purpose:** To compare the effect of volume-matched high-intensity interval training (HIIT) and moderate-intensity continuous training (CONT) on ischaemic muscle pain tolerance and high-intensity exercise tolerance. METHODS: Twenty healthy adults were randomly assigned to either 6 weeks of HIIT (~6–8 × 5 min at halfway between lactate threshold and maximal intensity) or CONT (~60–80 min at 90% lactate threshold) on a cycle ergometer. Immediately pre- and post-training, participants completed a tourniquet test to examine ischaemic muscle pain tolerance and two time to exhaustion (TTE) trials at 50% of exercise tolerance; the post-training TTE trials were completed at the pre-training 50% (same absolute intensity) and the post-training 50% (same relative intensity). RESULTS: HIIT and CONT resulted in similar improvements in all markers of aerobic fitness (P>0.05). Compared with pre-training, HIIT increased TTE at the same absolute and relative intensity as pre-training (148% and 43%, respectively) to a greater extent than CONT (38% and -4%, respectively) (P<0.05). HIIT increased pain tolerance (41%, P<0.001), which demonstrated an association with the increase in TTE at the same relative intensity as pre-training (r=0.50, P=0.07), however pain tolerance was unaffected by CONT (r=-3%, P>0.05). Conclusion: The repeated exposure to a high-intensity noxious exercise training stimuli increases ischemic muscle pain tolerance, which is independent of the improvements in aerobic fitness induced by endurance training. This increase in ischemic pain tolerance may be an important contributor to the increase in high-intensity exercise tolerance following HIIT.

**Keywords:** Central nervous system; endurance; exercise tolerance; high-intensity interval training; muscle fatigue; muscle pain.

Abstracts were prepared by the authors and printed as submitted.
The present study was to determine the effects of an acute bout of maximal aerobic exercise (VO2max) on plasma brain-derived neurotrophic factor (BDNF) and BDNF expression in peripheral blood mononuclear cells (PBMCs) in obese and non-obese individuals. Methods: Anthropometric data, plasma BDNF and the BDNF expression in PBMCs as well as VO2max were measured in 22 participants (9 obese, 12 non-obese). Blood samples were obtained at four time points; pre-, post-, 1-hour (R1H), and 2 hours (R2H) post-exercise. Plasma and PBMCs were isolated and analyzed for BDNF via ELISA and Western Blot techniques, respectively. A 2x4 repeated measures ANOVA was used with a Bonferroni test for post hoc comparisons. Pearson correlations were used to examine relationships between anthropometrics and VO2max with BDNF measures. Significance was set at p<0.05. Results: Significant group differences at pre-exercise were observed for BMI (34.5 ± 3.6 vs 21.9 ± 1.5 kg/m², p < 0.01), waist to hip ratio (115.5 ± 9.0 vs 94.7 ± 3.9cm, p < 0.01) and V′O2max (31.5 ± 5.6 vs 45.7 ± 8.25mg/min kg⁻¹, p < 0.01). Post hoc comparisons revealed that plasma BDNF pre-exercise (1522.01 ± 689.18 pg/ml) was significantly (p < 0.01) higher than R1H (1119.52 ± 133.40 pg/ml) and R2H (871.06 ± 815.97 pg/ml), but not post-exercise (2483.7 ± 1104.44 pg/ml) in obese individuals. Further, a significant (p = 0.046) group by time interaction was found from pre-exercise (0.0853 ± 0.2784 vs 0.9726 ± 0.2627 a.u to R1H (1.003 ± 0.4230 vs 0.9255 ± 0.2790 a.u) for BDNF expression in PBMCs in obese compared to non-obese individuals. A very strong correlation was observed between BMI and waist circumference (r = 0.9, p<0.01), while moderate correlations existed between waist to hip ratio (r = 0.5, p<0.002) and pre-exercise to R1H (r=0.58, p<0.01). Conclusion: Our results indicate a significant increase in PBMC BDNF expression from pre to R1H in obese individuals. This is consistent with other investigations suggesting a pro-inflammatory response mediated by maximal exercise. Correlations support the explanation that BDNF, both in circulation and within PBMCs is mediated by body mass, particularly when taking physical work capacity into account.

### Board #19

#### The Effect of Two Types of Suspension and Unsuspending Resistance Training on Salivary Bdnf of Preadolescence Children

Rana Fayazmilani, aynazpourmotahari, Ahad abbasi. Shahid Beheshti University, Tehran, Iran, Islamic Republic of. Email: r_fayazmilani@sbu.ac.ir

(no relationships reported)

**Abstract**

Force development, as a result of resistance training in children is mostly attributed to neural adaptations. According to high potential of neural plasticity in childhood, it is important to find the proper training methods to cultivate this capability. On the other hand, BDNF is a member of the neurotrophins family which is engaged in neuromuscular adaptations due to increased muscular activity. Purpose: the main purpose of this study is to investigate the effects of two types of suspension and unsuspension resistance training on salivary BDNF of prepubescent children. Methods: 24 immature boys (mean age 12.3±0.55, Tanner stage of 1 and 2) were divided into three groups of TRX suspension training (TRX), body weight training (BWT), and control (C). TRX and BWT groups completed training programs, two times a week for eight weeks. Saliva samples were collected before training and also 72 hours after last training session to measure salivary BDNF using ELIZA method. One-way ANOVA test with significance level of 0.05 was used for comparison between groups. Result: Although the effects of resistance training on muscle strength in the lower body was clearly observed in the experimental group, BDNF concentrations were not significantly different between the experimental and control groups (F=922, P=411). Conclusion: It is possible that the training protocol used in this study might not be long or intensive enough to make a significant change in BDNF concentration. Keywords: Children trainability, Neurotrophic Factor, TRX

### Board #21

#### Exercise Attenuates Chronic Unpredictable Mild Stress Induced Brain Microvascular Rarefaction In Obese Zucker Rat: Role Of Stat3 Signaling

Shinichi Asano¹, Mariah L. Dowson², Whitney J. Sheets², Ashlee N. Seldembridge¹, Kayla W. Branyan³, Evan R. DeVallance², Jefferson C. Frisbee², Paul D. Chantler², Fairmont State University, Fairmont, WV. ²West Virginia University, Morgantown, WV.

Email: r_milani@sbu.ac.ir

(no relationships reported)

**Abstract**

Exercise (AEX) is a promising intervention for improving learning and memory. The memory enhancing effects of AEX may be mediated by increased expression of neurotrophins, elevated catecholamine signaling, and modifications to postsynaptic glutamate receptors. Given the known memory enhancing effects of AEX in humans, it is important to explore how AEX and related noradrenergic signaling impact behavior in mice, which are commonly used to study the influence of exercise on brain plasticity and behavior. PURPOSE: To determine the effects of one acute bout of exercise on hippocampal Bdnf expression, AMPA receptor phosphorylation, and behavior in mice. METHODS: C57BL/6J mice were randomly assigned to 3 groups: control (CON; n=12); moderate-intensity AEX (MOD; n=12); and high-intensity AEX (HI; n=12). CON mice were placed on the stationary treadmill (TM) for 30 min and MOD and HI mice ran for 30 min at 12 m/min and 15-17 m/min, respectively. Mice were sacrificed immediately after AEX, mRNA from the hippocampus, including both Bdnf (exon IX), Bdnf exon IV (Bdnf IV), and glutamate receptor subunits were quantified with qPCR. Total and phosphorylated GluR1 (Ser845 and Ser831) protein were quantified with immunoblotting. Utilizing the same CON (n=15) and HI (n=15) TM protocol, object location memory following AEX was examined. Anxiety-like behavior was assessed in the open field test (OFT) in a subset of mice that were separated into 4 groups: CON Saline (CON-), AEX-Saline (AEX-), CON-DSP-4 (CON-), AEX-DSP-4 (AEX-). DSP-4 was used to lesion the central noradrenergic system. RESULTS: We observed higher Bdnf IV mRNA in hippocampus of HI compared to CON mice (p=0.03). There was no effect of AEX on total Bdnf or any other mRNA or protein targets. There were no effects of AEX on memory performance in the object location task, though HI mice explored the testing arena significantly less (distance) during the initial phase of the task compared to CON (p=0.0003). In the OFT, mice exposed to AEX traveled significantly less total distance (p=0.0001) and spent more time grooming (p<0.0001) than CON mice. There was no effect of DSP-4 on behavior. CONCLUSIONS: AEX increases Bdnf IV mRNA expression in an intensity-dependent manner; however, high-intensity AEX also induces behaviors suggestive of an anxious phenotype in C57BL/6J mice.

**References**

Effects of Voluntary Wheel Running Exercise on the Circadian Alterations of Neuroendocrine Induced by Chronic Unpredictable Mild Stress in Rats

Yan Zhao, Yu Fu. Cheng Du Sport University, Cheng Du, China.

(Please note: This text is not completely legible due to low resolution. It appears to discuss the effects of voluntary wheel running on circadian rhythms in rats induced by chronic unpredictable mild stress (CUMS).

CONCLUSION: Taken together, these results suggested that OZR is more susceptible to UCMS associated brain vascular structural alteration than LZR is. Importantly, exercise treatment appears to prevent UCMS associated brain rarefaction in OZR.

PURPOSE: To investigate the effects of aerobic exercise on tau phosphorylation and PI3K/Akt pathway in the hippocampus of obese rats, and provide some theoretical basis for physical activity improving obesity-related neurological disorders.

METHODS: Male Sprague-Dawley rats aged 3 weeks were randomly assigned to either a high-fat or a normal diet protocol for 12 weeks. Animals submitted to the high-fat diet were divided into two groups: sedentary group (HF-Sed) and exercise group (HF-Ex). The rats fed the normal diet were also divided into sedentary group (ND-Sed) and exercise group (ND-Ex). The rats in the HF-Ex and ND-Ex groups were underwent a treadmill training for 8 weeks. Then the hippocampus were isolated at 48h after last exercise. The protein and phosphorylation levels of tau, GSK3β, PI3K and Akt were assayed by Western blot.

RESULTS: After 8 weeks of treadmill exercise, compared with ND-Sed group, the phosphorylation levels of tau were increased significantly in the HF-Sed group. While the phosphorylation levels of tau were decreased remarkably in the HF-Ex group compared with HF-Sed group. Furthermore, compared with ND-Sed group, the activity of GSK3β was increased in the HF-Sed group by reducing Ser9 phosphorylation and increasing Tyr216 phosphorylation. But in the HF-Ex group, the activity of GSK3β was decreased significantly compared with HF-Sed group by increasing Ser9 phosphorylation and reducing Tyr216 phosphorylation. Moreover, compared with ND-Sed group, in the HF-Sed group the PI3K-Akt pathway was inhibited by reducing the protein levels of PI3K p110 and p85 subunits and the activity of Akt Thr308 and Ser473. But compared with HF-Sed group, the protein levels of PI3K p110 and p85 subunits and the phosphorylation levels of Akt Thr308 and Ser473 were increased remarkably in the HF-Ex group, and the activity of PI3K/Akt pathway was enhanced.

CONCLUSIONS: Obesity induces tau hyperphosphorylation in the rats hippocampus. While long-term aerobic exercise can reduce tau hyperphosphorylation by increasing PI3K/Akt pathway activity and inhibiting GSK3β activity. It has a positive effect on delaying neurofibrillary tangle formation and improving obesity-related neurological disorders.

PURPOSE: Persistent exposure to an energy dense diet leads to hypothalamic inflammation and is considered an early and a determining factor for the development of metabolic disorders. Hypothalamic pro-inflammatory signals activate the glial cells, resulting in various inflammatory mediators resulting in neuronal dysfunction further promoting obesity and systemic metabolic disease. It has been reported from our lab that moderate intensity treadmill training could revert the diet-induced microglial activation in the hypothalamus. Several lines of evidence suggest that chemokines are involved in the regulation of neurodegenerative and neuroendocrine disorders. Fractalkine (CX3CL1) is a chemokine that is secreted from neurons, which then binds to its receptor CX3CR1 on the microglia. This ligand-receptor interaction confers a resting - ramified phenotype to microglia thereby reducing hypothalamic inflammation. AIM: The aim of the present study is to investigate the role of exercise induced in neuronal dysfunction further promoting obesity and systemic metabolic disease. It has been reported from our lab that moderate intensity treadmill training could revert the diet-induced microglial activation in the hypothalamus. Several lines of evidence suggest that chemokines are involved in the regulation of neurodegenerative and neuroendocrine disorders. Fractalkine (CX3CL1) is a chemokine that is secreted from neurons, which then binds to its receptor CX3CR1 on the microglia. This ligand-receptor interaction confers a resting - ramified phenotype to microglia thereby reducing hypothalamic inflammation. AIM: The aim of the present study is to investigate the role of exercise induced microglial activation in reducing obesity-related neurological disorders.

METHODS: We determined the activation status of microglia and astrocytes in hypothalamus of C57Bl/6 mice in response to high-fat diet (HFD) and exercise. Immunohistochemical staining for Iba1 and GFAP respectively. RESULTS: High fat diet exposure for sixteen weeks induced microgliosis and astrocytosis. Treadmill running reversed microgliosis induced by HFD. Mice underwent an acute bout of exercise to elucidate the neuronal fractalkine response to exercise. Fractalkine mRNA expression (Q-RT-PCR) as well as protein levels (chemokine array) were increased after an acute bout of exercise. Furthermore, data from RNA-sequencing after acute bout of exercise indicates that Rfx4 which is a transcriptional regulator of CX3CL1 is also up regulated in response to exercise.

CONCLUSIONS: On going studies using CX3CR1 knock out mice will elucidate the role of fractalkine-receptor signaling in HFD induced hypothalamic inflammation. Hypothalamus targeted fractalkine delivery might ameliorate diet-induced hypothalamic inflammation and associated metabolic complications.
Several strategies have been studied to combat obesity, including physical exercise. The knowledge of whether exercise can modulate the expression of genes involved in energy homeostasis in hypothalamus of diet-induced obese mice can bring additional information about the treatment of this pathology. PURPOSE: Investigate the expression of voluntary exercise on the hypothalamic expression of genes related to energy homeostasis in high-fat diet fed mice. METHODS: C57BL/6 mice were divided into 3 groups: control (C), high-fat (H) and high-fat exercise (HE). Mice had free access to food (C, chow or H, 34% fat) and running wheel (HE, 5 days/week) for 10 weeks. Hypothalamus was collected and expression of 84 obesity-related genes was assessed by RT PCR with the gene array system. The data was analyzed in the PCR Array System Data Analysis Software (Excel & Web based - SABioscience). Results are expressed as fold change. Significance was set at p<0.05.

RESULTS: High-fat diet modulated (p=0.05) the expression of 14% of the 84 analyzed targets. The anorectic genes Bdnf (0.53 H vs C and 0.57 HE vs C), calcitonin receptor (H 0.63 and HE 0.57 vs C) and ciliary neurotrophic factor receptor (H 0.53 and HE 0.57 vs C) were downregulated in H and HE compared to C. The adrenergic receptor beta 1 (H 0.53 and HE 0.58 vs C) and interleukin 1 receptor type 1 (H 0.54 and 0.58 HE vs C) were also downregulated by high-fat diet. Neuropeptide Y receptor Y1 (H 1.06 and HE 1.15 vs C), protein tyrosine phosphatase non-receptor type 1 (H 1.17 and HE 1.15 vs C), corticotropin releasing hormone receptor 1 (H 1.06 and HE 1.14 vs C), S-hydroxytryptamine receptor 2C (H 1.07 and HE 1.15 vs C) and zinc finger protein 91 (H 1.07 and HE 1.16 vs C) were upregulated by high-fat diet. Interleukin-1 alpha was upregulated in H (1.06 H vs C) but downregulated in HE (0.57 HE vs C). All calcitonin receptor was not differentially expressed in HE compared to H. Except for interleukin-1 alpha, all the other genes were upregulated in HE compared to H.

CONCLUSIONS: High-fat diet downregulated anorexigenic and proatherogenic genes and upregulated genes linked to positive energy balance, favoring obesity. Voluntary exercise only marginally modulated (small magnitude despite significant) the expression these genes, indicating a discrete central effect.

Spontaneous physical activity (SPA) comprehends all daily physical activities other than volitional exercises (e.g. sports-related activities). The energy spent in SPA can represent up to 50% of the total daily energy expenditure. Little is known regarding the biological regulation of SPA, especially during ageing, when SPA is known to decline. As a mediator of energy homeostasis, hypothalamic leptin signaling may be involved. PURPOSE: to investigate the temporal relationship between hypothalamic leptin signaling and SPA in mice from 4 to 10 months of age.

METHODS: Male C57BL/6 mice were divided into three groups, according to age: 4 (4M, n=10), 6 (6M, n=10) and 10 (10M, n=20) months-old mice. SPA, distance travelled (DT), average speed of locomotion (AS) and energy expenditure (EE) were measured monthly from 4 to 10 months of age in the 10M group. Hypothalamic expression of STAT3 and phosphorylated STAT3 (pSTAT3) by Western Blotting, intraperitoneal glucose tolerance test (ipGTT), and retroperitoneal (RAP) and epidydimal (EAT) adipose tissue weight were determined in all the groups (4M, 6M and 10M). Results are shown as mean ± standard error of the mean. Repeated measures ANOVA or One-way ANOVA were employed and the Newman-Keuls post hoc test was used when necessary. Significance was set at p<0.05.

Supported by: FAPESP and CAPES.

CONCLUSIONS: Decreases in SPA, DT and AS were accompanied by a reduction of hypothalamic leptin signaling. Besides, glucose intolerance and increased fat pads weight manifested when SPA declined. Supported by: FAPESP and CAPES.

Spontaneous physical activity (SPA) comprehends all daily physical activities other than volitional exercises (e.g. sports-related activities). The energy spent in SPA can represent up to 50% of the total daily energy expenditure. Little is known regarding the biological regulation of SPA, especially during ageing, when SPA is known to decline. As a mediator of energy homeostasis, hypothalamic leptin signaling may be involved. PURPOSE: to investigate the temporal relationship between hypothalamic leptin signaling and SPA in mice from 4 to 10 months of age.

METHODS: Male C57BL/6 mice were divided into three groups, according to age: 4 (4M, n=10), 6 (6M, n=10) and 10 (10M, n=20) months-old mice. SPA, distance travelled (DT), average speed of locomotion (AS) and energy expenditure (EE) were measured monthly from 4 to 10 months of age in the 10M group. Hypothalamic expression of STAT3 and phosphorylated STAT3 (pSTAT3) by Western Blotting, intraperitoneal glucose tolerance test (ipGTT), and retroperitoneal (RAP) and epidydimal (EAT) adipose tissue weight were determined in all the groups (4M, 6M and 10M). Results are shown as mean ± standard error of the mean. Repeated measures ANOVA or One-way ANOVA were employed and the Newman-Keuls post hoc test was used when necessary. Significance was set at p<0.05.

Supported by: FAPESP and CAPES.

CONCLUSIONS: Decreases in SPA, DT and AS were accompanied by a reduction of hypothalamic leptin signaling. Besides, glucose intolerance and increased fat pads weight manifested when SPA declined. Supported by: FAPESP and CAPES.
mRNA and OX1R, and significantly reduce the expression of OXA, OX1R mRNA, OX1R; Over load swimming exercise could damage the spatial learning and memory ability of rats, after over load swimming exercise, the expression of NCAM, OXA and OX1R was normal. **Acknowledgments:** Supported by the National Natural Science Foundation of China (No.31371202). Supported by the Sports Medicine key laboratory of State Administration of Sports/ Sichuan province Foundation.

**METHODS:** A total of 248 (144 male, 104 female) athletes completed the survey. Of these, 137 athletes competed in leanness sports and 109 athletes in non-leanness sports. The Female Athlete Triad (Triad) is a syndrome defined as the interaction of three interrelated conditions: low energy availability with or without disordered eating, menstrual dysfunction, and low bone mineral density (BMD). The Triad may also impact males, and may have long-term health consequences if unaddressed. Although participation in elite para-sport is rapidly growing, no studies have assessed the prevalence of Triad risk factors in this population.

**PURPOSE:** To evaluate the prevalence of Triad risk factors in an elite para-athlete population and associations to sex and para-sport type.

**METHODS:** Subjects were United States para-sport athletes who were training to qualify for the 2016 Summer or the 2018 Winter Paralympic Games. Participants completed an online questionnaire characterizing nutrition, menstrual status (if female), bone health, and awareness of the triad. Responses were analyzed to determine overall prevalence of Triad components, and significant differences based on sex and sport type (leanness vs. non-leanness).

**RESULTS:** A total of 248 (144 male, 104 female) athletes completed the survey. Of these, 137 athletes competed in leanness sports and 109 athletes in non-leanness sports. Of the cohort, 40% (53 male, 45 female) of athletes indicated that they were currently trying to lose weight, and 61% (n = 151; 90 male, 61 female) indicated they were attempting to change their body composition to improve sport performance. Only 3% (1 male, 6 female) of athletes indicated that they had been previously diagnosed with an eating disorder. For pre-menopausal women, 32% (n = 29) reported less than 3% (1 male, 6 female) of athletes indicated that they had been previously diagnosed with an eating disorder. For pre-menopausal women, 32% (n = 29) reported less than

**CONCLUSIONS:** Elite para-sport athletes have high prevalence of Triad components, regardless of sex or sport type. Awareness of the Triad in athletes is low. While consequences of the Triad in a para-athlete population are poorly understood, screening tools and education to increase awareness are required to optimize overall health of this population.

**METHODS:** 1525 high school athletes (780 female, age=16–11.1±1.0 years old, grades 9–12) from 29 high schools were recruited to complete a pre-season questionnaire regarding their sport participation patterns and previous injury history. Sport competition volume in the previous 12 months was classified as high (>60 competitions), moderate (30–60 competitions), or low (<30 competitions). Sport specialization status was classified as low, moderate, or high using a widely utilized 3-point specialization scale. Chi-square tests were used to investigate associations of competition volume, club sport participation, specialization, and LEI by sex (a-priori p<0.05).

**RESULTS:** Females were more likely than males to participate in high competition volume (23.2% vs 11.0%, χ²=84.7, p<0.001), and be highly specialized (16.4% vs 10.4%, χ²=19.7, p<0.001). A total of 487 subjects (31.5%) reported sustaining a total of 599 previous time-loss LEI. Female athletes were more likely to report a previous LEI than males when considering all sports (36.5% vs. 27.9%, χ²=15.9, p<0.001) and when the sample was restricted to sex-equivalent sports (37.3% vs. 28.2%, χ²=9.0, p<0.003).

**CONCLUSIONS:** Female athletes were more likely to participate in sports at high volumes, on club teams in addition to their high school teams, be highly specialized, and report previous LEI. Female high school athletes may be at greater risk of injury due to these differences in sport participation patterns. Supported by grants from the American Medical Society for Sports Medicine and the National Federation of State High School Associations.

**METHODS:** 69 female soccer players (13–18 years) were monitored for 10 months of formal competition. Daily training load (TL) was determined by session-rating of perceived exertion (duration [min] x intensity [1-10]). Every morning, participants recorded sleep hours and rated stress from 1 to 3 (higher being better) and illnesses were recorded throughout the year. Data were aggregated weekly and 2, 3, and 4 week rolling averages were calculated as well as an acute-to-chronic workload ratio (A:C; weekly divided by 4-week TL) TL measures were converted to z-scores and Poisson regression analyses were used to compare the relative abilities of the different TL measures to predict the number of illnesses the following week. Based on this, 2-week TL was classified as low, moderate-low, moderate-high, high, or very high using z-scores, and the relative risk of subsequent illness was compared between the groups. Finally, a multivariable Poisson regression model was developed to predict the number of weekly illnesses, using 2-week TL, sleep, and stress values as covariates. **Results:** 73 illnesses occurred during the 10 months of competition. Weekly illnesses were significantly and similarly predicted by the preceding 2-week TL (OR=1.74, p=0.001), 3-week TL (OR=2.1, p=0.001), and 4-week TL (OR=1.70, p=0.001), but not 1-week TL (OR=1.21, p=0.15) or A:C (OR=2.2, p=0.22). Compared to low 2-week TL, the risk of illness was increased following 2-week periods of high (RR=2.0) and very high TL (RR=3.5). After inclusion in the multivariable model, 2-week TL remained a significant, independent predictor of subsequent weekly illness (OR=1.81, p=0.001) while sleep (OR=0.78, p<0.001) and stress (OR=0.22, p=0.09) did not. **Conclusion:** After controlling for sleep and stress, chronic training load is a significant, independent predictor of illness risk, while weekly TL and A:C are not. Monitoring cumulative TL over 2 or more weeks during the competitive season may allow for intervention to reduce the risk of illness in adolescent female athletes.
completed the Short Form 12v2.0 Acute Recall (SF-12) prior to the start of the competitive season (PRE) and within 1 month following the end of the competitive season (POST). Participants included athletes who did not sustain an injury during the season or 6 months prior to PRE competing in football (freshman=36, senior=12), soccer (freshman=16, senior=3), and cross country (freshman=17, senior=8) over the 2013-2014 or 2014-2015 seasons. Raw scores were converted to norm-based scores via a linear z-score transformation. Differences (median (IQR)) in PRE to POST Mental Composite Score (MCS) and Physical Composite Score (PCS) were analyzed using Wilcoxon signed-rank tests. RESULTS: MCS significantly decreased (p=0.001) pre- to post-season among freshmen collegiate athletes (PRE=57.06 (54.79, 59.43), POST=-54.67 (48.93, 57.06)). This decrease was observed in both males and females (p<0.001 and p=0.027, respectively). There was no change (p=0.341) in PCS among freshmen. Among senior collegiate athletes, MCS (PRE=55.34 (54.22, 58.26), POST=54.20 (49.50, 58.10)) and PCS (PRE=57.47 (54.39, 57.84), POST=56.71 (55.34, 58.40)) did not change significantly pre- to post-season (p=0.487 and p=0.889, respectively). CONCLUSION: Among freshmen collegiate athletes, mental aspects of HRQoL decreased over the course of the competitive season. Transitioning from high school to collegiate academics and athletics may produce high levels of psychological stress that can negatively impact HRQoL. University athletes should continue offering stress-management and counseling services to help incoming freshmen athletes adjust to college life.

2513 Board #33
June 2 11:00 AM - 12:30 PM
In-season Injury And Health-related Quality Of Life Among Collegiate Athletes
Email: blyholder@ortho.wisc.edu
(No relationships reported)

For many athletes, sport-related musculoskeletal (MSK) injuries result in significant time lost from activity and declines in athletic performance. These events may negatively impact health-related quality of life (HRQoL). PURPOSE: To determine the effect of MSK injuries sustained during the competitive season on HRQoL among collegiate athletes. METHODS: 160 Division I collegiate athletes (mean age=19.6±1.4, 117 males) at a large public university completed the Short Form 12v2.0 Acute Recall (SF-12) prior to the start of the competitive season (PRE) and within 1 month following the end of the competitive season (POST). Participants included athletes not injured in the prior 6 months who competed in football (n=73), soccer (n=43), cross country (n=35), and volleyball (n=45). Injuries sustained during the season was collected from a medical database maintained by sports medicine staff. SF-12 raw scores were converted to norm-based scores via a linear z-score transformation. Differences (median (IQR)) in PRE and POST Mental Composite Score (MCS) and Physical Composite Score (PCS) were analyzed using Wilcoxon signed-rank tests. RESULTS: Among athletes who suffered an in-season MSK injury (n=55), PCS significantly decreased (p=0.023) over the season (PRE=56.71 (54.24, 57.76), POST=55.86 (52.14, 56.71)) while MCS remained unchanged (p=0.208). Athletes who underwent surgery during the season (n=10) showed no change in PCS (p=0.097) or MCS (p=0.722). Among athletes who did not sustain an injury (n=105), MCS significantly decreased (p=0.003) pre- to post-season (PRE=57.06 (54.10, 59.43), POST=54.79 (51.75, 57.16)) while PCS did not change (p=0.289). Postseason PCS was significantly lower (p=0.001) among athletes who underwent surgery (POST=51.63 (48.72, 54.95)) and among athletes who suffered a MSK injury (POST=56.86 (52.14, 56.71)) compared to uninjured athletes (POST=56.71 (55.09, 57.76)). CONCLUSION: Among collegiate athletes, in-season MSK injury negatively affected physical aspects of HRQoL. Sports medicine providers should be aware that MSK injury can impact, not only athletic performance, but also self-perceived physical health and function among collegiate athletes.

2514 Board #34
June 2 11:00 AM - 12:30 PM
The Assessment Of Body Composition In Young Athletes
Giorgio Galanti, Benedetta Tosi, Martina Bocci, Giulio Tempesti, Gabriele Mascherini, Petri Cristiani. Sport Medicine Center, Florence, Italy.
Email: giorgio.galanti@unifi.it
(No relationships reported)

Purpose: In this study we have compared the body composition of elite athletes practicing two different sports, we also evaluated bone health in cyclists. Methods: We enrolled 64 male athletes (15-21 years old): 52 soccer players and 12 cyclists, belonging to same soccer or cyclism team. The athletes were subjected to anthropometric evaluations, measurements of circumferences and skinfolds, DXA and BIA. Specifically, using Durnin & Rahaman formula we evaluated fat mass (FM) and fat free mass (FFM). With DXA we evaluated Whole Body Total Fat (WBTF), Whole Body Total Lean (WBTL), Whole Body Total Mass (WBTM) and Whole Body Total Fat Free Mass (FFM). With DXA we evaluated Whole Body Total Fat (WBTF), Whole Body Total Lean (WBTL), Whole Body Total Mass (WBTM) and Whole Body Total Fat Free Mass (FFM).

2515 Board #35
June 2 11:00 AM - 12:30 PM
A Wellness Program for Older Female Golfers: Effects on Golf Performance and Range of Motion
Katherine James, Michael Rabel, Lorraine Lacoppola, Erin Ruest. University of Maryland Eastern Shore, Princess Anne, MD. (No relationships reported)

PURPOSE: To compare the effect of a wellness program on range of motion (ROM) and golf performance in older female golfers.

METHODS: Twenty-five female golfers, 65 ± 8 years old (range 55 to 73) and golf handicap ratings of 30 ± 10 (range 5 to 50), were divided randomly into an Intervention (n=10) and a Control (n=15) group. Subjects in the intervention group participated in a wellness program consisting of: (a) flexibility and strengthening exercises for the shoulder, hip, and trunk; (b) appropriate stretching exercises before and after golf practice; and (c) participation in a golf performance enhancement program. The Control group participated in a golf performance enhancement program only. All subjects were tested pre- and post-intervention for ROM of the shoulder, hip, and trunk and for golf performance measures. Changes in ROM and golf performance measures between pre- and post-intervention were analyzed using Wilcoxon signed-rank tests. RESULTS: After the 10-week program, significant improvements were observed in golf performance (P<0.05) for the intervention group but not for the control group. Surprisingly, the group that received the wellness program had a mean improvement of 16.0 ± 10.1 strokes per round, whereas the control group had an improvement of -0.5 ± 5.7 strokes per round. CONCLUSION: These preliminary results suggest that a wellness program consisting of flexibility and strengthening exercises, combined with a golf performance enhancement program, may improve golf performance in older female golfers.

2516 Board #36
June 2 11:00 AM - 12:30 PM
Investigating the Acute Effects of Olympic-style Boxing Among Females
David R. Howell1, William P. Meehan, III1, Michael P. Loosmore2, Joseph Cummiskey3, Jean-Paul Grabner von Rosenberg4, David McDonagh1. 1Boston Children's Hospital, Waltham, MA. 2University College Hospital London, London, United Kingdom. 3AIBA, Lausanne, Switzerland. 4St.Olavs Hospital, Trondheim, Norway. (Sponsor: Lou Osternig, FACSM)
Email: david.howell2@childrens.harvard.edu
(No relationships reported)

Although diagnosed concussions affect balance control, dual-task abilities, visual functions, and neurocognitive functions, few prospective investigations have examined how head impacts sustained during an Olympic-style boxing tournament that do not result in a concussion, so-called sub-concussive blows, affect performance. Female boxers, in particular, have received scant attention in the boxing literature to date. PURPOSE: To prospectively examine the neurocognitive, postural control, dual-task, and visual abilities of female Olympic-style boxers before and after participation in a boxing tournament. METHODS: Sixty-one females completed the modified Balance Error Scoring System (mBESS), King-Devick test, and 3n timed-up-and-go (TUG) test in single-task and dual-task conditions. A subset of the boxers completed the CogState computerized neuropsychological test. Initial testing was completed prior to the 2016 Women’s World Boxing Championships and each participant repeated the testing protocol within a day of elimination. Pre-tournament and post-tournament performance
2517 Board #37  
June 2 11:00 AM - 12:30 PM
The Influence Of Oral Contraceptives On Subjective Physical Condition And Athletic Performance In Japanese Female Athletes.


(Nos relationships reported)

In Japan, the prevalence of dysmenorrhea and premenstrual syndrome (PMS) in elite female athletes is 25.6% and 70.3% respectively (Ogura-Nose et al., 2014). However, the use of oral contraceptives (OC) in Japanese female athletes is low (2%)(Ogura-Nose et al., 2014). One of the reasons is because athletes are concerned about the side effects taking OC might have adverse effects on athletic performance. PURPOSE: To examine the influence of OC on subjective condition and athletic performance.

METHODS: Fourteen female athletes were recruited. All subjects were examined during the follicular (F) and luteal (L) phases, OC (days 10-20 of their OC use) and withdrawal-bleeding (W) phases (days 2-5 post OC phase). Each phase of the menstrual cycle was confirmed by serum luteinizing hormone (LH), follicular stimulating hormone (FSH), estradiol, and progesterone levels. After natural menstrual cycle tests, all subjects began taking OC. Monophasic OC with ultra low-dose was used. A post-exercise cardiovascular reactivation test, lactate curve test, oxygen consumption (VO_{2 max}), test, and Wingate test were performed during all phases. In addition, subjective fatigue, mood states and subjective perceived daily training load were estimated on visual analog scales (100mm). All parameters were analyzed by two-way analysis of variance for repeated measurements. RESULTS: There were no significant changes in subjective physical condition, post-exercise cardiovascular reactivation, VO_{2max}, and time to exhaustion during all phases. No significant changes in peak power, and mean power of Wingate test were observed. However, at the time of the low-intensity exercise (<2mmol/L) in lactate curve test, lactate acid values were high during the OC and W phases (OC: 1.6 ± 0.4, W: 1.5 ± 0.4 mmol/L) compared with the natural cycle (F: 1.3 ± 0.3, L: 1.3 ± 0.3 mmol/L, P < 0.05). In Wingate test, maximum lactate value after the Wingate test was high during the OC and W phase (OC: 12.0 ± 2.4, W: 12.0 ± 2.6 mmol/L) compared with the natural cycle (F: 11.2 ± 2.2, L: 11.1 ± 1.9 mmol/L, P < 0.05). CONCLUSION: These results suggest that ultra low-dose monophasic OC had no influence on athletic performance. Further research is needed regarding the influence of OC on the glycocalyx pathway. Supported by Japan Sports Agency’s consignment fund.

2518 Board #38  
June 2 11:00 AM - 12:30 PM
The Prevalence and Impact of Heavy Menstrual Bleeding Among Exercising Women.

Allison L. Parziali,1, Georgie Bruinevelds2, Toby Richards3, Charles R. Pedlar4, Kathy Eckerman, FACSM1, 1Boston Children’s Hospital, Boston, MA. 2University College London, London, United Kingdom. 3Massachusetts General Hospital, Boston, MA. (Sponsor: Kathryn Ackerman, FACSM)

Email: allison.parziali@childrens.harvard.edu

(Nos relationships reported)

PURPOSE: Heavy menstrual bleeding (HMB), which includes flooding through clothes, frequent changes of sanitary products, needing extra protection, and/or passing large clots, is prevalent among exercising females in the UK. HMB has negative associations with training and competition. However, only 41.87% with HMB reported seeking medical advice. On average, those with HMB reported longer bleeding days per cycle than those without HMB (5.3 days vs. 4.5 days, t=5.554, p<0.05), but there was no difference in total number of periods per year (p=0.05). Those with HMB were more likely to report experiencing non-menstrual cycle related cramps (X²=19.562; p<0.05) and feelings of gas, bloating (X²= 19.072; p<0.05). CONCLUSIONS: HMB is linked to negative impacts on training and performance, a longer menstrual cycle, cramping and bloating among American adolescent and young adult exercising females. Further research is required to elucidate the physical and psychological effects of HMB and the clinical implications.

2519 Board #39  
June 2 11:00 AM - 12:30 PM
Preliminary Evidence Of Sub-optimal Sleep Durations in Trained Middle Eastern Adolescent Soccer Players


Email: lee.taylor@aspetar.com

(Nos relationships reported)

Sub-optimal sleep durations relative to the National Sleep Foundations (NSF) guidelines of 8-10 h per night are seen in adolescents globally, with the Middle East region having specific lifestyle, environmental and cultural factors which could exacerbate these deficiencies. These deficiencies are due to general and athlete specific negative (e.g pre-bed screen time, socialising, etc) and non-negotiable (eg schooling, travel, etc) factors. This is concerning given the proposed relationship between sleep and illness/injury risk, athletic performance/recovery and holistic athlete development.

PURPOSE: Characterise sleep in trained adolescent Middle Eastern soccer players pre- and post-match and the influence of pre-sub-low sleep interruption upon these characteristics.

METHODS: During a 17 day training camp sleep was assessed in 20 male trained adolescent Middle Eastern soccer players prior to (PRE) and night of (POST) three discrete matches (MATCH 1, 2 and 3) on day 5, 9 and 13 of the camp. Quantitative sleep values were obtained by wrist actigraphy, with activity counts interpretation determining bedtime (hh:mm), get-up time (hh:mm), time in bed (hh:mm), sleep duration (h) and sleep efficiency (%) as well as whether a player did (YES) or did not (NO) experience pre-day sleep interruption. In YES sleep was seen in two bouts, BOUT1 - pre-day interruption - BOUT2. Linear mixed models were used to analyse data. RESULTS: On average these players do not meet NSF endorsed minimum sleep durations PRE and POST (6.87 ± 1.27 h vs. 8-10 h) with deficits significantly exacerbated (-10% or -0.76 h) in YES compared to NO (6.49 ± 1.05 h vs. 7.43 ± 1.29 h, p<0.01). Sleep efficiencies were less than the recommended 85% on average across all players (82.13 ± 7.04), and in YES, NO, BOUT1 and BOUT2. No differences in any sleep characteristics were observed between BOUT1 and BOUT2 (p>0.05). CONCLUSION: Deficiencies in these players in duration and quality of sleep relative to recommendations may jeopardize athletic development/recovery and holistic adolescent maturation. Given the high inter- and intra-individual variances in sleep characteristics seen, these players require from their practitioners individualised sleep education strategies/interventions, without reliance on sleep medications.

2520 Board #40  
June 2 11:00 AM - 12:30 PM
Influence of Sports Participation and Bone Stress Injury Anatomical Location on Low Bone Mineral Density in Male Athletes.

Adam S. Tenforde1, Allyson L. Parziali2, Kathy E. Akenhead, FACSM2, 1Spaulding Rehabilitation Hospital, Charlestown, MA. 2Boston Children’s Hospital, Boston, MA. (Sponsor: Kathryn Ackerman, FACSM)

Email: a.tenforde@spaulding.com

(Nos relationships reported)

PURPOSE: Sports participation can provide health benefits to male athletes, including improvements in bone mineral density (BMD) and strength. However, a subset of male athletes may experience imbalances in bone health associated with sports participation. The aim of this study was to identify the association of sports type and bone stress injury (BSI) location with low BMD (defined as BMD Z-scores < -1) in males athletes.

METHODS: A retrospective chart review was performed on male athletes (ages 14 - 35 years) referred to a single tertiary-care center for evaluation of BMD following development of clinical conditions that predispose to low BMD, and athletes taking medication(s) that could negatively influence bone health. Analysis is descriptive and demonstrates proportion of athletes with low BMD by sport type (runner versus other athletes) and location of BSI using Fisher exact test with significance at P<0.05.

RESULTS: Low BMD was observed in 16 of 37 (43.2%) male athletes (11 of 19, 58%) compared to other sports (4 of 18, 22%, P=0.045). Of athletes sustaining BSI in regions of higher trabecular bone content (localized to lumbar spine, pelvis, femoral neck, or calcaneus) 61% (11 of 18) had low BMD. Low BMD was less

Abstracts were prepared by the authors and printed as submitted.
common in athletes with BSI in anatomical sites with primarily cortical bone content (P < 0.02), including tibia (3 of 10), metatarsal (1 of 4), femur (0 of 3), tarsal navicular (0 of 1), and rib (0 of 1). CONCLUSIONS: A subset of athletes with history of BSI met criteria for low BMD; runners and athletes who sustain BSI in regions of higher trabecular bone content appear at increased risk. Clinicians should consider screening male athletes for low BMD and consider methods to optimize bone health in this population.

CONCLUSION: During multi-day youth soccer tournaments, sports medicine teams can optimize staffing and resources by preparing for increased frequency of tent visits along with the middle and end of the tournament, scheduling nurses for appropriate treatments, and ensuring adequate supplies for predominantly lower extremity injuries and treatments. Future data collection for multi-day tournaments should include injury time of day, games played, and non-injured player data to allow for incidence calculations and control comparisons.

E-26 Free Communication/Poster - Behavioral Aspects of Sport

Friday, June 2, 2017, 7:30 AM - 12:30 PM
Room: Hall F

Purpose: To determine the chronic effect of yoga, meditation or body awareness practice produces significant improvements in attention and sports performance in Futsal players. A second aim was to determine the association between attention and sports performance. METHODS: Thirty subjects (15 men, 15 women) were randomly assigned to four groups. Meditation (MG) (n = 8, mean age = 20.8 ± 2.4 yr.), Yoga (YG) (n = 8, mean age = 21.2 ± 1.6 yr.), Body awareness (BA) (n = 7, mean age = 20.5 ± 1.4 yr.), and Control Group (CG) (n = 7, mean age = 21.0 ± 2.3 yr.). Before (pre) and after (post) yoga, meditation or body awareness sessions, the subjects were measured on attention with the Stroop Test, and on sports performance with the Loughborough soccer passing test. RESULTS: There was no significant interaction in attention and sport performance (p > 0.05). There were significant main effects in measurement (pre- to post- ) on attention (Pre = 51.7 ± 5.7 vs. Post = 54.6 ± 4.5 tins, p < 0.05), and for sport performance (Pre = 65.2 ± 5.7 vs. Post = 63.6 ± 5.1 s, p < 0.05).
No significant correlations were found between the change in attention scores and sport performance in experimental groups MG (r = 0.62), YG (r = 0.20), BA (r = 0.16), and CG (r = 0.29) (p > 0.05). CONCLUSIONS: Meditation, yoga and body awareness exercises do not influence attention or sport performance in Futsal players.

Board #45
June 2 11:00 AM - 12:30 PM
The Utilization of Different Cues in Visual Anticipation in Skilled Table Tennis Players
Chenglin Zhou, Yingzhui Lu, Yingying Wang, Qiqi Yang. Shanghai University of Sport, Shanghai, China.
Email: chenglin_600@126.com
(No relationships reported)

It is reported that expert motor skill performance is superior to less skilled individuals to predict the outcome of an object in striking sport, such as table tennis, due to the ability of using advance information, such as body kinematics cue. Meanwhile, it also revealed that the accuracy would be improved with the visual information (such as the ball trajectory cue). It is unclear the utilization strategies on these two cues in striking sports between expert and novice.

PURPOSE: To investigate the utilization of body cue and ball cue in the visual anticipation and compare the utilization strategies among skilled players, less skilled players and non skilled players.

METHODS: 74 participants were grouped into Elite group (EG=24), Amateur group (AG=26) and Novice group (NG=24) based on the table tennis and skilled level. Participants were presented with short video-clips of serve that were partially occluded (racket-ball contact) (T1), 50ms after the contact (T1+1), 100ms after the contact (T1+2) and probably congruence or incongruence (T1+1; T2) within the body cue and ball cue. The task was to judge whether the ball would land on left or right side and the accuracy was analyzed.

RESULTS: The results showed that the EG (92.97±0.07) had a higher accuracy than the other two groups (AG: 82.5±0.07, p=0.010; NG: 78.5±0.07, p=0.001) when the video-clips were occluded before the ball cue was shown, while both the EG (T1: 98.1±0.04; T2: 97.2±0.04) and AG (T1: 95.5±0.05; T2: 95.0±0.07) had a better accuracy than the NG (T1: 88.5±0.07; T2: 87.2±0.07) when the ball cue was offered in the video-clips. Meanwhile the accuracy of EG (T1: 97.2±1.6; T2: 90.0±1.7) and AG (T1: 94.6±1.6; T2: 90.0±1.4) was sharply decreased in the incongruence video-clips, but their ability to discriminate these two cues was better, comparing with the NG (d-prime; F12, 68 =10.491, P<.001; EG: -7.7±4.1; AG: -6.1±4.1; NG: -52.2±7).

CONCLUSIONS: This leads us to argue that experts (both elites and amateur) had the anticipatory advantage than the novice in striking sport. They mainly utilized the body cue to anticipate the outcome, while the novice needed the ball cue to do anticipation. Also, the experience levels of the experts moderated the utilization strategy in visual anticipation. Supported by NSFC (No. 31571151)

Board #46
June 2 11:00 AM - 12:30 PM
Socially Prescribed Perfectionism Might Predict Enhanced Performance When Racing Against an Opponent
Lieke Schiphof-Godart1, Marco J. Konings2, Florentina J. Hettinga1. 1University of Groningen, Groningen, Netherlands. 2University of Essex, Colchester, United Kingdom. (Sponsor: Carl Foster, FACSM)
Email: l.schiphof@umcg.nl
(No relationships reported)

Recent research has shown that racing against an opponent can improve endurance exercise performance (Konings et al, 2016). To what extent athletes can be motivated by racing against an adversary might depend at least partially on personality characteristics such as type of perfectionism.

PURPOSE: We sought to explore the relationship between self-oriented (SO) and socially prescribed perfectionism (SPP) (Heuwa & Fleit, 1991) and trial performance. We hypothesized that SPP would be related to performance enhancements associated with the presence of an opponent, but that SO would not.

METHODS: Twelve experienced cyclists (45.8 ± 7.0 years) completed four 4-km time trials (TT) on a VeloTron cycle ergometer. Participants performed three TTs with a (virtual) opponent enhancing endurance athletes’ performance. In the present study, group of cyclists, overall 4-km performances with and without opponent did not differ (p > 0.05). Interestingly, our results show that the perception of enhancing endurance athletes’ performance during a 4 km cycling trial is correlated to socially prescribed perfectionism in sport. These findings support current literature and our hypothesis that the positive effect of racing against an opponent might differ according to athletes’ psychological characteristics.

Board #47
June 2 11:00 AM - 12:30 PM
Exploring Parental Preferences for Choosing Youth Flag or Tackle Football
Mallory McElroy1, Katie Stephenson-Brown1, Samantha Mohler1, Nathan D’Amico2, Anthony Kontos1, R.J. Elbin1. 1University of Arkansas, Fayetteville, AR. 2University of Pittsburgh, Pittsburgh, PA.
Email: mmcelroy@uark.edu
(No relationships reported)

Youth football participation rates have decreased 27.7% over the last six years. One of the primary reasons posited for this decline is parental concerns about concussion. In an attempt to provide an alternative to tackle football, many youth leagues are offering a choice of flag or tackle football. In fact, flag football participation has risen by 8.7 percent from 2014-2015. However, there is a lack of research exploring factors associated with parental preferences for choosing flag or tackle football.

PURPOSE: To explore factors associated with parental preferences for choosing youth flag and tackle football.

METHODS: Two youth sport leagues offering a choice of both youth tackle and flag football for players aged 5 to 15 years distributed an online survey to 859 parents of youth football participants. The 50-item online survey was administered via Qualtrics and gathered responses on several variables that included parental preference for flag or tackle, history of football participation, injury history, and concussion knowledge. A series of chi-square analyses with odds ratios (OR) and 95% confidence intervals (CI) were used to assess associations and likelihood of select variables and youth football preference.

RESULTS: A total of 29% (245/859) of parents completed the online survey. Seventy-seven percent (157/203) of parents preferred tackle instead of flag football. Parents that previously played or had a spouse/partner that played football were 2.61 times more likely to prefer flag over tackle football (χ[2, 199] = 4.87, p = .03, 95% CI = 1.09 - 6.25). Parents fearful of their child getting a concussion were 2.41 times more likely to prefer flag instead of tackle football (χ[2, 199] = 6.31, p = .01, 95% CI = 1.10 - 4.86). Parental history of concussion (p = .42), concussion knowledge (r = .67), perceived child size (r = .64), speed (p = .51), and strength (p = .25) were not associated with football preference.

CONCLUSIONS: When given a choice between flag or tackle football for their children, a majority (77%) of parents prefer tackle football. However, parents who played football or are fearful of their child getting a concussion are more likely to prefer flag for their children. Flag football may provide children with a physically active sport that parents view as less risky than tackle football.
Parents’ knowledge and attitudes towards concussions are often a vital factor affecting care for injured adolescent athletes. It is important to understand the role previous experiences play in regards to current concussion knowledge and attitudes. PURPOSE: To determine the influence of parental and child concussion history on parental knowledge and attitudes. METHODS: The Muscle Dysmorphia Inventory (MDI) was administered to 672 parents of youth sport athletes (n=234; males: n=82; females: n=152; age=44.0±6.3yrs) and 482 athletes (n=297; males: n=188; females: n=109). The questionnaire was distributed and collected at the end of a sports season. Data were collected via the MDI, a 27-item validated survey for muscle dysmorphia. Purposes of this study were to assess the prevalence of muscle dysmorphia characteristics in varsity athletes and to determine the influence of parental knowledge and attitudes. RESULTS: The results demonstrated a significant difference by sport in 5 of the 6 sub-categories of the MDI (p<.001; Diet: p=.001; Supplement: p<.001; Physical: p<.001; Exercise: p=.004; Size: p=.004; Pharmacology: p=.019). The results also demonstrated a significant difference by male and female athletes for all 6 sub-categories of the MDI (p<.001; Diet: p<.001; Supplement: p<.001; Physical: p<.001; Exercise: p<.001; Size: p<.001; Pharmacology: p=.019). CONCLUSIONS: Results revealed that 83% of parents had a previous diagnosed concussion while 26% (n=61) reported their child had experienced symptoms of a possible concussion. Mean parental knowledge and attitudes were 23.3±2.5 and 46.3±3.7, respectively. Parents with no previously diagnosed concussions had significantly higher total knowledge scores (mean=23.0±2.5; p<.001) than those with a previous concussion (mean=23.9±2.3). Those who had never experienced symptoms of a concussion trended towards significance (p=.05). There were no associations between any of the concussion history variables and knowledge and attitudes. CONCLUSIONS: Parents with no concussion history may benefit from enhanced education. However, given the multifaceted nature of recognizing and responding to concussion, it is important to look further and identify possible driving factors to improve educational efforts within this population. This study was funded in part by the National Operating Committee on Standards for Athletic Equipment.

INTRODUCTION: In society today, body image has been, and continues to be, a growing concern for individuals. Muscle dysmorphia (MD) is a preoccupation with the idea that one’s body is not sufficiently lean and muscular. Many associated disorders and risks of muscle dysmorphia have been identified including exercise dependence and increased anabolic steroid use. To date, few studies have investigated muscle dysmorphia in both male and female college athletes. PURPOSE: The purpose of this study was to examine the prevalence of muscle dysmorphia characteristics in NCAA Division III male and female athletes. METHODS: 297 athletes (188 males and 109 females) from 16 varsity sports teams (8 men’s teams and 8 women’s teams) were recruited from a private NCAA Division III school in the eastern United States. Data were collected via the Muscle Dysmorphia Inventory (MDI), which is a 27-item self-report measure designed for the assessment of MD. The 27 questions are divided into 6 sub-sections that assess different aspects of biological and psychological characteristics associated with MD. These sub-categories are 1. Diet; 2. Supplement usage; 3. Physique protection; 4. Exercise dependency; 5. Size/symmetry; and 6. Pharmacology. The questionnaire was distributed and collected at the end of a sports practice session or team meeting. A one-way ANOVA was used to determine any difference by sport and an independent t test was used for differences by gender using IBM SPSS 23. RESULTS: The results demonstrated a significant difference by sport in 5 of the 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p=.049; Size/symmetry: p<.001; and Pharmacology: p=.214). The results also demonstrated a significant difference between male and female athletes for all 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p<.001; Size/ symmetry: p<.001; and Pharmacology: p=.019). CONCLUSIONS: The current results suggest that Division III college athletes are indeed at a risk of developing muscle dysmorphia and its characteristics. This information may be valuable in helping sport coaches, strength and conditioning coaches, and athletic trainers to identify warning signs and characteristics of muscle dysmorphia.

INTRODUCTION: In society today, body image has been, and continues to be, a growing concern for individuals. Muscle dysmorphia (MD) is a preoccupation with the idea that one’s body is not sufficiently lean and muscular. Many associated disorders and risks of muscle dysmorphia have been identified including exercise dependence and increased anabolic steroid use. To date, few studies have investigated muscle dysmorphia in both male and female college athletes. PURPOSE: The purpose of this study was to examine the prevalence of muscle dysmorphia characteristics in NCAA Division III male and female athletes. METHODS: 297 athletes (188 males and 109 females) from 16 varsity sports teams (8 men’s teams and 8 women’s teams) were recruited from a private NCAA Division III school in the eastern United States. Data were collected via the Muscle Dysmorphia Inventory (MDI), which is a 27-item self-report measure designed for the assessment of MD. The 27 questions are divided into 6 sub-sections that assess different aspects of biological and psychological characteristics associated with MD. These sub-categories are 1. Diet; 2. Supplement usage; 3. Physique protection; 4. Exercise dependency; 5. Size/symmetry; and 6. Pharmacology. The questionnaire was distributed and collected at the end of a sports practice session or team meeting. A one-way ANOVA was used to determine any difference by sport and an independent t test was used for differences by gender using IBM SPSS 23. RESULTS: The results demonstrated a significant difference by sport in 5 of the 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p=.049; Size/symmetry: p<.001; and Pharmacology: p=.214). The results also demonstrated a significant difference between male and female athletes for all 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p<.001; Size/ symmetry: p<.001; and Pharmacology: p=.019). CONCLUSIONS: The current results suggest that Division III college athletes are indeed at a risk of developing muscle dysmorphia and its characteristics. This information may be valuable in helping sport coaches, strength and conditioning coaches, and athletic trainers to identify warning signs and characteristics of muscle dysmorphia.

INTRODUCTION: In society today, body image has been, and continues to be, a growing concern for individuals. Muscle dysmorphia (MD) is a preoccupation with the idea that one’s body is not sufficiently lean and muscular. Many associated disorders and risks of muscle dysmorphia have been identified including exercise dependence and increased anabolic steroid use. To date, few studies have investigated muscle dysmorphia in both male and female college athletes. PURPOSE: The purpose of this study was to examine the prevalence of muscle dysmorphia characteristics in NCAA Division III male and female athletes. METHODS: 297 athletes (188 males and 109 females) from 16 varsity sports teams (8 men’s teams and 8 women’s teams) were recruited from a private NCAA Division III school in the eastern United States. Data were collected via the Muscle Dysmorphia Inventory (MDI), which is a 27-item self-report measure designed for the assessment of MD. The 27 questions are divided into 6 sub-sections that assess different aspects of biological and psychological characteristics associated with MD. These sub-categories are 1. Diet; 2. Supplement usage; 3. Physique protection; 4. Exercise dependency; 5. Size/symmetry; and 6. Pharmacology. The questionnaire was distributed and collected at the end of a sports practice session or team meeting. A one-way ANOVA was used to determine any difference by sport and an independent t test was used for differences by gender using IBM SPSS 23. RESULTS: The results demonstrated a significant difference by sport in 5 of the 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p=.049; Size/symmetry: p<.001; and Pharmacology: p=.214). The results also demonstrated a significant difference between male and female athletes for all 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p<.001; Size/ symmetry: p<.001; and Pharmacology: p=.019). CONCLUSIONS: The current results suggest that Division III college athletes are indeed at a risk of developing muscle dysmorphia and its characteristics. This information may be valuable in helping sport coaches, strength and conditioning coaches, and athletic trainers to identify warning signs and characteristics of muscle dysmorphia.

INTRODUCTION: In society today, body image has been, and continues to be, a growing concern for individuals. Muscle dysmorphia (MD) is a preoccupation with the idea that one’s body is not sufficiently lean and muscular. Many associated disorders and risks of muscle dysmorphia have been identified including exercise dependence and increased anabolic steroid use. To date, few studies have investigated muscle dysmorphia in both male and female college athletes. PURPOSE: The purpose of this study was to examine the prevalence of muscle dysmorphia characteristics in NCAA Division III male and female athletes. METHODS: 297 athletes (188 males and 109 females) from 16 varsity sports teams (8 men’s teams and 8 women’s teams) were recruited from a private NCAA Division III school in the eastern United States. Data were collected via the Muscle Dysmorphia Inventory (MDI), which is a 27-item self-report measure designed for the assessment of MD. The 27 questions are divided into 6 sub-sections that assess different aspects of biological and psychological characteristics associated with MD. These sub-categories are 1. Diet; 2. Supplement usage; 3. Physique protection; 4. Exercise dependency; 5. Size/symmetry; and 6. Pharmacology. The questionnaire was distributed and collected at the end of a sports practice session or team meeting. A one-way ANOVA was used to determine any difference by sport and an independent t test was used for differences by gender using IBM SPSS 23. RESULTS: The results demonstrated a significant difference by sport in 5 of the 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p=.049; Size/symmetry: p<.001; and Pharmacology: p=.214). The results also demonstrated a significant difference between male and female athletes for all 6 sub-categories of the MDI (Diet: p<.001; Supplement: p<.001; Physique: p<.001; Exercise dependency: p<.001; Size/ symmetry: p<.001; and Pharmacology: p=.019). CONCLUSIONS: The current results suggest that Division III college athletes are indeed at a risk of developing muscle dysmorphia and its characteristics. This information may be valuable in helping sport coaches, strength and conditioning coaches, and athletic trainers to identify warning signs and characteristics of muscle dysmorphia.
Psychosocial aspects are factors that influence the psyche of the human being in development. Such aspects refer to the behavior patterns of the individual, causing physical, cognitive, and social changes throughout his life (Myers, 2012). One of the effective ways to experience these practices is the sport (Noble et al., 2014). PURPOSE: Identify the relationship between age and skills perceived by children assisted by a sports program.

METHODS: The sample consisted of 50 children of a municipal sports center of Anápolis, who practiced sport twice a week at the school turn against for more than 6 months (30 boys and 20 girls), aged between 7 and 12 years old. The psychosocial aspects of children were assessed using the Brazilian version of the Self-Perception Profile for Children, validated by Valenti et al. (2010). The Brazilian version called Self Perception Child scale (SPCS) is configured in a questionnaire that assesses six specific areas of competence: cognitive skills, emotional skills, motor skills, physical appearance, behavioral conduct, in addition to the global self-worth.

RESULTS: The children’s results showed moderate levels of self-perceived competence in the dimensions evaluated in the present study, by gender and age. Such skills are psychosocial aspects that can be influenced when compared to children who do not participate in sports programs. It was evident that the younger children, the lower the influence of the sports program on the skills perceived except in motor racing, which takes place from 9 years old. The sport seems to exert an influence on the self-perception skills (ie cognitive, social, motor and behavioral), especially when there is a longer practice. CONCLUSIONS: The skills perceived by children assisted by a sports program only are perceived as the children mature (i.e. 11 and 12 years old). No significant main effects across skill level (F(4,95)=1.524; p=0.180), but indicated a significant main effect by gender (F(1,48)=1.146; p=0.329), and academic classification (F(1,48)=1.146; p=0.329), and academic classification (upperclassmen, lowerclassmen). RESULTS: MANOVAs (Wills’ Lambda) indicated no significant main effects across skill level (F(7,104)=1.146; p=0.329), and academic classification (F(1,48)=1.146; p=0.329), and academic classification (upperclassmen, lowerclassmen).

Purpose: To quantify athletic coping skills of competitive high school pole vaulters.

METHODS: Following written informed consent, 59 high school pole vaulters completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peak performance (PEAK), goal setting/mental preparation (GWM), and concentration (CONC), freedom from worry (FRUE), confidence and achievement motivation (CONF), coactionability (COAC), and a composite score referred to as personal coping resources (PCR). Data were grouped by skill level (novice, intermediate, advanced), gender, and academic classification (upperclassmen, lowerclassmen). RESULTS: MANOVAs (Wilk’s Lambda) indicated no significant main effects across skill level (F(7,106)=1.46; p=0.180), but indicated a significant main effect by gender (F(1,52)=2.577; p=0.024). Univariate analyses (means/SD) indicated that males responded higher in PEAK (7.81±1.146 vs. 5.82±2.736; p=0.013) than female athletes, whereas females responded higher in COAC (9.75±2.703 vs. 8.26±2.683; p=0.038) than males. Although no significance, there was a trend for upperclassmen to respond higher in PEAK (7.81±1.146 vs. 5.82±2.736; p=0.013) than female athletes, whereas females responded higher in COAC (9.75±2.703 vs. 8.26±2.683; p=0.038) than males. Although no significance, there was a trend for upperclassmen to respond higher in PEAK (7.81±1.146 vs. 5.82±2.736; p=0.013) than female athletes, whereas females responded higher in COAC (9.75±2.703 vs. 8.26±2.683; p=0.038) than males.

Conclusions: The findings suggest that athletic coping skills can be influenced by gender, skill level, and academic classification. Future research should focus on determining the factors that influence athletic coping skills in this population.
**Purpose:** The aim of this study was to characterise the psychological state of recreational athletes during a six months training prior to a half Ironman triathlon. 

**Methods:** Thirty-one amateur athletes were recruited for this observational study. Participants were 40 ± 9.1 years old; and had a body weight of 74 ± 12.7 kg and a height of 172 ± 10.12 cm. All participants underwent a physical fitness assessment in January and two weeks prior to the half ironman event, held in June. They followed a training program supervised by a registered kinesiologist based on the Ironman University® annual planning. The training volume was 410.4 ± 201.48 min per week. For each month of training, participants received an email with a link to complete a monthly series of questionnaires that included: Facet Mindfulness Questionnaire Short Version (FMQ-Sv), Profile mood scale (POMS), Positive and Negative Affect Schedule (PANAS) and Sport Motivation Scale 2 Revised (SMS-2R).

**Results:** Vigour, anxiety and fatigue, POMS sub scale, significantly changed during follow the macrocycle of training. Thus, specific interventions and mental training could be structured around these important elements.

**Conclusion:** Psychometric Follow-up of 6 Months Training for a Half Ironman Triathlon

---

**Purpose:** To examine the relationship between serum 25 hydroxyvitamin D concentration ([Vit D]), serum ferritin concentration ([Fe]) and athlete burnout (AB) in Division I (DI) collegiate athletes. METHODS: Seventy-two (males = 24) DI college athletes (cross-country, swimming, basketball, women’s soccer) completed blood draws and psychosocial measurements both pre- and post-seasonal competition. Serum was analyzed for 25 hydroxyvitamin D and ferritin at a certified hospital laboratory. The athlete burnout questionnaire (ABQ) was completed post-seasonal season (Raedeke & Smith, 2001). Subscales of ABQ include devaluation of sport, emotional and physical exhaustion, and reduced sense of accomplishment. **Results:** Linear regression analyses on the entire cohort (male and female athletes combined) revealed no statistically significant relationships between pre- to post-seasonal season change (Δ) for either Δ[Vit D] (p = 0.78) or Δ[Fe] (p = 0.69) with regards to any subscale variable within the ABQ. When separated by gender, Δ[Vit D] (p = 0.57) and Δ[Fe] (p = 0.57) did not significantly predict AB in females. However, a significant decrease in pre to post competition Δ[Vit D] (Mean[SD] = −8.45 ± 4.33) did significantly predict and explain 20.6% of the variance of male athlete perceptions of physical and emotional exhaustion from sport (p < .05). Another linear regression showed that pre-season [Fe] (Mean[SD] = 68.53 ± 31.49) predicted and explained 16% of the variance of male athlete perceptions of physical and emotional exhaustion from sport (p ≤ .05). Additionally, medium to large correlations were noted in male athletes between [Fe], [Vit D], and AB including pre-season [Fe] and AB (r = 0.41,p<0.05), post-season [Fe] and AB (r = 0.36,NS), and Δ[Vit D] and AB (r = 0.41,p<0.05). **Conclusion:** These preliminary findings support a proposed interplay between mood and chemistry, with respect to Δ[Vit D], Δ[Fe], and AB, particularly for collegiate athletes who live and train in latitudes above 37 degrees north (Vitamin D winter). Although significant negative relationships were found in male athletes only (the lower [Vit D] and [Fe], the greater chance of AB) we will continue exploration in both genders with randomized (supplement) trials, greater number of subjects, and extended testing time through the winter.
**Conclusions:** Social psychology programs of short intervention, and in particular implicit attitudes. The body mass index was normal (22.5 ± 1.75) for the participants. IAT (Implicit Association questionnaire Antifaz, electronic version) for measuring implicit attitudes. The body mass index was normal (22.5 ± 1.75) for the participants. Statistical comparisons between groups before and after the interventions were made using the Mann-Whitney U test for the AFA, and Chi-square test for the IAT. RESULTS: AFA questionnaire revealed that the implementation of short intervention programs increased attitudes toward obesity with significant differences among all groups in aversion subscale (p=0.06) and unwillingness (p<0.007). In addition, DC group showed the lowest ranges whereas the CG showed the highest ranges for both subscales. The IAT questionnaire showed that DC group significantly decreased perpendiculas and negative attitudes toward obesity (x^2=0.04). The CG showed the smallest decrease compared to the rest of study groups.

**Conclusions:** Social psychology programs of short intervention, and in particular by dynamics direct contact programs could modify the implicit and explicit attitudes towards obesity in pre-professionals of exercise sciences.

**Purpose:** To explore the essential meaning that college athletes use to characterize their experiences of the misuse of drinking alcohol with their teams. This work describes college athletes’ shared experiences of the misuse of drinking alcohol with their teams. PURPOSE: To explore the essential meaning that college athletes use to characterize their experiences of the misuse of drinking alcohol with their teams. METHODS: The modified Van Kaam Method of Analysis was used in this psychosocial phenomenological study. Participants (n=15) represented a preponderance of ACL injury prevention programs (ACL IPP) have shown that these interventions are effective in decreasing the risk of ACL injuries. Research has shown that girls have a lower general perception of achievement in sports than boys. Little research has investigated sex-specific perceived achievement on lower extremity alignment, flexibility, strength, and performance. An independent t-test (p=0.05) was used to determine significant differences between male and female responses. RESULTS: There were no ACL injuries in either group. Males reported over twice the number of overall injuries (22) than females (10). Males exhibited significantly greater perceived improvement in lower extremity alignment (p<0.03), flexibility (p<0.01) and performance (p<0.05), however, not for strength (p=0.45) (Figure 1). CONCLUSIONS: While there were no ACL injuries in either group, and lower overall injuries in the female group, males had a significantly higher perceived improvement than females on lower extremity alignment, flexibility, and performance.
misuse. The interplay of multiple factors and the malleability of athletes’ identities (team identity, student identity) also influenced changes in alcohol misuse behaviors. Participants identified teammates as having the greatest potential to moderate their team’s culture of alcohol misuse. Health promoters ought to target transitions in psychosocial development by creating prevention strategies based on the malleability of athletes’ social identities.

Supported by a NCAA CHOICES Grant.

### 2545 Board #65 June 2 11:00 AM - 12:30 PM

The Psychological Parameters of Sports Related Injuries in Female Collegiate Athletes

Courtney Stewart-Reiner, Valparaiso University, Valparaiso, IN.

Email: courtenaystewartreiner@gmail.com

(No relationships reported)

**PURPOSE:** To determine if psychological parameters previous to injury had any impact on injury in female collegiate athletes.

**METHODS:** Participants were female athletes (n=51) from four various sports teams (basketball, golf, soccer, and softball) at a Division I college. Five questionnaires were completed, an injury report, The Life Events Coping Scale for Collegiate Athletes (LESCA), The Sport Anxiety Scale (SAS), The Sport Competition Anxiety Test (SCAT), and The Athletic Coping Skills Inventory-28 (ASCI-28). Data collection and analysis were completed to calculate mean, median, mode, range, standard deviation, and a t-test for injury by each team and overall.

**RESULTS:** Seventy-one percent of respondents suffered at least one injury in the previous 18 months. There was a statistically significant correlation found between life events and injury (P < .05, P = .03) and no significant correlation between the SAS and injury (P > .05, P = .12), the SCAT and injury (P > .05, P = .12), and coping skills and injury (P > .05, P = .08). For soccer, there was a definite significant correlation found between life events and injury (P > .05, P = .35), anxiety and injury (P > .05, P = .32, P<.2), and a somewhat significant correlation found between coping skills and injury (P > .05, P = .08). For soccer, there was a definite significant correlation found between life events and injury (P > .05, P = .01), and no significant correlation found between anxiety and injury (P > .05, P = .20, P<.27), and coping skills and injury (P > .05, P = .32). For softball, there was a somewhat significant correlation found between life events and injury (P > .05, P = .43, P<.29), and coping skills and injury (P > .05, P = .20). CONCLUSIONS: The findings show that almost all athletes, non-injury or injury have a history of negative life events and a large amount of sport anxiety, but a increased amount of coping skills. The findings suggest that certain psychosocial variables moderated the relationship between life stress and injury, supporting the components of Williams and Anderson’s model for stress and athletic injury.

### 2546 Board #66 June 2 11:00 AM - 12:30 PM

Health and Well-being Mindset and Behavior Patterns: A Qualitative Analysis of Swim Coaches

Krista M. Kezbers1, Bridget M. Miller1, Jamie C. Clark1, Suraj Vadhul Sivakumar2. 1Oklahoma State University, Stillwater, OK. 2Barry University, Miami Shores, FL.

Email: krista.kezbers@okstate.edu

(No relationships reported)

Full-time sports coaches face a unique, challenging, and constantly changing work environment. Understanding the experiences and perceptions of individual coaches is paramount to appreciating the implications of the profession on a coach’s behavior and ultimately their health and well-being.

**PURPOSE:** The purpose of this interpretative phenomenological analysis is to understand in-depth the individual perceptions and experiences of health and well-being for swim coaches.

**METHODS:** Participants were female coaches (n=1) as having the greatest potential to moderate their team’s culture of alcohol misuse. Health promoters ought to target transitions in psychosocial development by creating prevention strategies based on the malleability of athletes’ social identities.

Supported by a NCAA CHOICES Grant.

**PURPOSE:** The purpose of this interpretative phenomenological analysis is to understand in-depth the individual perceptions and experiences of health and well-being for swim coaches.

**METHODS:** Participants were female coaches (n=1) as having the greatest potential to moderate their team’s culture of alcohol misuse. Health promoters ought to target transitions in psychosocial development by creating prevention strategies based on the malleability of athletes’ social identities.

Supported by a NCAA CHOICES Grant.
RESULTS: There was an interaction with torque and Mth (p<0.001). There were no differences across Pre (p=0.312) but there were for Post (p<0.001) with torque. Increasing load [e.g. 10/40: -5.2 (-7.2, -3.2) Nm vs. 20/40: -24.4 (-34.9, -15.8) Nm] and pressure [e.g. 15/40: -15.1 (-23.7, -7.9) Nm vs. 15/80: -20.7 (-27.9, -12.2) Nm] resulted in a gradient pre-post increase in torque (p<0.001). Increasing load [e.g. 10/40: 0.18 (0.1, 0.25) cm vs. 20/40: 0.38 (0.29, 0.47) cm] and pressure [e.g. 15/40: 0.31 (0.23, 0.4) cm vs. 15/80: 0.43 (0.37, 0.48) cm] resulted in a gradient pre-post increase in Mth (p<0.001). For EMG amplitude there was a condition (p=0.002) and time (p=0.019) effect. EMG amplitude increased across time [e.g. 1st set: 40 (12.6) %MVC vs. 4th set: 45 (14.4) %MVC, p=0.033] and was augmented by increasing the load to 20% 1RM [15/80: 40 (9) %MVC vs. 20/40: 55 (15) %MVC, p=0.003] with no effect of pressure [20/80: 54 (20) %MVC].

CONCLUSIONS: These acute findings provide important information for implementing BFR with very low loads. We wish to suggest that higher pressures may be useful when implementing BFR with loads less than 20% 1RM.

**PO-051**
2549 Board #69 June 2 9:30 AM - 11:00 AM The Acute Muscular Responses to Blood Flow Restricted Exercise Using Low and High Relative Pressures
Matthew B. Jesse, Kevin T. Mattocks, Brittany R. Counts, Samuel L. Buckner, J Grant Mouser, Scott J. Dankel, Gilberto C. Laurentino, Jeremy P. Loenneke. *The University of Mississippi, University, MS. 1University of South Carolina, Columbia, SC. 2University of Sao Paulo, Sao Paulo, Brazil.

No relationships reported.

The efficacy of an exercise modality to increase muscle size has been linked to increased muscle activation, fatigue, and muscle swelling. With low load exercise in combination with blood flow restriction (BFR), a range of moderate (40%) to high (90%) pressures were used to add a hypertrophic stimulus while minimizing the cardiovascular response.

**PURPOSE:** To determine how a muscle responds to low relative BFR pressures.

**METHODS:** Participants (n=26) performed elbow flexion with 30% of one repetition maximum (1RM) while undergoing BFR with one of six BFR pressures: 0%, 10%, 15%, 20%, 30%, 90% of 1RM. Muscle thickness and maximal voluntary isometric contraction (MVC) of the elbow flexors were assessed prior to exercise as well as 15, and 30 minutes after exercise. Electromyography amplitude (EMG) was assessed during each set of exercise and normalized to the first 3 repetitions of set 1.

**RESULTS:** Data presented as mean (95% confidence intervals). There was a main effect for time of muscle thickness (p<0.001), which increased from pre to 0 minutes post-exercise [+0.47 (0.40, 0.54) cm] and trended back toward baseline. Decrements in MVC from pre to 0 minutes post-exercise were greater in higher pressure conditions compared to lower pressures (p=0.015) [e.g. 10% AOP: -20.7 (-15.5, -25.8) Nm vs. 90% AOP: -24 (-19.1, -28.9) Nm]. For each set of exercise EMG amplitude relative to the first 3 reps of set 1 was greater for the last 3 repetitions compared to the first 3 repetitions of sets 2-4 (p=0.003) [First 3 reps of Set 2-4: 130 (122, 138) % vs. Last 3 reps of Set 2-4: 151 (137, 165) %]. Repetitions decreased across sets (p=0.001), with most participants unable to complete all repetitions, indicating volitional failure. Repetitions were lower with increasing pressures (p<0.05) [e.g. 10% AOP sets 2-4: 13 (12, 14), 11 (10, 13), and 11 (9, 12) reps vs 90% AOP: 9 (7, 11), 6 (4, 7), and 5 (3, 7) reps].

**CONCLUSIONS:** When exercising to volitional failure with 30% of 1RM the application of BFR does not seem to augment the acute muscle responses indicative of a hypertrophic stimulus. However, increasing BFR pressure reduced the number of repetitions required to reach failure which may be beneficial for certain populations contraindicated to higher volumes of exercise.

**PO-052**
2551 Board #71 June 2 9:30 AM - 11:00 AM Cardiovascular And Perceptual Responses To Various Blood Flow Restriction Pressures And Exercise Loads
Scott J. Dankel, Matthew B. Jesse, Samuel L. Buckner, J Grant Mouser, Kevin T. Mattocks, Jeremy P. Loenneke. *The University of Mississippi, University, MS.

No relationships reported.

Blood flow restriction (BFR) allows individuals to exercise with lower loads while producing similar increases in muscle size as high load training. Most studies implement moderate to high pressures with loads corresponding to 20-30% of their one-repetition maximum (1RM). No study has examined perceptual or cardiovascular responses using loads lower than 20% 1RM, which may provide a more widely inclusive and palatable stimulus.

**PURPOSE:** To determine the cardiovascular and perceptual response to very low load BFR exercise using both moderate (40%) and high (80%) relative arterial occlusion pressures (AOP).

**METHODS:** 14 participants came to the lab on four separate days to complete six exercise protocols (2 per visit on visits 2-4) consisting of 4 sets (1 set of 30 followed by 3 sets of 15) of BFR elbow flexion exercise with either a 10%, 15% or 20% 1RM load, each of which was performed with a moderate (40%) or high (80%) relative pressure. A repeated measures ANOVA was used to determine differences in AOP and post exercise and a Friedman test was used to determine differences in discomfort and ratings of perceived exertion (RPE) following each set. AOP was expressed as [mean (95% confidence interval)] with RPE and discomfort expressed as [median (25%, 75% percentile)].

**RESULTS:** There was an interaction for AOP (p=0.002) with higher pressures and loads producing a gradient increase. The pre to post changes ranged from 21 (95% CI: 10-32) mmHg in the 10% 1RM/80% AOP condition to 62 (95% CI: 45-78) mmHg in the 20% 1RM/80% AOP condition. Ratings of discomfort were primarily dependent on the level of restriction pressure applied, with higher pressures resulting in greater discomfort (p<0.001) ranging from 2.5 (1.5) in the 15% 1RM/40% AOP condition to 6.5 (5.5, 7.25) in the 15% 1RM/80% AOP condition. Additionally, a gradient increase in RPE accompanied higher pressures and loads which ranged from 8.5 (7.12) at the conclusion of the 10% 1RM/40% AOP condition to 15.5 (12.75, 17.25) at the conclusion of the 20% 1RM/80% AOP condition.

**CONCLUSIONS:** Increases in load and restrictive pressure resulted in elevated AOP and RPE, but higher pressures were primarily responsible for increased discomfort. Individuals experiencing discomfort during low load BFR exercise may wish to decrease the applied pressure and increase the exercise load.
PURPOSE: The aim of the present study was to compare cardiac structure as well as global and regional cardiac function in athletes with and without MF.

METHODS: Cardiac magnetic resonance imaging with late gadolinium enhancement was used to detect MF and global cardiac structure in 9 lifelong veteran endurance athletes (58±5 years, 43±5 years of training). Transthoracic echocardiography using tissue-Doppler and myocardial strain imaging assessed global and regional (18 segments) longitudinal left ventricular function.

RESULTS: MF was present in 4 athletes (range 1-8 g) and not present in 5 athletes. MF was located near the insertion points of the right ventricular free wall on the left ventricle in 3 athletes and in the epicardial lateral wall in 1 athlete. Athletes with MF demonstrated a larger end diastolic volume (205±24 vs 173±18 ml, p=0.06) and posterior wall thickness (11±1 vs 9±1 mm, p=0.03) compared to those without MF. The presence of MF did not mediate global tissue velocities or global longitudinal strain (-22.0±4.3 vs -21.7±1.8) and strain rate (S' : -0.97±0.19 vs -1.02±0.11; E' : 0.95±0.20 vs 0.90±0.15; A' : 0.61±0.16 vs 0.66±0.17), however, regional analysis of longitudinal strain demonstrated reduced function in 5 out of 8 wall segments associated with the presence of MF in 3 athletes (Figures).

CONCLUSIONS: MF is associated with larger cardiac dimensions, normal global cardiac function but evidence of co-localised regional cardiac dysfunction in lifelong veteran endurance athletes. Given the heterogeneous phenotype of MF, we propose that follow-up studies and a case-by-case approach are needed for appropriate risk assessment in athletes with MF.

Oxidative stress-mediated arterial stiffening is related to the pathophysiological progression of vascular dysfunction with advancing age. However, the functional implications concerning the involvement of tumor necrosis factor-alpha (TNF-α), a marker of oxidative stress, on hemodynamic responses at rest and during physical exertion are unclear. PURPOSE: The aims of this investigation were to examine the independent effects of TNF-α on myocardial oxygen demand at rest and during submaximal exercise, while also evaluating the influence of TNF-α on exercise tolerance. METHODS: Forty, postmenopausal (65 ± 3 years) women, provided blood samples and completed a modified-thalke protocol to measure maximal oxygen uptake. Local pulse contour analyses were used to assess large artery compliance while rate-pressure product (RPP), a reliable index of myocardial oxygen demand, was measured at rest and during two submaximal workloads. RPP was calculated by dividing the product of heart rate and systolic blood pressure (via auscultation) by 100. Exercise tolerance corresponded with the cessation of the graded exercise test. P-values ≤ 0.05 were considered statistically significant for all analyses. RESULTS: Multiple linear regression revealed a positive association between TNF-α and RPP during submaximal exercise (partial ρ = 0.43; p = 0.015) adjusted for maximal heart rate, maximal oxygen uptake, large artery compliance, and percent body fat. Path analyses revealed a significant indirect effect of large artery compliance on exercise tolerance through TNF-α, β = 0.13, CI [0.03, 0.35] such that heightened levels of TNF-α translated to poorer exercise tolerance. CONCLUSIONS: These data indicate that TNF-α is independently associated with myocardial oxygen demand during submaximal exercise equating to 5 METs but not at rest and TNF-α mediates the indirect effects of large artery compliance on exercise tolerance. Future studies should explore differential responses to standardized exercise tasks among older adults and consider the influence of exercise training on myocardial oxygen demand and activity-related energy expenditure.
It is known that intense aerobic exercise elicits physiological adaptations of the cardiovascular system. However, it is unclear whether these adaptations exist over a lifetime of training. Little published data exists quantifying such adaptations in older competitive athletes, & even less data exists on populations engaged in long-term interval training, such as swimmers.

**Purpose:** To assess & compare the cardiovascular remodeling status of chronically trained Master’s swimmers to age-matched, inactive reference values. **Methods:** Chronically trained (20.0 ± 14.5 yrs), competitive men (M, n=7) & women (F, n=21) Master’s swimmers (age 55.2 ± 6.0 yrs) were studied just prior to competing in the 2009 US Masters Swimming Long Course Nationals. Demographics, anthropometrics, training history & resting hemodynamics were recorded. Subjects then underwent 2D transhoracic echocardiography with Doppler. Septal wall thickness (IVS), posterior wall thickness (PWT), left ventricular internal diastolic & systolic dimensions (LVDDs), end diastolic & systolic volumes (EDV/ESV), relative wall thickness (RWT), LV mass measured via truncated ellipsoid method (LVM), & left atrial volume (LAV) were assessed & indexed to body surface area where appropriate. RWT & LVM were used to characterize remodeling status per American Society of Echocardiography (ASE) guidelines. Sex-specific means as well as individual values were compared to ASE published normal values (mean ± 2SD = ULN, upper limit of normal). CONCLUSIONS: The swimmers in this study experienced a small increase in HR during acute recovery, with no significant differences between the groups. HR max was 200±11 for male swimmers (age range=21-22 yrs, BMI=24.8±3.3) & 195±12 for female swimmers (age range=26-29 yrs, BMI=24.8±3.3). Nonlinear regression techniques were used to fit the first 5-min of HRV data. Preliminary analyses show a significant interaction between VO2max & HRmax vs. predicted complexity (SampEn) surrounding the post-exercise HR response (p=0.003). A significant interaction between gender and HRmax predicted DFA, (p=0.02); after controlling for HRmax, DFA was greater in women than men during acute recovery. CONCLUSIONS: Nonlinear dynamics provide an additional perspective on HRV during acute exercise. The complexity surrounding the nonlinear trend of HRV during recovery may provide additional context for the role of fitness on cardiac autonomic nervous system modulation which has been previously described during resting HRV data. Future analyses should investigate the utility of this residual approach to examine the relationships across pre-, during-, and post-exercise HRV measures.

---

**Heart Rate Variability During Acute Recovery from Maximal Exercise; Utility of a Nonlinear Dynamics Approach**

Nathaniel Berry¹, James Janssen¹, Jessica Dollar¹, Cheryl Lovelady¹, Susan Calcins¹, Susan Keane¹, Lilly Shanahan¹, Laurie Wideman, FACSM, ¹University of North Carolina at Greensboro, Greensboro, NC. ²University of Zurich, Zurich, Switzerland. (Sponsor: Laurie Wideman, FACSM)

Email: nberry11@gmail.com

(No relationships reported)

The non-stationary trend of the heart rate (HR), response immediately following the cessation of exercise mathematically biases traditional measures of heart rate variability (HRV), during acute recovery. Fitness-induced alterations in resting HR, HRV and heart rate recovery (HRR) are observed in response to changes in cardiac autonomic nervous system modulations. PURPOSE: To pilot the utility of nonlinear dynamics to characterize the patterns of fluctuation and complexity surrounding the non-stationary drift in HRV during acute recovery from exercise. METHODS: HR data was collected throughout exercise and recovery following an incremental treadmill test to exhaustion in young adults [age range=19-21 yrs (male: n=14, Ht=173±7cm, Wt=71.7±11.4kg, BF=16.8±6.7%, VO2max=48.0±6.0ml/kg/min, HRmax=200±11; female: n=18, Ht=162.5±cm, Wt=67.8±15.9kg, BF=32.9±9.4%, VO2max=33.9±9.5ml/kg/min, HRmax=195±12)]. Nonlinear regression techniques were used to fit the first 5-min of R-R interval HRV data following the cessation of exercise. Residuals were calculated from individual-specific regressions and used to create a secondary time-series. Detrended fluctuation analysis (DFA) and sample entropy ( SampEn) were used to characterize self-similar patterns and the complexity of fluctuation in HRV-R, respectively. RESULTS: We successfully removed the non-stationary trend associated with post-exercise HRV data. Preliminary analyses show a significant interaction between VO2max, HRmax and HR as predictors of complexity (SampEn) surrounding the post-exercise HR response (p<0.05). A significant interaction between gender and HRpred predicted DFA, (p<0.02); after controlling for HRmax, DFA was greater in women than men during acute recovery. CONCLUSIONS: Nonlinear dynamics provide an additional perspective on HRV during acute exercise. The complexity surrounding the nonlinear trend of HRV during recovery may provide additional context for the role of fitness on cardiac autonomic nervous system modulation which has been previously described during resting HRV data. Future analyses should investigate the utility of this residual approach to examine the relationships across pre-, during-, and post- exercise HRV measures.

---

**Comparison of Heart Rate Variability in Intercollegiate Explosive Power vs. Sustained Power and Endurance Athletes**


Email: claiboa@miamioh.edu

(No relationships reported)

Heart rate variability (HRV) provides valuable feedback about heart function by measuring the RR interval change over time (Poincaré SD1 and SD2, RMSSD, PNN50), sympathetic activity (activity with low frequency (LF) Power). PURPOSE: To investigate HRV and autonomic activity in intercollegiate explosive power (EXP) vs. sustained power and endurance athletes (SEN). METHODS: A standard operating procedure was created Impedance cardiography (IC) is a non-invasive method for measuring cardiovascular hemodynamics during exercise. However, the consistency of measurements obtained via IC across different exercise modes has not been investigated.

**PURPOSE:** To investigate whether hemodynamic measures assessed via IC are consistent between treadmill (TM) and cycle (C) exercise at a given intensity. **METHODS:** Ten men (age = 21 ± 2.2 y; BMI = 24.8 ± 3.3) completed three exercise tests, two TM and one C. Within each test, a five minute, steady-state stage was completed with a target intensity of 5 METs. Oxygen consumption (VO2) was measured by indirect calorimetry. Hemodynamic measures were obtained via IC (PhysioFlow, PF07 Enduro) and included stroke volume (SV), heart rate (HR), cardiac output (CO), cardiac index (CI), end diastolic volume (EDV), end diastolic filling ratio (EDFR), ejec tion fraction (EF), ventricular ejection time (VET), and systemic vascular resistance (SVR).

**RESULTS:** There were no significant differences in VO2 and hemodynamic measures between repeated TM tests (p > 0.05). Steady-state VO2 (19.2 ± 1.1 vs 19.1 ± 1.2 ml/kg/min) and HR (112 ± 14 vs 113 ± 16 beats/min) did not differ between exercise modes (TM vs C). There were no significant differences between TM and C in SV, CO, CI, EDV, EF, and SVR, but EDFR and VET differed between trials. Significant intraclass correlation coefficients (r = 0.70 – 0.90, p < 0.05) were observed between modes for SV, HR, CO, EDV, EF, and SVR, but not for CI, VET, and EDFR. Bland-Altman analyses indicated good agreement between TM and C for in SV, HR, CO, CI, EDV, EF, and SVR. **CONCLUSION:** The majority of hemodynamic measurements obtained via IC during moderate exercise showed moderate-strong consistency between TM and C modes. Future research utilizing IC during exercise should be conducted across a greater range of exercise intensities. In addition, hemodynamic variables obtained with IC should be compared with invasive methods to confirm their validity.
to assess resting HRV and autonomic activity over 10-15 minutes in 27 intercollegiate athletes (EXP n=17, SEN n=10). Data were sorted and analyzed by sport type using t-tests. RESULTS: Despite a 43% variation, EXP athletes’ LF Power did not differ significantly from SEN athletes (p=0.08); however, EXP had a significantly higher HF Power (56%) than SEN (p=0.03). EXP did not differ significantly in HRV via Poincaré SD1 compared with SEN athletes (p=0.09). LF/HF ratio was similar in all athletic types.

<table>
<thead>
<tr>
<th>HRV Measure in Explosive Power Vs. Sustained Power and Endurance Athletes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive Power (n=17)</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>LF Power (ms²) ± SEM</td>
</tr>
<tr>
<td>HF Power (ms²) ± SEM</td>
</tr>
<tr>
<td>Mean LF/HF ± SEM</td>
</tr>
<tr>
<td>Poincaré SD1 (ms) ± SEM</td>
</tr>
<tr>
<td>Poincaré SD2 (ms) ± SEM</td>
</tr>
<tr>
<td>RMSSD (ms) ± SEM</td>
</tr>
<tr>
<td>PNN50 (%) ± SEM</td>
</tr>
</tbody>
</table>

CONCLUSION: Differences in HRV were observed between EXP and SEN athletes, with the major significance in HF Power indicating EXP athletes demonstrated greater parasympathetic activity at rest compared with SEN athletes. Most HRV studies have focused on endurance trained athletes. This finding is of interest as cardiovascular variability studies in explosive athletes have potential to elucidate autonomic and cardiovascular regulation. Supported by Miami University Student Tech Grant

Recent data from our laboratory has shown that increasing sympathetic activity to the heart via muscle metaboreflex activation speeds heart rate kinetics during transitions in the lower moderate intensity domain (from 20W to ~60% of the ventilatory threshold, VT). Whether the magnitude of the exercise transient and heart rate change influences the effects of elevated sympathetic activity on heart rate kinetics is not known. PURPOSE: We tested the hypothesis that increasing sympathetic activity to the heart via muscle metaboreflex activation would speed heart rate kinetics throughout the entire moderate intensity exercise transient. METHODS: Five healthy and active, but not trained, adults (mf = 3/2; age = 22 ± 2 yrs; peak VO2 = 46 ± 8 mL/kg/min) performed square-wave moderate intensity exercise transitions from 20W to 90% VT. Each subject was tested in 2 conditions. Condition 1 was a control (CTRL) condition. In condition 2, the muscle metaboreflex activation was induced by 2 min of handgrip at 40% maximal voluntary contraction during the pre-transition 20W baseline followed by 5 min of circulatory occlusion (OCCCL) during the transition to 90% VT. Trials were randomized and three repetitions of each condition were completed, time-aligned, and averaged by condition. Heart rate kinetics were determined using mono-exponential curve fitting and data was analysed with non-parametric tests. P < 0.05 was significant. RESULTS: The pre-transition baseline heart rate was not different between CTRL (93 ± 8 beats/min) and OCCCL (90 ± 10 beats/min), P = 0.138. Heart rate amplitude was not different between CTRL (29 ± 6 beats/min) and OCCCL (29 ± 5 beats/min), P = 0.500. Finally, the heart rate time constant, tau, was not different between CTRL (34 ± 10 s) and OCCCL (36 ± 16 s), P = 0.668. CONCLUSIONS: Heart rate kinetics are not altered by sympathetic activation via the muscle metaboreflex during the exercise transition from 20W to 90% VT. These findings suggest that the magnitude of step-change in exercise intensity and/or the magnitude of change in heart rate plays an important role in heart rate kinetics under a sympathetically elevated condition.

While it has been reported that women have greater vaginal withdrawal during aerobic exercise and supramaximal exercise compared to men, the sex-specific responses to an acute bout of resistance exercise are unknown. PURPOSE: To determine the effects of an acute bout of free-weight resistance exercise consisting of the squat, bench press, and deadlift. Two minutes of rest was given between sets and resistance training volunteers for the study. Autonomic modulation was assessed at rest as well as 15-20 minutes (Rec1) and 25-30 minutes (rec2) after an acute bout of resistance exercise utilizing 3 sets of 10 repetitions at 75% 1-repetition maximum on free weights. Men and women used a 16kg and 8kg KB, respectively. Low-frequency power (LF), high-frequency power (HF), the LF to HF ratio (LF/HF), HR, and BP were collected in the supine position at baseline, 3, 10 and 30 min after each trial. LF and HF were normalized to total power resulting in nLF, nHF, and nLF/nHF. RESULTS: There were significant group-by-time interactions (P < 0.05) for nLF (sympathetic activity), nHF (vagal tone), nLF/nHF (sympathovagal balance), HR, systolic and diastolic BP. There were significant increases (P < 0.01) in nLF, nLF/nHF and HR as well as significant decreases (P < 0.01) in nHF, systolic (~4mmHg) and diastolic (~3mmHg) BP for 30 min after KB compared to no changes after control. CONCLUSIONS: Our findings indicate that KB exercise increases sympathovagal balance 30 min post-exercise which is concurrent with a sustained hypotensive effect in young healthy adults. Further research is warranted to evaluate the potential clinical application of KB in populations that might benefit from post-exercise hypotension.
were decreased at Rec1 and Rec2 compared to Rest after the acute resistance exercise. **CONCLUSIONS**: These data suggest that acute RE using free-weights has a profound impact on autonomic modulation that is similar between the sexes.

2563 Board #83 June 2 9:30 AM - 11:00 AM The Effects Of Ultra-endurance Event Participation On Biomarkers Of Cardiac Damage - A Systematic Review And Meta-analysis
Steven E. Safille1, Hayley V. MacDonald2, Michael V. Fedewa2, James M. Smoliga3. 1High Point University, High Point, NC. 2University of Alabama, Tuscaloosa, AL. (Sponsor: Gerald Zavorsky, FACSM)
Email: jsmoliga@highpoint.edu

Meta-analysis has not yet collectively evaluated biomarkers of cardiac damage following ultra-endurance races or factors which modulate these biomarkers.

**PURPOSE**: To quantify the response of creatine kinase MB (CK-MB) and cardiac troponin (cTn) isoforms following a single ultra-endurance event and determine whether patient and ultra-endurance race characteristics modulated changes in these markers of cardiac damage.

**METHODS**: A systematic review was conducted and reported according to PRISMA guidelines. A generic search strategy using PubMed, CINAHL, and SportsDiscus was employed to comprehensively identify all peer-reviewed publications which evaluated health-related effects of participating in an ultra-endurance event. Data from observational studies which reported pre- and post-race measurements of CK-MB (k =16 studies), cTnl (k=8), and cTnT (k=6) were analyzed following random-effects assumptions.

**RESULTS**: On average, ultra-endurance participants were middle-aged males who competed in running, cycling, or triathlon races, 156-235 km and 20 h duration. Overall, ultra-endurance events significantly increased CK-MB (d =-11.29; 95%CI: 7.90, 14.69) and cTn levels (d =2.18; 95%CI: 1.39, 2.97) post-compared to pre-race. Collectively, these effects size lacked homogeneity (I^2 =95%CI: 92.2, 95.9); cTnI=90.9% [86.4, 93.8]). Bivariate moderator analyses revealed that older versus younger samples experienced greater increases in CK-MB following a single ultra-endurance event (β=0.543, p<0.030). Ultra-endurance running events elicited greater increases in cTn-MB compared to cycling and triathlon events (β=0.583, p=0.018). In contrast, greater increases in cTn levels were observed among younger compared to older samples following a single ultra-endurance event (β=0.01, p=0.020). Furthermore, cycling and triathlon events elicited greater increases in cTn compared to running events (β=0.472, p=0.036). Effects were similar whether cTn isoforms were analyzed separately or combined.

**CONCLUSIONS**: Cardiac biomarkers were consistently elevated following ultra-endurance events and dependent on age and race type. Further research is necessary to determine the long-term clinical significance of repeated ultra-endurance races.

2564 Board #84 June 2 9:30 AM - 11:00 AM Influence of Exercise Mode on Post-Exercise Parasympathetic Reactivation and Sympathetic Withdrawal
Scott W. Michael1, Ollie Jay, FACSM2, Kenneth S. Graham3, Glen M. Davis, FACSM1. 1University of Sydney, Sydney, Australia. 2New South Wales Institute of Sport, Sydney, Australia. (Sponsor: Prof. Glen Davis, FACSM)
Email: scott.michael@sydney.edu.au

**PURPOSE**: This study investigated indirect measures of post-exercise parasympathetic reactivation (using heart rate variability, HRV) and sympathetic withdrawal (using systolic time intervals, STI) following upper- and lower-body dynamic exercise. **METHODS**: 13 males (age 26±4.7 y) performed maximal incremental arm-crank and leg cycling exercise tests (MAX-ARM and MAX-LEG, respectively). Subsequently, participants performed separate 8-min bouts of submaximal HR-matched exercise of each mode (SUBMAX-ARM and SUBMAX-LEG). HRV (including the natural-logarithm of root mean square of successive differences, Ln-RMSSD) and STI (including the pre ejection period, PEP) were assessed throughout 10-min seated recovery. **RESULTS**: Peak HR was higher (p<0.001) during MAX-LEG (182±7 b.min^-1) compared with MAX-ARM (171±12 b.min^-1), while HR (p=0.01) and Ln-RMSSD (p=0.010) recovered more rapidly following MAX-ARM. PEP recovery was similar between maximal exercise bouts (p=0.106). HR during submaximal exercise was 146±7 and 144±8 b.min^-1 for SUBMAX-LEG and SUBMAX-ARM, respectively (p=0.139). The recovery of HR and Ln-RMSSD was also similar between submaximal modes (p=0.219 and 0.110, respectively), although these variables did not return to resting levels (p=0.001). PEP was similar at end-exercise (SUBMAX-LEG: 70±6 ms; SUBMAX-ARM: 72±9 ms; p=0.471), however PEP recovery was slower following SUBMAX-ARM (p=0.021), with differences between modes apparent over 1 to 10-min recovery (p=0.036). By 10-min post-exercise, PEP had recovered to near-resting levels (132±23 ms) following SUBMAX-LEG (130±21 ms; p=0.143) but not after SUBMAX-ARM (121±17 ms; p=0.001). **CONCLUSION**: Compared with submaximal HR-matched lower-body exercise, upper-body dynamic exercise elicited a similar recovery of HR and HRV indices of parasympathetic reactivation, but a delayed recovery of PEP (index of sympathetic withdrawal). These data indicate that exercise mode influences post-exercise parasympathetic reactivation and sympathetic withdrawal in a manner that is moderated by exercise intensity. These results may be of practical relevance to multi-discipline athletes, as well as for clinical monitoring applications where the mode of exercise testing may vary.

2565 Board #85 June 2 9:30 AM - 11:00 AM Early Life Nutrition Alters the Electrocardiogram of Adult Mice with Dobutamine Stimulation
Joseph R. Visker, David P. Ferguson. Michigan State University, East Lansing, MI.
Email: viskerjg@msu.edu

**PURPOSE**: Under nutrition in early life has been shown to increase the risk of cardiovascular disease (CVD) in adult life. Thus, the purpose of this study was to determine if early life undernutrition at various windows of development (Postnatal days 1-21) produced cardiac arrhythmias at rest and when pharmacologically stressed (PST) with dobutamine. **METHODS**: Mouse FVB/N dams were fed a semi-purified diet (CON: 20% protein), or a low-protein (LP: 8%) diet beginning 1 week prior to mating. In order to evaluate the phases (N=16/group) of early life undernutrition (early-EUN; PN1-10, late-EUN; PN11-21, E-L-EUN, PN1-21) a cross fostering model was used where pups suckled to dams from diet received a global reduction in caloric intake (~18% as compared to CON) during the designated window prior to weaning. After weaning all mice were fed the control diet until PN80. At PN80 body composition (BC) was measured by MRI, and then evaluated for cardiac function via electrocardiogram (ECG) under 1% isoflurane anesthesia. After baseline measure, the mouse was administered an intraperiosteal injection of dobutamine (1.5 µg/g BW) and measurements repeated. Quantitative ECG analysis was performed using EMKA Tech. software. **RESULTS**: At PN80 Undernutrition significantly (P<0.05) reduced weight in the LUN (22.68±0.88g) and EUN (19.96±0.32g) but there was no difference between CON (25.05±0.96g) and EUN (25.28±0.92g). Similarly fat mass was reduced (P<0.05) in all groups compared to controls (CON: 8.00±2.0g, EUN: 3.12±2.6g, LUN: 5.11±1.1g, PN: 3.90±0.25g), however lean mass was only significantly reduced (P<0.05) in the PUN group (CON: 17.99±0.26g, EUN: 17.78±0.39g, LUN: 17.34±0.33g, PUN: 15.85±0.28g). Heart weight when standardized to body surface area was only significantly (P<0.05) reduced in the EUN group (.001288±.000031 kg/cm^2) as compared CON group (.001405±.000089 kg/cm^2), with LUN (.001355±.00004 kg/cm^2) and PUN (.001342±.000031 kg/cm^2) not different from CON. ECG analysis showed that with dobutamine, EUN group had a 6.25% increase in 1st degree AV block and PUN group had a 43.75% increase in wide QRS complex. **CONCLUSION**: Thus, EUN reduces heart size with a predisposition for conduction delays to left ventricle but ischemia is primarily associated with prolonged undernourishment in postnatal life (PUN).
with BFR=(6±2:6 bpm, P<0.001). Compared to baseline, the standard deviation of R-R intervals was lower during high-intensity handgrip without BFR (baseline:58±8, vs. 60% with BFR: P=0.035). The SNR values were significantly higher for low- and high-intensity BFR (40% with BFR=40±4, P=0.071; 60% with BFR=4±6 ms, P=0.3). A similar finding was noted for root mean square of R-R standard deviations (P=0.01). The low and high frequency HRV components (markers of sympathetic and parasympathetic activity, respectively) were lower during exercise (P<0.05), but comparable across all handgrip bouts (P>0.05). CONCLUSIONS: These preliminary findings suggest that both low- and high-intensity handgrip exercise performed with BFR produce a comparable cardiac autonomic stress (i.e., parasympathetic withdrawal) as high-intensity handgrip exercise without BFR.

2568 | Board #88 | June 2 9:30 AM - 11:00 AM | Cardiac Autonomic Modulation and High Intensity Interval Training in Physically Inactive Men
---
Jami M. O’Driscoll, Steven Wright, Katrina A. Taylor, Damian D. Coleman, Jim D. Wiles, Jim D. Wiles. Canterbury Christ Church University, Canterbury, United Kingdom.
Email: jami.odriscoll@canterbury.ac.uk

Purpose: Cardiac autonomic dysfunction and physical inactivity are associated with increased risk of cardiovascular disease. Short duration high intensity interval training (HIIT) has been shown to improve aerobic capacity; however, adaptations of the cardiac autonomic nervous system are less clear. Therefore, the aim of the present study was to assess cardiac autonomic adaptations to HIIT.

Methods: A randomised crossover controlled trial, 40 physically inactive males (21 ± 1.7 years; 179.9 ± 5.4 cm; 82.6 ± 11.5 kg, mean ± SD) completed 2 weeks of HIIT and a matched duration control period. The HIIT protocol consisted of 3 x 30-second maximal cycle ergometer sprints against a resistance of 7.5% body weight, interspersed with 1-minute of active recovery (50 rev·min⁻¹ without resistance). In total 6-sessions were completed. Cardiac autonomic function was measured pre and post-training and control period using a plethysmographic device (Task Force® Monitor). Total power spectral density (PSD) and associated low-frequency (LF) and high-frequency (HF) power spectral components were recorded in absolute (ms²) and normalised units (ms⁻¹).

Results: Each participant completed 18-maximal cycle ergometer sprints over a 2-week period. The HIIT intervention produced an improvement in cardiac autonomic function with significant increases in total PSD (361.8 ±200.1 vs. 19.8 ±141, P<0.001), HF (ms²) (210.6±159.3 vs.15.6±86.9, P<0.001) and HF (ms) (3.6 ±12.5 vs. 0.23 ±1.7, P<0.001), coupled with a significant decrease in LF (ms) (-3.6 ±12.5 vs -0.23 ±1.7, P<0.001) and LF/HF ratio (-0.3 ±0.3 vs 0.01 ±0.2, P<0.001) compared to the control period. There was no significant change in the LF (nu) or power spectral component.

Conclusion: A short-term programme of HIIT was associated with a significant increase in cardiac autonomic modulation, demonstrated by a residual increase in cardiac vagal activity. Further research is required to establish whether these adaptations are sustained with regular HIIT training and any impact this may have on long-term cardiovascular disease risk.
Hydroxyproline of H group confirmed a gradual increase with training time, with significant increase from 8 weeks to 16weeks (P<0.05). TGF-β1 gene and protein expression of H group increased compared to control group at 8/12/16 weeks. Compared with their controls, miR-21 expression of H group showed a significant increase (P<0.05). miR-21 of H group significantly decreases from 8 weeks to 16weeks (P<0.05).

CONCLUSIONS: Long-term Intensive exercise induced sustained myocardial damage, resulted in sustained collagen increase which induced myocardial fibrosis. TGF-β1/miR-21 signaling pathway, upregulated by long-term intensive exercise, may involve in the pathology of intense exercise -induced myocardial damage and atrial fibrillation.
INTRODUCTION In heart failure with preserved ejection fraction (HFP EF), the underlying systemic inflammatory state is related to myocardial stiffening. However, optimal treatment remains largely undefined.

PURPOSE: To investigate the effects of exercise training (ExT) on left ventricle (LV) stiffness in a rat model of HFP EF.

METHODS: The study was performed with nine-week old ZSF1 obese rats (Ob n=20). At the 16th week, they were randomly divided in sedentary (ObSED, n=10) and exercised (ObEX, n=10; treadmill ExT during 4 weeks, 5 days/week, 60 min/day). At the end of each week, body mass, heart and LV weight, CSA, and diastolic function evidenced by E/E' ratio (14,81±2,27 vs 16,53±1,47 p<0,05). Moreover, in skilled cardiomyocytes, the ObEX showed decreased passive tension, which suggests a reduction in myocardial stiffness (p<0,05). No significant differences were observed between the groups in body mass, heart and LV weight, CSA, and MMPs and TIMPs expression and activity (p>0,05). However, the ratio collagen/muscle was significantly reduced in ObEX, compared to ObSED (0.08 vs. 0.12 p<0,05).

CONCLUSION: ExT improved diastolic function mainly due to the decrease on collagen deposition and diminished cardiomyocyte stiffness.

FUNDING: Grant from the European Commission FP7-Health-2010; MEDIA-261,409. CIFAEL is funded by European Regional Development Fund through the Operative Competitive Programme, and by FCT (UID/DTP/00617/2013).

Schmidt, C.: CAPES (BEX 0554/14-6).


MEDICINE & SCIENCE IN SPORTS & EXERCISE®

2577 Board #97 June 2 9:30 AM - 11:00 AM Exercise Improves Diastolic Function In HfPef By Reducing Intrinsic Cardiomyocyte Stiffness And Fibrosis

Cristine Schmidt1, João Coelho2, Rita Ferreira3, Nuno Paiva3, Inês Falcão-Pires4, André Lourenço5, Adelino Leite-Moreira6, José Oliveira7, Daniel Moreira-Gonçalves8. CIFAEL, Faculty of Sports, University of Porto, Porto, Portugal. 1Faculty of Medicine, University of Porto, Porto, Portugal. 8University of Aveiro, Aveiro, Portugal.

Email: schmidtcristine@gmail.com

(No relationships reported)
white athletes. Despite the wide availability of ECG analysis, echocardiographic studies on young black and white athletes are lacking in literature. We aimed to assess the secondary LV remodelling to load training in young black players compared to matched white players. Methods: 77 young black soccer players (BP) and 53 white matched soccer players (WP) (mean age = 17.3 ± 0.50 and 18.25 ± 0.77 yo in BP and WP, respectively) were enrolled. The athletes, training with the same load and having the same lifestyle, were evaluated with echocardiography. 30 BP and 27 WP were followed up for 4 years (middle age at the first evaluation: 19.30 ± 0.50 yo in BP and WP, respectively). Contractile function was determined using speckle-tracking echocardiographic longitudinal strain (GLS). Results: No significant differences in basal anthropometric parameters were found in both groups. BP showed higher level of LV remodelling, consisting in higher interventricular septum (IVS) and posterior wall (PW) thickness (IVS: 10.04 ± 0.14 and 9.55 ± 0.10 mm, p < 0.001; PW: 9.70 ± 0.20 and 9.19 ± 0.10 mm, p < 0.05; in BP and WP respectively). Strain data showed no significant differences between the two groups (−22.35 ± 0.48 and −23.38 ± 0.69% in BP and WP, respectively). At the beginning of the follow up period, BP showed a significantly higher LV remodelling (IVS: 9.29 ± 0.3 and 8.53 ± 0.12 mm, p< 0.002; PW: 9.01 ± 0.2 and 8.40 ± 0.20, p< 0.1; in BP and WP respectively). A regular parallel increase in LV wall thickness and diameters, proportionally with body-size and LV mass, was observed in both groups during the follow up-period (IVS=10.5 ± 0.20 and 9.03 ± 0.22 mm, p< 0.001; PW: 10.06 ± 0.17 and 8.26 ± 0.19 mm, p< 0.01; in BP and WP respectively). Conclusion: LV remodelling in BP seems to be a specific and normal phenotype already present in pre-adolescent period, suggesting the central role that ethnicity played in it since the first years of life in elite athletes and the need for echocardiographic specific ethnic criteria.

Doxorubicin (DOX) is a highly effective chemotherapeutic agent used in the treatment of cancer; however, its clinical use is limited due to a dose-dependent cardiotoxic side-effect. Insulin-like growth factor-1 (IGF-I) signaling regulates cardiomyopathy, metabolism, hypertrophy, apoptosis, and many other processes related to optimal cardiac function. DOX treatment has been shown to decrease IGF-1 expression and down-regulate other markers in the IGF-I signaling pathway. Although exercise training has been shown to mitigate the cardiotoxic side-effects of DOX, it is unclear whether exercise may mediate its effects via IGF-1 expression. Purpose: The purpose of this study was to examine the effects of endurance exercise on DOX-induced changes in cardiac IGF-I expression. Methods: Male Sprague-Dawley rats (n = 12) were randomly assigned to either sedentary (SED) or treadmill (TM) exercise groups. The TM protocol included 10 weeks of running, 5 days/week, with progressive increases in intensity and duration on a motorized treadmill, while SED animals were limited to normal cage activity for 10 weeks. Following the 10-week treatment period, animals were further randomized to receive saline (SAL) or a 12.5 mg/kg bolus dose of DOX. Cardiac IGF-I was quantified in all hearts three days following injection. Results: Cardiac IGF-I expression decreased 22% in the SED/DOX group when compared to SED/SAL (Cohen’s d = 0.774). Results also indicate a 22% increase in IGF-I expression in the TM/SAL group when compared to the SED/SAL group (Cohen’s d = 0.843) and a 16% increase in IGF-I expression in the TM/DOX group when compared to SED/DOX (Cohen’s d = 1.131). Conclusions: These pilot studies show that the cardioprotective effects of exercise may be mediated, at least in part, through preservation of IGF-1 expression. Initial data from these studies show a large effect size across all comparisons and warrants further exploration with larger sample sizes. While several mechanisms may explain exercise-induced protection against chemotherapy cardiotoxicity, IGF-1 and IGF-I signaling pathways may be involved.

CONCLUSION: The use of weighted non-linear regression model resulted in a decreased false-positive rate. These updated and new reference values provide an accurate lower limit of normal thus improving their value for prognostic and risk-stratification in children with chronic diseases.

Abstracts were prepared by the authors and printed as submitted.
Children after the Fontan operation have reduced heart rate variability (HRV) and altered blood pressure control, consistent with autonomic dysfunction. We tested the hypothesis that increasing sympathetic nerve activity via the muscle metaboreflex may improve post exercise blood pressure responses in children after the Fontan operation.

PURPOSE: To determine resting HRV and the mean arterial pressure (MAP) response to post-handgrip exercise muscle metaboreflex activation in children after the Fontan operation compared to age- and sex-matched healthy controls.

METHODS: Five children after the Fontan operation and 10 controls (12 ± 2 yrs) underwent resting electrocardiography and continuous finger arterial plethysmography. Children then completed 2 min of isometric handgrip exercise at 30% of maximal voluntary contraction, followed in random order by either (1) 3 min of rest with no occlusion or (2) 5 min of brachial cuff occlusion to produce post exercise ischemia and increased sympathetic nerve activity via the muscle metaboreflex. Post-handgrip MAP changes were calculated as the 1 min average value after 3 min of recovery minus the pre-handgrip resting 1 min average value.

Comparisons were made using unpaired t-tests.

RESULTS: Resting heart rate was higher in children after the Fontan operation vs. controls, indicating autonomic dysfunction. Following handgrip exercise with no occlusion, the change in heart rate (-2 ± 5 vs. -3 ± 6 BPM; P < 0.05) was significant. RESULTS: HRV spectral analyses were similar in the low frequency domain (24 ± 10 vs. 22 ± 13%; P = 0.720), but increased in the high frequency domain (23 ± 15 vs. 52 ± 16%; P = 0.005) and low/high frequency domain ratio (1.5 ± 1.3 vs. 0.6 ± 0.4; P = 0.046) for children after the Fontan operation vs. controls, indicating autonomic dysfunction. Following isometric handgrip exercise with no occlusion, the change in heart rate (-2.5 ± 5 vs. -3.5 ± 5 beats/min; P = 0.666) was similar, but children after the Fontan operation had greater lowering in MAP (-5 ± 1 vs. -5 ± 5 mmHg; P = 0.024) vs. controls. With brachial occlusion, changes in heart rate (0 ± 5 vs. -1 ± 6 beats/min; P = 0.701) and MAP (6 ± 7 vs. 6 ± 7 mmHg; P = 0.980) were similar between children after the Fontan operation vs. controls.

CONCLUSION: Our findings suggest that increasing sympathetic nerve activity via the muscle metaboreflex helps to improve post exercise blood pressure responses in children after the Fontan operation.

---

### CARDIOPULMONARY EXERCISE TEST RESULTS

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>2585</td>
<td>2584</td>
</tr>
<tr>
<td>IMVO2 (cc/kg/min)</td>
<td>23 ± 3</td>
<td>26.4 ± 2 *</td>
</tr>
<tr>
<td>ET (minutes)</td>
<td>10.9 ± 3.0</td>
<td>13.2 ± 3.4 **</td>
</tr>
<tr>
<td>MHR (BPM)</td>
<td>190 ± 13</td>
<td>192 ± 3</td>
</tr>
<tr>
<td>SLOPE</td>
<td>26 ± 9</td>
<td>24 ± 6</td>
</tr>
<tr>
<td>P2O2</td>
<td>11.6 ± 3.4</td>
<td>3.0 ± 3.2 **</td>
</tr>
<tr>
<td>MRQ</td>
<td>1.02 ± 0.06</td>
<td>1.06 ± 0.08</td>
</tr>
<tr>
<td>AT VE/VO2</td>
<td>22.8 ± 3.6</td>
<td>22.2 ± 3.2</td>
</tr>
<tr>
<td>AT VE/VCO2</td>
<td>25.4 ± 3.5</td>
<td>25.2 ± 3.3</td>
</tr>
</tbody>
</table>

Pre versus Post: * p<0.05, ** p<0.01

RESULTS: There was no significant difference in mean age between AA and C groups (12.4 ± 2.8, 11.8 ± 2.9 years pre-program). The C group had a significant decrease in weight (84.9 ± 28.8 vs 81.7 ± 27.7 kilograms (kg)) pre and post program. IMVO2, exercise time (ET), and P2O2 was significantly increased post program in both groups with a significant increase in MHR in the C group. Aerobic efficiency improved in the C group only (8.9 vs 6.6), indicating a decrease in VE/VO2 equivalent.

CONCLUSION: These data suggest that a 16-week weight management program increases aerobic capacity in both AA and C obese pediatric patients. Improved aerobic efficiency, however, was only seen in the C group. Further investigation into racial disparity effecting weight loss and aerobic efficiency is warranted.

---

### EFFECT OF LIGHT EXERCISE ON AERobic CAPACITY AND VENTILATORY EFFICIENCY

**PURPOSE:** To examine the relationship between self-reported leisure time PA and peak VO2 in pediatric Fontan patients.

**METHODS:** Twenty-six youth with Fontan physiology (age 4.1–18.1 yrs, male 57%) underwent routine cardiopulmonary exercise testing. Peak VO2 (ml/kg/min), respiratory exchange ratio (RER), VE/VCO2 slope, oxygen pulse (ml/beat), and maximal heart rate (BPM) were measured. Subjects exercised to volitional fatigue on a cycle ergometer using the Modified James protocol. Subjects were excluded if RER at peak VO2 was <1.0. Self-reported leisure time PA was assessed using the interviewer administered Modifiable Activity Questionnaire for Adolescents (MAQ-A). Relationships were assessed using Pearson partial correlations and nonparametric Kruskal-Wallis tests.

**RESULTS:** Significant positive relationships were found between VO2 peak (24.44 ± 5.8 ml/kg/min) and self-reported hours per week of PA (1.36 ± 1.15 hrs) (r=0.534, p<0.05) and MET hours per week of PA (7.71 ± 6.66 MET hrs) (r=0.483, p<0.05). Significant negative relationships were found between VE/VCO2 slope (35.78 ± 7.08) and hours per week of PA (1.36 ± 1.15 hrs) (r=-0.481, p<0.05) and MET hours per week of PA (7.71 ± 6.66 MET hrs) (r=-0.483, p<0.05). Days per week of light exercise was associated with VE/VCO2 slope (X2=9.97, p=0.05) and O2 pulse (X2=12.9, p=0.05). CONCLUSIONS: Greater self-reported hours per week and MET hours per week of leisure time PA were associated with higher peak VO2 and lower VE/VCO2 slopes. Despite the hemodynamic compromises in single ventricle Fontan physiology, routine leisure-time PA appears to have a beneficial effect on both aerobic capacity and ventilatory efficiency, thus improving their prognosis in cardiac mortality risk.
study was to compare the cardiac response to maximal exercise between adolescent children born preterm and age-matched controls. Methods: Seven children born preterm (PT) (age 12-13, birthweight <1500 g, gestational age 24-31 weeks) and 6 age-matched children born full term (CT) (gestational age 38-40 weeks) underwent progressive maximal exercise testing on a cycle ergometer, with continuous measurement of O2 consumption (ml/kg/min), and cardiac output (Q), stroke volume (SV) and heart rate (HR) using thoracic bioimpedance. SV and Q were indexed to body surface area (BSA) and used to calculate cardiac output (CO). HR was recorded during two minutes following exercise, and HR recovery (HRR) was calculated as decrease in HR at 2 minutes after maximal exercise. Statistical analysis was done using multiple t-tests. Results: PT had lower relative maximal oxygen consumption (VO2peak) compared to CT (38.3 ± 9.3 vs. 51.5 ± 7.3 ml/kg/min, p<0.03). PT did not increase in VT from rest to maximal exercise (51.7 ± 9.0 vs. 53.3 ± 8.2 ml/min, p=0.77), while SV significantly increased in CT (47.4 ± 4.0 vs.67.7 ± 14.4 ml/m2, p=0.01). The change in SV from rest to maximal exercise was significantly smaller in PT compared to CT (1.6 ± 6.5 vs. 20.3 ± 17.0 ml/m2, p=0.04). The increase in Q from rest to exercise was also significantly smaller in PT than in CT (5.6 ± 1.1 vs. 9.0 ± 2.6 L/min/m2, p=0.02). There was no difference in resting or maximal HR between the groups (p=0.05 for all). HRR was lower in PT than CT (54 ± 64 beats, p=0.01). Maximal arteriovenous O2 difference was not different in PT compared to CT (13.2 ± 6.5 vs.13.2 ± 2.3 ml/dL, p=0.98). Conclusion: Adolescent children born preterm exhibit lower maximal aerobic capacity and significantly smaller maximal SV and Q than age-matched controls. PTs also demonstrated slower HRR after maximal exercise. This data suggests that PTs may not be able to increase SV in response to increasing metabolic demand, and this may reduce their ability to exercise at higher intensities. National Institutes of Health: 1R01 HL086897 (ME) and R01 HL38149 (MP), and UW CVRC T32 HL 07936 (KH).

 PURPOSE

To investigate differences in the accuracy to discriminate elevated cardiometabolic risk among Prepubertal Children.

TUOSO TOMPURI, JARMO JAASKELAINEN, EERO HAAPALI, TAMO LAITINEN, TIMO A. LAKKA. KUPIO UNIVERSITY HOSPITAL, KUPIO, FINLAND. UNIVERSITY OF EASTERN FINLAND, KUPIO, FINLAND. (No relationships reported)

The measures of cardiorespiratory fitness scaled by lean mass (LM) have physiological rationale for assessing aerobic capacity as the scaling by body weight introduces confounding by adiposity.

PURPOSE

To investigate differences in the accuracy to discriminate cardiometabolic risk between the measures of adiposity and cardiorespiratory fitness when using alternative methods to perform body size related scaling of maximal workload (Wmax).

METHODS

Altogether 448 children (214 girls) aged 6-8 years participated in the study. We assessed fat mass (FM), percent body fat (%BF) and LM by dual-energy X-ray absorptiometry, and Wmax by incremental bicycle ergometer exercise test. Absolute and by body weight, FM and LM scaled Wmax were used in the analysis. We used age and sex-specific criteria (Ahrens et al. Int J Obes, 2014;38:S4-S14) to define dyslipidemia (elevated triglycerides or high density lipoprotein cholesterol), elevated blood pressure and elevated insulin resistance (HOMA-IR), and 90th percentile for cardiometabolic risk score (CMS). Maximal SVi and Qi were elevated when above 90th percentile. We used area under the curve (AUC) by receiver operating characteristics to investigate the accuracy of the measures of cardiorespiratory fitness and adiposity to discriminate elevated cardiometabolic risk, and the Youden index to assess the thresholds discriminating elevated CMS.

RESULTS

In boys, %BF and Wmax/FM were able to discriminate CMS (AUC 0.86, P<0.001), HOMA-IR (AUC 0.79-0.80, P<0.001), elevated blood pressure (AUC 0.73-0.74, P<0.001) and dyslipidemia (AUC 0.64, P<0.05). While Wmax/body weight had AUC 0.82 (P<0.001) for CMS, and AUC 0.71 (P=0.001) for HOMA-IR and AUC 0.64 (P<0.05) for elevated blood pressure, Wmax/LM had AUC 0.65 (P=0.05) for CMS and the absolute Wmax had AUCs >0.6. In girls, %BF, Wmax/FM and Wmax/body weight were able to discriminate CMS (AUC 0.75-0.78, P<0.001) and HOMA-IR (AUC 0.69-0.71, P=0.01). Proposed thresholds in girls and in boys were 2.5 and 2.6 W/kg of body weight (sensitivity 67% and 64%; specificity 80 and 85%) and 3.9 W/kg of LM in boys (sensitivity 82%; specificity 45%).

CONCLUSIONS

Measures representing adiposity (%BF, Wmax/FM; Wmax/body weight) were the best discriminators for cardiometabolic risk, and Wmax/LM showed ability to discriminate elevated CMS only in boys.

HIGH-INTENSITY INTERVAL TRAINING IN CHILDREN WITH A CHRONIC DISEASE OR CONDITION

Maremka Zwinkels, Tim Takkeren, Anne Visser-Meily, Olaf Verschuren. ‘De Hoogstraat Rehabilitation, Utrecht, Netherlands. ‘University Medical Center Utrecht, Utrecht, Netherlands. (Sponsor: Thomas Janssen, FACS)’

Email: m.zwinkels@dehoogstraat.nl (No relationships reported)

High-intensity interval training (HIT) is superior compared to moderate-intensity continuous training for improving anaerobic fitness, agility and aerobic fitness. However, for children and adolescents with a chronic disease or condition the effects of HIT as a training modality is relatively unknown. PURPOSE: To investigate the effect of eight weeks of HIT on physical fitness in children and adolescents with a chronic disease or condition who 1) are able to run, 2) walk independently but are not able to run, and 3) propel a manual wheelchair. METHODS: A total of 68 children and adolescents were recruited from schools for special education in the Netherlands (mean age 13.5±2.8, range 8-19 years, 56% boys). They had various chronic diseases: cerebral palsy (41%), spina bifida (18%), other neuromuscular diseases (34%), muscularskeletal (4%), cardiovascular (4%) and metabolic diseases (9%). The sample consisted of 35 runners, 24 independent walkers, and 9 wheelchair users. All subjects performed HIT twice a week for 45 minutes. Each session consisted of 8-12 intervals containing a 30 seconds all-out exercise followed by 90 or 120 seconds of active recovery. Anaerobic fitness was measured by the Muscle Power Sprint Test (MPST), agility with the 10x5 meter sprint test and a shuttle run/ride test (SRT) was performed to determine aerobic performance (shuttles) and aerobic capacity (VO2peak). RESULTS: Exercise attendance was 85%. A significant improvement in respectively mean and peak power on the MPST was only found for children who are able to run, the 30s all-out HIT principle is probably not applicable for independent walkers and wheelchair users. Future studies about HIT protocols to improve VO2peak as well are warranted.

An Assessment of Cardiovascular Health in Southern Maine Children and Comparison to National Normative Values

Katherine Wallingford. University of New England, Biddeford, ME

Email: kwallingford@une.edu (No relationships reported)

Childhood obesity has been on the rise, with an increase in obesity from 7% to 18% from 1980 to 2012. Along with the rise in obesity, the onset of coronary artery disease

Abstracts were prepared by the authors and printed as submitted.
We previously showed (Dougherty et al., 2011) that muscle strength and power adjusted for body size and composition deficits, were attenuated in children with type SS sickle cell disease (SCD-SS) compared to healthy African-American children. However, in today’s SCD clinical care environment, hydroxyurea is considered a “standard of care” treatment and is introduced at a young age. It is unclear if this change in treatment may have corrected these body size and muscle performance deficits. PURPOSE: To compare muscle strength and power, adjusted for body size and composition, in a contemporary group of 5- to 20-yr-old African-American children with and without SCD-SS. METHODS: Anthropometry and DXA for body composition were measured and associated Z-scores generated. Maximum muscle strength with a handgrip dynamometer and peak power via 3 squats jumps on a force plate were assessed. RESULTS: Twenty-one children with SCD-SS and 23 healthy control children did not differ by age (11 ± 1 vs. 10 ± 1 yrs), sex (male, female: 9, 12 vs. 11, 13) or maturation stage ( Tanner 1, 2, 3, 4, 5; 10, 4, 3, 4, 0 vs. 11, 2, 3, 5, 2), respectively. Children with SCD-SS compared to healthy controls had significantly lower (all P < .005) height Z (±0.5 ± 0.3 vs. 0.4 ± 0.2), weight Z (±0.7 ± 0.3 vs. 0.8 ± 0.2), BMI Z (±0.6 ± 0.2 vs. ±0.7 ± 0.2), arm circumference Z (±0.9 ± 0.3 vs. ±0.8 ± 0.3), upper arm muscle area Z (±0.6 ± 0.3 vs. ±0.4 ± 0.3), and whole body fat mass-to-height Z (±1.9 ± 0.2 vs. ±0.9 ± 0.3). Unadjusted dominant hand maximum handgrip strength (16 ± 2 ± 2.3 ± 2 kg; P<0.01) and peak power (1054 ± 107 vs. 1488 ± 169 W, P<0.04) were significantly reduced in children with SCD-SS compared to healthy controls. Performance decrements persisted when handgrip strength was adjusted for lean body mass and fat mass explaining 66% of the variance and power was adjusted for age, lean body mass, fat mass, height explaining 91% of the variance. CONCLUSIONS: Body habitus adjusted muscle strength and power are reduced in children with SCD-SS compared with healthy children beyond expectation for growth and body composition deficits suggesting that additional factors contribute to attenuation in anaerobic performance. Supported by K12 (KL2RR024132), K23 (K23HL114637), UL1TR000003, CHOP RAiG Pilot Grant, GI Research and Education Fund, and Nutrition Center.

ACSM May 30 – June 3, 2017
Denver, Colorado

No relationships reported
E-30 Free Communication/Poster - Elite Athletes

Friday, June 2, 2017 - 7:30 AM - 12:30 PM
Room: Hall F

2593 Board #113 June 2 11:00 AM - 12:30 PM
Physiological & Anthropometric Profiles Of Elite Collegiate Rugby Union Players
Robert C. Pritchett¹, Todd T. Thorlsey¹, Kelly L. Pritchett¹, Matt J. Green, FACSMD, ¹Central Washington University, ELLensburg, WA. ²University of North Alabama, Florence, AL.
Email: pritchett@cwu.edu
(No relationships reported)

PURPOSE: To Investigate physiological and anthropometric characteristics of Elite US College Rugby Union Players (ECP).

METHODS: Thirty-six elite college rugby union players (20 forwards, 16 backs) were measured for height (cm), body mass (kg), percentage of body fat (3 sites), muscular power (vertical jump, power Clean), speed (100m and 40m sprint), strength (back squat, bench press) and maximal aerobic power (Yo-Yo test).

RESULTS: Forwards were significantly taller (183.8士6.0cm vs. 176.8士4.3cm) (p<0.01), more massive (110士13.9kg vs. 86.4士8.1kg) (p<0.01), more athletic (0.30 vs. 5.21士0.22), Yo-Yo test (865士312m vs. 1240士360m) performance (p>0.05). CONCLUSION: Comparisons with previous literature indicate male rugby players have higher CS values than female rugby players. Using referent data on male Olympic distance runners, male rugby players have markedly higher D’ values and markedly lower CS values. Feature utility of the CS concept is anticipated as we begin to understand norms for CS and D’ of different athletes and different running conditions (e.g., load carriage, shuttle running).

The GPS data were used to determine the total distance and velocities performed, and to examine for pacing affects. Summary statistics of mean ± SD are provided.

RESULTS: Total running speeds for the initial 150 s (S150 = 5.79 ± 0.59 m/s) and total distance (3 MT distance = 871.5 ± 71.9 m) were observed. A total of 13 of 30 subjects surpassed the 300 m D’ value (mean D’ = 288.2 ± 49.1 m). The CS of the total group was 3.87 ± 0.55 m/s. Skewing of CS and D’ was observed between forwards and backs, therefore between-group differences in neither CS nor D’ were observed (p > 0.05).

CONCLUSION: Comparisons with previous literature indicate male rugby players have higher CS values than female rugby players. Using referent data on male Olympic distance runners, male rugby players have markedly higher D’ values and markedly lower CS values. Feature utility of the CS concept is anticipated as we begin to understand norms for CS and D’ of different athletes and different running conditions (e.g., load carriage, shuttle running).

While strength and conditioning training can improve athletic skills and physical attributes, little is known on how effectively an interdisciplinary approach can be when focused on additional factors (medical, psychological, nutrition) shown to influence such variables. PURPOSE: to evaluate the effectiveness of an interdisciplinary athlete development program for improving skills and physical attributes related to the NFL combine. METHODS: Retrospective review (2008-2016) of 108 elite level football athletes that completed the St. Vincent Sports Performance NFL Pre-Draft Program. Sports health and fitness professionals created 6-week individualized training programs based on 4 disciplines: 1) Physical Training (strength, speed, position skills), 2) Medical (diagnostic, treatment, corrective exercises), 3) Nutrition (dietary analysis, meals), and 4) Psychological (mental preparation, composure). Anthropometric and skill measurements for strength, power, speed, and agility were obtained pre- and post-program. Paired t-test (p<0.05) was used to assess pre to post differences for all athletes and for subgroups of position demands (speed, hybrid, power). Independent t-test was used to compare both pre- and post-program to NFL combine averages.

RESULTS: All variables significantly improved pre- to post-program (Table 1), which moved our athletes from worse than combine averages at pre-program, to the same or better at post. Subgroup outcomes showed the same general pattern of improvements, except for fat weight where hybrid (right end, quarterback, linemanbacker) showed significant change (38.4 to 36.8 lbs, p<0.03). CONCLUSION: While our athletes were of elite status pre-program, thus little room for gains, all outcomes improved post-program and were the same or better than the NFL combine averages. This was likely due to the interdisciplinary approach focused on the athlete. Future studies should assess how such gains translate to performance.

The critical speed (CS) concept helps characterize the aerobic and anaerobic fitness of an athlete. Rugby players should hypothetically have modest CS values but extremely high curvature constant (D’) values, yet, normative data are unavailable.

PURPOSE: To gather normative data of CS and D’ on high-level male rugby athletes.

METHODS: A total of 30 male rugby players, were recruited from the Eastern Cape of South Africa. All subjects performed the running 3-min all-out exercise test (3 MT) using global positioning system (GPS) technology to determine CS and D’.

2594 Board #114 June 2 11:00 AM - 12:30 PM
Positional Norms For Critical Speed And D’ Of High-level Male Rugby Athletes
Robert Pettitt, FACSMD, Ida E. Clark, Nicholas A. Jannick, Cody J. Strom, Mark Kramer, ¹Minnesota State University, Mankato, Mankato, MN. ²University of Exeter, Exeter, United Kingdom. ³Victoria University, Melbourne, Australia. ⁴Nelson Mandela University, Port Elizabeth, South Africa.
Email: robert.pettitt@msu.edu
(No relationships reported)
PURPOSE:
The purpose of this study is to examine the differences in shoulder range of motion, proprioception and balance ability between general peoples(28±3 yrs, n=9) and pro golfers (members of Korea Professional Golfers’ Association, 26±4 yrs, n=9).

METHODS:
Data of the results was analyzed by using the SPSS/PC Window version 21.0 statistics program. To verify differences between the groups, Independent T-test was conducted. All the statistical significance level was set at α=0.05.

RESULTS:
1. In shoulder range of motion (ROM), pro golfers group showed higher shoulder range of motion in flexion, abduction, internal rotation than the general people, but there was no significant difference. Pro golfers group showed significant higher range of motion than general people in external rotation (p<0.05).
2. In shoulder passive joint position sense (JPS) test, there was no significant difference between the groups, but in shoulder active joint position sense (APJS) test, pro golfers group showed significant low error angle than general people (p<0.05).

CONCLUSION:
As a result of this study, pro golfers were identified that they have higher shoulder ROM in external rotation and they showed a low error angle of APJS than general people. This results might come from the superior motor ability of the pro golfers, however to improve athletic performance and prevent injury& rehabilitation, exercises to improve shoulder range of motion and proprioceptive sense should be included.

For balance ability, there was no significant difference between the groups, but pro golfers group showed the tendency of higher scores than general people, exercise to increase balance ability also considered to be included. However, the limitations of range of motion and proprioception ability measurement for single joint, balance ability test was conducted by the movement of supported plate not by the active movement of the subjects. Therefore, further study is a assessment through a more various and segmentation study are needed.

The differences between sand and indoor volleyball courts can affect an athlete’s performance, most notably jumping and agility performance. Maximal jumps have been reported to be lower when performed on sand compared to rigid surfaces similar to a wood-flooring court. PURPOSE: To examine the performance of elite female sand and indoor collegiate volleyball players in agility and approach jump testing in sand and on an indoor surface; including heart rates and ratings of perceived exertion.

METHODS: Participants (n=21, age 19.8±1.1yrs, height 1.78±0.08m, body mass 73.62±9.63kg) were members of NCAA Division I women’s indoor and sand volleyball teams who finished their seasons ranked in the top 8 nationally. Two thirty minute sessions (one sand, one indoor) were completed for each test and the outcome measures were the participant’s subjective ratings of perceived exertion, agility trials, and the measurement of heart rate and heart rate recovery.

RESULTS: There was a significant difference between surfaces for both approach jump (57.57±6.28cm indoor vs. 51.03±5.47cm sand, mean difference 6.5±4.3cm, p=0.001) and agility trials (6.66±0.52sec indoor vs. 6.96±0.66sec sand, mean difference 0.30±0.46sec, p=0.022), but not in HRR (36.4±10.2bpmin indoor vs. 36.3±9.9bpmin sand, p=0.05), peak HR (139.5±12.1bpmin indoor vs. 142.3±11.8bpmin sand, p=0.05), and RPE (9.6±2.1 indoor vs. 9.4±2.2 sand, p=0.05). There were no significant differences in approach jump or agility time for athletes who competed in sand, indoor, or both (p>0.05 for all), although the difference in RPE trended towards significance (p=0.082). Although not significant, sand athletes and hybrid (compete in sand and indoor) athletes consistently performed better than indoor athletes on both surface (mean difference 0.593±0.238 sec and 0.553±0.79 sec, respectively).

CONCLUSIONS: Significant differences exist between sand and indoor surfaces when performing approach jump and agility drills, but not between sand and indoor volleyball athletes.

Cortisol can negatively affect athletic performance, potentially causing fatigue and inflammation, and high levels of this hormone have been associated with impaired performance in elite athletes. Monitoring hormones in saliva has distinct advantages over doing it in other biological fluids. However, little is known about the salivary cortisol responses in female athlete and particularly after a basketball match.

PURPOSE: The purpose of this study was to examine the salivary cortisol responses in elite female athletes after a women’s basketball final match. METHODS: Fifteen elite female basketball players participated in the study. Unstimulated mixed saliva samples were collected in saline swabs before and immediately after the basketball match. Specifically, the swab was placed in the mouth for one minute, then it was transferred into plastic tubes, centrifuged and the resulted saliva sample was analyzed. Saliva samples were assayed in duplicate using a commercially available ELISA kit for cortisol. Differences between the cortisol levels before and after the match were analyzed using student’s T-test, while Pearson correlation coefficient (r) was used to reveal potential relationship between post-match cortisol levels and participation time in the match.

RESULTS: Salivary cortisol levels were significantly higher after the completion of the basketball match compared to the baseline levels (2425.6±1927.6 pg/ml vs. 1014.5±548.6 pg/ml; p<0.005). No significant correlation was revealed between the participation time (in minutes) of the elite basketball players and their salivary cortisol levels (r=0.22; p=0.05). CONCLUSIONS: The findings of the present study suggest that monitoring cortisol in saliva can be a useful, non-invasive and sensitive method to assess this hormonal response in female athletes after a basketball match. The increased cortisol levels appear not to be associated with the total participation time of the elite basketball players. However, the possible negative effects of these cortisol responses on the female elite athlete’s performance needs to be further investigated.

The following measurements were made each time: body fat, hydration, blood profiles (Hct, Hgb, %ΔV), fatiguing (questionnaire), and inflammatory plasma proteins (creatinine kinase, IL-6, TNFα), II-1β, IL-10). RESULTS: The wrestlers trained 3–4 hours per day during the season. The self-reported level of muscle soreness and fatigue was significantly higher in the season late into the season, but leveled off late into the season (p<0.05). Creatine Kinase levels peaked early in the season at time point 2 versus pre-season (391.32±48.46 vs. 220.75±54.18, p<0.05), but decreased at the end of season versus pre-season (158.11±44.3 vs. 287.79±44.3, p<0.05). Plasma TNFα levels increased late into season (time point 4) compared to pre-season (5.26±0.38 vs. 3.34±0.36, p<0.05). Plasma IL-8 followed a similar trend and peaked at time point 4, however this value was not significant (p=0.08). Sleep quality correlated with plasma levels of IL-8 (r=−0.120, p=0.05). No other plasma cytokine data was statistically significant (p<0.05).

CONCLUSIONS: Muscle soreness and fatigue values peaked early in the competitive season and decreased as the season progressed, without a reduction in training volume; suggesting an adaptive response to training load. Low grade systemic inflammation increased late into the season (measured by plasma cytokines), and correlated with poor sleep quality. Sleep quality may be a simple marker to track inflammation among wrestlers. Based on these data, wrestlers may benefit by additional recovery time early into the season to prevent fatigue and muscle damage. As the season progresses, low-grade inflammation may be prevented by tracking the quality of sleep. Combined these measures may prevent injury and improve performance.

Email: moustogi@gmail.com

No relationships reported
In 2016, USA Track & Field (USATF) fielded a team of 129 athletes to compete at the Olympic Games in Rio de Janeiro. Trends in the retention rates of athletes on past USATF national teams may help to better direct future USATF funding and support.

**PURPOSE:** To assess the retention potential of the 2016 U.S. Olympic Track and Field team for future World Championships and Olympic Games teams.

**METHODS:** USATF rosters from 13 World Championships and Olympic national teams dating back to 2000 were analyzed in terms of athlete retention rates at subsequent national team events. The relationship between the mean retention rates of national teams and subsequent national team events was modeled using non-linear regression. Data from this model were used to make inferences regarding the future retention rates of the 2016 Olympic team and its athletes with the significance level set at P=0.05.

**RESULTS:** The retention rate of a given national team falls logarithmically (y = -0.0203ln(x)+0.5443) with time as athletes attempt to make subsequent teams (R = 0.98). Furthermore, individual athlete retention rates decayed exponentially (y = 1.354e-0.09x) with time as athletes attempted to make subsequent teams (R = 0.99).

Using these models to assess the 2016 Olympic team, the model predicts that only 65 of the 129 members will make the 2017 World Championships team (95% CI, [58-73]). Additionally, the model suggests that only 39 athletes from the 2016 Olympic team will make the 2020 Olympic team (95% CI, [32-46]). Finally, when applied to the 48 first time national team athletes in 2016, the model projects that 19 (41.2%) will never make another national team (95% CI, [17-22]).

**CONCLUSIONS:** The large amount of turnover from one national team to another is likely a reflection of the highly competitive and objective nature of national track & field team selection in the United States. From an athlete funding standpoint, national governing organizations with limited resources may be able to optimize their return on investment by funding athletes on a year to year basis as opposed to making long term commitments.

Olympic athletes are overexposed to training and daily routine, and the training log should be matched with multifactorial issues, such as nutrition, physiotherapy, psychological, and health, focusing on improvement of performance. Evaluate how the athlete is responding to each period of preparation is challenging, specially on a 4 year Olympic cycle. Interdisciplinary approach is mandatory and any mismatch may lead to injury or decrement of performance. Canoeing has specific demands and methods for evaluation, and multifactorial analysis such as biomechanical, metabolic and clinical aspects should be encouraged.

**PURPOSE:** The aim of this study was to evaluate athletes participating in Rio 2016 Summer Olympics Games on a multidisciplinary and multifactorial aspect.

**METHODS:** 2 male athletes (Bronze Medalists) were evaluated during a 1,000m sprint on an ergometer, analyzing aerobic capacity (VO2), Heart Rate (HR) and Power (W) on every 250m. Blood samples were collected for muscle-damage biomarkers: Creatine-Kinase (CK) and Lactate Dehydrogenase (LDH); Electrolytes: Sodium (Na) and Potassium (K) levels.

**RESULTS:** Descriptive data demonstrate that VO2 (mL/kg/min), HR (bpm), W (watts) were, during 250m: 39.3 ± 172/133 x 3.9 ± 159/107, 500m: 51.2 ± 105/76 x 37.1/160/109, 750m: 36.7/178/110 x 34.9 ± 168/100, and 1,000m: 45.3/184/182 x 45.1/178/118, respectively. CK levels (mg/dL) and LDH (U/L) were, pre vs post protocol, 835 ± 1008 and 548 vs 682 for the first athlete, and 255 vs 340 and 488 vs 492 for his teammate. Electrolytes, Na (mEq/L) and K (mEq/L) were 143 ± 151 and 5.8 ± 5.6, and 141 vs 151 and 5.4 ± 5.9. The time for completing the 1,000m protocol were 5m12s08ms vs 5m20s22ms.

**CONCLUSIONS:** The protocol described evidences multidisciplinary variables that should be focused when detailing improvement in performance, on cardiorespiratory and metabolic approach.

**PURPOSE:** The purpose of this study was to compare ball velocity (BV) and elbow varus torque (EVT), as well as kinematic and kinetic differences between high school (HS) and professional (PRO) baseball pitchers. **METHODS:** Seventy-eight HS (n = 39; 16 ± 1 y; 74 ± 10 kg; 178 ± 7 cm) and PRO (n = 40; 21 ± 2 y; 94 ± 9 kg; 185 ± 7 cm) baseball pitchers were analyzed while throwing fastball pitches using an eight-camera 3D motion capture system. Following a warm-up, participants threw –8 maximal effort fastballs. The 6 pitches with the greatest BV were used for analysis. Independent samples t-test were used to examine differences between the HS and PRO pitchers. Pearson correlation coefficients were used to assess potential relationships between BV, EVT and several kinetic and kinematic variables during phases of the throwing motion. **RESULTS:** BV (66.3 ± 2.2 vs 70.4 ± 6.5 mph; p < 0.001) and EVT (79.2 ± 14.9 vs 44.4 ± 16.0 Nm; p < 0.001) were greater in PRO than in HS. BV was related to EVT (r = 0.77) and BV and EVT were related to elbow flexion torque, elbow flexion and extension velocity, shoulder anterior and elbow medial shear force at arm acceleration, shoulder rotation torque at arm cocking, and elbow and shoulder proximal force at arm deceleration (r = 0.35 - 0.98, p < 0.05). However, in PRO, BV and EVT were not related to each other (r = 0.01) but were related to elbow flexion torque and shoulder anterior shear force at arm acceleration (r = 0.32 - 0.52, p < 0.05). In Pro, EVT, but not BV, was related to elbow medial shear force at arm acceleration, shoulder rotation torque at arm cocking, and elbow and shoulder proximal force at arm deceleration (r = 0.69 - 0.96, p < 0.05) and was inversely related to upper trunk rotation at foot contact (r = -0.31, p < 0.05). **CONCLUSION:** The results of this study indicated that PRO achieve higher fastball velocities and experience greater elbow varus torques than HS pitchers. However, in PRO pitchers, those who achieved the highest fastball velocities did not necessarily experience the greatest ETVs, whereas in HS pitchers, those who threw harder generally experienced higher ETVs. The inverse relationship seen in PRO, but not HS, pitchers for EVT and upper trunk rotation may suggest that PRO pitchers have a greater ability than HS pitchers to utilize their trunk to generate the forces necessary to achieve higher fast ball velocities.
Serious injuries due to falls in people 65 years old and older is a critical aspect of life due to our society; slow and degraded gait is of particular concern in older women. Falling often correlates with impaired gait and balance caused by loss of muscular strength and/or sensory impairments. Pelvic and pelvic symmetry (between left and right sides of the body) are key measures of quality.

**PURPOSE:** To examine how pelvic tilt symmetry (range of pelvic tilt) and pelvic rotation (2) between age groups and the relationship between pelvic tilt symmetry and pelvic rotation. These initial findings reveal a particular focus of gait impairment as a function of age in older women -- pelvic tilt symmetry. Interventions to address this aspect of gait may improve walking patterns, and thus dynamic stability, in older walkers.

**METHODS:** Women 55 and older. 60 women ranging from 13 to 19 months in age were recruited for this study. Each child completed five trials for three conditions in a single session. The project was approved by the University’s IRB, and participation was granted with written consent from a legal guardian. Sixty children ranging from 13 to 19 months in age were recruited for this study. Each child completed five trials for three conditions in a single session. The purpose of this study was to examine how a physical perturbation (a dry and a wet diaper versus underwear) affect 13 to 19 month old children’s gait.

**RESULTS:** These initial findings reveal a particular focus of gait impairment as a function of age in older women -- pelvic tilt symmetry. Interventions to address this aspect of gait may improve walking patterns, and thus dynamic stability, in older walkers.

**CONCLUSION:** Based on this data, step width and peak plantar flexor moments were increased with increased body fat percentage, suggesting that persons with a larger percent body fat require more force to propel themselves forward to toe off. Strengthening plantar flexors, or reducing body fat percentage, may allow those with high percent body fat to ambulate and perform other daily tasks efficiently. Further research is needed to examine non-normalized data to show practical effects. Additionally, the current study used primarily active individuals, a comparison to sedentary individuals is needed.

**REFERENCES:**

Over the years obesity has become a widespread pandemic that has affected many people. Obese persons experience difficulty ambulating and conducting daily activities. While body mass index is typically used to identify obese individuals percent body fat was preferred for this study because body mass index presents as an inaccurate obesity classification (Shah, 2012). It has been proposed that as percent body fat increases joint mechanics of the hip, knee, and ankle will increase as well on all three planes. **PURPOSE:** The purpose of this study is to show the correlation between body percent fat and lower extremity joint mechanics. **METHODS:** 54 participants (24 male, 30 female; Height=170.9±9.2 cm, Weight: 74.4±18.8 kg ) were fit with reflective markers on the bony landmarks of the lower extremity and asked to walk across Bertec force plates (Bertec, Inc, Columbus, OH) a total of 10 times. Kinematic data were collected and normalized to body weight and collected with Vicon Nexus 2.4 (Vicon, Inc., Oxford, UK) and processed through Visual 3D software (C-Motion, Inc., Germantown, MD). Body composition was measured using a Bod Pod (Cosmed, Inc., Chicago, IL). Data were analyzed using Pearson correlation coefficients (r=0.05). **RESULTS:** The data revealed a significant relationship between percent body fat and stride width (r=0.368) as well as peak ankle plantarflexion moment (r=0.373) (p=0.032 and p=0.005 respectively). No other significant relationships were observed. **CONCLUSIONS:** Based on this data, step width and peak planter flexor moments were increased with increased body fat percentage, suggesting that persons with a larger percent body fat require more force to propel themselves forward to toe off. Strengthening plantar flexors, or reducing body fat percentage, may allow those with high percent body fat to ambulate and perform other daily tasks efficiently. Further research is needed to examine non-normalized data to show practical effects. Additionally, the current study used primarily active individuals, a comparison to sedentary individuals is needed.

**REFERENCES:**
We recently showed that the observed walk-to-run transition stride frequency agrees with a transition stride frequency predicted in a novel way by the two stride frequencies applied during treadmill walking and running at freely chosen velocities and freely chosen stride frequencies. The two latter stride frequencies are defined as behavioral attractors. PURPOSE: To test the day-to-day reliability of the predicted walk-to-run transition stride frequency determined by this novel approach. METHODS: Healthy individuals (n=25, 19 men and 6 women of age, height, and body mass of 26.6±4.2 years, 1.77±0.08 m, and 76.4±11.6 kg, respectively) were recruited for a laboratory test of treadmill walking and running. The two behavioral attractors were determined during walking and running at freely chosen velocities and stride frequencies. Subsequently, the walk-to-run transition stride frequency was predicted to occur at the point where the walking stride frequency starts to get closer to the running attractor than to the walking attractor. The laboratory test was repeated 3 times with a minimum of 1 day in between. The observed walk-to-run transition stride frequency was 77.2±2.7 strides/min (95% confidence intervals: 73.2 to 81.2). The reproducibility of the predicted stride frequency was very high with a mean measurement error of 0.48 strides/min (p=0.52) and with a mean standard error of measurement of 2.1 strides/min (p=0.3). The ICC of the predicted walk-to-run transition stride frequency was 0.89, the SEM was 1.1 strides/min, and the SD was 3.1 strides/min. CONCLUSION: The predicted walk-to-run transition stride frequency showed almost perfect relative reliability and high absolute reliability.

Purpose Joint moments, calculated via inverse dynamic (ID) analyses, represent the net effect of all forces spanning a joint, and are used as a surrogate to represent joint demand and are used to describe movement patterns. However, because excessive instrumentation is required, ID analyses are rarely used outside of a laboratory setting. Insight into joint moments using simply collected quantitative measures has the potential to impact a variety of settings (e.g. movement retraining, sports performance, etc.). Therefore, the objective of this study was to determine if hip moment could be a measure of heel strike. The algorithm identified heel strike as the first a maxima that h maxima provided p. The stride times calculated using this method were compared to stride times measured using a force sensitive resistor (FSR), Interlink Electronics, Camarillo, CA placed under the heel. The two methods were compared at various walking speeds on a treadmill (1.25, 1.5, 1.75, and 2.0 m/s). Three-legged walking speeds ranged from 1.0 to 3.0 ms−1 included 55 stumbles (N = 25 pairs of subjects). RESULTS: The identified heel strike using the wearable unit occurred ± 28 ±5 ms after heel strike measured using an FSR. The stride times calculated using the algorithm differed from the FSR by an average of 2.0 ± 0.16 ms. Less than 0.1% of the strides were not identified by the algorithm. CONCLUSION: The wearable unit and algorithm is suitable for use in gait studies measuring stride times during solo and 3-legged walking. Supported by HHMI grant number 52007536 and 52007544.

Soldiers are fielded with a wide range of loads to carry including battery powered electronic devices. An energy harvesting backpack (EHB) was developed to convert gait kinetic energy into electrical power, providing a power source to recharge batteries and reduce the load of extra batteries carried in standard backpacks. Little is known about the kinematic effects of carrying the EHB compared to the military standard assault pack (AP). PURPOSE: To determine if trunk lean changes when carrying the EHB compared to the AP and whether these changes are affected by pack, load, and speed. METHODS: Sixteen subjects (28.6±4.7 years; 173.9±10.1 cm; 76.9±16.1 kg) walked on an instrumented treadmill under 8 combinations of pack, load, and speed conditions each for 5 minutes. Conditions included 1) pack: AP and EHB, 2) load: 7.9 kg (light) and 15.9 kg (heavy), and 3) speed: 1.34 m/s and a self-selected faster speed. Due to its design, the empty EHB mass was 4.4 kg greater than the AP. Kinematic data were collected using a 3D motion capture system. The results indicate that hip moment was highly correlated (r=0.67). The predicted walk-to-run transition stride frequency was 69.7±3.3 and 77.4±2.7 strides/min (p=0.03). The freely chosen running stride frequency showed almost perfect relative reliability and high absolute reliability.
were calculated to collect trunk lean relative to the vertical axis (degrees). A 3-way repeated measures ANOVA was used to determine effects of pack, load, and speed on trunk lean with an alpha level set a priori at p<0.05. Post-hoc pairwise comparisons were performed with Bonferroni corrections. **RESULTS:** A significant main effect of speed on trunk lean (F(1,14)=44.1, p<0.001) was observed where forward lean was greater at faster speeds (Slow: 3.8±1.6°; Fast: 7.5±0.7°, F(1,14)=44.1, p<0.001). There was a significant pack x load interaction on trunk lean (AP-Light: 1.4±2.1; AP-Heavy: 4±5.5; EHB-Light: 5.5±2.9; EHB-Heavy: 10.9±3.4; F(1,14)=15.5, p<0.002). Subjects using the EHB walked with greater increase in forward lean when carrying the heavy load. **CONCLUSION:** Walking with heavy loads and carrying the EHB produced greater increase in forward lean when compared to the AP. This suggests a potential nonlinear effect of pack and load on trunk lean. The weight cost or oscillation of the EHB may also contribute to these changes in gait. Phase relationships between the user and EHB centers-of-mass should be examined in future research to help elucidate gait biomechanics. Further analysis is also warranted to determine tradeoffs in power generated from the EHB and Soldier biomechanics while walking with the system.

---

**S554 Vol. 49 No. 5 Supplement**

**11:00 AM**

**FRIDAY, JUNE 2, 2017**

---

**2612 Board #132 June 2 9:30 AM - 11:00 AM**

**Test-retest Reliability Of Spatial-temporal Characteristics In Novice Walkers**

Sydni Wilhoite, Sally-Marie Futch, Nicholas Murray, Li Li, FACSM. Georgia Southern University, Statesboro, GA.

(No relationships reported)

Infant walkers have immature gait patterns. Small perturbations to gait, such as a dry diaper, could impact their already unstable spatial-temporal gait characteristics. However, little is known regarding the test-retest reliability of spatial temporal measurements as measured by the GAITRite of novice walkers in dry diapers.

**PURPOSE:** To determine the reliability of spatial-temporal gait characteristics, such as Velocity, Cadence, Stride length, and Base of Support in 13-16 month old novice walkers wearing a dry diaper.

**METHODS:** The project was approved by local IRB board and participated with written consent from legal guardians. 18 novice walkers, 9 males and 9 females, (14.4±1.0 months of age) participated in a series of 5 walking trials at a self-selected pace in a dry diaper on the GAITRite System (sampling rate 120Hz) on two separate testing sessions one week apart (Day 1 and 2). During each session, participants were fitted with the dry diaper and encouraged to walk 5 or more steps continuously for each trial, five trials total, over the GAITRite. Upon completion of each testing session, the raw data was exported and averaged across five trials for each day. Average gait velocity (cm/s), cadence (step/s), stride length (cm) and base of support (cm) were calculated at each time point. Intraclass Correlations were employed to assess between-day reliability. **RESULTS:** Gait Velocity, 92.3 ± 25.0 and 93.6 ± 20.0, for Day 1 and 2 respectively, ICC = 0.848 (95% CI = 0.594 to 0.943); Cadence, 208.6 ± 34.7 and 209.9 ± 25.8, for Day 1 and 2 respectively, ICC = 0.836 (95% CI = 0.561 to 0.939); Stride Length = 53.0 ± 9.0, and 53.5 ± 7.8, for Day 1 and 2 respectively, ICC = 0.767 (95% CI = 0.376 to 0.913).

**CONCLUSION:** The results of the study demonstrated excellent test-retest reliability for Gait Velocity, Cadence, and Stride Length and good test-retest reliability for Base of support when testing 13-16 month old novice walkers in a dry commercially available diaper on the GAITRite. Future research needs to address the test-retest reliability of infants wearing a wet diaper since wet diapers introduce greater perturbation to walking.

---

**2613 Board #133 June 2 9:30 AM - 11:00 AM**

**Altered Locomotive Hip Joint Patterns in Patients with Chronic Ankle Instability**

James Mitchell1, Hyunsoo Kim2, S. Jun Son1, Jordan Read1, Matthew K. Seeley1, J. Ty Hopkins, FACSM1. Brigham Young University, Provo, UT. West Chester University, West Chester, PA. (Sponsor: J. Ty Hopkins, FACSM)

Email: jame1mehtanorr@gmail.com

(No relationships reported)

Lateral ankle sprains are common among athletes and often times lead to chronic ankle instability (CAI). Altered hip joint biomechanics during functional activity has been noted in CAI patients. However, few studies have comprehensively examined locomotive hip joint movement strategies in subjects with CAI.

**PURPOSE:** To examine gait patterns of frontal and sagittal hip kinematics, kinetics, and muscle activation in those with and without CAI. **METHODS:** 100 CAI patients (M=49, F=51; 22±2 yrs, 174±10 cm, 71±14 kg, 82±9% FAAM ADL, 62±13% FAAM Sports, 4.5±2.6 ankle sprains) and 100 controls (M=56, F=44; 22±3 yrs, 172±13 cm, 72±18 kg, 100% FAAM ADL & Sports, no previous sprains) performed five walking trials, while hip joint angles, moments and muscle activation were collected during the stance phase. Functional analyses (n=0) were used to compare the entire stance phase of gait between groups. Functions of each group as well as 95% confidence intervals (CI) were plotted to determine significant differences. If functions and associated 95% confidence intervals did not cross zero, group differences existed. **RESULTS:** Figure 1. CAI subjects demonstrated increased hip flexion and extension, likely a result of greater hip joint moments during stance. CAI patients decreased hip abduction during 45-70% and increased hip abduction between 90-100% of stance. CAI subjects decreased hip abduction moment during 10-14% of stance. Gastroc maximus and medius activation decreased during mid- and terminal stance of gait. **CONCLUSION:** Lack of EMG activation combined with altered biomechanics at the proximal joint may alter the position and loading of distal joints in the chain, potentially affecting injury risk.
Knee osteoarthritis (KO) is one of the most predominant causes of pain, functional decline and disability in elderly. In China, the prevalence of radiographic KO was 42.8% in women and 21.5% in men. Medial KOA has been shown to affect a multitude of biomechanical and gait parameters.

**PURPOSE:**
The objective of study was to investigate the multi-joint of lower extremity motor coordination during walking in individuals with KOA, and then supplies biomechanics theoretical basis for the prevention and rehabilitation of KOA. Motion analysis system and force platforms were used to measure biomechanical data of medial KOA individuals and age-matched controls during walking. Each participant walked at a self-selected, comfortable pace on a 10-m walkway. All biomechanical variables characterizing sagittal-plane joint function were compared between two groups using Independent-Samples T Test. The level of significance was set at α=0.05.

**RESULTS:**
Significant reductions were observed for medial KOA group compared to control group in terms of the left, right step length (0.62±0.05m vs. 0.70±0.02m, P<0.05; 0.61±0.05m vs. 0.68±0.05m, P=0.05) and gait speed (1.28±0.12m/s vs. 1.39±0.13m/s, P<0.05).

Significant differences were observed in the peak flexor (0.77±0.13Nm/kg vs. 1.00±0.23Nm/kg, P<0.05) and extensor muscle torque (-0.58±0.16Nm/kg vs. -0.88±0.20Nm/kg, P<0.05) of left hip between medial KOA and controls; Ankle joint angle at the heel-strike portion in medial KOA individuals were greater than controls (-5.11±3.22° vs. -1.03±3.75°, P<0.05). Besides, peak dorsiflexor moment (0.19±0.05Nm/kg vs. 0.29±0.07Nm/kg, P<0.05) were different between two groups.

During the heel-strike portion, midstance portion and terminal portion of stance phase, Significant differences were observed in the peak angle of left knee between two groups: 6.9° ±1.9° vs. -2.2±1.6°, P<0.05; -16.6±2.5° vs. -18.0±2.6°, P<0.05; -9.2±2.3° vs. -5.5±1.9°, P<0.05). Besides, knee extensor muscle torque of heel-strike in KOA group are less than that in control group.

**CONCLUSION:**
The biomechanical changes of knee induced by disease will alter the angle, muscle torque of adjacent joints. So in future rehabilitation and prevention of medial KOA, we should not only do focus on knee joint alone, but also other joints motion.

**Methods:**
To examine the association between obesity and plantar pressure distribution and to evaluate its relationship with body fat distribution in older women. Overweight and obesity are associated with increased peak pressure in older women, regardless of body fat distribution patterns. Therefore, clinicians dealing with foot problems should consider the effect of increased bodyweight on plantar pressure.

**Purpose:**
To determine the effect of the prototype KT Flex product, knee sleeve with stabilizing splints and two other KT Tape conditions on lower extremity hip and knee kinematics and ground contact time during running and walking.

**Methods:**
23 Healthy College aged individuals (18 men, 5 women) (age 23.42 ±2.66;174.04 cm ±7.72; 68.78 kg ±12.95) served as their own control and completed all 5 conditions in random order. All subjects walked (3 mph) and jogged (7 mph) on an instrumented treadmill for 30 seconds under 5 separate conditions: 1) Normal (no intervention), 2) KT Flex on lateral knee, 3) KT Flex on lateral and KT Tape on medial knee, 4) KT Tape on medial and lateral knee, and 4) Knee sleeve with medial and lateral support springs. 18 reflective markers were used with 12 Vicon motion analysis cameras. Peak knee flexion during both stance and swing, peak hip flexion during swing, and peak knee and hip rotation were measured. Motion capture data was processed using Visual 3D. The results were evaluated using a General linear model ANOVA with pairwise comparisons for both walking and jogging conditions.

**Results:**
The only significant difference was found in Peak knee flexion angle during stance phase of walking between the knee sleeve and KT Flex with Medial KT Tape (p=0.034). The knee sleeve kept the knee in 3° more flexion. No other significant (p<0.05) differences were found between any of the measured variables within walking or jogging conditions.

**Conclusion:**
The KT Flex prototype product and generic knee sleeve with spring support do not alter gait kinematics during running and the effect on measured variables was similar. The knee sleeve caused more flexion in stance during walking. Both types of equipment can be used without interfering with normal running mechanics. These findings are significant to serious runners considering using knee support products which have been reported in the literature to help reduce various pain related syndromes.
Older breast cancer survivors (BCS) report more falls and less stability than older adults with no cancer history. Spatio-temporal gait parameters are often used as indicators of fall risk in older adults. PURPOSE: To assess the differences in forward, backwards, and accelerated forward walking in BCS in comparison to a control group.

METHODS: 13 postmenopausal BCS (mean age: 58.5±8.5 years) and 8 control (mean age: 60.8±6.1 years) participated. Four BCS had surgery, chemo and radiation done. Gait was measured on the 16x4' Zeno walkway. Participants completed 5 trials each of forward, backward, and accelerated forward walking conditions. Participants had a lead and follow-up distance of 1 m to capture steady-state gait. Gait speed, step length, step time, and stride width were used as dependent variables. A mean of five trials was used to run a Group X Condition ANOVA. RESULTS: Significant group main effect indicated that BCS (59.63±1.38cm) had significantly shorter step length compared to healthy controls (64.42±1.76 cm) across all conditions (P<0.045). Significant condition main effect was observed for all the variables (all post hoc tests P<0.001). All participants walked significantly slowest during backwards condition (0.91±0.03ms/s), followed by forward (1.24±0.03ms/s) and accelerated forward (1.76±0.06ms/s) conditions. All participants walked with significantly shorter step length during backwards condition (48.42±1.76cm), followed by forward (44.38±1.01cm) and accelerated forward (12.06±1.12cm) conditions. Participants took significantly shorter step time during accelerated forward condition (0.42±0.01s) compared to forward (0.52±0.01s) and backward (0.54±0.02s) conditions. All participants walked with significantly wider stride during backwards condition (16.07±0.77cm) compared to forward (7.65±0.47cm) and accelerated forward (7.31±0.50cm) conditions. No significant interaction was observed. CONCLUSION: Shorter step length irrespective of forward or backwards walking could indicate a more conservative gait approach as forward or backwards walking could indicate a more conservative gait approach among BCS. Overall, spatio-temporal gait parameters among BCS seem to be similar compared to healthy controls. Whether these results hold true based on exposure to surgery and/or radiation and/or chemo therapy needs to be determined.

One of the early signs of Multiple Sclerosis (MS) is weakness on one side of the body, which is experienced by more than 75% of people with MS (PwMS). In addition, up to 92% of PwMS are affected by fatigue. Our previous findings indicate that leg strength asymmetries are associated with imbalanced muscle activity during walking. PURPOSE: To determine the association between leg strength asymmetries and walking characteristics, as indicated by total distance covered and step count, during a 6-minute walk test in PwMS. METHODS: PwMS (aged 46-52 yrs) with self-reported asymmetries (2-5 on a 1-5 scale) and moderate disability (PDDS score 2-6) completed a series of maximal voluntary contractions of the knee extensors on each leg. Subsequently, participants walked as quickly and safely as possible during a 6-minute walk test in a hallway with 2 cones placed 29 m apart. Pods with built-in accelerometers were strapped on both ankles to detect steps. In addition, ratings of perceived exertion (RPE) and distance covered were recorded every minute. Stride length was then calculated by dividing total distance by step count. RESULTS: The distance covered by the PwMS was 391 ± 110 m with 572 ± 86 steps. The average increase in stride length from minute to minute was 8 ± 4 %. The average difference in leg strength was 27 ± 12 %. The subject with the greatest leg strength asymmetry (37%) demonstrated the shortest distance during the 6-minute walk test (307 m) and the greatest change in stride length (12%). Furthermore, RPE and distance covered were imbalanced during the first hour of the test. The maximum rate of decline in performance during the 6 minutes. Conclusion: These preliminary data indicate that leg strength asymmetries may result in altered walking strategies during a 6-minute walking test in PwMS. While previous studies have used the 6-minute walking test as a measurement of fatigue, in this sample, fatigability, defined as a decline in performance over time, appears to rather manifest itself as changes in walking characteristics.

Board #142 June 2 9:30 AM - 11:00 AM Changes In Healthy Old Adults’ Gait Biomechanics Following Short-term Lower Extremity Power Training

Azusa Uematsu1, Tibor Hortobagyi, FACSM2, Kazushi Tsuchiya1, Norio Kadono1, Hirofumi Kobayashi1, Tomoya Ogawa1, Shuji Suzuki1, 1Dokkyo Medical University, Shimotsuga-gun, Japan. 2University of Groningen, Groningen, Netherlands. Waseda University, Tokorozawa, Japan. 3The University of Tokyo, Meguro-ku, Japan. (Sponsor: Tibor Hortobagyi, FACSM) Email: auematsu@dokkyomed.ac.jp (No relationships reported)

PURPOSE: Age-related slowing of walking speed predicts many clinical conditions later in life. A variety of exercise programs can increase old adults’ habitual and fast gait speed. However, the biomechanical mechanism of how old adults make use of the newly acquired physical abilities during gait is still unknown. Here, we examined the kinematic and kinetic mechanisms of how lower extremity power training increases healthy old adults’ gait speed.

METHODS: 12 males and 10 females (age 70-81 y) were randomly assigned to a control (n = 7) and training group (n = 15). The training intervention consisted of 16 sessions, administered over 8 weeks to improve lower extremity muscle power by assessment of gait at baseline (n=24), while symptomatic (n=13) and/or when cleared to return-to-play (n=10). The gait protocol (10m walk under single and dual task conditions) was assessed pre and post intervention through the use of the Mobility Lab software using ADPM sensor system. Gait measures included cadence, gait speed, step length, step duration and double stance time. RESULTS: A 2 (cognitive load) x 3 (phase assessment) MANOVA was conducted. There was a significant overall cognitive load main effect (p<0.05), assessment phase main effect (p<0.01) and a cognitive load x assessment phase interaction (p<0.05). Univariate analysis showed there were significant differences for all variables when a cognitive load was added (p<0.05). There were no significant differences found for gait speed (p>0.05), but significant differences were found between assessment phase groups for double support (p<0.05), step duration (p<0.05) and cadence (p<0.05). CONCLUSIONS: Time point in recovery and cognitive load affects gait patterns and will overall speed may not show differences in recover, underlying mechanisms of control still remain affected even when student-athletes are returned to play. This has implications for concussion recovery and susceptibility to injuries if not fully recovered.
having participants explosively leg press progressively increasing loads of 30-40% of 1-repetition maximum (1RM). We measured participants’ leg muscle strength in five muscle groups and gait biomechanics before and after the training intervention. RESULTS: Training increased maximal leg press load by ~40% (P < 0.05) and maximal voluntary force in five groups of leg muscles by ~32% (P < 0.05) but not in the no-exercise control group. Training (12.3%) vs. control (7.4%) tended to increase habitual and fast gait speed (21.1 vs. 8.9%) more (all P < 0.05). In the training group only, these increases were correlated with decreases in stride length (habitual: r² = 0.84, fast: r² = 0.89). Training made old adults’ gait more erect, as hip and knee extension increased in the stance phase of gait. Training increased ankle joint power by 3.3 J (control: -0.1, Group by Time interaction: P < 0.05), which correlated r² = 0.58 and r² = 0.67 with increases in habitual and fast gait speed without changes in hip and knee joint powers.

CONCLUSION: After the intervention, old adults walked with a more erect gait due to increases in hip and knee extension in the stance phase of gait. The small but significant increase in ankle joint but not in hip and knee joint power correlated with increases in gait speed. The present results provide the first mechanistic insights into how short-term lower extremity power training improves healthy old adults’ gait biomechanics.

Supported by JSPS KAKENHI Grant Number 16K21320.

2623 Board #143 June 2 9:30 AM - 11:00 AM
High Intensity Cycling Improves Spatiotemporal and Kinematic Gait Parameters in Parkinson’s disease Patients
Elise Baron. Cleveland Clinic, Cleveland, OH.
Email: barone@ccf.org
(No relationships reported)

Purpose: Gait dysfunction is a cardinal symptom of Parkinson’s disease (PD). Alterations in gait are more pronounced during dual-task conditions where a cognitive and motor task are performed simultaneously. We have demonstrated that high-intensity aerobic exercise programs improve gait function under single-task (ST) conditions, however its impact on gait function while dual-tasking (DT) is unknown. A fundamental gap exists in understanding how high intensity exercise may impact DT performance. The aim of this project was to determine the changes in gait performance under ST and DT conditions following an 8-week cycling program.

Methods: Eleven individuals with idiopathic PD were recruited to participate in an 8-wk stationary cycling intervention. Participant’s gait was analyzed before and after the intervention using the Computer Assisted Rehabilitation Environment (CAREN) virtual reality system to assess upper and lower extremity kinematics. Participants walked on a treadmill at a self-selected speed while performing three cognitive tasks: N-back, Serial 7’s and Verbal fluency.

Results: MDS-UPDRS scores significantly improved from pre to post testing (-4.72±5.54). Participants demonstrated significant increases in velocity (0.169±0.61 m/s), arm swing path length, hip joint range of motion (ROM), and knee joint ROM during the stance phase of walking tasks. Functional analyses (α=.05) were used to evaluate difference in joint power between groups. If functions and associated 95% confidence intervals did not cross zero, group differences existed.

CONCLUSIONS: To examine the effect of a hip strap on these variables while hiking for extended periods.

A lateral ankle sprain is among the most common sports-related injuries often leading to chronic ankle instability (CAI). Identification of energetic patterns in patients with CAI may clarify underlying injury pathomechanics of CAI.

PURPOSE: To examine the effect of CAI on energetic patterns of the lower extremity joint powers during walking.

METHODS: 100 CAI patients (M=49, F=51; 22±2 yrs, 174±10 cm, 71±14 kg, 82.9± FM, 62±17% FM, 62% non-sprain), and 100 controls (M=56, F=44; 22±3 yrs, 172±13 cm, 72±18 kg, 100% FM) were measured during the stance phase of walking tasks. Functional analyses (α=.05) were used to evaluate difference in joint power between groups. If functions and associated 95% confidence intervals did not cross zero, group differences existed.

RESULTS: Figure 1. CAI subjects had less ankle eccentric power and concentric power during early to mid stance phase. CAI demonstrated decreased eccentric knee joint power during the initial phase and increased eccentric knee joint power during pre-swing phase. Both concentric and eccentric hip joint power were increased throughout the entire stance phase in patients with CAI.

CONCLUSIONS: The CAI group increased proximal joint energetic absorption and generation to compensate for decreased distal joint power during walking compared to a control group. More data are needed to determine if joint power redistribution in CAI patients is a risk factor for further ankle injury.
Chronic ankle instability (CAI) patients often exhibit altered walking mechanics, due to strength and proprioceptive deficits associated with CAI. Reduced strength and proprioception function may decline a gait energetic efficiency, which can reduce shock absorption and power generation. It is unclear whether strength and proprioceptive training can affect walking energetics for CAI patients. PURPOSE: To examine the effect of a 6-week ankle and hip rehabilitation program on ankle, knee, and hip joint energetic patterns during walking in CAI patients. METHODS: 15 CAI patients (23±2 yrs, 178±8 cm, 76±9 kg, 83±7% FAAM ADL, 56±10% FAAM Sports, 3.6±1.1 MAII, 4.7±2.0 ankle sprains) performed ankle and hip strength and proprioceptive exercises (i.e., theraband, wobble board, etc.) 3 times per week for 6 weeks (this was the rehab group). 14 CAI patients (22±2 yrs, 177±9 cm, 75±12 kg, 81±9% FAAM ADL, 56±12% FAAM Sports, 3.4±1.2 MAII, 5.9±3.3 sprains) performed no rehabilitative exercises (this was the control group). We measured ankle, knee, and hip joint power during walking for all patients before and after the exercises. Functional statistics (α=0.05) were used to evaluate the influence of the rehab exercises on joint power for both groups across the entire stance phase of walking. RESULTS: Figure 1. The rehab intervention resulted in up to 0.07 W/kg more positive ankle joint power for both groups across the entire stance phase of walking. CONCLUSION: Data suggest that the strength and proprioceptive training results in an improved gait energetic efficiency through the increased ankle and knee power generation during mid-stance. As greater muscular strength can lead to an increase in power absorption and generation, the intervention focusing on strength should be beneficial in improving walking energetics in a CAI population.

A major health concern for individuals with MS is the likelihood of suffering a fall. The cause of any fall is often multifaceted, given the numerous physiological changes linked to this disease process. For this population, tiredness and fatigue are prominent factors linked to increased falls risk, given that these metrics have been linked to a decline in balance, walking ability, sensation and general muscle function. PURPOSE: To assess the effect of performing a standardized endurance task (the six-minute walk test, 6MWT) on gait, balance, strength and falls risk in older adults with MS. METHODS: Twenty-three persons with MS (mean 55.1±9.1 yr) participated in this study whereby their walking ability, balance and falls risk was assessed prior to and after performing the 6MWT. Each person’s falls risk was assessed using the Timed Up and Go (TUG) test and the Physiological Profile Assessment (PPA). The PPA incorporates physiological measures related to falls including vision, sensation, posture, reaction time and muscle strength. Walking ability was assessed using a 20 ft GAITRite mat. RESULTS: At baseline, the MS persons had an increased falls risk reflected by higher PPA values (2.4±0.4, slow TUG times (13.9±0.4 s) compared to age-matched normative adults. Following the 6MWT, the MS group exhibited no significant changes in gait performance from baseline (velocity 1.07 to 1.04 ms, p=0.284; Cadence 15 to 17 steps/min, p=0.645). In contrast, significant declines in knee extension strength (from 27.3 to 23.2 kg, p<0.05) and increases in postural sway (from 8.3±3 to 11.9±3 cm, p<0.05) and falls risk (2.8±0.3, p<0.05) were for the MS group. CONCLUSION: Compromised balance control leading to the increased likelihood of suffering a fall is a major problem for persons with MS. For the current study, we assessed the impact of performing the standardized clinical assessment of endurance on gait, balance and overall falls risk. Interestingly, the immediate effects of the 6MWT were not reflected by any notable change in gait performance. However, declines in balance control, knee extension strength, and increased falls risk were seen following the 6MWT. Overall, it would appear that while mobility (i.e. gait) of the person with MS was not affected by this endurance task, general stability and balance were compromised.
Thirty-one subjects volunteered for the study (males=13; females=18). Nine highly trained cyclists (18-55 years of age) performed a graded exercise test while wearing the Insight and data was simultaneously collected via the TrueOne metabolic cart and Lactate Plus analyzer. Lactate threshold heart rate (HR) and lactate concentration were determined. The BSX Insight is a wearable NIRS device that evaluates lower limb muscular power and is practical for users to estimate their SLHmax performance and perform a SLHmax (on dominant and non-dominant legs) during a basketball game (8-9.5 h). The reliability of the basketball drills was determined using a 10-min warm up and followed by four ~20-min quarters consisting of 13 basketball drills; involving sprinting, vertical jumping (VJ), shooting, dribbling, passing, pre-planned agility, reactive agility, and a basketball-specific cognitive task (recall of a mock scouting report and game plan). Heart rate (HR) was measured continuously. Subjects received the same volume of a carbohydrate-free, electrolyte beverage to maintain euhydration during both trials. Paired samples t-tests and coefficient of variation (CV) were used to assess the reliability of each drill between mean values of the two trials. Results: There were no differences between trials in mean HR (160 ± 11 bpm vs. 161 ± 10 bpm, p=0.77). There were no differences in performance between trials for any of the drills (p > 0.05). Between-trial CV’s by drill were as follows: 15±4 VJ max height (11.5%) and mean height (6.8%), pre-planned agility (3.9%), passing accuracy (9.8%), dribbling speed (3.7%), mid-range shooting accuracy (13.1%), lay up accuracy (3.3%), reactive agility (7.0%), lane slides (3.5%), 3-point shooting accuracy (14.7%), sprints (4.3%), rebounding (7.9%), free throw accuracy (15.8%), and accuracy on the cognitive task (9.4%). Shooting accuracy was more reliable in the guards vs. posts; mid-range (9.0% vs. 15.4%), 3-point (8.5% vs. 19.4%), and free throw (9.4% vs. 18.7%). Conclusion: The reliability of the basketball drills in 14-19 y players ranged from 3 to 16% and varied by player position. Future research is needed to determine the validity (e.g., identifying different skill levels) and sensitivity (e.g., measuring the efficacy of nutritional interventions) of this novel basketball-specific protocol.

There is limited information available on sport-specific performance protocols in basketball, particularly where reliability has been assessed. Purpose: To determine the reliability of a set of drills designed to assess a wide variety of skills related to basketball-specific performance. Methods: Seventeen (8 guards, 9 posts) competitive, male basketball players (171 ± 1 y, 72.6±11.9 kg) completed a familiarization visit followed by two identical experimental trials. Subjects ate a consistent diet 24 h before each trial and consumed 500 ml water and a granola bar 3 h before each trial. The test protocol began with a 10-min warm up, followed by four ~20-min quarters consisting of 13 basketball drills; involving sprinting, vertical jumping (VJ), shooting, dribbling, passing, pre-planned agility, reactive agility, and a basketball-specific cognitive task (recall of a mock scouting report and game plan). Heart rate (HR) was measured continuously. Subjects received the same volume of a carbohydrate-free, electrolyte beverage to maintain euhydration during both trials. Paired samples t-tests and coefficient of variation (CV) were used to assess the reliability of each drill between mean values of the two trials. Results: There were no differences between trials in mean HR (160 ± 11 bpm vs. 161 ± 10 bpm, p=0.77). There were no differences in performance between trials for any of the drills (p > 0.05). Between-trial CV’s by drill were as follows: 15±4 VJ max height (11.5%) and mean height (6.8%), pre-planned agility (3.9%), passing accuracy (9.8%), dribbling speed (3.7%), mid-range shooting accuracy (13.1%), lay up accuracy (3.3%), reactive agility (7.0%), lane slides (3.5%), 3-point shooting accuracy (14.7%), sprints (4.3%), rebounding (7.9%), free throw accuracy (15.8%), and accuracy on the cognitive task (9.4%). Shooting accuracy was more reliable in the guards vs. posts; mid-range (9.0% vs. 15.4%), 3-point (8.5% vs. 19.4%), and free throw (9.4% vs. 18.7%). Conclusion: The reliability of the basketball drills in 14-19 y players ranged from 3 to 16% and varied by player position. Future research is needed to determine the validity (e.g., identifying different skill levels) and sensitivity (e.g., measuring the efficacy of nutritional interventions) of this novel basketball-specific protocol.
no significant mean differences were noted for any HRV variable. Intraclass correlation coefficients were significant for SDNN (0.87), RMSSD (0.78), LF (0.83), HF (0.76), but not for LF/HF (0.38), LFnu (0.38), and the LF/HF ratio (0.43). Bland-Altman analysis showed good agreement for all HRV variables (P > 0.05).

CONCLUSION: Results suggest that HRV variables measured during steady-state exercise at moderate exercise intensity were repeatable, particularly those associated with parasympathetic function. Future research is needed at higher intensities, when parasympathetic withdrawal has occurred, and sympathetic control of heart rate is the dominant factor.

In order to prescribe training intensities based on maximal heart rate (MHR), it is important to determine the potential differences in MHR using a variety of different testing conditions. Systematic differences in MHR across testing and competition conditions are poorly defined. PURPOSE: To determine if MHR varies between laboratory testing, field testing, practice, games and an age-prediction equation in collegiate female hockey athletes. METHODS: MHR was measured in 16 NCAA Division 1 female hockey athletes during a progressive, graded maximal treadmill test (MHRFIELD), on-ice fitness testing (MHRICE), one season of practices (MHRPRD) and games (MHRGAME), and estimated by an age prediction equation (208.7 - 4.4 x age; MHRRED). Participants were excluded if they failed to obtain 2 out of 3 criteria during MHRFIELD: 1) RER ≥ 1.1, 2) plateau in VO2 and 3) attainment of ≥90% of MHRRED. MHR measures were compared across different methods by Kruskall-Wallis tests and Pearson correlation coefficients were determined between the different methods.

RESULTS: MHRFIELD (194.5 ± 6.0 bpm) was significantly higher than MHRICE (192.3 ± 4.9bpm, p < 0.037) and lower than MHRRED (201.1 ± 8.3 bpm, p = 0.018) and MHRGAME (201.1 ± 11.0 bpm, p = 0.01), but not significantly different from MHRPRD (193.8 ± 9.0 bpm, p = 0.64). Significant correlations were found between MHRFIELD and MHRICE (r = 0.79, p < 0.001), but not MHRPRD (r = 0.41, p = 0.10) or MHRGAME (r = 0.10, p = 0.70). MHRRED was not correlated with any other methods (r = 0.15 to 0.22, p > 0.05 for all). CONCLUSIONS: Among elite female hockey athletes, MHRFIELD and MHRRED were significantly lower than practices and games. This suggests that MHR from competition may overestimate the heart rate that is representative of maximal aerobic capacity. Use of this value as a reference to prescribe training volume could result in unintentionally higher training loads with potentially increased risk of overtraining or injury.

A customized submaximal exercise test for cycle ergometry was reported as a superior estimate of maximum oxygen uptake (V̇O2max) in comparison to the YMCA bike test. PURPOSE: Following similar methodology, we sought to evaluate a group-specific, submaximal treadmill test (MSST) with the best fit to the YMCA test.

METHODS: Participants (29 women and 21 men; age = 31.7 ± 11.4 y, BMI = 24.02 ± 3.03) performed a graded exercise test (GXT) with a subsequent exhaustive, square-wave bout for the verification of true V̇O2max. In counterbalanced-order, subjects then completed submaximal protocols. The MSST consisted of 2-3 min stages estimated at 35% and 70% of V̇O2max, where V̇O2max was estimated with a linear regression equation utilizing gender, BMI, age, and self-reported physical activity.

RESULTS: VO2 values from the GXT and verification bout were 47.2 ± 7.7 and 47.0 ± 7.7 ml·kg⁻¹·min⁻¹, respectively (ICC = 0.99, CV = 2.0%, TE = 0.83 ml·kg⁻¹·min⁻¹), with the highest value used as “true” V̇O2max. Neither the Bruce (45.95 ± 6.97 ml·kg⁻¹·min⁻¹) nor the MHR (49.8 ± 9.5 ml·kg⁻¹·min⁻¹) differed from “true” V̇O2max. The MHR field test had a “very large” measurement agreement with “true” V̇O2max (ICC = 0.78, CV of 9.1%, TE = 4.07 ml·kg⁻¹·min⁻¹). The Bruce had a “large” measurement agreement with “true” V̇O2max (ICC = 0.62, CV of 10.0%, TE = 4.51 ml·kg⁻¹·min⁻¹).

CONCLUSIONS: Our results suggest that the MSST is superior to the Bruce protocol because it yields a better measurement agreement for “true” V̇O2max, is more time efficient, and can be used to prescribe exercise.

Modern smartphones allow measurement of heart rate (HR) via detection of pulsatile photoplethysmographic (PPG) signals from the fingertips or the face without physical contact by extracting subtle beat-to-beat variations of skin color that is similar to HR fluctuations with built-in cameras. PURPOSE: To evaluate HR measurements at rest and after exercise using a smartphone based PPG detection application.

METHODS: Forty healthy subjects (50% males; mean age 24.7 ± 5.2 years; V̇O2max Bruce ± 7.7 ml·kg⁻¹·min⁻¹, respectively (ICC = 0.99, CV = 2.0%, TE = 0.83 ml·kg⁻¹·min⁻¹), with the highest value used as “true” VO2max (47.7 ± 7.7 ml·kg⁻¹·min⁻¹). Neither the Bruce (45.95 ± 6.97 ml·kg⁻¹·min⁻¹) nor the MHR (49.8 ± 9.5 ml·kg⁻¹·min⁻¹) differed from “true” V̇O2max. The MHR field test had a “very large” measurement agreement with “true” V̇O2max (ICC = 0.78, CV of 9.1%, TE = 4.07 ml·kg⁻¹·min⁻¹). The Bruce had a “large” measurement agreement with “true” V̇O2max (ICC = 0.62, CV of 10.0%, TE = 4.51 ml·kg⁻¹·min⁻¹).

CONCLUSIONS: Our results suggest that the MSST is superior to the Bruce protocol because it yields a better measurement agreement for “true” V̇O2max, is more time efficient, and can be used to prescribe exercise.

Modern smartphones allow measurement of heart rate (HR) via detection of pulsatile photoplethysmographic (PPG) signals from the fingertips or the face without physical contact by extracting subtle beat-to-beat variations of skin color that is similar to HR fluctuations with built-in cameras. PURPOSE: To evaluate HR measurements at rest and after exercise using a smartphone based PPG detection application.

METHODS: Forty healthy subjects (50% males; mean age 24.7 ± 5.2 years; V̇O2max Bruce ± 7.7 ml·kg⁻¹·min⁻¹, respectively (ICC = 0.99, CV = 2.0%, TE = 0.83 ml·kg⁻¹·min⁻¹), with the highest value used as “true” VO2max (47.7 ± 7.7 ml·kg⁻¹·min⁻¹). Neither the Bruce (45.95 ± 6.97 ml·kg⁻¹·min⁻¹) nor the MHR (49.8 ± 9.5 ml·kg⁻¹·min⁻¹) differed from “true” V̇O2max. The MHR field test had a “very large” measurement agreement with “true” V̇O2max (ICC = 0.78, CV of 9.1%, TE = 4.07 ml·kg⁻¹·min⁻¹). The Bruce had a “large” measurement agreement with “true” V̇O2max (ICC = 0.62, CV of 10.0%, TE = 4.51 ml·kg⁻¹·min⁻¹).

CONCLUSIONS: Our results suggest that the MSST is superior to the Bruce protocol because it yields a better measurement agreement for “true” V̇O2max, is more time efficient, and can be used to prescribe exercise.

Modern smartphones allow measurement of heart rate (HR) via detection of pulsatile photoplethysmographic (PPG) signals from the fingertips or the face without physical contact by extracting subtle beat-to-beat variations of skin color that is similar to HR fluctuations with built-in cameras. PURPOSE: To evaluate HR measurements at rest and after exercise using a smartphone based PPG detection application.

METHODS: Forty healthy subjects (50% males; mean age 24.7 ± 5.2 years; V̇O2max Bruce ± 7.7 ml·kg⁻¹·min⁻¹, respectively (ICC = 0.99, CV = 2.0%, TE = 0.83 ml·kg⁻¹·min⁻¹), with the highest value used as “true” VO2max (47.7 ± 7.7 ml·kg⁻¹·min⁻¹). Neither the Bruce (45.95 ± 6.97 ml·kg⁻¹·min⁻¹) nor the MHR (49.8 ± 9.5 ml·kg⁻¹·min⁻¹) differed from “true” V̇O2max. The MHR field test had a “very large” measurement agreement with “true” V̇O2max (ICC = 0.78, CV of 9.1%, TE = 4.07 ml·kg⁻¹·min⁻¹). The Bruce had a “large” measurement agreement with “true” V̇O2max (ICC = 0.62, CV of 10.0%, TE = 4.51 ml·kg⁻¹·min⁻¹).

CONCLUSIONS: Our results suggest that the MSST is superior to the Bruce protocol because it yields a better measurement agreement for “true” V̇O2max, is more time efficient, and can be used to prescribe exercise.
PURPOSE: Using a verification phase test (VP) following a graded exercise test has been shown to be superior to secondary criteria to determine a “true” VO\textsubscript{2max}. It has not been determined if a sex difference in the optimal intensity for cycle ergometry VP testing exists. METHODS: 31 participants (16 females, age: 21±1.5 yrs, BMI: 23.2±3.3 kg/m\textsuperscript{2}, 15 males, age: 22±1.5 yrs, BMI: 24.5±2.2 kg/m\textsuperscript{2}) completed a ramp VO\textsubscript{2max} test, then on 4 subsequent days, in random order, completed VP tests at 80, 90, 100, and 105% of the peak wattage achieved during the initial ramp test. RESULTS: The VO\textsubscript{2max} values for each test (Ramp, 80%, 90%, 100%, and 105%) for women were 2.36±0.35, 2.29±0.34, 2.34±0.33, 2.35±0.31, 2.32±0.32 L/min and for men were 3.65±0.66, 3.67±0.71, 3.67±0.67, 3.56±0.51, 3.49±0.48 L/min. For males VO\textsubscript{2max} at 105% was significantly lower than Ramp (P=0.02), 80% (P <0.01), and 90% (P=0.02). Also VO\textsubscript{2max} at 80% (P = 0.07) and 90% (P = 0.08) was marginally higher than at 100%. Females showed no significant differences between VO\textsubscript{2max} values for any VP or Ramp test. 10 of the 16 female subjects had their highest VO\textsubscript{2max} during the 100 or 105% VP while 12 of 15 male subjects had their highest from a VP at a submaximal wattage. When comparing all VP’s a significant sex x test interaction (P=0.01) was observed. CONCLUSIONS: Submaximal VP intensities of 80% and 90% of max wattage achieved on the ramp test produce the highest VO\textsubscript{2max} values in males. In females the maximal and supramaximal intensities most frequently produced the highest VO\textsubscript{2max} values whereas the 80% led to excessive time to exhaustion (9.23±4.99 min). In order to obtain the highest VO\textsubscript{2max} values in the most optimal test time we recommend using 90% of max wattage in males and 100% or 105% of max wattage in females.

 PURPOSE: The applicability of verification phase (VP) testing as a means to confirm the attainment of a ‘true’ VO\textsubscript{2max} in males with obesity is widely unknown due to only two previous published studies on this population. The aim of the present study was to assess the validity of verification phase testing on separate days in males with obesity and determine the optimal work rate at which the highest VO\textsubscript{2max} can be elicited. METHODS: Nine healthy males with obesity between the ages of 18 and 35 (age = 24.1 ± 0.61 years; body mass index [BMI] = 33.2 ± 4.2 kg/m\textsuperscript{2}) performed a ramp-style VO\textsubscript{2max} test on the cycle ergometer followed by four randomly assigned constant power (verification phase) tests on separate days. VP tests were set at 80, 90, 100 and 105% of maximal wattage (W\textsubscript{max}) attained during the ramp test. RESULTS: All participants but one attained a higher, but not significant, VO\textsubscript{2max} (L/min) during a VP test to values elicited during the initial ramp test. A trend (p=0.06) was shown for VO\textsubscript{2max} during the 90% (3.61 ± 0.54 L/min) VP to be higher than the ramp (3.37 ± 0.39 L/min). A trend (p=0.06) was also seen for VO\textsubscript{2max} during the 90% VP (3.61 ± 0.54 L/min) to be higher than the 105% (3.41 ± 0.53 L/min) test. HR\textsubscript{max} was significantly lower/ during the 105% VP (170 ± 17 b/min) compared to the 80% (177 ± 16 b/min, P<0.02) and 90% (176 ± 14 b/min, P=0.02) VP tests. CONCLUSION: Verification phase tests at submaximal work rates, of 90% of W\textsubscript{max} attained during the ramp test, may elicit the highest VO\textsubscript{2max} and HR\textsubscript{max} in males with obesity. Using a verification test in this population may provide more accurate VO\textsubscript{2max} results as well as more accurate HR based exercise prescriptions.

PURPOSE: To examine the physiological responses during a GXT when using two-way breathing valves with differing resistances to airflow. METHODS: Forty healthy subjects participated in this study (10 endurance trained males (ETM), 10 endurance trained females (ETF), 10 recreationally active males (RAM), and 10 recreationally active females (RAF)). On two separate occasions, subjects performed identical GXTs using either the Rudolph 2700 (high resistance) or the Daniels’ (low resistance) breathing valve. The GXTs were completed on a treadmill and consisted of a submaximal and a maximal phase. During the submaximal phase, running economy (RE), energy expenditure (EE), ventilation (\textit{V}‘L), heart rate (HR) and respiratory exchange ratio (RER) were measured. During the maximal phase, peak oxygen consumption (VO\textsubscript{2peak}), \textit{V}‘L, HR, RER and time to exhaustion (TTE) were measured. RESULTS: When using the Daniels’ valve, all groups had significantly better RE (2.7–3.5, -1.9, and -1.8% for ETM, ETF, ETM and RAF, respectively, p<0.05) and lower EE (2.4–3.4, -2.7, and -2.0% for ETM, ETF, RAM, and RAF, respectively, p<0.05) across all submaximal speeds. The ET group also had lower \textit{V}‘L (4.6 and 3.8% for ETM and ETF, respectively, p<0.05) when using the Daniels’ valve across all submaximal speeds. During the maximal phase, TTE was significantly longer when using the Daniels’ valve for all groups (6.0, 10.9, 6.2 and 9.8% for ETM, ETF, RAM and RAF, respectively, p<0.05). There were no other differences between valves in all groups for the submaximal or maximal portions of the GXT. CONCLUSION: These findings indicate that higher resistance two-way breathing valves alter the assessment of an individual’s RE, \textit{V}‘L and EE during submaximal exercise. Although breathing valve resistance altered TTE, VO\textsubscript{2peak} was unchanged. Therefore, airflow resistance of a breathing valve must be considered when comparing physiological responses to a GXT in the applied and research settings.

The graded exercise test (GXT) is a fundamental tool in the field of exercise physiology, which requires the use of a two-way breathing valve to direct inspiratory and expiratory airflow. These two-way breathing valves impose resistances to airflow and can increase the work of breathing, thus altering an individual’s physiological response to a GXT. PURPOSE: To examine the physiological responses during a GXT when using two-way breathing valves with differing resistances to airflow. METHODS: Forty healthy subjects participated in this study (10 endurance trained males (ETM), 10 endurance trained females (ETF), 10 recreationally active males (RAM), and 10 recreationally active females (RAF)). On two separate occasions, subjects performed identical GXTs using either the Rudolph 2700 (high resistance) or the Daniels’ (low resistance) breathing valve. The GXTs were completed on a treadmill and consisted of a submaximal and a maximal phase. During the submaximal phase, running economy (RE), energy expenditure (EE), ventilation (\textit{V}‘L), heart rate (HR) and respiratory exchange ratio (RER) were measured. During the maximal phase, peak oxygen consumption (VO\textsubscript{2peak}), \textit{V}‘L, HR, RER and time to exhaustion (TTE) were measured. RESULTS: When using the Daniels’ valve, all groups had significantly better RE (2.7–3.5, -1.9, and -1.8% for ETM, ETF, ETM and RAF, respectively, p<0.05) and lower EE (2.4–3.4, -2.7, and -2.0% for ETM, ETF, RAM, and RAF, respectively, p<0.05) across all submaximal speeds. The ET group also had lower \textit{V}‘L (4.6 and 3.8% for ETM and ETF, respectively, p<0.05) when using the Daniels’ valve across all submaximal speeds. During the maximal phase, TTE was significantly longer when using the Daniels’ valve for all groups (6.0, 10.9, 6.2 and 9.8% for ETM, ETF, RAM and RAF, respectively, p<0.05). There were no other differences between valves in all groups for the submaximal or maximal portions of the GXT. CONCLUSION: These findings indicate that higher resistance two-way breathing valves alter the assessment of an individual’s RE, \textit{V}‘L and EE during submaximal exercise. Although breathing valve resistance altered TTE, VO\textsubscript{2peak} was unchanged. Therefore, airflow resistance of a breathing valve must be considered when comparing physiological responses to a GXT in the applied and research settings.
The use of a reduced impact, aquatic environment for physical activity and rehabilitation in older adults has become a focus of recent literature. **PURPOSE**

The present study sought to evaluate the mechanical specificity of countermovement jumps performed on land and in water. **METHODS** Fifty-six young (22.0±3.9 years) adults and twenty-two healthy older (57.3±4.4 years) adults were asked to perform maximal countermovement jumps on land and in chest-deep water. Kinetic and kinematic measures of jump performance were obtained using a tri-axial force platform and two-dimensional videography, respectively. **RESULTS** As expected, peak (PP) and mean mechanical power (MP) outputs were greater (p<0.01) for jumps performed by young vs older adults (PP:732±4035 W; MP:3049±1771 W) and for jumps performed by all subjects in water (PP:9387±3981 W; MP:3781±1864 W) vs land. Compared to young adults, older adults experienced less of an increase in bodyweight normalized PP and MP for jumps performed in water vs land (p<0.05).

Peak movement velocities in older adults tended to be slower, with older adults spending 55% greater time in body unweighting. Compared to land, unweighting time increased more in the water for older adults (Land: 0.5±0.3 s; Water:1.2±0.7 s) than young adults (Land:0.4±0.1 s; Water:0.7±0.2 s). Across ages, amortization rate was 26% greater for jumps performed in water and, in comparison with younger adults, amortization time in older adults was 20% longer in duration. A 1444% increase in peak dorsiflexion velocity for jumps performed in water (66:34° vs 4:27°) suggests that loading strategy during amortization is likely unique from land-based jumping. **CONCLUSION** The aquatic environment produces jumping movements that are mechanically distinct from jumping movements performed on land. The results of the present study suggest that jumping in an aquatic environment may be beneficial in older adults training to improve mechanical power output and lower-extremity neuromuscular function.

**CONCLUSION**

Exercise intensity is traditionally prescribed using %HRmax, %HRR, %VO2max or %VO2R. Recently, the Talk Test (TT) has been proposed as an alternative method to guide exercise intensity. However, it is unknown if prescribing exercise intensity solely using the TT can promote training responses that are comparable to traditional guidelines. **PURPOSE:** To compare the training responses consequent to training using either the TT or %HRR. **METHODS:** Forty-four subjects (17 males and 27 females: age=20.4±3.02 years; ht=170.5±9.79 cm; wt=71.9±13.63 kg) completed an incremental maximal cycle ergometer test, were stratified by VO2max and gender, and randomly assigned to training groups guided by either %HRR (n=20) or the TT (n=24). Both groups completed 40-minute training sessions 3 days per week for 10 weeks. In the HRR group, exercise intensity was targeted at 40-59 %HRR for weeks 1-4, 50-59 %HRR for weeks 5-8, and 60-79 %HRR for weeks 9-10. In the TT group, exercise intensity was targeted at the highest power output that still allowed for comfortable speech. Changes in VO2max, peak power output (PPO – watts and watts/kg), ventilatory threshold (VT); and PO at VT, were compared between groups using two-way ANOVA with repeated measures. **RESULTS:** There were significant (p<.05) pre vs. post increases in VO2max (TT=+10.6%; HRR=+11.5%), PPO - watts (TT=+18.5%; HRR=+14.1%), PPO - watts/kg (TT=+19%; HRR=+14%), VT (TT=+56.9%; HRR=+32.7%), and PO at VT (TT=+39%; HRR=+43%) in both groups as a result of training, with no significant differences (p>0.05) in the magnitude of improvement between groups. **CONCLUSION:** Guiding exercise prescription using the TT is a simple and effective method for prescribing exercise intensity and elicits improvements in exercise performance that are comparable to traditional %HRR guidelines.
Previous research on male subjects demonstrated the validity and reliability of a new ruler-based protocol as an alternative to the Modified Sit and Reach test (Cullum and Turley, 2016 MSSE Abstract). In contrast to the Sit and Reach test, which requires specialized equipment and a person to administer the test, the new protocol only requires commercially available tools and can be administered by the subject without assistance. To date, however, this protocol has not been validated for a female population.

**PURPOSE:** The purpose of this study is to assess the validity and reliability of the ruler-based protocol as an alternative to the Modified Sit and Reach test for a female population.

**METHODS:** Sixty-two females participated in the research project. Following a measurement of height and weight, subjects completed in a randomized order the modified Sit and Reach test using the standard measurement device and the new ruler-based protocol. This procedure had subjects stand with a 12-inch ruler extended from between their hands, bend over at the waist, and allow the floor to push the ruler into their hands as far as possible. The remaining length beyond their fingertips was recorded as their score. A Pearson correlation was utilized to compare the results from the two protocols. A second group of 32 subjects performed both tests in a randomized order on two separate occasions to establish the test-retest reliability of the protocols, as indicated by Intraclass Correlation.

**RESULTS:** Thirteen subjects (age = 22.5 ± 3.4 years) recruited for this study. The push-up is a classic exercise that is used to strengthen the upper body. It is popular because it is a body weight exercise which can be modified to accommodate different ability levels. The push-up is also used to assess muscular endurance during fitness testing. Though several standardized protocols have been established, there are still execution related issues that have not been fully examined to date, which may affect interpretation of testing and training outcomes. **PURPOSE:** To study the effects of cadence on performance and electromyographic (EMG) activity of the pectoralis major and triceps brachii during a push-up exercise to failure in young and healthy college males. **METHODS:** Thirteen subjects (age = 22.5 ± 3.4 years) recruited for this study. Height, weight and body composition were measured. Subjects completed one-set of push-ups to failure at the following cadence during 5 randomly assigned sessions: (1) 120 beats per minute (bpm), (2) 60 bpm, (3) 40 bpm, (4) 30 bpm, (5) self-selected pace (SSP). EMG activity of the right pectoralis major and right triceps brachii were recorded during each session. Repeated measures ANOVA were used to determine differences between sessions. **RESULTS:** Subjects completed 35.15 ± (17.70) push-ups at the self-selected pace, 23.15 ± (13.99) at the 30 bpm, 25.23 ± (12.83) at 40 bpm, 28.31 ± (12.89) at 60 bpm and 31.31 ± (15.04) at 120 bpm. The total number of completed repetitions was significantly different between sessions. SSP, which equated to 98 bpm (+ 20.75) was greater than 30 bpm (p < .001), and 60 bpm (p = .019). Push-ups performed at 120 bpm was greater than 30 bpm (303) and 40 bpm (p = .015) and push-ups performed at 60 bpm was greater than 40 bpm (p = .002). There were no differences in the EMG activity of the pectoralis major or triceps brachii between the 5 cadence sessions. **CONCLUSIONS:** Young and healthy college-age subjects performed more push-ups to failure at a self-selected pace compared to slower cadences without differences in EMG activity in the pectoralis major or triceps brachii. Self-selected pace appears to be optimal in terms of push-up performance compared to slower cadences and supports self-selected for testing purposes. However, additional work is necessary to investigate higher cadences, additional muscles, and energy costs at different speeds.

Lactate threshold (LT) is an important variable to consider for aerobic training programs and has traditionally been analyzed by measuring blood lactate concentration ([La]) during maximal exercise tests. Previously, near-infrared spectroscopy (NIRS) techniques have been used to non-invasively estimate the LT during maximal exercise tests by assessing the microvascular oxygenation (SmO2) response. **PURPOSE:** To determine the validity and reliability of a new wireless NIRS system in estimating the LT during a maximal exercise test. **METHODS:** 10 subjects with minimal cycling experience (29.7 ± 3.4 yrs, 178.0 ± 10.0 cm, 67.0 ± 13.7 kg) were divided into two groups. One group (N = 5) performed both tests to failure using a cycle ergometer and the other group (N = 5) used a treadmill ergometer. **RESULTS:** No significant differences were found between the two protocols. The new wireless NIRS system may be able to accurately and reliably estimate the LT during maximal exercise tests performed on a cycle ergometer in a healthy, adult population.

**PURPOSE:** The purpose of this study is to assess the validity and reliability of the ruler-based protocol as an alternative to the Modified Sit and Reach test for a female population. **METHODS:** Sixty-two females participated in the research project. Following a measurement of height and weight, subjects completed in a randomized order the modified Sit and Reach test using the standard measurement device and the new ruler-based protocol. This procedure had subjects stand with a 12-inch ruler extended from between their hands, bend over at the waist, and allow the floor to push the ruler into their hands as far as possible. The remaining length beyond their fingertips was recorded as their score. A Pearson correlation was utilized to compare the results from the two protocols. A second group of 32 subjects performed both tests in a randomized order on two separate occasions to establish the test-retest reliability of the protocols, as indicated by Intraclass Correlation.

**RESULTS:** Thirteen subjects (age = 22.5 ± 3.4 years) recruited for this study. The push-up is a classic exercise that is used to strengthen the upper body. It is popular because it is a body weight exercise which can be modified to accommodate different ability levels. The push-up is also used to assess muscular endurance during fitness testing. Though several standardized protocols have been established, there are still execution related issues that have not been fully examined to date, which may affect interpretation of testing and training outcomes. **PURPOSE:** To study the effects of cadence on performance and electromyographic (EMG) activity of the pectoralis major and triceps brachii during a push-up exercise to failure in young and healthy college males. **METHODS:** Thirteen subjects (age = 22.5 ± 3.4 years) recruited for this study. Height, weight and body composition were measured. Subjects completed one-set of push-ups to failure at the following cadence during 5 randomly assigned sessions: (1) 120 beats per minute (bpm), (2) 60 bpm, (3) 40 bpm, (4) 30 bpm, (5) self-selected pace (SSP). EMG activity of the right pectoralis major and right triceps brachii were recorded during each session. Repeated measures ANOVA were used to determine differences between sessions. **RESULTS:** Subjects completed 35.15 ± (17.70) push-ups at the self-selected pace, 23.15 ± (13.99) at the 30 bpm, 25.23 ± (12.83) at 40 bpm, 28.31 ± (12.89) at 60 bpm and 31.31 ± (15.04) at 120 bpm. The total number of completed repetitions was significantly different between sessions. SSP, which equated to 98 bpm (+ 20.75) was greater than 30 bpm (p < .001), and 60 bpm (p = .019). Push-ups performed at 120 bpm was greater than 30 bpm (303) and 40 bpm (p = .015) and push-ups performed at 60 bpm was greater than 40 bpm (p = .002). There were no differences in the EMG activity of the pectoralis major or triceps brachii between the 5 cadence sessions. **CONCLUSIONS:** Young and healthy college-age subjects performed more push-ups to failure at a self-selected pace compared to slower cadences without differences in EMG activity in the pectoralis major or triceps brachii. Self-selected pace appears to be optimal in terms of push-up performance compared to slower cadences and supports self-selected for testing purposes. However, additional work is necessary to investigate higher cadences, additional muscles, and energy costs at different speeds.

Individuals who are not regularly physically active are at a greater risk for developing chronic diseases, with at least 1.9 million annual deaths attributed to physical inactivity, making it the fourth leading cause of global mortality. **PURPOSE:** To measure the improvement of a 14-week student-led wellness project aimed at increasing physical activity while also addressing four components of health-related physical fitness: cardio-respiratory fitness, musculoskeletal fitness, body composition, and flexibility. **METHODS:** 46 apparently healthy adults volunteered to participate in this study. Week 1 and 14 were devoted to pre- and post-fitness assessment data collection utilizing The President’s Challenge Adult Fitness Test, Weeks 2-13 were dedicated to addressing the participants’ goals, as well as any strengths/weakness identified in the first fitness assessment. Data were compared using paired t-tests. **RESULTS:** There were statistically significant (p < .05) improvements in the following variables from pre- to post-assessment: resting heart rate (73.6 ± 68.3 bpm), weight (88.7 vs. 86.6 kg), waist circumference (91.1 vs. 86.8 cm), BMI (30.1 vs. 29.3 kg/m²), VO2max (29.7 ± 34.7 mL/kg/min), musculoskeletal fitness (push-ups: 17.1 ± 27.6; sit-ups: 28.3 ± 42.7), flexibility (37.1 vs. 41.5 cm), and overall fitness score (38.5 ± 58.4%). **CONCLUSIONS:** Exercise Science students were effective at improving overall physical fitness and decreasing overall mortality risk in an apparently healthy adult population. Colleges and Universities with Exercise Science programs should aim to decrease physical inactivity on campus by implementing student-led worksite wellness initiatives.
Using visual cues such as colors along with the standardized numerical and verbal descriptors in OMNI scales may be more appealing to an exercise cohort to measure perceived exertion accurately. **Purpose:** To examine the concurrent and construct validity of a newly developed 10-point OMNI Ratings of Perceived Exertion (RPE) Colored Scale (OMNI-Color) in young adult women and men. **Methods:** 40 subjects (age (yrs): 22.75 ± 1.79; weight (kg): 60.05 ± 10.67; height (cm): 167.12 ± 5.87) participated in a cross-sectional, perceptual estimation paradigm to assess exertional differences in grand mean HR (H=62.9, L=61.2), mean RR (1008.8, 1024.8), and VO2 uptake (55.5 ± 5.5 vs 56.6 ± 4.5 ml*kg⁻¹*min⁻¹). Independent sample t-tests were used to identify differences between protocols for VO2 max, VT1 and VT2. **RESULTS:** VO2 max was not different between Bruce and SPV protocols (55.5 ± 5.5 vs 56.6 ± 4.5 ml*kg⁻¹*min⁻¹, respectively, p < 0.15). Five tests (4 during SPV) produced atypical slopes and VT2 identification was difficult. VT1 occurred at a higher %VO2 max in SPV (41.1 ± 8.1 SPV vs 32.2 ± 7.4 Bruce, p = 0.005) as did VT2 (86.4 ± 7.5 SPV vs 67.8 ± 8.9 Bruce, p < 0.001). **CONCLUSIONS:** SPV allowed subjects to alter their pace and their ventilatory responses making it more difficult to identify VT. Higher VT in SPV is in contrast to recent research. The magnitude of difference in VT may be due to both the difficulty in identifying VT in SPV and also the potential for SPV to allow subjects to alter their metabolic requirements and postpone anaerobiosis. Measurement of blood lactate throughout testing is needed to aid in the validation of VT in SPV.
lower lactate accumulation following a VO2max test is associated with the ability to generate higher cumulative accelerations during on-ice sessions among NCAA DIII hockey players.

### 2653
Board #173
June 2 11:00 AM - 12:30 PM
Comparison Of Pre- And Post-season Laboratory And On-ice Measures Among NCAA Division III Hockey Players

Dakota Burke1, Stephen McGregor1, Andrea Workman1, Joe Williams1, Adam Coughlin1, Martin Urbanian1, Eastern Michigan University, Ypsilanti, MI. 2 Saginaw Valley State University, University, Grand Rapids, MI. (Sponsor: Mark Peterson, FACSM)

(Purpose) The purpose of this study was to compare on-ice physiological measures to pre- and post-season off-ice physiological laboratory tests to determine i) the relationship between off-ice tests and on-ice performance and ii) changes over the course of a season among collegiate ice-hockey players. METHODS: Seven NCAA D III male ice hockey players (age 22 ± 0.5, body weight 87.8 ± 6.1 kg, height 185.4 ± 3.4 cm) participated in procedures approved by the Adrain College Human Subjects Committee. Laboratory tests including the Wingate anaerobic test, treadmill VO2max test, and lactate threshold tests, were performed at the beginning and end of the 5 month hockey season. Peak power output (PP), mean power output (MP), and anaerobic fatigue (AF) were assessed by the Wingate test. VO2max test, previously validated among ice hockey players, was used to obtain VO2max values and time on treadmill. Lactate levels were also measured at the end of the VO2max test (V2 Lac) and one minute after the completion of the test (V2 Lac P1). Subjects wore a Zephyr bioharness (Zephyr, MD) to measure on-ice physiological exertions during all practices and games. The sensor measured triaxial accelerations, breathing rate, and heart rate. Statistics were performed using SPSS 21.0 (IBM, NY). Season-long measures were divided into quartiles to correspond to laboratory testing. Data from the sensors from the first and last quartiles was compared to pre- and post-season lab tests. RESULTS: There were no significant differences from pre- to post-season among any laboratory tests. In contrast, there were significant decreases in average on-ice accelerations at 10, 20, 30 and 60 seconds (p<0.05). There were non-significant changes in average accelerations over 20 minutes, while average accelerations over 45 minutes significantly increased (p<0.05). CONCLUSION: The increase in average accelerations over 45 minutes from pre- to post-season suggest an increase in on-ice aerobic fitness. The decrease in average accelerations during anaerobic measures at 10 to 60 seconds suggest decreased anaerobic capacity of the subjects that were not identified by Wingate tests. Wearable sensors may provide additional information to laboratory testing for the assessment of physiological changes across a season among collegiate hockey players.

### 2654
Board #174
June 2 11:00 AM - 12:30 PM
Determination of Trials Needed for Measurement Consistency of Standing Long Jump in Collegiate Volleyball Players

Robert Ah Sue1, Chad Harris, FACSM1, Kent J. Adams, FACSM1, Joseph Berning, FACSM1, Mark DeBeliso, FACSM1. Southern Utah University, Cedar City, UT. 2 Metropolitan State University of Denver, Denver; CO. 3 California State University Monterey Bay, Seaside, CA. 4 New Mexico State University, Las Cruces, NM.

(Purpose) Lower body power is an important physical attribute of competitive volleyball athletes. In order to best evaluate such an attribute, it is important that the test reliability is established using a sport specific athlete group and used in a realistic group of the particular sport. Furthermore, identification of the appropriate number of trials to use during assessment, insures accuracy of scores and time efficiency for coaches. PURPOSE: This aim of this investigation was to establish the minimum number of trials needed for reliability of the standing long jump (SLJ) in female collegiate volleyball players. METHODS: Nine female athletes (age: 18.3 ± 3.0 yrs, height: 179.2 ± 5.3 cm, mass: 68.8 ± 7.9 kg) completed five trials of a SLJ. Jumps were performed at 2, 6, 10, 14 and 18 minutes following a dynamic warm-up. In an attempt to simulate the active nature of sport, the athletes alternated between walking and jogging the length of a basketball court between successive trials. For the SLJ, subjects performed a standard countermovement SLJ and distance in centimeters was measured from the starting line to the rear-most heel upon landing. Pearson (rCC) and Intraclass (ICC) Correlation Coefficients were calculated between successive trials. RESULTS: Means for the for the successive trials were as follows: Trial 1: 1.9:1.41:0.10.1cm; Trial 2: 196.1±10.2cm; Trial 3: 200.0±10.3; Trial 4: 200.0±11.8cm; Trial 5: 200.0±11.8cm. Mean difference between successive trials (i.e. Trials 2 to 1, 3 to 2, 4 to 3 and 5 to 4) were: 4.86±6.9, 3.8±5.5, -0.40±5.6 and 1.1±5.4. PCC and ICC for successive trials were: 0.77 and 0.82; 0.86 and 0.89; 0.88 and 0.91; 0.89 and 0.91. CONCLUSIONS: Given the parameters of this study, adequate assessment of SLJ performance is best achieved using three trials. Enhanced consistency was not realized with application of additional trials. Therefore, when testing female collegiate volleyball athletes for lower body power using the SLJ, three trials are sufficient.

### 2655
Board #175
June 2 11:00 AM - 12:30 PM
Comparison Of Cardiorespiratory Responses During Body Weight-supported Treadmill And Standard Treadmill Exercise

Kyle D. Biggerstaff, Kaitlyn Abruzzese, Desiree Patterson, Christopher Irvine, Matthew F. Brisebois. Texas Woman's University, Denton, TX.

(Purpose) To determine the cardiorespiratory response to graded exercise on a standard treadmill (ST) and body weight-supported treadmill (BWST). METHODS: In random order, 20-36 yr old adults (n = 6 males, 4 females) performed BWST and ST trials. Identical exercise sessions were performed on each treadmill except 25% of body weight was supported by the BWST. On each treadmill a two-minute warm up was performed at 2 mph and 0% grade, followed by 6 minutes of exercise at 3% grade at each of the following treadmill velocities: 3, 4.5, and 6 mph. Expired respiratory gases were analyzed each minute. Steady state heart rate, VO2, VCO2, and RER were calculated as the average value during the final three minutes of each exercise stage. Blood pressure and RPE were recorded during the final minute of each stage. A 2x3 repeated measures ANOVA was used to determine significant differences at the p<0.05 level, and the LSD method for post hoc analyses. RESULTS: There was a significant difference (p<0.05) in absolute VO2 between ST and BWST at 4.5 mph (2.14±0.39 v 1.42±0.27 l/min) and 6 mph (2.75±0.58 v 1.79±0.40 l/min). Relative VO2 was significantly different (p<0.05) at each exercise intensity between treadmills (ST v BWST: 16.0±1.1 v 13.6±1.2 l/min; 20.6±2.4 v 18.9±2.9 l/min; 25.1±2.9 v 22.6±2.4 l/min). There was a significant difference (p<0.05) in VO2 between the ST and BWST at 4.5 mph (1.41±0.3 v 1.22±0.5 l/min) and 6 mph (2.68±0.3 v 1.35±0.3 l/min). There was a significant difference (p<0.05) in RER between the ST and BWST (1.8±0.7 v 1.9±0.9) at each exercise intensity. There were no significant differences in DBP at any point during exercise. There was a significant difference (p<0.05) in RPE on the ST at 6 mph (1.5±1.0 l/min) and 1.3 mph (9±1.1). CONCLUSION: There appears to be a lower cardiorespiratory response during body weight-supported exercise and traditional treadmill exercise.

### 2656
Board #176
June 2 11:00 AM - 12:30 PM
Agreement Between Electromyographic Fatigue And Ventilatory Thresholds During Taekwondo Specific Test

Marcos Paulo Araujo, Pedro Paulo Soares, Matheus Hansen, Débora Esteves, Hilbert Julio, Roberto Tauli, Jonas Gurgel. Fluminense Federal University, Niterói, Brazil.

(Purpose) The aim of the present study is to compare electromyographic fatigue and ventilatory thresholds during taekwondo specific test. METHODS: 10 male taekwondo athletes (20±2yrs, body mass 67.5±6.3kg, height 176±9cm) participated in the study. The University ethics committee approved the study (opinion nº765.698). At first visit, anthropometric assessment and TKDet were performed. TKDet were constituted by 1-min progressive stages of kicking sequences, and kicking interval started from 4,6s and reduced 0,4s every minute until participant’s fatigue. Expired gases were measured continuously with portable analyzer VO2max (MediKrafts, Saint Louis, USA). Ventilatory thresholds were determined with the ventilatory equivalent for carbon dioxide (V’E/VCO2) max. Heart rate, blood pressure and RPE were collected during exercise. Subjects were instructed to maintain the same posture and position during the tests. Subjects were instructed to move forward towards the wireless EMG system connected to a pair of surface electrodes placed in the rectus femoris, according to SENIAM recommendations. EMG signal was recorded continuously during the tests with a frequency of 2000 Hz. EMG was filtered by third order Butterworth band-pass filter. RMS values were calculated during every non-sequential passing windows with 1s duration. EMG thresholds were detected by peak by peak regression (two infections - three segments line). Parametric data were described by mean and standard deviation, 95% confidence interval of mean and compared with Paired T-test (effect size Cohen’s d). Non-parametric data were described by median and interquartile range, 95% confidence interval of median and compared with Wilcoxon test (effect size r). The coefficient of variation of error of measurement were reported to describe data variability, and intraclass correlation coefficient was calculated to determine the agreement. P < 0.05 was adopted for all tests. RESULTS: Detailed results were present in table 1.

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: Although the VO2 values are similar, these methods may not be interchangeable to determine training zones. Supported by CAPES, CNPq, and FAPERJ.

Table 1. Comparison of cardiorespiratory exercise test: electromyographic fatigue and ventilatory thresholds [n=15]

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Mean (SD)</th>
<th>CV</th>
<th>ICC</th>
<th>ICC(95% CO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT1</td>
<td>48.9 (22)</td>
<td>19.3</td>
<td>0.93</td>
<td>0.89 (0.88-0.94)</td>
</tr>
<tr>
<td>VT2</td>
<td>67.4 (24)</td>
<td>16.6</td>
<td>0.92</td>
<td>0.89 (0.88-0.94)</td>
</tr>
</tbody>
</table>

Assessment of barbell velocity during resistance training is an effective tool to gauge progress in strength and power and to manage intra-session fatigue. The criterion measurements of velocity are 3D motion capture or force plate systems; however, the cost of these implements is extraordinary and impractical. Therefore, linear position transducers (LPTs) are commonly used for velocity calculation. Specifically, the TENDO Weightlifting Analyzer System (TWAS), which costs ~$1,000 is widely used. However, the Open Barbell System (OBS) LPT was recently developed for a cost of <$300. PURPOSE: To investigate if average concentric velocity calculations during the barbell back squat via the TWAS and OBS were valid compared to the Optotak Certus 3D (OC3D) motion capture system. METHODS: Twenty-Five males (Age: 25±3yrs, Body Mass: 89.0±14.7kg, Body Fat Percentage: 12.9±4.5%) performed a one- repetition maximum (IRM) back squat followed by one set of maximum repetitions at 70% of the established IRM. Average velocity (AV) was calculated on every IRM attempt and every repetition at 70% of IRM with the OC3D, TWAS, and OBS. For OC3D, AV was calculated from the observed y-coordinates (i.e. vertical position) via post-process coding in the MATLAB program. Both LPTs were attached to the right side of the barbell via a Velcro strap, and AV was displayed immediately upon completion of the lift for the LPTs. Independent samples t-tests between each LPT and OC3D were used to compare AV between devices. To assess agreement between LPTs and OC3D, intraclass correlation coefficients (ICCs) and 95% confidence intervals (CI) were calculated. Significance was set at p≤0.05. RESULTS: The number of usable samples from all IRM squat attempts and repetitions at 70% of IRM were as follows: OC3D-522, TWAS-573, and OBS-558. There was no difference for AV between OC3D vs. TWAS (p=0.54) or OC3D vs. OBS (p=0.48). Regarding ICCs the OBS had an ICC of 0.936 in comparison to OC3D with a 95% CI of 0.914-0.952; while TWAS had an ICC of 0.870 compared to OC3D with a 95% CI of 0.830-0.899. CONCLUSION: Our results indicate that ICC values and CIs associated with the OBS show better validity in comparison to the criterion OC3D for AV than does TWAS. Therefore, the OBS is an effective low-cost option to assess AV during resistance training.

The portable metabolic analyzer (MA) has been commonly utilized in assessing sport- or physical activity related energy expenditure. However, little is known about the validity of the portable MA. PURPOSE: To determine the accuracy of oxygen consumption (VO2) and carbon dioxide (VCO2) production measured by the portable MA, Oxycon Mobile 5.0 (OM) using the Parvo Medic TrueOne 2400 metabolic cart (MC) as a criterion measure. METHODS: A total of 19 participants (age: 19-45 yrs) completed the same exercise protocols during the two separate visits. The metabolic analyzers (i.e., OM and MC) were randomly assigned for the visit. The exercise protocol included 15 mins for resting (laying down), 5 mins for sitting, standing, 3 mph, 4 mph, 5 mph, 6 mph running, and 2.5 mph cool down with a minute break between each activity. Measures of VO2 and VCO2 from OM were statistically compared to the values from the MA and MC. Pearson correlation was calculated to identify the measurement relationship between the MA and the MC. Mean absolute percentage error (MAPE) was calculated to evaluate the measurement error of OM. Cohen’s D was calculated to investigate the effect size of the measurement difference. RESULTS: The strong overall agreements of VO2 and VCO2 between the OM [r=0.94 (p=0.01)] and MC [r=0.96 (p=0.01)] were observed. For each stage of the exercise protocol, Pearson r of VO2 and VCO2 measurement between the OM and MC were 0.33 and 0.34 for resting, 0.26 and 0.31 for sitting, 0.28 and 0.3 for standing, 0.57 and 0.3 for 3mph, 0.68 and 0.53 for 4mph, 0.74 and 0.63 for 5mph, 0.78 and 0.76 for 6mph, 0.70 and 0.47 for 2.5mph cool down. Calculated MAPEs of VO2 and VCO2 for each stage are as follows: 19.22%, 13.06% for resting, 14.49%, 7.53% for sitting, 6.32%, 0.19% for standing, 10.78%, 8.70% for 3mph running, 7.49%, 5.23% for 4mph running, 4.23%, 1.22% for 5mph running, 3.87%, 0.47% for 6mph running, 3.34%, 4.34% for 2.5mph cool down. Effect size for VO2 and VCO2 were 0.78 and 0.43 for resting, 0.54 and 0.23 for sitting, 0.27 and 0.01 for standing, 0.44 and 0.33 for 3mph, 0.34 and 0.22 for 4mph, 0.74 and 0.63 for 5mph, 0.78 and 0.76 for 6mph, 0.70 and 0.47 for 2.5mph cool down.
The power push-up (PPU) is an explosive upper-body test performed on a force plate and has recently replaced the bench press test in high school football combines such as the U.S. Army National Combine and Under Armour All-American Combine. PURPOSES: Compare the PPU test performed from the knees versus the toes across 3 age groups (6-9, 10-11, and 12-15 yr) of young male athletes and report the test-retest reliability. METHODS: Sixty-eight boys (mean±standard deviation (SD); height=154±14 cm; mass=47±16 kg) were tested twice over 5 days. The PPU was performed from the knees and from the toes. Measurements included peak force (PF, N), peak rate of force development (pRFD, N·s⁻¹), average power (AP, W), and peak power (PP, W). Two-way ANOVA (position x age) were performed, while intraclass correlation coefficients (ICCs), standard errors of measurements (SEM), coefficients of variation (CV), and minimum detectable changes (MDC) were calculated. RESULTS: PF, pRFD, and PP were greater (p ≤ 0.05) from the knees for the 10-11 and 12-15 yr groups, whereas AP was greater (p ≤ 0.05) from the knees for all age groups. PF and pRFD were greater (p ≤ 0.05) in 12-15 yr than 6-9 and 10-11 yr from the knees and the toes. Table 1 shows the mean values and test-retest reliability metrics. CONCLUSIONS: PF, pRFD, AP, and PP were greater from the knees than the toes, and the oldest age group (12-15 yr) demonstrated the highest PF and pRFD values. However, the only consistently reliable measure was PF when the PPU test was performed from the knees in 10 to 15-year-olds. None of the measures from the youngest age group were reliable, and neither of the power measures (AP or PP) were reliable across all ages.

Muscuar endurance resistance training (MERT) has been shown to improve the onset of blood lactate accumulation (OBLA). It has been speculated that improvements in OBLA following MERT is related to metabolic adaptations associated with continued exposure to increased blood lactate concentrations. PURPOSE: The purpose of this study was to investigate metabolic responses during each training session of a 4 week MERT program in aerobically trained males. METHODS: 17 males, ages 18-45, participated in this study. Subjects were randomly assigned to either an experimental (EX) or control (CON) group, 9 EX and 8 CON. Baseline measures included VO₂max and OBLA using a cycle ergometer, and 1 repetition maximum (IRM) for: leg press (LP), leg curl (LC), and leg extension (LE). The EX group performed MERT (4 sets of 12-15 repetitions at 50% of IRM for LP, LC, and LE) for 4 weeks with 2 sessions per week. Resistance was increased after 4 sessions to accommodate any potential strength gains. Pre and post blood lactate concentrations were measured for each MERT session. Both groups were instructed to maintain current aerobic training throughout the study with participants returning to the lab to repeat all baseline measurements. T-tests were used to determine if significant between group differences existed using delta scores (post-pre). RESULTS: No significant differences in baseline measurements were observed (p≥0.05). No significant group differences were observed for VO₂max, OBLA, LP, and LE. However, significant group differences were observed for LC (kg) (EX 9.21±5.35 vs. CON -0.142±5.08). The average blood lactate response (mmol/L) for the first 4 MERT sessions ranged from 7.0±0.716 to 13.8±1.76 and the last 4 sessions ranged 8.23±0.956 to 13.8±1.76. CONCLUSIONS: 4 weeks of MERT did not significantly improve VO₂max, OBLA, LP, and LE but did improve LC. Although subjects performed all MERT at the same percentage of IRM a large range of lactate responses were observed between subjects. The range in lactate responses suggest that the relative intensity of the exercise and metabolic responses were not the same between subjects. May be of more appropriate to trainload with MERT based on lactate response to ensure similar metabolic responses between subjects.

Physical activity tracking wearables have emerged as a popular method for consumers to assess their daily activity, calories expended and heart rate. However, less is known if these health measures are valid at various levels of exercise intensity. PURPOSE: To examine heart rate (HR) and energy expenditure (EE) validity of three popular wrist-worn activity monitors at different exercise intensities. METHODS: 62 participants (36 females, 46.8% non-white) wore the Apple Watch (AW), Fitbit Charge HR (FCHR) and Garmin Forerunner 225 (GF). Validity was assessed by 2 criterion devices: HR chest strap and a metabolic cart. Participants completed a 10-min seated baseline; separate 4-min stages of light, moderate and vigorous-intensity treadmill exercises; and a 10-min seated recovery. Data from devices were compared to each criterion via two-way RM-ANOVA and Bland-Altman analysis. Differences were expressed in mean absolute percentage error values (MAPE).

RESULTS: AW - HR MAPE between 1.14-6.70% HR not significantly different at the start (p = .13), baseline (p = .76) or vigorous intensity (p = .84). Lower HR readings during light (p = .05), moderate (p = .01) and recovery (p < .01). EE MAPE between 14.07-210.84%. Measured higher EE at all stages (p < .01). FCHR - HR MAPE between 2.38-16.99% HR not significantly different at start (p = .43) or moderate intensity (p = .34). Lower HR readings during baseline, vigorous and recovery (p < .001) and higher HR in light (p < .001). EE MAPE between 16.85-84.98%. Measured higher EE at baseline (p < .05), light (p < .001) and moderate (p < .001). GF - HR MAPE between 7.87-24.38% HR not significantly different

Abstracts were prepared by the authors and printed as submitted.
at vigorous intensity (p = .35). Measured higher HR readings start, baseline, light, moderate (p < .001) and recovery (p < .05). EE MAPE between 30.77-155.05%. Measured higher EE at all stages (S568: Fitbit Charge HR, Apple Watch and Garmin Forerunner 225). An advantage and novel approach of the study is the examination of HR and EE at specific PA intensities. Establishing validity of wearables is of particular interest as these devices are being used in weight loss interventions and could impact findings. Future research should investigate why differences occur between exercise intensities and the devices exist.

INTRODUCTION: While hip accelerometer has traditionally been considered the gold standard in the measurement of physical activity, wrist-worn devices have gained popularity in both research and consumer markets. The relationships between these measurements are not well characterized.

PURPOSE: To compare acceleration measurements between hip- and wrist-worn devices in young EE and middle-aged (MA) adults across sex and age.

METHODS: 37 healthy, non-smoking, Y (18-39 years; 10M,10F) and MA (40-65 years; 8M,9F) adults participated in this one-on-video, observational study. Participants wore a triaxial accelerometer on their non-dominant wrist and corresponding hip during a series of 14 well-defined, but varied-intensity common activities. Three-way mixed repeated measures ANOVAs (age by sex by device location) were used to assess cohort differences in accelerations for each activity, with movement speed as a covariate when appropriate (e.g. self-selected walking velocity). Significance was set at p < 0.005 to adjust for multiple comparisons.

RESULTS: After correcting for self-selected walking speed, over-ground walking wrist accelerations were approximately 50% greater in women compared to men in both age groups (p = 0.004, effect size, d = 1.2) despite no difference in hip accelerations (p = 0.15). Accelerations for other activities did not differ by sex (p = 0.03). MA adults demonstrated greater accelerations than Y adults (p = 0.005; d = 0.82) with sweeping but no other tasks (p > 0.05). Wrist accelerations were often measured to be greater than hip but not consistently so.

CONCLUSIONS: Hip and wrist accelerations demonstrated few sex and age differences and were not consistently related to each other. The sex difference in wrist accelerations suggests lifestyle physical activity may be overestimated in women using wrist accelerometer. The inconsistent relationship between hip and wrist accelerations suggests previous hip cut points cannot be reliably used for wrist assessments.

Research Support: United States Army Research Institute of Environmental Medicine, Natick, MA. University of Iowa, Iowa City, IA.
Email: shannon.1.merkle.mil@mail.mil

No relationships reported

2665 Board #185 June 2 9:30 AM - 11:00 AM
GPS Analysis of Elite Chinese Male Hockey Players During Competition: Based on New IHF Rules
Xudan Cal1, Wayne Lombard2, Nianshuang Zhou1, Xiaoping Chen1. 1Ningbo University, Ningbo, China. 2University of Cape Town, Cape Town, South Africa. 3China Institute of Sport Science, Beijing, China.
Email: caixudan1993@yahoo.com

No relationships reported

PURPOSE: The aim of this study was to investigate the physiological demands of a match under the new rules as compared to the old rules.

METHODS: Four matches analyzing 16 elite Chinese field hockey players (Height:178±4.41cm, Weight:76.50±6.12kg ) were record by using global positioning system (SPI Elite, GPSports, Australia) and analyzed using Team AMS (v2014.11) software during 2015 Chinese National Tournament. All the matches were filmed by using two high definition cameras (HDR-SR12E, Sony, Japan), which were placed on the top of the stadium and filmed each half field respectively. Exact timing, including beginning and ending of each quarter, timing and details of substitutions, playing time of each player and positional changes, were reviewed post-match and used to edit the GPS data. Multi-paired t-tests were used to compare data between different positions and different quarters. Significance was set at P<0.05. Average values were used to compare differences between new rules and old rules' hockey matches.

RESULTS: The mean total distance covered by each player was 5788±1710m, and overall mean playing time was 37.8±14.0min. Compared with other positions, strikers had a significantly greater high-intensity activity (>14km/h) percentage (strikers: 29.7±4.8%; midfielders:25.6±5.8%; defenders: 17.9±3.3%; P<0.01). Average sprint (defined as speed >19km/h, interval of at least 1 second) counts for each player was 25.5±9.9 per match, with an average duration of 2.5±0.3s. About 75% of sprint distances were between 5-20m, with recovery times varying greatly, however the two most frequently observed recovery times were >120s (36%) and 0-40s (35%). The average repeated-sprint (defined as interval time between two sprints was less than 60s) counts were 11.4±6.9, and the average percentage of repeated-sprint counts and average recovery interval of repeated-sprints were 40.1±16.8% and 23.0±8.3s respectively.

CONCLUSIONS: These results suggest that players are required to complete more high intensity bouts in a shorter time period (37.8±14.0 vs. 51.9±17.8 min) however average total distance was less under the new IHF rules. Supported by NSSFC and Xinxiao Project through key project 13BTY049 and 2016R40593.

2666 Board #186 June 2 9:30 AM - 11:00 AM
An Examination of Body Mass Index Influence on Activity Tracker Accuracy
Chris Dondzila, Holly Johnson, MeKayla Steckel. Grand Valley State University, Allendale, MI. (Sponsor: Steve Glass, FACSM)

No relationships reported

A variety of activity trackers with evolving technology are commercially available, yet it remains uncertain the influence body size has on these devices’ accuracy (as previous activity trackers have been), which would compromise their generalizability. PURPOSE: To examine the accuracy of consumer-grade activity trackers in quantifying steps and moderate-vigorous physical activity (MVPA) engagement in free-living conditions in a diverse sample of body mass index (BMI) categories.

METHODS: Sixty individuals (21.1 ± 1.5 years, 2.3 ± 0.2 ft stride length) across three BMI categories (Normal [n=25]: 20.24-24.9 kg/m²; overweight [n=25]: 25-29.9 kg/m²; Obese [n=13]: ≥30 kg/m²) wore four activity trackers during one 24-hour day (wear time 12.7 ± 1.9 hours). On the non-dominant side of the body, the Fitbit Charge HR (Charge) and Jawbone UP3 (UP3) were worn on the wrist and the Fitbit One (ONE) on the waist, with the NL1000 activity tracker (NL; serving as the criterion device) worn on the dominant side of the waist. Mixed within-between ANOVA analyses were performed to examine differences in steps and MVPA for the activity track across three BMI categories. RESULTS: There were no differences in steps or MVPA for the individual devices across BMI categories. In the Normal group, the UP3 (6667 ± 3366 steps) and ONE (7400 ± 8135 steps) underestimated steps (p<0.001), compared to the NL (8135 ± 3562 steps). Similarly, in the Overweight group, the UP3 (8799 ± 3986 steps) and ONE (9019 ± 3841 steps) underestimated steps (NL 9312 ± 3986 steps, both p<.05). In the Obese group the Charge overestimated

S568 Vol. 49 No. 5 Supplement
Smart watches have greatly evolved since their first release. With advancements in technology, many smart watches now estimate aerobic capacity. These watches are user-friendly and affordable but there are no current investigations that have reported accuracy of the predicted VO2max. PURPOSE: The purpose of this study was to compare actual VO2max values (AMax) to predicted VO2max values obtained from the Garmin Forerunner 230 (230Max) and 235 (235Max) smart watches as well as the V800 Polar smart watch (PMax). METHODS: Eighteen females (BMI=24.9 ± 3.3 kg/m², age=24.7 ± 3.8, AMax=42.9 ± 4.8 ml/kg/min) and 24 males (BMI=26.6 ± 3 kg/m², age=24.2 ± 4.4, AMax=49.5 ± 5.8 ml/kg/min) participated in this study. VO2max values for each individual were obtained following a 10 min supine rest and were based upon the different training ranges that can be programed into the watch. Participants then completed a treadmill VO2max test. Within 48 hours of completing the treadmill VO2max test, individuals completed a 10 min, self-paced outdoor run using both Garmin smart watches. Paired sample T-tests were used to determine if there were differences between AMax and the predicted VO2max values of each watch. RESULTS: There were significant differences between AMax and PMax (2.5 ± 6.8 ml/kg/min, p<0.001), 230Max (-1.3 ± 4.3 ml/kg/min, p=0.02) and 235Max (-1 ± 4.0 ml/kg/min, p=0.026) in females. In males there were significant differences between AMax values and the predicted VO2max values ranging from an overestimation of 2.5 ml/kg/min to an underestimation of 1.1 ml/kg/min. In males, predicted VO2max values were significantly different from AMax values and the differences ranged from a significant, negative association of a large effect size to a significant, positive association of a small effect size. RESULTS: Caution should be taken when using these predicted values for exercise prescription especially in men.

Technological advances have provided exercise watches with the ability to assess heart rate without the need of a chest strap. The Garmin Forerunner 230 (G230) and 235 (G235) are identical watches with the exception that the G230 uses a chest strap to measure heart rate (HR) and the G235 measures HR via an optical sensor built into the watch. The use of optical sensing technology has provided exercise watches with the ability to assess heart rate, distance, cadence, and kcals are also recorded. PURPOSE: The purpose of this study was to compare PMax, AHR, MHR, distance, kcals, and cadence values obtained from the G230 and the G235 during a self-paced 10 min outside run. METHODS: Eighteen females (BMI=24.9 ± 3.3 kg/m², age=24.7 ± 3.8, VO2max=42.9 ± 4.8 ml/kg/min) and 24 males (BMI=26.6 ± 3 kg/m², age=24.2 ± 4.4, VO2max=49.5 ± 5.8 ml/kg/min) reported to a paved trail, free of any GPS interference to complete a self-paced 10 min run while wearing both watches and the HR strap associated with the G230. Participants’ gender, age, height, and weight were also entered into each watch before the run. RESULTS: In females, AHR was significantly higher in the G230 (4.3 ± 4.8 bpm, p<0.004) but there was no significant differences in PMax (-0.8 ± 1.86 ml/kg/min, p=0.09) when compared to the G235. In males, AHR was significantly higher in the G230 (8.1 ± 15.2 bpm, p=0.028) and the PMAX was significantly lower in the G230 (2.1 ± 20.0 ml/kg/min, p=0.000) when compared to the G235. There were no significant differences between watches for MHR, distance, cadence, or kcal in females or males. CONCLUSION: The AHR values from the Garmin Forerunner 230 were significantly higher than the values from the G235 in both males and females. The PMAX values from the G230 were significantly lower than the values from the G235 in men. In males, the differences in AHR are responsible for differences in PMAX between watches since there are no differences between the other variables measured during the run. Caution should be taken when using exercise HR values obtained from an optical sensor.

Distance running is a tremendously popular sport/fitness activity amongst US adults. Individualizing training volume (i.e., distance) is necessary to optimize training responses and reduce injury risk. While personal global positioning satellite (GPS) devices are a validated means of accurately measuring distance, the validity of distance measurements by accelerometer-based physical activity monitors is unknown. PURPOSE: Assess the concurrent validity of wireless accelerometer-based activity monitors to those of a personal GPS device during self-paced running. METHODS: Twenty-four recreational runners (n = 12 females) wore a personal GPS (Garmin Forerunner 10, GPS) and commercially-available physical activity monitor (MOViband accelerometer, MB) on the dominant wrist during three separate outdoor training runs. Participants followed their normal training schedules, such that the pace and duration of each run was voluntarily determined by the participant. The association between MB and GPS distance measurements was determined using Pearson’s correlation analysis. The 95% limits of agreement between MB and GPS were calculated according to the method of Bland and Altman. Specifically, the upper and lower limits of agreement were calculated as the mean of the differences (d) between GPS and MB ± 1.96 x the standard deviation of the differences, expressed as: d ± 1.96s. RESULTS: There was a significant, positive association of a large effect size between measurements of distance by GPS and the commercially-available physical activity monitor (MB) (r = 0.763, p < 0.001). However, the calculated limits of agreement (-1.946 to 2.025km) between GPS and accelerometer measurements suggest that individual MB measurements may be up to 2km above or below GPS. CONCLUSION: We suggest that non-GPS distance measurements by commercially-available physical activity monitors may be useful for monitoring overall, cumulative volume for health and fitness purposes. However, these measurements fall short of GPS when high accuracy is needed, as in training programs designed to enhance performance. These findings cannot be generalized to all accelerometer devices.

Preliminary results from the ACSMנתית in 2016-2017 fitness trend. The accuracy of these devices has yet to be firmly established. The objective of the study was to determine the validity of wearable devices’ assessment of step count, heart rate (HR) and caloric expenditure (KCAL) during various physical activities. METHODS: Thirty college students (19 female, 11 male) engaged in 3 activity sessions (walking with a broom and dustpan, climbing stairs, and walking 1/4 mile) while wearing an Apple Watch Sport, Fitbit Charge HR, Accusplit Hip Pedometer, and iPhone 6 Plus. Step counts from devices were compared to those objectively recorded using a tally counter. Subjects also completed a treadmill graded exercise test during which HR and KCAL were reported by an Apple Watch Sport, Fitbit Charge HR, and Polar T31. Values were compared to those from a six-lead ECG and metabolic analyzer. HR was recorded at rest and during each stage. KCAL was determined at the end of the protocol. RESULTS: Correlations between objective step counts and from the devices: walking (.08 to .84), stair climbing (.12 to .90), and sweeping (.12 to .70). No device accuracy of these devices has yet to be firmly established. The objective of the study was to determine the validity of wearable devices’ assessment of step count, heart rate (HR) and caloric expenditure (KCAL) during various physical activities. METHODS: Thirty college students (19 female, 11 male) engaged in 3 activity sessions (walking with a broom and dustpan, climbing stairs, and walking 1/4 mile) while wearing an Apple Watch Sport, Fitbit Charge HR, Accusplit Hip Pedometer, and iPhone 6 Plus. Step counts from devices were compared to those objectively recorded using a tally counter. Subjects also completed a treadmill graded exercise test during which HR and KCAL were reported by an Apple Watch Sport, Fitbit Charge HR, and Polar T31. Values were compared to those from a six-lead ECG and metabolic analyzer. HR was recorded at rest and during each stage. KCAL was determined at the end of the protocol. RESULTS: Correlations between objective step counts and from the devices: walking (.08 to .84), stair climbing (.12 to .90), and sweeping (.12 to .70). No device accuracy of these devices has yet to be firmly established. The objective of the study was to determine the validity of wearable devices’ assessment of step count, heart rate (HR) and caloric expenditure (KCAL) during various physical activities. METHODS: Thirty college students (19 female, 11 male) engaged in 3 activity sessions (walking with a broom and dustpan, climbing stairs, and walking 1/4 mile) while wearing an Apple Watch Sport, Fitbit Charge HR, Accusplit Hip Pedometer, and iPhone 6 Plus. Step counts from devices were compared to those objectively recorded using a tally counter. Subjects also completed a treadmill graded exercise test during which HR and KCAL were reported by an Apple Watch Sport, Fitbit Charge HR, and Polar T31. Values were compared to those from a six-lead ECG and metabolic analyzer. HR was recorded at rest and during each stage. KCAL was determined at the end of the protocol. RESULTS: Correlations between objective step counts and from the devices: walking (.08 to .84), stair climbing (.12 to .90), and sweeping (.12 to .70). No device accuracy of these devices has yet to be firmly established. The objective of the study was to determine the validity of wearable devices’ assessment of step count, heart rate (HR) and caloric expenditure (KCAL) during various physical activities. METHODS: Thirty college students (19 female, 11 male) engaged in 3 activity sessions (walking with a broom and dustpan, climbing stairs, and walking 1/4 mile) while wearing an Apple Watch Sport, Fitbit Charge HR, Accusplit Hip Pedometer, and iPhone 6 Plus. Step counts from devices were compared to those objectively recorded using a tally counter. Subjects also completed a treadmill graded exercise test during which HR and KCAL were reported by an Apple Watch Sport, Fitbit Charge HR, and Polar T31. Values were compared to those from a six-lead ECG and metabolic analyzer. HR was recorded at rest and during each stage. KCAL was determined at the end of the protocol. RESULTS: Correlations between objective step counts and from the devices: walking (.08 to .84), stair climbing (.12 to .90), and sweeping (.12 to .70). No device
was accurate across all activities. The most accurate devices for activities were: walking (Apple Watch, r = 0.84); stair climbing (iPhone, r = 0.86); and swimming (Fitbit, r = 0.70). During the treadmill test, correlations between EKG and devices were: Apple Watch (r = 0.98); Polar T31 (r = 0.94); and Fitbit (r = 0.98). Heart rate accuracy across the session was highest in the Apple Watch. KCAL from neither the Apple Watch (r = 0.63) nor Fitbit (r = 0.48) had a high correlational value to that from the metabolic analyzer.

CONCLUSIONS: Fitness-related values provided by wearable devices had varying levels of accuracy when compared to objective step counts, HR and KCAL assessed by calibrated scientific equipment. Accuracy of step counts varied by activity and was higher across activities in the iPhone. HR reported from wearable devices, similarly, had varying levels of accuracy, with the Apple Watch being most accurate across a graded exercise test. Fitness-related information from wearables that are not medical devices should be considered as estimates and used for motivation. Further validation of these devices should include a variety of physical activity modalities.

2671 Board #191 June 2 9:30 AM - 11:00 AM Validity Of The DiagnostixTM 2100 And Fitbit Charge HRTM In Assessing Heart Rate Paige Hardekopf, Charles Fountaine. University of Minnesota Duluth, Duluth, MN. (Sponsor: John R. Keener, FACSM) Email: hard0365@d.umn.edu (No relationships reported)

The importance of exercise intensity is an important factor when maximizing the health benefits that result from exercise. New innovations in consumer based activity trackers and electronic healthcare monitoring devices have been able to quantify the level of exercise intensity based on heart rate (HR) values. However, there is limited research assessing the validity of these devices. PURPOSE: To assess the validity of the Fitbit Charge HR (FB) and ACSC Diagnostix 2100 Fingertip Pulse Oximeter (PO) in assessing heart rate during exercise in comparison to the heart rate from an electrocardiogram (EKG).

METHODS: Healthy college students (n=30, 18 females) performed 1 min of standing rest, 10 min of the standard Bruce Protocol test on a treadmill, and a 2 min cool-down walk. Each participant simultaneously wore the FB on the right wrist, the PO on the right index finger, and had 10 electrodes placed on their chest for the 12-lead EKG. HR was recorded from each device every minute. Absolute differences between the 3 HR monitors were compared using repeated measures ANOVA. Pearson r correlation coefficients and Standard Error of Estimate (SEE) were calculated to determine the relationships between each HR monitor vs. EKG.

RESULTS: Repeated measures ANOVA indicated a significant difference in HR between the 3 monitors, F(2,58)=16.876, p<0.001. Post hoc tests identified a significant difference between EKG and FB (132.1 ± 13 vs. 120.5 ± 13.7 bpm, p<0.001), and between the 3 monitors, F(2,58)=16.876, p<0.001. Post hoc tests indicated a significant difference in HR: Repeated measures ANOVA indicated a significant difference in HR across the three devices and should be considered as estimates and used for motivation. Further validation of these devices should be considered as a variety of physical activity modalities.

2672 Board #192 June 2 9:30 AM - 11:00 AM Validity of the Fitbit® Distance Traveled Feature Among Multiple Speed Trials Christina J. Marton. Gustavus Adolphus College, Saint Peter, MN. Email: cmarton@gac.edu (No relationships reported)

A science review by Delago (2014) suggested that the distance-traveled feature on Fitbit® was an accurate measurement. However, as speed increased the accuracy of the Fitbit® decreased meaning the faster the pace, the greater the error for distance measured. Whereas a systematic review conducted by Evenson et al. (2015) reported that the Fitbit® over-estimated at lower speeds and underestimated at faster speeds. PURPOSE: To examine whether the fitness device, Fitbit® Charge, provides an accurate measurement of the distance-traveled feature at various speeds and to expand on the research regarding the distance-traveled feature. METHODS: Twenty-eight inactive adults (53% female; 42 ± 9.1 mean age) participated in this study. Participants were randomly assigned to one of three conditions: low (n = 10; 4.2 ± 0.8 mph), medium (n = 10; 6.0 ± 0.9 mph), or high (n = 8; 7.9 ± 1.0 mph) speed. Participants wore the Fitbit® Charge on their right wrist and the Garmin Forerunner 45 on their left wrist. The study was conducted on a 200 meter indoor track. Each participant ran for 5 minutes at the assigned speed. Post-intervention, participants completed a survey assessing self-reported PE (1-10). Tri-axial accelerations were measured using a commercial accelerometer system (Hexoskin, Carre Technologies Inc, Montreal, CA) with the accelerometer located on the lateral aspect of the right hip. Average acceleration range (AVG) was calculated each trial during training (3 trials) and show (2 trials). Time based acceleration data were also classified into 5 ranges: 0 ≤ AVG < 2.0; 2.0 ≤ AVG < 4.0; 2.0 ≤ AVG < 8.0; 8.0 ≤ AVG < 16.0; > 16.0. Time spent in each range was averaged during training and in-show. Dependent variables were compared using paired-sample t-tests and a repeated-measures ANOVA.

RESULTS: AVG was significantly higher during training vs. in-show (5.25 ± 0.32 vs. 4.67 ± 0.09, p = 0.030, effect size = 0.53). AVG was significantly lower during training vs. in-show (2.75 ± 0.53 vs. 3.42 ± 0.10, p = 0.027). RM ANOVA revealed no interaction between acceleration ranges and environment (p > 0.05), and no main effect for environment (p > 0.05). Time spent in acceleration ranges was influenced by level (p < 0.05) such that there was a both a linear and cubic trend across bin levels. CONCLUSION: The lower AVG may reflect that the show environment promotes less intense movements to maintain synchronization with co-artists. Wearable technology may be useful for analyzing show movements in a way to better develop effective training programs.

Supported by Cirque Du Soleil
not equivalent at the ±10% equivalence zone. A Bland Altman plot was constructed to visualize the MPA data using 95% limits of agreement that are between -121.1 and 200.4. More details below the mean of 39.65, suggesting proportional bias that self-report overestimated activity.

**Conclusion:** This study provides some support for the use of the IPAQ, but confirms the common observation in self-report instruments with participants tending to overestimate their participation in MPA and underestimate sedentary time. The use of measurement error modeling and calibration methods may be needed to address this error in future studies.

2677 Board #197  June 2 9:30 AM - 11:00 AM
**Assessing Physiological Function During a High-Altitude Hike Using Real-Time Monitoring**
Nicholas Fox1, John E. Davis2, Allison Brown3, Nicole Deel1, Alexander Montoye1, Monroe Moleisky1, Eric Achatz1, Michael Miller1, Jeremy Rettinger2, Elaine Reno2, Luke Yaeger2, Ann Wisiolowsk1, Andrew Subudhi, FACSM1, Robert Roach, FACSM1,1 Alma College, Alma, MI; 2CU School of Medicine, Aurora, CO. **Altitude Research Center CU School of Medicine, Aurora, CO.** (Sponsor: Andy Subudhi, FACSM)
Email: fox1ntr@alma.edu

Assessing the physiological responses to exercise at high altitude in real time or using cloud-based data storage has important implications for remote monitoring of human health and well-being in challenging environments. **Purpose:** To determine the feasibility of using real-time monitoring to assess the cardiovascular responses to a simulated climb for military operations. **Methods:** Seventy-four male (age = 21.9 ± 2.2 yrs, height = 1.78 ± .02 m, weight = 78.2 ± 9.7 kgs) sea level (SL) residents volunteered to participate in this study after giving informed consent and completing the Army Physical Fitness Test. Subjects were drawn from SL to high altitude (HA) and completed a 5.9-km hike with a 3529 m summit that began at 3239 m and finished at 3840 m the morning after arrival at HA. They were instructed to complete the course as fast as possible. Heart rate (directly from ECG), breathing rate and depth, and step counts were collected using a wrist-worn heart rate monitor and a wrist and arm worn monitors producing significantly different (p<.05) step counts. Pearson correlation coefficients (r) were calculated by comparing the MPA data during the hike to all three fitness trackers: LT, FB, and AW for treadmill walking and running. **Results:** Correlation coefficients indicate a moderate to high level of validity on measuring physical activity while walking (range from .55 to .76) and running (range from .61 to .75). For the LT and AW monitors, the accuracy of heart rate during the high altitude exercise was evaluated; a 610 m elevation gain results in relatively high heart rates that generally reflect the elevation gained.

**Conclusions:** This study provides some support for the use of the IPAQ, but confirms that self-report overestimated activity.
Low-cost, consumer-grade, wearable physical activity monitors are increasingly popular for personal use and may provide a more accurate measure of physical activity than subjective methods (e.g., self-report) while being less expensive than research-grade accelerometers. Because of their popularity in individuals wishing to monitor their personal physical activity behavior and their potential merits in a research setting, assessments of the validity of these devices is warranted. **PURPOSE:** To assess the validity of a novel, low-cost, wearable physical activity monitor (Movband 3) relative to established measures physical activity intensity during treadmill exercise.**METHODS:** Participants (N = 19) completed four, ten-minute treadmill stages (1.5, 3.0, 4.0, 6.0 MPH) while wearing the Movband 3 on their wrist and the previously-validated Actigraph GT3X monitor around their waist. During each treadmill stage, relative oxygen consumption (VO2 ml/kg/min) and heart rate (beats/min) were recorded via indirect calorimetry and telemetry monitoring, respectively. The relationship between Movband counts and Actigraph counts, VO2, and heart rate were then assessed via Pearson’s correlation analyses. The relationship between miles traveled as reported via the Movband and actual miles traveled on the treadmill was assessed via correlation and tests of agreement as established by Bland and Altman. **RESULTS:** There were large, positive effect sizes for the associations between Movband counts and Actigraph counts (r = 0.72), VO2 (r = 0.59), and heart rate (r = 0.63). There was also a large, positive association between Movband miles and actual miles traveled (r = 0.97). These correlations would support the validity of the Movband. However, the difference (∆) between Movband miles and actual miles was greater than a null hypothesis of zero (∆ = 0.3 ± 0.4 miles, β< 0.001) and there was a significant positive association between ∆ and the mean of the Movband and treadmill miles (β = 0.54, p < 0.001) which indicates a lack of agreement. **CONCLUSIONS:** There was evidence to support the validity of the Movband 3 for the assessment of physical activity intensity in a laboratory setting. However, while this device is associated with measures of exercise intensity it does not provide an accurate measure of miles traveled.

**AMPK Subunit Isoform Expression Differs Between Human Skeletal Muscle Fiber Types**
Irene S. Tobias1, James R. Bagley2, Lee E. Brown, FACSM1, Andrew J. Galpin1. *California State University, Fullerton, Fullerton, CA. 1University of Sao Paulo, Sao Paulo, Brazil.*

AMPK-activated protein kinase (AMPK) is an energy-sensing regulator of cellular metabolism that is activated during acute exercise and mediates long-term adaptations through initiation of gene expression programs. Previous studies on AMPK in human skeletal muscle have analyzed protein expression and activation in whole muscle biopsy samples, though more recent studies show AMPK protein expression is highly dependent on myosin heavy chain (MHC) fiber type. Additionally, transgenic animal studies indicated AMPK regulates exercise-induced MHC fiber type conversion. **PURPOSE:** Evaluate methods of detecting human skeletal muscle fiber type-specific expression for all known AMPK subunit isoforms. **METHODS:** Individual fibers from a tissue sample (biopsy) of the vastus lateralis were mechanically isolated under a microscope. Each fiber was partitioned with tweezers such that portions were available for both fiber typing (SDS-PAGE) and protein quantification (western blotting). Analyses of signaling kinases from single fibers present challenges regarding detection of protein from small sample sizes. To address this technical issue, we pooled several fibers (10-20) of the same type together following fiber type identification. **RESULTS:** AMPK of subunit isoform γ2 (regulatory subunit) and β1 (scaffolding subunit) expression is noticeably elevated in MHC I vs. MHC IIa fibers (Figure 1). This concurs with previous results for β1, but represents the first fiber type-specific identification of γ2. **CONCLUSIONS:** AMPK expression is detectable through our fiber type-specific method. Moreover, subunit isoform concentrations appear to differ between MHC I and MHC IIa fibers in human skeletal muscle, thus emphasizing key metabolic signaling differences between fiber types. These pilot methodological studies support future larger scale investigations of AMPK subunit isoform adaptations in single fibers at rest and in response to acute and chronic stimulations.
We know that muscle tissue size is inversely associated with the amount of intramuscular fat (Akima et al. 2015). In prolonged bed-rest, atrophy of lower-limb muscle occurs, implying that an increase of intramuscular fat may occur in parallel. Successful countermeasures, such as resistance training, may also affect the amount of intramuscular fat. Given that muscles atrophy at different rates in disuse (Belavý et al. 2009), the adaptation in intramuscular adipose tissues may also muscle specific. PURPOSE: The purpose of this study was to quantify the effect of exercise during 8-week bed-rest on intramuscular fat and muscle tissue in individual thigh muscle groups. METHODS: Twenty-one men were randomized to either 8-week bed-rest with resistance exercise (TR-group, n = 13) or no exercise (CTR-group, n = 8). The training was performed 3 days a week and consisted of bilateral leg press, single and double leg heel raise, and back and forehead raise. Axial images of the mid-thigh were taken before and after the bed-rest using magnetic resonance imaging. Intramuscular fat cross-sectional area (CSA) and muscle tissue CSA were measured in quadriceps femoris (QF), adductors (AD) and hamstrings (HM). We calculated the percent change of intramuscular fat CSA between before and after the bed-rest. RESULTS: After bed-rest, muscle tissue CSA in CTR was significantly decreased compared to before bed-rest in all muscle groups (p < 0.05), whereas muscle tissue CSA did not change in the TR-group. Intramuscular fat CSA in individual muscles did not change after bed-rest in either group (QF: TR 7.3 ± 20.6 % vs. TR -38.0 ± 31.4 %, AD: CTR -3.8 ± 19.7 % vs. TR -34.2 ± 26.1 %, HM: CTR -9.6 ± 26.8 % vs. TR -33.6 ± 30.1 %). However, for intramuscular fat of all muscle groups pooled a significant difference between the groups was observed with a reduction of intramuscular fat in the TR group (CTR 1.0 ± 13.9 % vs. TR -36.2 ± 28.2 %, p=0.004). CONCLUSION: Resistance training during 8-week bed-rest reduces thigh muscle atrophy and results in a reduction of intramuscular fat. No evidence was seen on the impact of bed-rest itself, in inactive subjects, on intramuscular fat in the thigh muscle groups.

Cancer is a major public health problem in the U.S. and the world. In 2013 there were an estimated 1,660,290 new cases of cancer in the U.S. Severe weight and muscle loss in cancer (cancer cachexia [CC]) is accepted as a common effect of many cancers, and is directly responsible for 20-40% of cancer-related deaths. The mechanisms that control the development of CC are not well understood. In order for muscle wasting to occur, there must be either a decrease in myogenic factors or an increase in catabolic factors. Most investigations of CC focus on the post-cachectic state and do not examine the progression of the condition. PURPOSE: The purpose of this study is to determine the roles of classical myogenic factors (Pax7, MyoD and Myogenin; markers of satellite cell activity and regulators of myocyte proliferation and differentiation, respectively), and catabolic factors (Atrogin and MuRF; E3 ubiquitin ligases regulating ubiquitin-mediated protein degradation) in the onset of CC. METHODS: 5x10^6 Lewis Lung Carcinoma cells (LLC) or Phosphate Buffered Saline (PBS, control) were injected into the hind-flank of normal wildtype C57BL/6J mice at 8 wks of age, and tumor allowed to develop for 1, 2, 3, or 4 wks, gastrocnemius muscle weights were measured to assess CC. MyoD, Myogenin, Atrogin, MuRF, and Pax7 were analyzed using RT-PCR for all 5 groups (1, 2, 3, 4 wk LLC and PBS). Data were analyzed by one-way ANOVA, Student-Newman-Keuls test was used to determine differences among means, significance was set at P<0.05. RESULTS: Gastrocnemius muscle weights were only lower than PBS control at 4 wk post tumor-implantation. Pax7 was ~30% lower at all timepoints following tumor implantation. MyoD and Myogenin were ~50% lower in wks 1 and 2 post-tumor implantation, and returned to baseline for wks 3 and 4. Atrogin was ~3.5-fold greater in wk 4, while MuRF was ~2.3-fold higher in wk 3 and ~3.8-fold in wk 4 post-tumor implantation. CONCLUSIONS: Our data suggest a reduction in satellite cell content shortly after tumor implantation which is tied to an early reduction in markers of myogenic differentiation and proliferation though muscle loss is not evident until 4 wk post tumor implantation; while MuRF and atrogin mediated protein degradation does not seem to be altered until later in tumor progression. Supported by Arkansas Biosciencce Institute.
Sleep deprivation (SD) increase catecholamine concentrations and decrease growth factors, which may impair the muscle regeneration. PURPOSE: Evaluate the influence of SD on the muscle regeneration, cellular proliferation and muscular-insulin-like growth factor-1 (IGF-1) concentration after cryolesioning in rats. METHODS: Forty male rats, Wistar, 3 month, were distributed into 4 groups: Control (CTL), submitted to SD for 96h (SD96), CTL plus sleep recovery period (CTL+R), submitted to SD for 96h plus 96h of sleep recovery (SD96+R). Previously, the animals were submitted to cryolesioning of Tibialis anterior (TA) from left leg. After 3 days of recuperation, SD96 and SD96+R groups were sleep deprived for 96h by modified multiple platform method, following of sleep recovery for 96h to SD96+R group. TA of both legs were excised (intact and injured) to histopathologic analysis (with HE, 40x), PCNA (western blot) and muscular IGF-1 (ELISA) analysis. The data were analyzed by one way ANOVA. RESULTS: The concentration of IGF-1 in intact leg was reduced in SD96 compared to CTL (356±27 vs 816±105 ng/dL respectively; P<0.05), and the basal and hormonal PCNA expressions were reestablished in SD96-R group (776±69 ng/dL). In injured leg, the concentration of IGF-1 increased in all groups, but with less magnitude in SD96 compared to CTL (1442±256 vs 3851±249 respectively; P=0.001) and SD96+R compared to CTL-R (1605±260 vs 2307±182 ng/dL respectively; P<0.001). PCNA protein not change with SD, but injury increased its concentration proportionally in all groups when compared to intact leg (CTL - 1.8±0.2 vs 0.46±0.15 AU respectively; SD96 - 2.4±0.6 vs 0.62±0.12 AU respectively; CTL-R - 1.68±0.35 vs 0.55±0.08 AU respectively; P<0.001). The qualitative histopathologic analysis showed a delay in process of muscle regeneration, with higher amounts of fibrous tissue, inflammatory process and muscle atrophy in SD96+R group compared to CTL-R. CONCLUSION: SD reduced muscular IGF-1 concentration and delayed the muscle regeneration stimulated by cryolesioning in TA of rats. Supported by CEPID/SONO-FAPESP (#98/14303-3), CNPq, CAPES, and FAPESP (#2011/15962-7; 2013/00152-5) (No relationships reported).
unique morphological and architectural adaptations over time may influence athletic performance and/or potential risks of musculoskeletal injuries; however, future studies are needed to test these hypotheses. Supported by NHI Grant 15-060

2690 Board #210 June 2 11:00 AM - 12:30 PM

Muscle Volume Is A Critical Determinant Of Rowing Performance In Olympic Rowers

Stephan van der Zwaard1, Guido Weide1, Koen Levels1, Michelle Eikelboom1, Dionne A. Noordhoof2, Mathijs J. Hofmijster1, Willem J. van der Laarse3, Cornelis J. de Ruiter1, Jos J. de Koning, FACSM4, Richard T. Jaspers3, 1Vrije Universiteit, Amsterdam, Netherlands. 2VU University Medical Center, Amsterdam, Netherlands. (Sponsor: Jos de Koning, FACSM)

Email: s.vander.zwaard@vumc.nl

(No relationships reported)

BACKGROUND: Rowing races challenge rowers to combine high sprint and endurance capacity. Muscle morphology is an important determinant of sprint and endurance capacities and as such may also be a critical determinant of rowing performance.

PURPOSE: To determine how much of the rowing performance of Olympic rowers is explained by sprint and endurance capacity and by muscle morphology.

METHODS: 18 elite rowers (12 male, 6 female and 17 competed in different disciplines at the 2016 Olympics) performed a maximal incremental rowing test to obtain V02max, reflecting the endurance capacity. Sprint capacity was assessed by a 30-second Wingate cycling test and maximal isometric knee extension torque. Morphology of m. vastus lateralis (volume, physiological cross-sectional area (PCSA), fascicle length and pennation angle) was derived from a 3D ultrasound reconstructed voxel array. 13 rowers completed a 2000m time trial on a rowing ergometer to assess rowing performance.

RESULTS: Coefficients of determination were obtained from multiple and single regression analyses.

RESULTS: Rowing performance was largely explained by absolute maximal oxygen uptake combined with peak power output obtained during the Wingate test (R2=0.98, p<0.001). Muscle volume largely explained rowing performance (R2=0.85, p<0.001) and was strongly related to Wingate peak power output (r2=0.82, p<0.001). VO2max (r2=0.65, p<0.001) and maximal isometric knee extension torque (r2=0.60, p<0.001). Less variance in rowing performance was explained by PCSA (r2=0.68, p<0.001) and fascicle length (r2=0.43, p<0.05) and none by pennation angle (r2=0.00, p=0.774).

CONCLUSION: Rowing performance of Olympic rowers is excellently explained by VO2max and Wingate peak power output (R2=0.98). Muscle volume, of all morphological properties, is the most important determinant of rowing ergometer performance, and endurance and sprint capacity in Olympic rowers.

Funding: Technologiestichting STW

2691 Board #211 June 2 11:00 AM - 12:30 PM

Effects Of Time-of-day Specific Resistance Training On Muscle Strength And Muscular Il-6-associated Signaling In Male Rats

Szu-Hsien Yu1, Shueh-I Lin1, Shih-Chang Cheng1, Chung-Pu Chi2, Chia-Hua Kuo, FACSM3, 1National Ilan University, Yilan City, Taiwan. 2Taipei Medical University, Taipei, Taiwan. 3University of Taipei, Taipei, Taiwan. (Sponsor: Chia-Hua Kuo, FACSM)

Email: meck168@hotmail.com

(No relationships reported)

PURPOSE: Muscle mass and strength play an important role in athletic sports and health promotion. Although resistance training (RT) is known to be effective for muscle mass improvement, the optimal daily timing of RT and feeding has not yet been determined. The purposes of the present study are to investigate the best daily timing of RT for the muscle hypertrophy in male rats.

METHODS: In study I, SD rats were divided into Control (C, non-exercise), Early (E, beginning of active phase, 8:00) and Late (L, end of active phase, 17:00). Rats of exercise groups (E and L) were asked to perform RT by climbing for 10 weeks in beginning and end of active phase respectively. Climbing strength and weight of flexor muscles (E, beginning of active phase, 8:00) and Late (L, end of active phase, 17:00). Rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into E (Early) and L (Late) groups and subjected to normal cage ambulation and increased physical activity (E) and running training (L) in the afternoon for 12 weeks. In study II, rats were divided into...
observations), ambulation at G/3 is sufficient to maintain anabolic signaling capacity however, further developmental changes were not apparent into adulthood. Each measure was found to be uniquely influenced by other factors, including age and BMI. Longitudinal evaluation of phase angle and EI amongst children and adolescents may provide much needed insight into the process of maturation.

### METHODS

A total of 36 male children (n=11; age=12.7±1.4y), adolescents (n=13; 16.7±1.0), and adults (n=12; 25.8±3.8y) were compared. Whole body (PhAWB) and leg (PhADL) phase angle were determined using 50kHz BIA. Greyscale analysis was used to determine EI from ultrasound-derived images of the cross-sectional area of the vastus laterals. Phase angle and EI between age-based developmental groups were compared by 1-way ANOVA, while stepwise linear regression was used to evaluate relationships between these measures and the potential influence of age and body mass index (BMI). RESULTS: Significant differences were demonstrated between age-based developmental groups for PhAWB (p<0.001), PhADL (p<0.002), and EI (p<0.001). Post-hoc analysis showed lower phase angle (p<0.05) in children (PhAWB = 5.4±0.6°; PhADL = 5.9±0.8°) compared to adolescents (PhAWB = 6.4±0.8°; PhADL = 6.8±0.9°) and adults (PhAWB = 6.9±0.6°; PhADL = 7.2±0.7°). EI was greater (p<0.001) in children (57.2±10.6 au) compared to adolescents (40.0±6.8 au) and adults (41.4±7.9 au). PhAWB was identified as the strongest predictor variable for EI (r²=0.21; p=0.005), while age and BMI were identified as the strongest predictor variables for PhAWB (r²=0.44; p<0.001) and EI (r²=0.384; p<0.001), respectively. CONCLUSION: Phase angle and EI appear to distinguish changes in body composition between childhood and adolescence; however, further developmental changes were not apparent into adulthood. Each measure was found to be uniquely influenced by other factors, including age and BMI. Longitudinal evaluation of phase angle and EI amongst children and adolescents may provide much needed insight into the process of maturation.

### RESULTS

Phase angle, determined from resistance and reactance via bioelectrical impedance analysis (BIA), provides an indication of cellular function and hydration. Ultrasound-derived echo intensity (EI) is often used to evaluate the relative variation in the derived echo intensity (EI) is often used to evaluate the relative variation in the composition of underlying tissue. Assessment of these non-invasive methods may allow for characterization of age-based developmental changes related to body composition. PURPOSE: To examine phase angle and EI amongst children, adolescents, and adults. METHODS: A total of 36 children (n=11; age=12.7±1.4y), adolescents (n=13; 16.7±1.0), and adults (n=12; 25.8±3.8y) were compared. Whole body (PhAWB) and leg (PhADL) phase angle were determined using 50kHz BIA. Greyscale analysis was used to determine EI from ultrasound-derived images of the cross-sectional area of the vastus laterals. Phase angle and EI between age-based developmental groups were compared by 1-way ANOVA, while stepwise linear regression was used to evaluate relationships between these measures and the potential influence of age and body mass index (BMI). RESULTS: Significant differences were demonstrated between age-based developmental groups for PhAWB (p<0.001), PhADL (p<0.002), and EI (p<0.001). Post-hoc analysis showed lower phase angle (p<0.05) in children (PhAWB = 5.4±0.6°; PhADL = 5.9±0.8°) compared to adolescents (PhAWB = 6.4±0.8°; PhADL = 6.8±0.9°) and adults (PhAWB = 6.9±0.6°; PhADL = 7.2±0.7°). EI was greater (p<0.001) in children (57.2±10.6 au) compared to adolescents (40.0±6.8 au) and adults (41.4±7.9 au). PhAWB was identified as the strongest predictor variable for EI (r²=0.21; p=0.005), while age and BMI were identified as the strongest predictor variables for PhAWB (r²=0.44; p<0.001) and EI (r²=0.384; p<0.001), respectively. CONCLUSION: Phase angle and EI appear to distinguish changes in body composition between childhood and adolescence; however, further developmental changes were not apparent into adulthood. Each measure was found to be uniquely influenced by other factors, including age and BMI. Longitudinal evaluation of phase angle and EI amongst children and adolescents may provide much needed insight into the process of maturation.

### CONCLUSIONS

- Longitudinal evaluation of phase angle and EI amongst children and adolescents may allow for characterization of age-based developmental changes related to body composition.
- Phase angle, determined from resistance and reactance via bioelectrical impedance analysis (BIA), provides an indication of cellular function and hydration.
- Ultrasound-derived echo intensity (EI) is often used to evaluate the relative variation in the composition of underlying tissue. Assessment of these non-invasive methods may allow for characterization of age-based developmental changes related to body composition.

**Age-Related Changes in Sleep Are Broadly Documented and Complaints of Sleep May Allow for Characterization of Age-Based Developmental Changes Related to Body Composition.**

- Purpose: To examine phase angle and EI amongst children, adolescents, and adults.
- Methods: A total of 36 children (n=11; age=12.7±1.4y), adolescents (n=13; 16.7±1.0), and adults (n=12; 25.8±3.8y) were compared. Whole body (PhAWB) and leg (PhADL) phase angle were determined using 50kHz BIA. Greyscale analysis was used to determine EI from ultrasound-derived images of the cross-sectional area of the vastus laterals. Phase angle and EI between age-based developmental groups were compared by 1-way ANOVA, while stepwise linear regression was used to evaluate relationships between these measures and the potential influence of age and body mass index (BMI). Results: Significant differences were demonstrated between age-based developmental groups for PhAWB (p<0.001), PhADL (p<0.002), and EI (p<0.001). Post-hoc analysis showed lower phase angle (p<0.05) in children (PhAWB = 5.4±0.6°; PhADL = 5.9±0.8°) compared to adolescents (PhAWB = 6.4±0.8°; PhADL = 6.8±0.9°) and adults (PhAWB = 6.9±0.6°; PhADL = 7.2±0.7°). EI was greater (p<0.001) in children (57.2±10.6 au) compared to adolescents (40.0±6.8 au) and adults (41.4±7.9 au). PhAWB was identified as the strongest predictor variable for EI (r²=0.21; p=0.005), while age and BMI were identified as the strongest predictor variables for PhAWB (r²=0.44; p<0.001) and EI (r²=0.384; p<0.001), respectively. Conclusion: Phase angle and EI appear to distinguish changes in body composition between childhood and adolescence; however, further developmental changes were not apparent into adulthood. Each measure was found to be uniquely influenced by other factors, including age and BMI. Longitudinal evaluation of phase angle and EI amongst children and adolescents may provide much needed insight into the process of maturation.
Cancer is associated with severe weight and muscle loss (cancer cachexia). Cancer cachexia is the most common manifestation of the advanced malignant disease, leading to death. Underlying mechanisms of cancer cachexia are not well understood.

Muscle wasting is associated with an imbalance of protein turnover favoring protein breakdown. Autophagy is a mechanism for protein breakdown that has not been adequately studied throughout the progress of cancer cachexia. PURPOSE: Assess autophagy machinery and flux throughout the progression of cancer cachexia.

METHODS: 1x10⁶ Lewis Lung Carcinoma cells (LLC) or Phosphate Buffered Saline (PBS, control) were injected into the hind-flank of C57Bl6/J mice at 8 weeks age, respectively. Mice were subjected to exercise 3x per week for 13 weeks. Skeletal muscle function (grip strength) was evaluated at 12, 17, and 25 weeks of age and cardiac function was evaluated using echocardiography at 25 weeks of age.

RESULTS: Exercise intervention did not show a change in bodyweights of the BL10 mice. However, these mice showed significant improvement in hindlimb (HL) but not forelimb (FL) grip strength in comparison to non-exercised group. Analysis of the serum showed that the creatinine kinase (CK) levels in the VW group significantly increased compared to the non-treated group. All three exercise interventions showed significant decreases in body weight at 25wks of age of mdx mice. Dystrophin deficient mdx mice showed different effects on muscle function depending on the exercise regimen. DT exercise was significantly detrimental to HL grip strength, while VW exercise showed significant improvement on HL grip strength over time. Evaluation of cardiac function (% ejection fraction and fraction shortening) showed that HT and VW but not DT interventions showed significant improvement. Analysis of CK levels showed that the VW group significantly increased compared to the non-treated group.

CONCLUSIONS: Our study demonstrates that type of exercise intervention significantly affects dystrophin deficient skeletal and cardiac muscle function. Our study highlights that mild but not strenuous (DH) exercise regimen show benefits in DMD muscle therefore caution must be taken when prescribing exercise regimes to DMD patients.

2698

Board #218

June 2 11:00 AM - 12:30 PM

Cancer-cachexia Upregulates Autophagy Machinery

Jacob L. Brown, 727011, Megan E. Rosa-Caldwell1, David E. Lee1, Thomas A. Blackwell1, Richard A. Perry1, Lemuel A. Brown1, Wesley S. Haynie1, Terry A. Washington1, Nicholas P. Greene1. 1University of Arkansas, Fayetteville, AR. 2University of Texas-Tyler, Tyler, TX. (Sponsor: Stephen F. Crouse, FACSM)

Email: jb0241@email.aurak.edu

(No relationships reported)

Critical torque (CT) is an integrative measure/concept that represents the "critical" or upper boundary of steady-state work that can be performed without leading to exhaustive fatigue. While this concept has been observed across multiple voluntary exercise modalities, it has not been tested under neuromuscular electrical stimulation (NMES). PURPOSE: The purpose of this study were 1) to determine if NMES exercise results in hyperbolic work-duration pattern that plateau at the end of exercise and 2) determine if NMES exercise performed below CT results in no fatigue.

METHODS: Participants (n = 9) were tested. Following familiarization, participants completed 2 identical testing sessions each consisting of four separate 5-minute NMES bouts separated by 20 minutes of rest. The NMES protocol consisted of 3-seconds of stimulation, followed by 2-seconds of rest, for 60 total isometric contractions. Current and pulse duration (200-μs) were held constant among all tests. Initially 100 Hz NMES was used. During the second test a frequency that elicited a torque value below the end test torque during the 100 Hz test (under CT) was used. The third and fourth tests were at 50 and 25 Hz, applied in a random order. The second testing session was performed 2-7 days later.

RESULTS: End-test torque (CT) was calculated as the mean of the last 6 contractions relative to peak torque. Torque values did not differ over the final 6 contractions within each exercise bout—100 Hz (p = 0.49), 50 Hz (p = 0.15), 25 Hz (p = 0.31), and under CT (p = 0.15). Torque declined from 93 ± 18% to 22 ± 7% of peak torque at 100 Hz, from 60 ± 24% to 22 ± 8% at 50 Hz, and from 29 ± 13% to 20 ± 6% at 25 Hz. These ETT values did not differ from each other (p > 0.05). Initial torque and ETT for the under CT bout did not differ (12 ± 8% vs 11 ± 5% of peak torque; p = 0.48), but ETT was lower than the ETT values from the 100, 50, and 25 Hz bouts (p < 0.05).

CONCLUSIONS: Intermittent isometric NMES results in a hyperbolic work-duration relationship similar to what is observed during voluntary isometric exercise. NMES exercise above CT declined to a similar torque value regardless of stimulation frequency, while exercise under CT showed no declines in torque. These findings suggest the NMES exercise protocol can be used to determine CT.

2700

Board #220

June 2 11:00 AM - 12:30 PM

The Effect of Myostatin SNP on Muscle Fiber Properties in Thoroughbred Horses during Training Period

Hirofumi Miyata1, Fumio Sato2, Tetsuro Hada1, Teruki Tozaki1, 1Yamaguchi Univ., Yamaguchi, Japan. 2Japan Racing Horse Association, Hidaka, Japan. 3Laboratory of Racing Chemistry, Usunomya, Japan.

Email: hiro@yamaguchi-u.ac.jp

(No relationships reported)

Purpose: Variants of the myostatin gene (MSTN) have been shown to have an influence on muscle hypertrophy phenotypes in a wide range of mammalian species. Recently, a thoroughbred horse with a C–Allele at the g.66493737C/T single nucleotide polymorphism (SNP) has been reported to be suited to short distance racing. In this study, we examined the effect of the MSTN SNP on muscle fiber properties in young horses during a training period. METHODS: To investigate the effect of the MSTN SNP on muscle fiber before training, several mRNA expressions were relatively quantified in biopsy samples from the middle gluteal muscle of 24 untrained male thoroughbreds horses (1.5-year old, C/C: n = 8; C/T: n = 8; T/T; n = 8) using real-time RT-PCR analysis. Furthermore, the remaining muscle samples were used for immun histochemical analysis to determine the number of satellite cells (SC), as well as the population and area of each fiber type. All measurements were revaluated in biopsy samples of the same horses after a 5-month period of conventional training.

RESULTS: As compared to values before training, although there were not significant differences, cross sectional areas of all muscle fiber types increased (12-17%) in all SNP groups after training. Although the expressions of MSTN mRNA decreased in all SNP groups, a significant decrease was found in only the C/C group after training. However, the expressions of mRNA related to SCs activation and proliferation (HGF, Pax7, MyoD, and Myogenin) were identical among all SNP groups after training. While, expression of VEGFa, PGC1α, and SDHα mRNA, which relate to the biogenesis of mitochondria and capillaries, was significantly higher (54-82%) in the T/T group than the C/C group after training. CONCLUSION: It is suggested that hypertrophy of muscle fiber is directly associated with a decrease in MSTN mRNA expression in the C/C group, and that increased expressions of VEGFa, PGC1α, and SDHα in the T/T group might be indirectly caused by the MSTN SNP. These results indicate that the C/C and T/T groups with the MSTN SNP have an advantage in short and long distance races, respectively.
obtained from 37 recreational athletes (25±4 yrs, 181±7 cm, 83.5±15 kg) after 12 weeks (wks) of regular rehabilitation following ACL-R (quadriceps tendon autograft, n=22 or semitendinosus tendon autograft, n=15) and again after 12 wks with 2x/wk either conventional (CON/ECC, n=16) or CON/ECC+ (n=21) supervised leg press training (random assignment). Immunohistochemical analyses were used to determine myosin heavy chain (MyHC) I, II and hybrid fibers to quantify fiber type specific satellite cells (SCs, Pax7+) and active SCs (Pax7+/MyoD+). Magnetic resonance imaging was performed to measure quadriceps cross sectional area (CSA) RESULTS: After 12 wks of one-legged quadriceps strength training CSA was significantly (p<0.000) increased with a significantly (p=0.003) greater increase after CON/ECC+ compared to CON (81.7±13.1 to 96.3±14.7 cm² vs. 78.5±12.1 to 87.0±11.8 cm²). MyHC I fiber number significantly (p=0.002) increased only after CON/ECC+ (35.7±17.1 to 41.7±15.8 %). The change was significantly (p=0.022) different from CON/ECC+ (36.6±13.0 to 35.1±10.4 %). MyHC II hybrid fibers showed a significant (p=0.001) similar decrease after CON/ECC+ (7.1±6.5 to 4.0±4.5 %) and CON/ECC+ (7.7±4.9 to 4.8±3.6 %). MyHC II fiber number did not change significantly. While no significant change in SC content was observed (SCs related to MyHC I or II fibers 0.15±0.08 and 0.14±0.07 before, 0.14±0.09 and 0.14±0.07/fiber after training) the number of active SCs per biopsy section was significantly (p=0.007) greater after training (2.42±2.09 vs. 1.08±1.38) without significant difference between the training regimes. No significant differences occurred with regard to the different autografts.

CONCLUSION: Strength-training induced muscle regeneration after ACL-R lead to an increase in activated SCs and a decrease in MyHC II hybrid fibers. After CON/ECC+ the gain in muscle mass was greatest and was accompanied by a significant increase in MyHC I fibers.

Supported by the Dietmar Hopp Foundation (23011935)

2702  Board #222  June 2 11:00 AM - 12:30 PM  Thigh Muscle Cross-sectional Area by pQCT: Precision of Two Software Programs  Samuel R. Buchanan1, Christopher Poole2, Daniel Schiffler3, Debra Bemben, FACSM1, Michael Bemben, FACSM1, The University of Oklahoma, Norman, OK. 1Southern Methodist University, Dallas, TX. 2Bone Diagnostic Inc., Spring Branch, TX. (Sponsor: Dr. Debra Bemben, FACSM) (No relationships reported)

Scans performed by pQCT produce images with voxels, each with a density value that is the average of all the tissue densities contained within the voxel. Software programs differentiate between bone and soft tissues within the human limb using contour/peel modes and threshold ranges. Subtle calculation differences of voxel partial volumes by software may lead to variations in tissue density and area values. PURPOSE: The purpose of the investigation was to compare the precision of two software programs, Stratec v6.00 (STC) and ImageJ (IMJ), for thigh muscle cross-sectional area (mCSA) in college age men. METHODS: pQCT scans (XCT 3000, Stratec) performed at the 50% femur site for 10 male subjects (18-30 years) on 3 different days, were used to measure femur mCSA using STC and IMJ. Loops were created within STC with the legs (133.2%) compared to the arms (50.9%). A tendency was noted for changes in BMC across ROI’s (F = 2.86, p = 0.067, η2 = 0.11), where improvements occurred in the legs (1.6%, p = 0.002) but not the arms (0.14%, p = 0.689) or axial region (0.48%, p = 0.167). CONCLUSION: Our data suggests that a 16-wk HIFT intervention focusing on general physical preparedness is particularly beneficial for stimulating adaptations in lower limb BMC and lean mass.

2703  Board #223  June 2 11:00 AM - 12:30 PM  Regional Differences in Musculoskeletal Adaptation Following 16-Weeks of High-Intensity Functional Training.  Wade Hoffstetter, Paul Serafini, Gerald Mangine, Yuri Feito, FACSM. Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSM) Email: wadehoffstetter@gmail.com (No relationships reported)

High-Intensity Functional Training (HIFT) continues to gain traction in the fitness world; however, many questions remain about its effect in musculoskeletal adaptations.

PURPOSE: We sought to investigate what musculoskeletal regions of interest (ROI) were affected following a 16-week HIFT program among a group of recreationally active adults. METHODS: Nine men (34.2±9.12 yrs, 1.78±0.05 m, 91.5±17.7 kg) and 17 women (36.3±7.84 yrs, 1.63±0.07 m, 68.5±12.8 kg) completed 16-weeks (2 – 5 sessions · wk⁻¹) of HIFT. Prior to training (PRE; <2 weeks), measures of bone mineral density (BMD), bone mineral content (BMC), and lean mass (LM) were collected in the arm, leg, and axial (skeletal muscles only) regions via dual-energy X-ray absorptiometry. Post-testing (POST) measurements were collected within two weeks following the conclusion of the 16-wk training program. RESULTS: Analysis of variance with repeated measures revealed a significant ROI × time interaction for LM (F = 436.967, p < 0.001, η2 = 0.95), where greater improvements were observed in the legs (133.2%) compared to the arms (50.9%). A tendency was noted for changes in BMC across ROI’s (F = 2.86, p = 0.067, η2 = 0.11), where improvements occurred in the legs (1.6%, p = 0.002) but not the arms (0.14%, p = 0.689) or axial region (0.48%, p = 0.167). CONCLUSION: Our data suggests that a 16-wk HIFT intervention focusing on general physical preparedness is particularly beneficial for stimulating adaptations in lower limb BMC and lean mass.

2704  Board #224  June 2 11:00 AM - 12:30 PM  Effects of Doxorubicin Treatment and Exercise on Skeletal Muscle Function and Myogenic Regulatory Factors  Michael J. Capps, Nicole R. Wood, Raquel B. Busekraus, Reid Hayward, David S. Hydock, University of Northern Colorado, Greeley, CO. (No relationships reported)

Doxorubicin (DOX) is used to treat a wide range of cancers, but its use is limited due to its toxicities. DOX treatment causes myotoxicity leading to skeletal muscle dysfunction and impairments in activities of daily living for cancer patients. Maintenance and repair of skeletal muscle involves myogenic regulatory factor (MRF) signaling, and evidence suggests that DOX inhibits MRF expression. Exercise, however, attenuates many of the toxicities associated with DOX treatment, and including exercise with DOX treatment may have a positive effect on MRF expression. PURPOSE: To determine the effects of exercise and DOX treatment on skeletal muscle function and MRF expression. METHODS: Male rats were randomly assigned to sedentary+saline (SS), sedentary+DOX (SD), treadmill+DOX (TMD), resistance training+DOX (RDX), or combined endurance and resistance training+DOX (COMD). DOX groups received 1 mg/kg DOX daily for 12 consecutive days and SS received 0.9% NaCl at an equivalent volume as a placebo. TMD then trained on a motorized treadmill 5 days per week for 2 weeks, RSD animals were then housed in cages where food and water were progressively raised to force a bipedal stance for 2 weeks, and COMD rats were then housed in raised cages and treadmill trained for 2 weeks. Sedentary rats were restricted to normal cage activity during this time period.

Two-hours after the activity intervention, grip strength (GS) was measured, and the soleus was extracted and analyzed for expression of the primary MRFs MyoD and Myf5 using Western blotting. RESULTS: SS had a 29% lower GS than SS (p <0.05), but this significant GS decline was not observed in TMD, RESD, or COMD (-10%, -5%, -2% vs. SS, respectively, p<0.05). MyoD expression was 61% lower in SD when compared to SS, but none of the activity interventions attenuated this decline (-56%, -65%, -65% vs. SS in TMD, RSD, and COMD, respectively, p<0.05 for all comparisons). A similar Myf5 decline was observed with SD, TMD, RSD, and COMD expressing 44%, 40%, 65%, and 56% lower Myf5 than SS, respectively (p<0.05). CONCLUSION: Activity interventions protected against the DOX-induced reduction in GS, but this does not appear to be the result of changes in MRF expression suggesting that exercise-induced protection against DOX myotoxicity may not be due to mitigating decreases in primary MRF expression.
There are two main running foot-strike patterns; heel striking (HEEL) and mid-foot striking (MID). Given that people who run with different gait patterns likely experience different loading profiles, it would be of interest to analyze regional differences in bone mineral density (BMD) in order to characterize foot-strike specific injury risk. PURPOSE: To investigate the differences in hip and foot BMD of male collegiate runners with different foot-strike patterns. METHODS: Thirteen NCAA D1 athletes were recruited for the study (Age: 20.1 ± 1 yrs; Height: 179 ± 5 cm; Weight: 70 ± 6 kg; Body Fat: 10.8 ± 4 %). Ground Reaction Force (GRF) data was collected with an instrumented treadmill while the subjects ran at two different paces; threshold 70 ± 6 kg; Body Fat: 10.8 ± 4 %). Ground Reaction Force (GRF) data was collected with an instrumented treadmill while the subjects ran at two different paces; threshold 70 ± 6 kg; Body Fat: 10.8 ± 4 %. Given that people who run with different gait patterns likely experience different loading profiles, it would be of interest to analyze regional differences in bone mineral density (BMD) in order to characterize foot-strike specific injury risk. PURPOSE: To investigate the differences in hip and foot BMD of male collegiate runners with different foot-strike patterns. METHODS: Thirteen NCAA D1 athletes were recruited for the study (Age: 20.1 ± 1 yrs; Height: 179 ± 5 cm; Weight: 70 ± 6 kg; Body Fat: 10.8 ± 4 %). Ground Reaction Force (GRF) data was collected with an instrumented treadmill while the subjects ran at two different paces; threshold 70 ± 6 kg; Body Fat: 10.8 ± 4 %.}

RESULTS: Individuals with SI joint dysfunction exhibited fewer muscle synergies than healthy controls (mean EV for the 5th PC (range): SI = 0.89 (0.74–1.02), control = 1.04 (0.94–1.10)). The first PC for the ensemble EMG for controls included a contribution from contralateral GM and LD (Pearson r with 1st PC of ensemble EMG: right GM = -0.20, left LD = -0.22, left GM = 0.29, right LD = -0.25), whereas this synergy was absent from left LD to right GM for individuals with SI joint dysfunction (right GM = -0.11, left LD = 0.05, left GM = 0.36, right LD = -0.37). CONCLUSION: Individuals with SI joint dysfunction exhibit fewer synergies than healthy controls when walking. Our results support the hypothesis that individuals with SI joint dysfunction do not exhibit a synergy between contralateral glutaeus maximus and latisissimus dorsi when walking.
Peak Patellofemoral and ACL/PCL Forces While Performing the Forward Lunge Exercise With Varying Techniques

Rafael F. Escamilla, FACSM,1 Naiquan Zheng,2 Toran D. MacLeod,1 Rodney Imamura,1 Changsheng Wang,2 Glenn S. Fleisig,1 Kevin E. Wilk,1 James R. Andrews.2 1California State University, Sacramento, Sacramento, CA. 2University of North Carolina, Charlotte, Charlotte, NC. American Sports Medicine Institute, Birmingham, AL. 1’Champion Sports Medicine, Birmingham, AL. 1’Andrews Institute, Gulf Breeze, FL. Email: rescamilla@csus.edu

PURPOSE: To compare peak patellofemoral and ACL/PCL forces among varying lunge techniques involving lunges with a long and short stride both on flat ground and up to a 4 inch platform. METHODS: Sixteen male and female subjects (mean bodyweight 67.8 kg, 175.9 cm height; 28.9 years old) using bodyweight only performed a forward lunge with a long stride (shank vertical at bottom position) and a short stride (1/2 the long stride distance) on flat ground and up to a 4 inch platform. Force platform and video data were collected and input into a biomechanical model, and peak patellofemoral and ACL/PCL were calculated as a function of knee angle. A One-Way Repeated measures ANOVA assessed significant differences among lunge techniques (p<0.05). RESULTS: Peak patellofemoral force occurred between 7º-9º knee angles and was significantly greater (p<0.001) with a short stride lunge on flat ground (1568±479N) and up to a 4 inch platform (1553±580N) compared to lunging with a long stride lunge on flat ground (1193±512N) and up to a 4 inch platform (1061±523N), but no significant differences in peak patellofemoral force were found between the two short stride lunges (p=0.99) and between the two long stride lunges (p=0.99). Peak ACL force occurred between 7º-12º knee angles and was not significantly different (p>0.70) among any of the lunge techniques. Peak PCL force occurred between 62º-83º knee angles and was significantly greater (p<0.001) with a long stride lunge on flat ground (554±220N) and up to a 4 inch platform (609±265N) compared to lunging with a long stride lunge on flat ground (402±114N) and up to a 4 inch platform (458±145N), but no significant differences in peak ACL PCL were found between the two short stride lunges (p=0.99) and between the two long stride lunges (p=0.99). Peak ACL force occurred between 7º-12º knee angles and was not significantly different (p>0.70) among any of the lunge techniques. Peak PCL force occurred between 62º-83º knee angles and was significantly greater (p<0.001) with a long stride lunge on flat ground (554±220N) and up to a 4 inch platform (609±265N) compared to lunging with a long stride lunge on flat ground (402±114N) and up to a 4 inch platform (458±145N), but no significant differences in peak ACL PCL were found between the two short stride lunges (p=0.99) and between the two long stride lunges (p=0.99). CONCLUSIONS: Lunge technique variations did affect peak patellofemoral and cruciate ligament forces. Compared to a long stride lunge, lunging with a short stride, which causes the knees to translate forward approximately 8 cm beyond the knees at bottom lunge position, resulted in greater peak patellofemoral force but less ACL force. Lunging technique variations did not affect peak ACL force. There were no patellofemoral or PCL differences in peak force between the two long stride lunges or between the two short stride lunges.

Slope of Time-to-maximum Intensity of the Mechanomyograph in the Calf Muscles During Incremental Electrical Stimulation

W. Jeffrey Armstrong. Western Oregon University, Monmouth, OR.

PURPOSE: In previous analysis of the mechanomyogram (MMG) obtained during incremental electrical stimulation using the von Tscharner “intensity analysis” suggested a possible decrease in time-to-maximum total intensity (TTMax) for the soleus with increasing stimulus intensity. In the present study, the slopes of TTMax were analyzed for the medial gastrocnemius (MG) and soleus (SOL) muscles. METHODS: 9 (7M, 2F) moderately active college-aged (21-28 y, mean = 22 ± 2 y) persons with measurable H-reflexes participated. The tibial nerve was stimulated in increments of 5V from 10-100 V with with a 10-second rest interval between stimuli. To minimize the interference of the H-wave contraction on the MMG, data from 50 to 100V were analyzed. Normalized MMG (NormMMG) data were subjected to the intensity analysis, and total intensity (sum of the intensities over the set of 11 Cauchy wavelets for each sample in time), the peak total intensities, and corresponding TTMax were determined. The slopes of the TTMax by NormMMG were determined, and correlation coefficients were analyzed. In addition, the TT data for the SOL and MG were compared using the paired t-test. It was hypothesized that the slopes of the TTMax data would be negative and greater for the MG. RESULTS: TTMax was significantly different between SOL and MG (p<0.001). There was a significant negative correlation between TTMax_SOL and NormMMG_SOL (r = -0.335 (p<0.01), CI: -0.501 to -0.145); range: -0.961 to 0.878). The correlation between TTMax_MG and NormMMG_MG was not significant (0.117 (p = 0.252, CI: -0.804 to 0.531); range: -0.679 to 0.936). Overall, slopes varied among participants and muscles. CONCLUSIONS: The hypothesis that TTMax intensity would decrease with increasing stimulus (i.e., would reflect the rate of muscle shortening, Vmax) was not supported. Variation among muscles and participants suggest that there may be information in the MMG TTMax that reflect other characteristics of the muscle fiber recruitment (muscle composition, motor unit depth, etc.). Further study is warranted.

Bilateral Correlations between Peak Ground Reaction Forces and Bone Mineral Density in Male Collegiate Runners

Alec C. Miller, Kevin S. Ryan, Toni D. Uhrich, Kristof Kipp. Marquette University, Milwaukee, WI. (Sponsor: Paula E. Papanek, FACSM) Email: alec.miller@marquette.edu

PURPOSE: To investigate the bilateral correlations between peak GRF at two different speeds and left and right femoral neck BMD in male, NCAA Division I distance runners. METHODS: Fifteen male collegiate runners participated in this study (Age: 20 ± 1 year; Height: 179 ± 9 cm; Weight: 70 ± 15 kg; Body Fat: 10.75 ± 4%). Ground reaction forces (N) were collected with Noraxon SciFit (Scottsdale, AZ) instrumented treadmill as participants ran at two different speeds; threshold pace (TP: 19.3 km/hr or 5:00 min/mi) and long-slow pace distance (LSD: 13.8 km/hr or 6:58 min/mi). The femoral necks were scanned with dual-energy x-ray absorptiometry (DXA) using Norland Elite (Fort Atkinson, WI). Peak stance-phase GRF of the left and right leg...
were extracted from the TP and LSD condition. Femoral neck BMD (g/cm2) values for right and left leg were extracted from the DXA scans. Bivariate correlations were used to analyze the relationship between femoral neck BMD and peak GRF at the two running speeds. Separate correlation analyses were run for the left and right leg.

RESULTS: During the LSD condition, peak GRF and BMD data were correlated only for the right leg (Right: $r = 0.531, p = 0.004$). Similarly, peak GRF and BMD were correlated only for the right leg during the TP condition (Right: $r = 0.506, p = 0.005$).

CONCLUSIONS: Peak stance-phase GRF of the right leg were positively correlated with BMD of the right femoral neck, regardless of running speed. The fact that significant correlations between peak GRF and BMD data were only observed on one side suggests that side-to-side differences could influence the risk of sustaining unilateral overuse injuries in runners.

2712 Board #232 June 2 9:30 AM - 11:00 AM
Motor Units Discriminated From High-density, Surface Electromyography Require Careful Scrutiny.

Leah A. Davis1, Awd Almuklass1, Landon Hamilton1, Taian Vieira1, Alberto Botter2, Roger M. Enoka1.
1University of Colorado Boulder, Boulder, CO. 2Politecnico di Torino, Turin, Italy.

Email: leah.davis@colorado.edu

(No relationships reported)

High-density, surface electromyography (EMG) allows concurrent recording of motor unit (MU) activity by increasing the recording area and the number of recording sites. The recorded signal comprises overlapping MU action potentials, some of which can be identified with a decomposition algorithm. However, such analyses often produce results that contradict the classical findings on motor unit discharge characteristics.

PURPOSE: To evaluate the quality of the interspike intervals (ISIs) extracted from a high-density surface EMG recording by a decomposition algorithm. METHODS: Muscle activity was recorded using high-density, surface EMG (4x8 grid with a 10 mm interelectrode distance) in 10 persons with multiple sclerosis during steady, isometric dorsiflexor contractions on their less-affected limb. The target force was 10% of maximum. Custom Matlab software was used to perform a convolution kernel compensation model and a blind-source separation algorithm to discriminate individual MUs from EMG recordings. The discharge times (DT) from the discriminated MUs were used to calculate the ISIs (ISI = DTn-DTn-1). For each MU, the average ISI, MUs from EMG recordings. The discharge times (DT) from the discriminated MUs were used to calculate the ISIs (ISI = DTn-DTn-1). For each MU, the average ISI, average coefficient of variation for ISI (ISIcv), kurtosis for the distribution of ISIs, and skewness for the distribution of ISIs was calculated. ISIs outside of the range of 25 ms - 400 ms were deemed inaccurate and removed from the data and the same analyses were repeated. Data are reported as mean ± [95% CI]. RESULTS: The ISIs (n = 33,980; 303 [285-321] per MU) of 113 MUs were examined. Before removing ISIs that did not meet the inclusion criteria (25 - 400 ms), the average ISI was 136 ms [123 - 151 ms], the average ISIcv was 32% [30 - 35%], the average kurtosis was 53.5 [39.1 - 67.8], and the average skewness was 3.55 [3.45 - 3.65]. On average, 3.3% (range 0 - 31%) of the ISIs per MU were outside the acceptable range. After ISI removal, the average ISI was 120 ms [114 - 125 ms], the average ISIcv was 28% [26 - 31%], the average kurtosis was 11.0 [8.9 - 13.2], and the average skewness was 1.95 [1.70 - 2.20]. Most removed ISIs were <25 ms. CONCLUSION: The findings quantify the extent to which MU discharge times extracted from high-density, surface EMG recordings with an automatic decomposition algorithm can be confounded by discrimination errors.

2713 Board #233 June 2 9:30 AM - 11:00 AM
Blood Flow Restricted Exercise Alters Motor Unit Recruitment And Firing Rate

Pedro Fatela1, Goncalo V. Mendonca1, Janne Avela1, Pedro Mil-Homens2.
1Faculdade de Medicina da Universidade de Lisboa, Lisboa, Portugal. 2Faculty of Medicine, Pontifical Catholic University, Lisbon, Portugal.

(No relationships reported)

Purpose: Despite suggestions that low-intensity (LI) blood flow restricted exercise (BFRE) may be as effective as high intensity (HI) resistance exercise for the purpose of enhancing the recruitment of type II motor units (MU); individual MU acute response to LI BFRE has never been observed and/or reported. Recently, the decomposition of the surface electromyography (EMG) signal has introduced new analysis methods to assess single MU properties. Through these methods we aimed to observe LI BFRE has never been observed and/or reported. Recently, the decomposition of the surface electromyographic (EMG) signals introduced new analysis methods to assess single MU properties. However, such analyses often produce results that contradict the classical findings on motor unit discharge characteristics.

RESULTS: The BI BFRE condition decreased the lower-threshold MUAP amplitude and LI BFRE induced a significant change in the MU recruitment pattern, with higher-threshold and lower-firing rate MUs being recruited earlier to compensate muscle failure. Moreover, these findings strongly suggest that an elevated firing rate in similar MUAP amplitude after LI BFRE condition.

Conclusion: LI BFRE induced a significant change in the MU recruitment pattern, with higher-threshold and lower-firing rate MUs being recruited earlier to compensate muscle failure. Moreover, these findings strongly suggest that an elevated firing rate in similar MUAP amplitude after LI BFRE condition.

Acknowledgements: The authors would like to express their gratitude to Dr. Paola Contessa (Delays Inc., Natick, USA), for all the invaluable assistance, comments, and support.

2714 Board #234 June 2 9:30 AM - 11:00 AM
The Effect of Real-Time Haptic Feedback on Kinesthetic Awareness and Motor Skill Performance

Jo T. Shattuck, Mateusz Mittek, John Ransone, FACSMD.
University of Nebraska, Lincoln, NE.

Email: joshhattuck@huskers.unl.edu


PURPOSE: Kinesthetic awareness is an individuals’ knowledge of their own body position and movements in space. Sensory integration in the process of combining inputs from proprioceptive receptors in muscles, mechanoreceptors in skin, and visual/motor/visual spatial systems is critical to motor skill acquisition. We proposed that kinesthetic awareness training (KAT): the addition of haptic feedback in real time, to introduce secondary discriminatory system information into kinesthetic processing. We hypothesized that input will reinforce proprioceptive skills by merging a non-native input with native proprioceptive and visual system information, and subsequently cause an increase in accuracy in a single session of motor skill practice.

METHODS: We assessed torso angle, a crucial control element that are common to many multi-joint, complex actions. Three subjects (19.7 ± 0.58 yrs) performed static and dynamic torso control movements with and without real-time haptic feedback. A wearable mini motion-capture/feedback device with embedded accelerometer, magnetometer, gyroscope and proximity sensors recorded continual positional data in 8 axes. The device provided haptic feedback (vibrations via tiny motor ) when the target parameters were achieved. After 5 repetitions of practice, alternating sets with and without real-time haptic feedback were measured, (2 sets of 5 and 10 repetitions).

RESULTS: We analyzed posture control in 2 conditions in the beginning and end of a training session. An ANOVA was performed on normalized differences from the target means was significantly higher in the initial training sets, (p <0.01, F=4.2), and not significant in the final sets, (p = 0.09, 4.00). The results suggest a significant learning effect with KAT training after 30 repetitions. CONCLUSION: The results of this study suggests KAT training with haptic feedback could be a valuable teaching tool for improving somatosensory proprioception and kinesthetic awareness. Further investigations should examine if the KAT training leads to neural adaption and improved motor performance.

2715 Board #235 June 2 9:30 AM - 11:00 AM
A 6-week Strength Training Increases Muscle Size in Patients with Chronic Ankle Instability: MRI Analysis

Hyeri Gonzales1, S. Jun Son1, Hyunsoo Kim2, Kade Eppich1, Neil K. Bangert1, Matthew K. Seeley1, J. Ty Hopkins, FACSMD.1 Brigham Young University, Provo, UT. 2West Chester University, West Chester, PA.

(No relationships reported)

PURPOSE: To examine if the effect of a 6-week ankle and hip strength program on peroneus longus (PL) and gluteus medius (GM) muscle size in CAI patients. Little is known whether strength deficits are associated with muscle size in this patient population, and if strengthening can improve muscle size.

METHODS: To examine if the effect of a 6-week ankle and hip strength program on peroneus longus (PL) and gluteus medius (GM) muscle size in CAI patients. Little is known whether strength deficits are associated with muscle size in this patient population, and if strengthening can improve muscle size.

RESULTS: To examine if the effect of a 6-week ankle and hip strength program on peroneus longus (PL) and gluteus medius (GM) muscle size in CAI patients. Little is known whether strength deficits are associated with muscle size in this patient population, and if strengthening can improve muscle size.

CONCLUSION: To examine if the effect of a 6-week ankle and hip strength program on peroneus longus (PL) and gluteus medius (GM) muscle size in CAI patients. Little is known whether strength deficits are associated with muscle size in this patient population, and if strengthening can improve muscle size.

Abstracts were prepared by the authors and printed as submitted.
at pre- and post-intervention. Axial cross-sectional area (CSA) from each muscle was segmented using Analyze 12.0 software. PL muscle belly was constitutively defined at 15th/64 slices (7.5 cm) from the superior head of the fibula. GM muscle belly was defined at 15th/64 slices (7.5 cm) from the superior greater trochanter of the femur. ANCOVA analyses (covariate: pre-intervention value) were used to detect group × time differences.

RESULTS: ANCOVA analyses confirmed between-group differences in PL (F 1,26=36.32, p < .001) and GM CSA (F 1,25=13.38, p < .01) over time. The strength training resulted in a 5% increase in PL (pre: 67.1±13 cm2; post: 70.6±13 cm2; p < .05) and a 3.7% increase in GM CSA (pre: 44.7±7.3 cm2; post: 46.4±6.6 cm2; p < .05). No changes were detected in PL (0.7% reduction; pre: 6.96±1.7 cm2, post: 6.91±1.6 cm2; p > .05) and GM CSA (0.6% increase; pre: 47.5±7.9 cm2; post: 47.7±7.8 cm2; p > .05) in the control group.

CONCLUSIONS: Relative to the control group, a 6-week strength program is beneficial in increasing ankle evertor and hip abductor muscle size. As muscle size is proportional to strength, increased muscle size would result in greater muscle strength, which can have positive effects on movement and dynamic stability during functional movement.

**2716 Board #236 June 2 9:30 AM - 11:00 AM Influence of Body Position on Maximum Ankle Torque under Volitional Fatigue Conditions**

Taemin Moon, Yongung Kwon, Chris Karaffa, Stella Matthews, Jai K. Jung, D.S. Blaise Williams III, FACSM.
Virginia Commonwealth University, Richmond, VA.
Youngstown State University, Youngstown, OH.
Email: taemoon86@gmail.com

No relationships reported

Many studies have investigated the reliability of measuring isometric ankle strength using isokinetic dynamometer. However, hip position and body position may influence the participant’s ability to generate torque during the test. **Purpose:** To investigate the effect of body position on isometric ankle plantarflexor (PF) and dorsiflexor (DF) strength measurement in pre and post-fatigued conditions. **Methods:** Fifteen healthy subjects (age: 20.5±1.5 yrs) participated. Subjects required a total 2 of visits with a week period between visits. Subjects were initially assigned one of two test positions (seated and supine). The order of test positions were randomized and counterbalanced. Subjects performed the Bruce protocol on a treadmill until they reached volitional exhaustion. Before and after the Bruce protocol, subjects performed a total of 3 maximum voluntary isometric contractions (MVIC) in PF and DF directions. Data were analyzed using peak torque in each direction from the 3 trials of the MVIC. Separate two-way analysis of variance with repeated measures was used to assess the effect of fatig (pre-fatigue and post-fatigue) and test position (seated and supine) for PF and DF.

**Results:** There were significant differences between both pre and post-fatigue (PF, pre: 103.1±17.2 Nm vs post: 82.4±14.4 Nm, p-value<0.001, DF, pre: 21.7±4.9 vs post: 18.3±6.3, p-value<0.001) and supine and seated positions (PF, supine: 84.7±15.6 Nm vs seated: 101.5±18.8 Nm, p-value<0.001, DF; supine: 44.7±7.3 cm2 vs seated: 47.7±7.8 cm2, p-value<0.05). No significant changes were detected in PL (0.7% reduction; pre: 6.96±1.7 cm2, post: 6.91±1.6 cm2; p > .05) and GM CSA (0.6% increase; pre: 47.5±7.9 cm2; post: 47.7±7.8 cm2; p > .05) in the control group.

**CONCLUSIONS:** Relative to the control group, a 6-week strength and proprioceptive program is effective in increasing muscle size at ankle and hip musculature. As muscle size is proportional to muscular strength, increased muscle size might have a positive impact on dynamic functions at the ankle and hip.

**2718 Board #238 June 2 9:30 AM - 11:00 AM Sex-Specific Responses to Fatiguing Exercise Can Be Explained by Electromechanical Efficiency**

Ethan C. Hill, 68583-0806, Terry J. Housh, FACSM, Cory M. Smith, Josh L. Keller, Richard J. Schmidt, Glen O. Johnson, FACSM. University of Nebraska - Lincoln, Lincoln, NE.

(Sponsor: Dr. Terry J. Housh, FACSM)

Email: ethan.hill@unl.edu

No relationships reported

**PURPOSE:** It is well known that muscle fatigue is manifested uniquely between men and women. Electromechanical efficiency has been used to examine various aspects of muscle function, but has not been applied to examine sex-specific fatigue responses. Therefore, the purpose of the present study was to examine electromechanical efficiency between men and women during a fatiguing task. **METHODS:** Twenty-two resistance-trained men and women performed 50 submaximal (65% of concentric peak torque), concentric muscle actions of the dominant forearm flexors at 60°·s⁻¹. Concentric peak torque was determined prior to and immediately after the fatiguing protocol. Surface electromyographic and mechanomyographic signals were simultaneously recorded from the biceps brachii muscle and electromechanical efficiency was calculated as the ratio of mechanomyographic amplitude to electromyographic amplitude. An independent samples t-test was used to compare the percent decreases in concentric peak torque between the men and women. Polynomial regression analyses were used to examine the composite patterns of responses for electromechanical efficiency for the men and women. In addition, in order to allow for the comparison of slope coefficients, composite electromechanical efficiency values were normalized and fitted with a linear model. **RESULTS:** Concentric peak torque decreased to a greater extent in the men (30.5%) compared to the women (22.3%). In addition, electromechanical efficiency decreased for both the men (quadratic, p=0.016, r⁻²=0.919) and women (quadratic, p=0.006, r⁻²=0.605). However, the natural log transformed slope coefficients indicated that the decrease was greater (p=0.026) for the men (-0.009) than the women (-0.003). **CONCLUSION:** Like concentric peak torque, electromechanical efficiency decreased for both the men and women, but the decrease was greater in the men. These findings indicated that men exhibited decreased electromechanical efficiency compared to their female counterparts which may have contributed to the greater decrease in concentric peak torque for the men. Thus, electromechanical efficiency may provide additional insight regarding the potential mechanisms mediating sex-specific responses to fatigue exercise.

**2719 Board #239 June 2 9:30 AM - 11:00 AM MMAX Normalisation of Voluntary EMG Removes the Confounding Influences of Electrode Location and Body Fat.**

Marcel B. Lanza, Tom B. Balshaw, Jonathan P. Folland, FACSM. Loughborough University, Loughborough, United Kingdom.

Email: marcel.lanza@gmail.com

No relationships reported

The evoked maximal M-wave (Mₘₐₓ, peak-to-peak [P-P]) is frequently used to normalise surface electromyography (sEMG) during voluntary contractions. However, it is unknown if Mₘₐₓ normalization: (i) accounts for the variation in electrode position over a muscle, potentially removing the need for precise and yet imperfect electrode placement between measurement sessions; and (ii) removes the documented influence of body fat on sEMG amplitude during voluntary contractions.
PURPOSE: The first aim of the study was to assess the influence of electrode positioning on sEMG measurements, using multiple recordings sites over the vastus lateralis (VL), during voluntary contractions (MCVs) and evoked Hmax and examine if any site differences in these parameters were proportional. The second aim was to investigate if Mmax normalization removes the confounding influence of body fat, quantified by skin-muscle distance (SMD), on sEMG during MCVs.

METHOD: Young healthy males completed both experiments. Experiment 1 (n=10; 22 ± 2 y; 1.78 ± 0.07 m; 73.6 ± 9.6 kg) involuted simultaneous sEMG measurements from 8 different VL sites during knee extension isometric MVCs and twitch contractions. Experiment 2 (n=24; 24 ± 2 y; 1.76 ± 6 m; 69 ± 6 kg) involved the same contractions with sEMG recordings from one location over the VL, vastus medialis and rectus femoris, and measurements of SMD at each sEMG site using B-mode ultrasonography.

RESULTS: Experiment 1 demonstrated that absolute sEMG at maximal voluntary torque (EMGmax) differed between the VL recording sites (P<0.001) with lower values at more proximal sites (P=0.030). However, when EMGmax was normalised to Mmax-P, P-Between sites no differences were found (P=0.929). Experiment 2 showed that absolute EMGmax was negatively related to SMD (P=0.001, r=-0.786) but when EMGmax was normalised by Mmax-P the relationship with SMD was not significant (P=0.967, r=0.067).

CONCLUSION: The present study suggests voluntary sEMG and Mmax-P amplitude vary proportionally across the surface of the VL muscle and that normalising voluntary sEMG to Mmax-P removes the confounding influence of body fat. Therefore, Mmax-P normalisation is recommended to overcome the issues of both sensor re-positioning between test sessions and variable body composition between participants.

2720 Board #240 June 2 9:30 AM - 11:00 AM

H-Reflex Plasticity Following Cast Immobilization Of Distal Radius Wrist Fractures

Peter Yee, Natasha G. Boyes, Geoffrey H. Johnston, Joel L. Lanovaz, Jonathan P. Farthing. University of Saskatchewan, Saskatoon, SK, Canada.

Email: peter.yee@usask.ca

(No relationships reported)

The Hoffmann (H)-reflex has been used as a recovery marker in disuse-immobilization models. The data is limited on the effects of forearm immobilization on the H-reflex, especially in clinical populations. PURPOSE: To determine H-reflex changes following a distal radius wrist fracture requiring cast immobilization. METHODS: Five fracture (FX) patients (4 W; 1 M; Age: 45.2±18.9 yrs; ht: 164.1±7.0 cm; wt: 8.5±2.3 Nm; p < 0.05), but normalized EMG during MVC showed a decreasing trend (27.41±8.97N.m; 47.02 ± 13.77N.m and 10.06±1.36N.m, the peak flexor torque were 27.41±8.97N.m, 51.28 ± 13.77N.m and 19.89 ± 6.75N.m before training. The hip, knee and ankle peak extensor/flexor torque increased after training (p < 0.05), the ankle extensor/flexor torque increased after training (p < 0.05), the ankle extensor/flexor torque increased after training (p < 0.05). The hip, knee and ankle extensor/flexor muscle peak torque of older adult before and after intervention were tested by Contrax (Swissland) at 90° angular velocity. A paired Student’s t test was used to compare pre-post differences. Written informed consent was received from all participants.

RESULTS: The hip, knee and ankle peak extensor torque were 38.67 ± 15.08N.m, 51.28 ± 13.77N.m and 10.06±1.36N.m, the peak flexor torque were 27.41±8.97N.m, 47.02 ± 13.77N.m and 19.89 ± 6.75N.m before training. The hip, knee and ankle peak extensor torque were 26.81 ± 16.08N.m, 48.71 ± 6.91N.m and 26.4± 22.11N.m after training. The hipknee extensor/flexor torque did not change after training (p > 0.05), the hipknee extensor/flexor torque increased after training (p < 0.05). CONCLUSION: 24 weeks Tai Chi training will help OA older adults to improve the strength of ankle joint and it was related to the characteristics of Tai Chi movement.

2722 Board #242 June 2 9:30 AM - 11:00 AM

Change Of Lower Limb Muscle Strength Of Older Oa Adult After 24 Weeks Tai Chi Intervention

Cui Zhang, Keyi Yin, Donghui Wang, Yunqi Tang, Yu Liu. Shanghai University of Sport, Shanghai, China.

Email: 1510302016@student.sus.edu.cn

(No relationships reported)

The incidence of knee osteoarthritis (OA) increases with age. Epidemiological studies have shown a high prevalence of knee OA among older Chinese. Tai Chi exercise, as a traditional Chinese practice has long been used to enhance fitness. Research increasingly shows that many OA signs and symptoms, such as reduced joint mobility, pain, and increased joint stiffness, can be ameliorated by Tai Chi exercise. However, the lower limb joint torque of OA patients were less reported after long term Tai Chi exercise. PURPOSE: To determine whether the Tai Chi exercise intervention would improve lower limb joint power of OA older adult or not. METHODS: 20 older women65yrs -79yrs, Kellgren-Lawrence 3 grade, having no lower limb surgery, no orthopedic problems of the hip, knee, or ankle, no neurological disease, no regular exercise.) with clinically diagnosed knee OA were recruited in this study, 9 finished this at last. Participants practiced Tai Chi exercise which include eight Tai Chi forms of Yang Style 24 weeks, 3 times/week, 1 hour/time. Hip, knee and ankle extensor/flexor muscle peak torque of older adult before and after intervention were tested by Contrax (Swissland) at 90° angular velocity. A paired Student’s t test was used to compare pre-post differences. Written informed consent was received from all participants.

RESULTS: The hip, knee and ankle peak extensor torque were 38.67 ± 15.08N.m, 51.28 ± 13.77N.m and 10.06±1.36N.m, the peak flexor torque were 27.41±8.97N.m, 47.02 ± 13.77N.m and 19.89 ± 6.75N.m before training. The hip, knee and ankle peak extensor torque were 26.81 ± 16.08N.m, 48.71 ± 6.91N.m and 26.4± 22.11N.m after training. The hipknee extensor/flexor torque did not change after training (p > 0.05), the hipknee extensor/flexor torque increased after training (p < 0.05). CONCLUSION: 24 weeks Tai Chi training will help OA older adults to improve the strength of ankle joint and it was related to the characteristics of Tai Chi movement.

2723 Board #243 June 2 9:30 AM - 11:00 AM

Electro- Or Traditional-acupuncture Immediately Increases Flexibility, But Does Not Affect Kinesthesia And Muscle Activation


Email: daeho.kim@khu.ac.kr

Seoul, Korea, Republic of.

Abstracts were prepared by the authors and printed as submitted.

FRIDAY, JUNE 2, 2017
treatment. An acupuncturist performed three physical examinations (SLR test, Thomas test, and hip abduction manual muscle test) to determine one of three acupuncture options (option A: S9, SP1; option B: ST34, ST36, and GB2; option C: GB33, GB34, and GB27). Afterwards, one of three treatments (control: no treatment, n=16; electro-acupuncture, n=19, and traditional-acupuncture, n=15) was randomly assigned to each participant for 15-min. Measurements were assessed at baseline, 0-, 20-, and 40-min post treatment. At each time point, HROM was measured using a goniometer on a seated position. KIPS on two knee flexion angles (15° and 45°) were randomly assessed. Quadriceps MVIC and CAR were measured on a dynamometer with superimposed bursts (knee locked at 90°). To test treatment effect over time, 3 × 4 mixed model ANOVAs and Tukey-Kramer post hoc tests were performed (p<0.05).

RESULTS: Either electro- (4.2; p<0.0001) or traditional-acupuncture (5.8; p<0.0001) immediately increased HROM (F6,141=4.27, p<0.001) at 0-min post treatment. There was no difference between acupuncture types (p=0.41). Regardless of treatments (time main effect: F6,141=12.57, p<0.0001), quadriceps MVIC was reduced at 0° (5.2%; p<0.0001), 20° (5.0%; p<0.0001), and 40° post treatment (7.1%; p<0.0001), compared to the baseline values. KIPS (F6,141=1.81, p=0.01) and CAR (F6,141=0.42, p=0.87) did not change at any time point.

CONCLUSIONS: A single session of electro- or traditional-acupuncture treatment is beneficial for flexibility but not for kinesthesia and muscle activation. Changes in blood flow volume, overlap between actin and myosin filaments, and viscoelastic properties of muscle-tendon units may explain an increase in flexibility.

### Board #244
**June 2 9:30 AM - 11:00 AM**

**Effects of Marijuana Use on Lower Extremity Isokinetic Strength and Core Endurance**

**Brian C. Garcia, Grace Rhodhouse, Jonathon Lisano, Laura K. Stewart, Jeremy D. Smith. University of Northern Colorado, Greeley, CO**

(Marijuana use among athletes is becoming more widely reported, particularly as more states legalize the drug. Anecdotally, supporters suggest that marijuana aids in recovery and improves performance. Unfortunately, the effect of marijuana use on muscle function is not currently understood. **Purpose:** To determine whether muscle strength and endurance are altered by marijuana use. **Methods:** All participants were physically active, defined by at least 150 minutes of moderate-intensity exercise per week via the I-PAQ Short Format, and were either marijuana users (MU, n = 10, mass = 81.4 ± 19.0 kg; ht = 1.75 ± 0.08 m; age = 25 yrs ± 6 yrs) or non-marijuana users (NU, n =15, mass = 73.5 ± 13.5 kg; ht = 1.80 ± 0.08 m; age = 25 yrs ± 6 yrs). Marijuana use habits were assessed via the I-PAQ Short Format, and were either marijuana users (MU, n = 10, mass = 81.4 ± 19.0 kg; ht = 1.75 ± 0.08 m; age = 25 yrs ± 6 yrs) or non-marijuana users (NU, n =15, mass = 73.5 ± 13.5 kg; ht = 1.80 ± 0.08 m; age = 25 yrs ± 6 yrs). Marijuana use habits were quantified through the Marijuana Use Measure. MU were described as those consuming marijuana products at least once a week for the past 6 months and NU were described as not having used any form of marijuana in the past 12 months. Hip (90°∙s-1), knee (30°∙s-1), and ankle (30°∙s-1) isokinetic strength was assessed in the dominant leg of each participant using a BioDex dynamometer. Leg dominance was determined by asking which leg the person would choose to kick a ball with for maximum velocity and distance. Core endurance (back extension, left side plank, right side plank, and trunk flexion) was also assessed by holding the position until failure. The time it took to reach failure for each condition for each participant was recorded. All conditions were randomized across participants and groups to avoid any order effects. A single factor MANOVA (α < 0.05) was used to determine differences between groups. **Results:** There were no statistically significant differences between groups for any strength or core endurance measures (L2 = 0.657; DF = 10, 15; F = .730; p > .687). **Conclusion:** Marijuana use in a healthy, young, active population does not appear to have delayed agonist activation during early wrist FLEX.**

### Board #245
**June 2 9:30 AM - 11:00 AM**

**Comparison of Electromyographic Responses Across Handle Types During Seated Row Exercise**

**Tyler F. Meckes1, Sam Meske2, Daniel G. Drury, FACSM2, Swapan Mookerjee1. 1Bloomsburg University, Bloomsburg, PA. 2Gettysburg College, Gettysburg, PA. (Sponsor: Daniel G. Drury, FACSM)**

(Handl design and wrist position can affect the muscular performance during resistance exercises. **Purpose:** This study compared the electromyographic (EMG) responses during seated row exercise in the Latisimus Dorsi (LD), Biceps Brachii (BB), and Flexor Carpi Radialis (FCR) using a cylindrical handle versus a MAG® handle. **Methods:** Ten males (aged 21 ± 1.4 yrs) with prior resistance training experience (6.3 ± 1.9 yrs) performed the exercise protocol on a cable machine. Participants completed a one-repetition maximal lift (1-RM) followed by one set at 85% 1-RM until failure, using both handle types in randomized order. Root mean square EMG (EMGRMS) recordings from the BB, LD, and FCR were normalized to the 1-RM values. **Results:** Two-way repeated measures ANOVA was used to analyze differences between handle types and EMG activity. EMGRMS values (%) are presented in the table below.

<table>
<thead>
<tr>
<th>Handle Type</th>
<th>EMGRMS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder</td>
<td></td>
</tr>
<tr>
<td>MAG®</td>
<td></td>
</tr>
<tr>
<td>Biceps Brachii</td>
<td>66.6 ± 8.9</td>
</tr>
<tr>
<td>Latissimus Dorsi</td>
<td>86.6 ± 13.3</td>
</tr>
<tr>
<td>Flexor Carpi Radialis</td>
<td>57.9 ± 4.1</td>
</tr>
</tbody>
</table>

* Significant differences (p<0.001)

The 1-RM lifts were significantly greater (p < 0.003) with the MAG® handle (115.2 ± 17.4 kg) versus the cylindrical handle (102 ± 15.1 kg). These findings showed significantly higher maximal lifts and greater EMG activity in the BB using the MAG® handle. Possible mechanisms for these differences may be related to actin and myosin overlap of the forearm flexors, grip comfort and differences in handle contact surface area.

### Board #246
**June 2 9:30 AM - 11:00 AM**

**Effect of Movement Speed on Pattern Matching for a Continuous Activity with Visual Feedback**

**Matthew E. Holman, Bejamin J. Darter. Virginia Commonwealth University, Richmond, VA. Email: holmanme@vcu.edu**

(Result relationships reported)

Providing visual feedback (VF) during a task is a common strategy to enhance patient success. However, the speed of the targeted movement may impact one’s ability to use feedback toward matching a desired outcome. **PURPOSE:** 1) To determine the effect of target pattern speed on matching the movement pattern of a continuous activity with VF. 2) To determine if different speeds produce distinct task normalized muscle activation patterns. **METHODS:** Ten young healthy subjects were recruited. Participants completed a non-resisted continuous wrist flexion (FLEX) and extension (EXT) activity. The task involved matching wrist angular motion with a target sine wave (0.7 or 1.0 Hz). VF of wrist movement and the target pattern were provided concurrently on a monitor. An electrogoniometer captured wrist movement while EMG was used to record forearm muscle activation. Five 20s trials with 2min rest periods were completed at each target speed. Cross-correlation (CC) was used to calculate temporal lag between movement and target patterns. Discrete Fourier Transformation (DFT) was used in calculating pattern frequencies to determine movement-target speed. Muscle activation on/off time (ON, OFF), total activation time (TAT), total movement time (TMT), and total co-contraction time (TCt) were calculated to assess movement characteristics. Paired samples t-tests compared variables between the tested speeds. **RESULTS:** Different wrist movement speeds and muscle activity (TMT and TAT) were found for each target speed (p < .05). Further analysis revealed movement and target patterns were similarly matched regardless of target speed, and wrist movement lagged behind target patterns by a similar amount at each speed (0.7 Hz, 0.07s; 1.0 Hz, 0.03s). Muscle activation in early EXT was similar between speeds for EXT ON (0.03s) and FLEX OFF (0.01s). At the start of FLEX, EXT OFF (0.04s; p < .05) and FLEX ON (0.07s; p < .05) occurred later at 0.7 Hz. No differences between speeds for TCt were found. **CONCLUSIONS:** Despite lagging behind the target, movement speed did not alter one’s ability to match target patterns. Furthermore, movement characteristics were similar between speeds, except for activation during initial FLEX. Greater elastic energy stored during wrist EXT at the higher speed may have delayed against activation during early wrist FLEX.

### Board #247
**June 2 9:30 AM - 11:00 AM**

**Acute Effects of Unilateral Static Stretching On Handgrip Strength in the Stretched and Non-Stretched Limb**

**Jacob D. Jelmini, Andrew Cornwell, Nazareth Khodiguian, Jennifer Thayer. California State University, Los Angeles, Los Angeles, CA. Email: jjelmin2@calstatela.edu**

(Result relationships reported)

**Scientific Abstract:** Previous research has demonstrated that an acute bout of static stretching can reduce force and power output from the muscles undergoing the stretching treatment. Although the mechanism for this effect remains unclear, evidence has been presented for a neurological inhibition and a decrease in muscle-tendinous stiffness. To further investigate the presence of a neural inhibitory mechanism, the current study focused on the impact of stretching just one limb on both the stretched limb and the contralateral non-stretched limb. It was reasoned that any decrease in force output from the non-stretched side could only be accounted for by neural inhibition as no mechanical adaptation would have occurred.
PURPOSE: To observe the effects of an acute bout of unilateral static stretching on handgrip strength and to discern whether a neural cross-over inhibitory effect is present to cause a decrease in force output and associated electrical activity from the non-stretched limb. METHODS: Thirty participants (15 males, 15 females) performed maximum voluntary unilateral handgrip contractions of both limbs before and after stretching the finger flexors of the strength-dominant side only. Each trial was assessed for peak force and associated muscle activity (iEMG), as well as rate of force generation. RESULTS: Peak force (p = 0.002) and associated iEMG (p = 0.000) decreased by 4.2% and 6.5% respectively in the stretched limb only. However, rate of force generation was significantly impaired in both the stretched (15.2%; p = 0.000) and non-stretched limbs (-4.4%; p = 0.006) one-minute post-stretch, and remained similarly depressed for both limbs 15 minutes later. CONCLUSION: We conclude, therefore, that acute stretching negatively impacts rate of force generation more than peak force. Moreover, a reduced rate of force generation from the non-stretched limb indicates the presence of a cross-over inhibitory effect through the nervous system, which provides additional evidence for a neural mechanism.

E-36 Free Communication/Poster - Physical Activity and Health in Adults

2728 Board #248 June 2 11:00 AM - 12:30 PM
The Epidemiological Evidence of Cardiometabolic Disease Risk Factors in College-Aged Subjects: A Cross-Sectional Investigation
Michael J. Carper1, Hillary Dickey2, Derek A. Crawford3, Jessica Heinz4. 1Pittsburg State University, Pittsburg, KS. 2University of Oklahoma, Norman, OK. Email: mcarper@pittstate.edu

PURPOSE: The purpose of this 5-year cross-sectional investigation was to collect basic body composition and fitness data on college-aged males and females to national recommended guidelines for throughout the college years.

METHODS: A total of 3,388 college aged males (n = 1919) and females (n = 1469) age 18 - 25yrs participated in this investigation. Subjects performed the following tests: height; weight; body composition; muscular strength and endurance; cardiopulmonary function; flexibility; waist and hip circumferences; and resting blood pressure.

RESULTS: Females demonstrated a significant increase, from 18-19yrs to 20-25 yrs, respectively, in weight (67.1 to 70.8 kg), % body fat (27.9 to 30.4%), waist (80.5 to 83.3 cm) and hip (95.1 to 98.9 cm), fat mass (19.9 to 24.3 kg), and BMI (24.4 to 25.8 kg/m²), diastolic blood pressure (75.8 to 77.4 mmHg), waist-to-hip ratio (0.48 to 0.51), and total overweight and obese status (33.9 to 39.1%). These subjects demonstrated a significant decrease, from 16-19yrs to 20-25yrs, respectively, in sit-and-reach (15.4 to 14.6 in) and total push-ups (15.2 to 13.3). Males demonstrated a significant increase, from 18-19yrs to 20-25 yrs, respectively, in weight (80.8 to 85.3 kg), % body fat (15.1 to 17.6 %), waist-to-hip ratio (0.88 to 0.90), waist (85.9 to 89.4 cm) and hip measurements (97.3 to 99.7 cm), waist-to-height ratio (0.48 to 0.50), fat mass (13.3 to 17.1 kg), BMI (25.1 to 26.3), total overweight and obese status (38 to 48.5%), diastolic blood pressure (76.7 to 79.3 mmHg), and right (49.1 to 51.1 kg) and left (46.8 to 48.3 kg) grip strength. These subjects demonstrated a significant decrease, from 18-19yrs to 20-25 yrs, in sit-and-reach (14.5 to 13.9 in), total sit-ups (52.7 to 50.9), and total push-ups (33.6 to 32.1). All data was analyzed using independent sample t-tests (SPSS, v. 23; p < 0.05).

CONCLUSIONS: We have demonstrated that there is a continuous decline in basic health and fitness outcomes in college-aged students that may lead to the development of co-morbid conditions and the development of cardiometabolic diseases such as diabetes, hypertension, and cardiovascular disease.

2729 Board #249 June 2 11:00 AM - 12:30 PM
Physical Activity and Perceived Stress Among Student Physical Therapists
Eric Arguello. 1University of North Texas Health Science Center, Fort Worth, TX. Email: j.churilla@unf.edu

(NO relationships reported)

Methods: Doctor of Physical Therapy Students (n=113) were grouped according to their year in the academic program as Grad I’s, Grad II’s, and Grad III’s. Perceived Stress Scale and Exercise Activity Scale were combined in a questionnaire to describe student physical therapist’s perceived stress levels and to determine the average amount of aerobic and muscle strengthening physical activity performed on a weekly basis. Sedentary activities questions were also included in the questionnaire. Data were analyzed for mean perceived stress levels, percentages of student who met the exercise and activity guidelines on a weekly basis, and the mean time spent in sedentary activities. RESULTS: Perceived stress was lower for the Grad II’s compared to Grad I’s (p = 0.005) and Grad III’s (18.79 ± 8.4 p < .005). Perceived stress was lower for the Grad I’s compared to Grad II’s (p = 0.05). Perceived stress was higher in Grad II’s among all physical therapy students. Aerobic physical activity guidelines were met by 65% of Grad I’s, 54% of Grad II’s, and 93% of Grad III’s. Muscle strengthening activity guidelines were met by 33% of Grad I’s, 25% of Grad II’s, and 75% of Grad III’s. When spent in sedentary activities was lower for Grad III’s (867 ± 765 min) compared to Grad I’s (2884 ± 1531.1 min, p < .005) and Grad II’s (3741.5 ± 2092.3 p < .005). There was a negative correlation between perceived stress and meeting the aerobic (rs = -0.326, n = 113, p < 0.001) and muscle strengthening (rs = -0.326, n = 113, p < 0.001) physical activity guidelines for all cohorts.

Conclusion: Student physical therapists in this Doctor of Physical Therapy program experiencing higher levels of perceived stress also demonstrate overall decreased physical activity and increased sedentary levels. In addition, perceived stress and activity levels appear to fluctuate during their education.
was defined using the 75th percentile of fasting insulin as the cutoff value. Logistic regression analysis was used to examine the associations among impaired fasting glucose, hypertriglyceridemia, and hyperinsulinemia. Logistic regression models were adjusted for age, race, moderate-intensity physical activity (MIPA), and waist circumference (WC). RESULTS: Demographic adjusted analyses revealed significantly greater odds of hyperinsulinemia in euglycemic men (OR 3.09, 95% CI 1.96-4.83) and women (OR 3.13, 95% CI 2.12-4.63) with hypertriglyceridemia (P=0.001 for both). Additionally, women with impaired fasting glucose and normal triglycerides had significantly greater odds of hyperinsulinemia (OR 5.62, 95% CI 3.61-8.75, P<0.0001). A similar relationship was not revealed in men (OR 1.09, 95% CI 0.23-5.13, P=0.92). Following adjustments for MIPA and WC, the odds of hyperinsulinemia in euglycemic men (OR 2.42, 95% CI 1.45-4.05) and women (OR 1.49, 95% CI 1.01-2.18) with hypertriglyceridemia were attenuated, but remained statistically significant (P=0.05 for both). However, the odds of hyperinsulinemia in women with impaired fasting glucose and normal triglycerides were no longer statistically significant (P=0.12). CONCLUSION: Our findings revealed greater odds of hyperinsulinemia in euglycemic men and women with hypertriglyceridemia regardless of MIPA or WC.

2732 Board #252 June 2 11:00 AM - 12:30 PM
Association Of Resistance Exercise With The Incidence Of Hypercholesterolemia In Men
Esmée A. Bakker1, Duck-Chul Lee, FACSM2, Xuemei Sui1, Thijs M.H. Eijjsvogels1, Carl J. Lavie1, Steven N. Blair, FACSM2, 1Radboud university medical centre, Nijmegen, Netherlands. 2Iowa State University, Ames, IA. 3University of South Carolina, Columbia, SC. *John Ochsner Heart and Vascular Institute, New Orleans, LA. (Sponsor: Dr. Duck-Chul Lee, FACSM)
Email: Esmee.Bakker@radboudumc.nl

Hypercholesterolemia is a significant risk factor for cardiovascular disease. Although the beneficial effects of aerobic exercise (AE) are well-documented, evidence for the effects of resistance exercise (RE) on the development of hypercholesterolemia is still scarce. PURPOSE: To examine the associations of RE, independent of and combined with AE, with the risk of developing hypercholesterolemia in men.

METHODS: Men, aged 18-83 years (mean age 46), who received comprehensive preventive examinations at the Cooper Clinic in Dallas, Texas, were included in this study. Baseline RE, AE, and meeting the 2008 US Physical Activity Guidelines (RE ≥2 days/week; AE ≥500 MET-minutes/week) were determined by self-reported frequency and minutes of exercise. Hypercholesterolemia was defined as total cholesterol of ≥240 mg/dL or physician-diagnosed hypercholesterolemia during follow-up examinations. Hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated using Cox proportional hazards regression.

RESULTS: Among 7,317 participants, 1,430 men (20%) developed hypercholesterolemia during a median follow-up of 4 years. Individuals meeting the RE guidelines had a 24% lower risk of developing hypercholesterolemia (HR 0.76; 95% CI 0.54-1.05), and those meeting both the RE and AE guidelines had a 42% lower risk (HR 0.58; 95% CI 0.42-0.81) compared to meeting neither of the guidelines. Additionally, RE was associated with 32% and 31% lower risks of hypercholesterolemia (HR 0.68; 95% CI 0.54 to 0.86 and HR 0.69; 95% CI 0.54 to 0.88), respectively, compared to no RE. Furthermore, after full adjustment, less than 1 hour/week and 2 sessions/week of RE were associated with 32% and 31% lower risks of hypercholesterolemia (HR 0.68; 95% CI 0.54 to 0.87; 95% CI 0.77 to 0.996) after adjustment for potential confounders and AE. In addition, after full adjustment, less than 1 hour/week and 2 sessions/week of RE were associated with 32% and 31% lower risks of hypercholesterolemia (HR 0.68; 95% CI 0.54 to 0.86 and HR 0.69; 95% CI 0.54 to 0.88), respectively, compared to no RE. RESULTS: Demographic adjusted analyses revealed significantly greater odds of hyperinsulinemia in euglycemic men (OR 3.09, 95% CI 1.96-4.83) and women (OR 3.13, 95% CI 2.12-4.63) with hypertriglyceridemia (P<0.0001 for both). Additionally, women with impaired fasting glucose and normal triglycerides had significantly greater odds of hyperinsulinemia (OR 5.62, 95% CI 3.61-8.75, P<0.0001). A similar relationship was not revealed in men (OR 1.09, 95% CI 0.23-5.13, P=0.92). Following adjustments for MIPA and WC, the odds of hyperinsulinemia in euglycemic men (OR 2.42, 95% CI 1.45-4.05) and women (OR 1.49, 95% CI 1.01-2.18) with hypertriglyceridemia were attenuated, but remained statistically significant (P=0.05 for both). However, the odds of hyperinsulinemia in women with impaired fasting glucose and normal triglycerides were no longer statistically significant (P=0.12). CONCLUSION: Our findings revealed greater odds of hyperinsulinemia in euglycemic men and women with hypertriglyceridemia regardless of MIPA or WC.

2733 Board #253 June 2 11:00 AM - 12:30 PM
Health Behaviors and Dietary Supplement Use among Military Personnel: A Latent Class Analysis
Xiaying Zheng1, Josh B. Kazmair1, Tzucheg Kao2, Krauss Stephen2, Diana Jeffery3, Patricia A. Deuster, FACSM4, 1University of Maryland, College Park, MD. 2Uniformed Services University, Bethesda, MD. 3Defense Health Agency, DOD, Falls Church, VA. Email: xyzheng86@gmail.com

Dietary supplements (DS) are commonly used to increase muscle mass and/or lose weight, even though many are ineffective and linked to adverse events. DS use is particularly common among military personnel and athletes, correlating with both health-promoting and risky/deleterious behaviors. Latent class analysis (LCA) identifies and classifies people into separate groups based on combinations of categorical responses. PURPOSE: To extend the current literature focused on individual differences among DS use and health behaviors, the present study used LCA to: (1) characterize military personnel with respect to health behaviors related to the performance triad, and (2) describe differences in body building (BB) and weight loss (WL) DS use across the classes constructed in (1). METHOD: Data from the 2011 DoD Health Related Behaviors Survey of Active Duty Military Personnel for 39,877 service members were assessed. Variables related to diet, activity and sleep were used in a sample weighted LCA to identify a best-fitting model and number of classes, and then relate class membership to BB and WL use. RESULTS: The best-fitting model identified four latent classes: 1) Balanced: balanced performance class (30%), characterized by healthy diet, high-to-moderate activity, and adequate sleep; 2) Active: highly active class (31%), characterized by poor diet, very high activity, and low-to-moderate sleep; 3) Unhealthy: weak performance class (34%), characterized by poor diet, low activity, and moderate-poor sleep; and 4) Inconsistent: careless responding class (5%), characterized by extreme and inconsistent responses. BB and WL supplements were most prevalent in the Active class (BB: 38%; WL: 37%) and least prevalent in the Unhealthy class (BB: 22%; WL: 28%). Females were less likely to use BB (17% female vs. 37% male) but more likely to use WL (23% female vs. 20% male) supplements. Class membership and WL/BB use also varied by military service branch. CONCLUSION: Among military personnel, BB and WL use are related to distinct patterns of positive and deleterious health behaviors. Educational DS campaigns should be tailored towards these latent classes of health behaviors. BB and WL use may be more common among individuals who engage in otherwise healthy behaviors than among those who engage in deleterious behaviors.

2734 Board #254 June 2 11:00 AM - 12:30 PM
Characterizing the Relationship between Physical Activity and Osteoporosis in the Greater Philadelphia Hispanic Population
Allison R. Altman-Singles, Eliana Bolano. Pennsylvania State University, Berks Campus, Reading, PA. (Sponsor: Mary Jane De Souza, FACSM)
Email: ara5093@psu.edu

The Hispanic population in the United States has increased 9-fold since 1960, and currently accounts for 20% of the total population. While the incidence of osteoporosis in this population is similar to the national average, the literature exploring the connection between physical activity and osteoporosis incidence in Hispanic Americans is limited. PURPOSE: To determine the relationship between physical activity and osteoporosis in the Philadelphia Hispanic population. METHODS: 49 postmenopausal Hispanic women were recruited from community centers in the greater Philadelphia area. Surveys obtained self-reported osteoporosis status, which was used to separate women into healthy and osteoporosis groups. Both groups were queried regarding their physical activity level and type in childhood, adulthood, and late adulthood. Subject characteristics, fractures, nutrition, and socioeconomic status were also obtained. RESULTS: Groups (healthy n=25, osteoporosis n=24) were similar in height, weight, and age of menopause, but the osteoporosis group (67.6±10.0 yr) was older than the healthy group (73.8±6.2 yr). The osteoporosis group reported 25 total fractures (9 at hip), versus 8 in the healthy group (0 at hip). In both groups, activity levels decreased with aging from 3.2 hr/wk during childhood to 2.3 hr/wk during late adulthood. Physical activity levels were very low at all stages of life were 33-37% higher in the healthy group (Fig 1). Impact exercise was more widely practiced in the healthy group at all stages. The osteoporosis group reported more meals containing starch, but fewer meals containing meat, vegetables, fruit, and dairy. Education level was lower in the osteoporosis group. CONCLUSION: The results display a positive relationship between increased physical activity and bone health in Hispanic women. This study suggests more education may encourage better habits, potentially reducing osteoporosis incidence in this Hispanic American population.
2735
Board #255 June 2 11:00 AM - 12:30 PM
Healthy Lifestyle Behaviors Related to Cardiovascular Risk among Young Adults
Melissa A. Napolitano1, Jessica A. Whiteley2, Meghan Mavredes3, Laura L. Hayman1, Samuel Simmens1, Loretta DiPietro, FACSM1. 1The George Washington University, Washington, DC; 2University of Massachusetts Boston, Boston, MA. 3Sponsor: Loretta DiPietro, FACSM
Email: mnapolitano@gwu.edu

Purpose: Participation in healthy lifestyle behaviors is associated with decreased risk for CVD across the lifespan. Examining clustering of healthy lifestyle behaviors among young adults at increased risk due to elevated BMI could provide insight into CVD preventive interventions that could be implemented during this developmental transition. Methods: Young adults (ages 18-35) enrolled in a healthy body weight clinical trial (n=210; % female=79.5%; M age=22.1±3.9; M BMI=31.4±3.7) completed surveys: demographics, the International Physical Activity Questionnaire (IPAQ) and the Population Assessment on Tobacco and Health (PATH) questions. Healthy Lifestyle Behaviors included: 1) meeting guidelines for moderate-to-vigorous physical activity (MVPA; >150 minutes); 2) never cigarette user 3) never e-cigarette user 4) low sedentary behavior (<4 hours/day). Participants were scored for the presence of up to 4 healthy lifestyle behaviors. Results: Participants reported engaging in 122.7±103.6 minutes/week of MVPA and 8.5±3.4 hours/day of sedentary behavior. Approximately 6.2% met criteria for MVPA, 60.9% reported never smoking cigarettes, 83.2% reported never using e-cigarettes, and 17.6% had low sedentary behavior time. In terms of clustering of healthy lifestyle behaviors, 11.0%, 29.9%, 50.5%, 7.6%, 1.1% had 0, 1, 2, 3, 4 healthy behaviors, respectively. The distribution of number of health behaviors varied little by age, gender or BMI status (overweight vs. obese). Conclusions: Young adults with elevated BMIs are at increased risk due to elevated BMI could provide insight into CVD preventive interventions that could be implemented during this developmental transition. Participants reported engaging in 122.7±103.6 minutes/week of MVPA and 8.5±3.4 hours/day of sedentary behavior. Approximately 6.2% met criteria for MVPA, 60.9% reported never smoking cigarettes, 83.2% reported never using e-cigarettes, and 17.6% had low sedentary behavior time. In terms of clustering of healthy lifestyle behaviors, 11.0%, 29.9%, 50.5%, 7.6%, 1.1% had 0, 1, 2, 3, 4 healthy behaviors, respectively. The distribution of number of health behaviors varied little by age, gender or BMI status (overweight vs. obese). Conclusions: Young adults with elevated BMIs are at increased risk due to elevated BMI could provide insight into CVD preventive interventions that could be implemented during this developmental transition.

2736
Board #256 June 2 11:00 AM - 12:30 PM
Effects Of Changes in Depressive Symptoms and Cardiorespiratory Fitness on All-cause Mortality: The HUNT Study
Trude Carlsen1, Oyvind Salvesen2, Ulrik Wislöff1, Carl J. Lavie1, Steven N. Blair, FACSM2, Linda Ernstsen1, 1Norwegian University of Science and Technology, Trondheim, Norway, 2John Ochsner Heart and Vascular Institute, Ochsner Clinical School, The University of Queensland School of Medicine, New Orleans, LA. 3Arnold School of Public Health, University of South Carolina, Columbia, SC.
Email: trude.carlsen@ntnu.no

Purpose: Depression and cardiorespiratory fitness (CRF) are positively and negatively associated with mortality, respectively. Studies examining the relationship between depressive symptoms (DS) and mortality seldom account for the possible effect of CRF. We investigated the independent and combined associations of changes in DS and CRF with all-cause mortality. METHODS: 14,799 participants (mean age 63 years, 51.8% women) from the second (1995-97) and third (2006-08) wave of the Nord-Trondelag Health Survey (HUNT) were included. DS were measured with the validated Hospital Anxiety and Depression Scale (HADS-D). A HADS-D score ≥8 indicated high DS. CRF was estimated (eCRF) using a validated non-exercise model. eCRF above median value indicated high eCRF. Change in HADS-D score was classified into persistently high, increased, decreased, and persistently low DS. Change in eCRF was classified into persistently high, increased, eCRF, decreased, eCRF and persistently low eCRF. Deaths were ascertained using The Norwegian Cause of Death Registry. RESULTS: During a mean follow-up period of 7.2 years after baseline (HUNT3), 1101 all-cause deaths (7.4%) were registered. A multivariate analysis adjusted for baseline age, sex, marital status, education, physical activity, body mass index, smoking status, alcohol consumption, inchoinic heart disease, cancer, stroke, brain hemorrhage, hypercholesterolemia, diabetes, systolic blood pressure and change in eCRF, showed having persistently low DS was associated with a 29% risk reduction of all-cause mortality (hazard ratio (HR) 0.71; 95% CI 0.55-0.91) compared to persistently high DS. Persistently high eCRF independently predicted lower risk of all-cause mortality (HR 0.62; 95% CI 0.50-0.77), compared to persistently low eCRF. In the combined analyses, test for trend (p<0.001) suggests a linear relationship between the worst (persistently high DS and persistently low eCRF) and the best (persistently low DS and persistently high eCRF) combinations of DS and eCRF. CONCLUSION: Maintaining low levels of DS and maintaining high levels of eCRF are associated with a lower risk of all-cause mortality in middle aged and older people.

2737
Board #257 June 2 11:00 AM - 12:30 PM
New Get-up Test As an Indicator Of Sarcopenia, Sarcopenic Obesity, And Cardiovascular Disease Risk Factors
Duck-chul Lee, FACSM, Nathan F. Meier. Iowa State University, Ames, IA.
Email: dclec@iastate.edu

Purpose: To investigate the associations of get-up test time with sarcopenia, sarcopenic obesity (SO), and cardiovascular disease (CVD) risk factors. METHODS: This cross-sectional study included 269 older adults (56% female) aged ≥65 years (mean age 72, range 65-95). The get-up test was newly developed as a physical function test in which the participant should lie down to the floor and back up to standing as fast as possible, and categorized into three tertiles (fast, moderate, and slow) based on the get-up test time in seconds. Sarcopenia was defined as low appendicular lean mass index (men, ≤7.23 kg/m²; women, ≤5.67 kg/m²) plus either slow gait speed (<0.8 m/s) or weak handgrip strength (men, <30 kg; women, <20 kg), according to the European Working Group on Sarcopenia in Older People. SO was defined as the coexistence of sarcopenia and obesity based on % body fat (men, ≥25%; women, ≥30%) using Dual Energy X-Ray absorptiometry. RESULTS: Mean (SD) get-up test time was 7.2 (3.2) seconds, and 29 (11%) and 27 (10%) older adults had sarcopenia and SO, respectively. Each one second increase (slow) in get-up test time was associated with unfavorable sarcopenia variables and CVD risk factors, specifically with 0.02 m/s slower gait speed, 0.67 kg weaker handgrip strength, 0.87% increased body fat, 0.64 mg/dl increased fasting glucose, and 0.71 kg/m² increased body mass index (all p<0.05) in the linear regression after adjusting for age, sex, smoking status, and alcohol intake. Compared to the fast get-up test group, odds ratios (95% confidence intervals) in moderate and slow get-up test groups were 4.42 (1.17-16.74) and 5.86 (1.60-21.41) for sarcopenia, and 4.00 (1.04-15.34) and 5.41 (1.47-19.92) for SO, respectively, in the multivariable logistic regressions. Although mostly not statistically significant, older adults in the moderate and slow get-up test groups had increased odds ratios for the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity, compared to the older adults in the fast get-up test group.
2738 Board #258 June 2 11:00 AM - 12:30 PM
Active Transportation And C-reactive Protein In U.S. Adults
Nicholas F. Diaz, Michael R. Richardson, James R. Churilla, FACSM. University of North Florida, Jacksonville, FL. (Sponsor: James R Churilla, FACSM)

CONCLUSIONS: Among different ethnicity groups, increased use of active transportation and elevated C-reactive protein (CRP) was associated with increased risk of cardiovascular disease. A similar relationship was not revealed in those reporting less than two days per week (d/wk) of active transportation (p=0.0664). A similar relationship was not revealed in those reporting less than two d/wk of active transportation (p=0.87, 95% CI, 0.61-1.24, P=0.4267).

RESULTS: Compared to a referent group of U.S. adults reporting no use of active transportation, analysis revealed significantly lower odds of having an elevated CRP concentration in those reporting more than two days per week (d/wk) of active transportation (Odds Ratio [OR] 0.83; 95% Confidence Interval [CI], 0.72-0.94, P=0.0064). A similar relationship was not revealed in those reporting less than two d/wk of active transportation (OR 0.87; 95% CI, 0.61-1.24, P=0.4267).

PURPOSE: Examine the associations between self-reported use of active transportation and elevated C-reactive protein (CRP) using a nationally representative sample of U.S. adults. METHODS: The study sample (n=9937) included male and female adults (>20 years of age) who participated in the 2007-2010 National Health and Nutrition Examination Survey. Elevated CRP was defined using the current Centers for Disease Control and Prevention and American Heart Association recommendations. Active transportation included walking or use of a bicycle to and from work, for shopping, or to school for at least 10 minutes continuously. RESULTS: In a nationally representative sample of U.S. adults, increased use of active transportation (>2 d/wk) was associated with significantly lower odds of elevated CRP independent of waist circumference.

2739 Board #259 June 2 11:00 AM - 12:30 PM
Impact Of Race And Non-exercise Estimated Cardiorespiratory Fitness On Incident Stroke: The Regards Study
Xuemei Sui1, Virginia Howard2, Michelle McDonnell1, Linda Ernsten1, Carl Lavie3, Steven Hooker, FACSM. 1University of South Carolina, Columbia, SC. 2University of Alabama at Birmingham, Birmingham, AL. 3University of South Australia, Adelaide, Australia. 4University of Science and Technology, Trondheim, Norway. 5John Heart and Vascular Institute, New Orleans, LA. 6Arizona State University, Phoenix, AZ. (Sponsor: Steven P. Hooker, FACSM)

CONCLUSIONS: In older adults, increased use of active transportation was associated with significantly lower odds of elevated CRP independent of waist circumference.

CONCLUSIONS: Substituting sitting time with VPA or MPA appears to be a significant predictor of incident stroke. Routine utilization of cardiorespiratory fitness (CRF) in cardiovascular disease risk assessment is limited due to cost and the need for exercise equipment and skilled personnel. Estimated CRF (eCRF), based on non-exercise algorithms utilizing readily available clinical and self-reported data, is a promising alternative though its role as a predictor of incident stroke remains unclear, especially in an African American (AA) population. PURPOSE: To study the association between eCRF and incident stroke as well as the impact of race on the associations. METHODS: This population-based U.S. cohort study included 24,465 participants (54.8% women, 39.6% AA, mean age 64.6 years) from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study who were free of stroke at enrollment 2003-2007. Participants were telephoned every 6 months to assess potential stroke, with retrieval and central physician adjudication of medical charts of suspected strokes through March 31, 2016. Baseline eCRF in maximal metabolic equivalents (METs) was determined using non-exercise sex-specific algorithms and further grouped into age-, and sex-specific tertiles. Active transportation and elevated C-reactive protein (CRP) using a nationally representative sample of U.S. adults. RESULTS: Compared to a referent group of U.S. adults reporting no use of active transportation, analysis revealed significantly lower odds of having an elevated CRP concentration in those reporting more than two days per week (d/wk) of active transportation (Odds Ratio [OR] 0.83; 95% Confidence Interval [CI], 0.72-0.94, P=0.0064). A similar relationship was not revealed in those reporting less than two d/wk of active transportation (OR 0.87; 95% CI, 0.61-1.24, P=0.4267).

CONCLUSIONS: In older adults, increased use of active transportation (>2 d/wk) was associated with significantly lower odds of elevated CRP independent of waist circumference.

2740 Board #260 June 2 11:00 AM - 12:30 PM
Exercise Cardiac Power And Coronary Artery Calcification In Men
Sae Young Jae1, Kanokwan Bunsawat2, Eun Sun Yoon2, Hyun Jeong Kim2, Won Hah Park3, Bo Fernhall, FACSM. 1University of Seoul, Seoul, Korea, Republic of. 2University of Illinois at Chicago, Chicago, IL. 3Samsung Medical Center, Seoul, Korea, Republic of.

CONCLUSIONS: This study suggests that faster get-up test physical performance in older adults is associated with lower prevalence of sarcopenia, SO, and CVD risk factors in older adults.

CONCLUSIONS: This study suggests that faster get-up test physical performance in older adults is associated with lower prevalence of sarcopenia, SO, and CVD risk factors in older adults.

PURPOSE: Low exercise cardiac power (ECP), defined as a ratio of peak oxygen consumption with peak systolic blood pressure during exercise, is associated with adverse cardiovascular events, but the underlying mechanisms remain unclear. Coronary artery calcification (CAC) as a surrogate marker of atherosclerosis is associated with an increased risk of cardiovascular outcomes. We tested the hypothesis that lower levels of ECP may be associated with the prevalence of CAC, independent of conventional risk factors, in a cross-sectional study of 2165 (age 53±6 yrs, range 40-78 yrs) men. METHODS: We measured CAC using multidetector computed tomography using the Agatston coronary artery calcium score. The prevalence of CAC was defined as dichotomous variables of CAC score >0. ECP was calculated by a ratio of peak oxygen consumption with peak systolic blood pressure and classified into quartiles. RESULTS: The presence of CAC was inversely associated with ECP quartiles (both, P < .001 for trend). After adjusting for age, BMI, SBP, HDL-C, hsCRP, glucose, heart rate, smoking, hypertension and diabetes, men in the lowest quartile of ECP had a significantly elevated odds ratios for having CAC (odds ratio (OR) 1.43, 95% CI 1.06-1.93), compared with men in the highest quartile of ECP. Each ECP unit increment as a continuous variable was associated with 4% (OR 0.96, 95% CI 0.93-0.99) lower prevalence of CAC after adjusting for established risk factors. CONCLUSIONS: Our findings demonstrate that lower levels of ECP are associated with the prevalence of coronary artery calcification, which could contribute to increased risk of cardiovascular events.
PURPOSE: To examine the relationship between changes in cardiorespiratory fitness and changes in ideal cardiorespiratory health (CVH) score over time. METHODS: The association between change in fitness and change in ideal CVH score was examined in 2,355 adults who had at least two clinic visits in the Aerobics Center Longitudinal Study. Fitness was measured as duration in minutes from a maximal treadmill test. Ideal CVH score was calculated on a 14 point scale using the AHA’s simple 7 criteria of smoking status, BMI, physical activity (MET-min/wk), healthy diet, total cholesterol, blood pressure, and fasting plasma glucose. Participants were grouped into categories of loss, stable, or gain, by tertiles of change in cardiorespiratory fitness and also by tertiles of change in ideal CVH score between baseline and last follow-up visit. RESULTS: After a mean follow up of 3.3 ± 2.4 years, the average change in ideal CVH score was 0.14 ± 1.9 and the average change in treadmill time was -0.25 ± 2.7 minutes for the total sample. After controlling for age, sex, and time between exam dates, the gain in fitness group (n=851) significantly (p<0.0001) increased their ideal CVH score by an average of 0.71 ± 1.9, while the stable and loss of fitness groups (n=830 and 873 respectively) significantly (p<0.0001) decreased their scores by -0.07 ± 1.9 and -0.55 ± 1.9, respectively (p<0.0001 for difference between groups). Change in treadmill time per year explained 6.5% of the change in ideal CVH score. For every minute increase in treadmill time per year, the ideal CVH score increased by 0.09 per year. CONCLUSIONS: Improving cardiorespiratory fitness during middle age is associated with higher scores and greater improvement in ideal cardiorespiratory health.

PURPOSE: Observational studies often adjust for confounding by socioeconomic status (SES) but rarely report the magnitude of confounding bias. Also, different indicators of SES may not meet the definition of a confounder for some associations. This study will determine whether different measures of SES have different confounding effects on the associations of screen time with BMI and of moderate/vigorous physical activity (MVPA) with BMI.

METHODS: In a 15 year prospective cohort study, 1830 young adults (age 25 - 36) were added individually to these models to determine the percent change in the association of screen time with BMI and of MVPA with BMI. Crude associations of screen time with BMI and of MVPA with BMI were regressed with linear regression on each SES measure and a composite measure that combined young adults’ income and education. Crude associations of screen time with BMI and of MVPA with BMI were assessed with linear regression. The SES measures associated with better global and domain-specific cognitive function. Estimated KES was measured annually from 1998 (baseline) to 2002. We included participants with KES measured at baseline and at least two more times from 1999 to 2002. We estimated the change per year in KES for each person using simple linear regression. Participants were then divided into quartiles based on the regression coefficient (first quartile, -3.54% per year; second quartile, -3.53% to -0.82% per year; third quartile, -0.81% to 2.31% per year; fourth quartile, >2.32% per year), and were followed up for 8 years (2002-2010). The hazard ratios and 95% confidence intervals (CIs) for death across the baseline quartiles of KES trend were obtained from a Cox proportional hazards model while adjusting for sex, body mass index, smoking status, alcohol intake, medication use, functional capacity and initial KES value.

RESULTS: Forty-six (13.6%) participants died during the follow-up period. The hazard ratios for death across the quartiles of KES trend (lowest to highest) were 1.0 (referent), 0.55 (95% CI 0.25-1.21), 0.61 (95% CI 0.28-1.31), 0.63 (95% CI 1.02-1.26; P for trend=0.033). Participants in the highest quartile had a significantly lower risk of death across the quartiles of KES.

CONCLUSIONS: These results indicate that, among physically-independent Japanese elderly individuals, 4-year change in KES among 70-year-olds is associated with lower risk of all-cause mortality over 8 years of follow-up, independent of the KES value at baseline.

Purpose: Clinical studies suggest that higher cardiorespiratory fitness (CRF) is associated with better global and domain-specific cognitive function. Estimated CRF (eCRF), based on non-exercise algorithms from clinical and self-reported data, is feasible and practically useful in primary care. However, whether eCRF is an appropriate predictor for increased risk for cognitive impairment in the general population remains unclear.

Methods: This prospective study included 21,220 participants (55.9% women, 37.1% African American, mean age 64.2 years) from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study without cognitive impairment and no history of stroke at baseline. Participants’ global cognitive status was assessed annually with the validated Six-Item Screener.

Abstracts were prepared by the authors and printed as submitted.
Cardiorespiratory fitness was determined by calculating VO\textsubscript{2}\text{max} from a submaximal treadmill test. Data were analyzed using repeated measures hierarchical linear models in SAS. RESULTS: The sample was middle-aged (45.9 \pm 17 years), overweight (BMI: 27.1 \pm 5.6 kg/m\(^2\)), and their VO\textsubscript{2}\text{max} was 36.6 \pm 9.8 ml/kg/min. Approximately 53\% of the sample reported watching TV often and only 3\% of the sample reported engaging in regular physical activity often. In models adjusted for age, BMI, physical functioning and smoking status, there was a significant TV time x sex interaction (p<0.0001) when modeling FEV\textsubscript{1}, such that higher TV time in females was associated with worse FEV\textsubscript{1} compared to males. A physical activity x sex interaction (p<0.0001) was also observed in adjusted models of FEV\textsubscript{1}. When TV time, physical activity and cardiorespiratory fitness were included in the same model, only the association between cardiorespiratory fitness and FEV\textsubscript{1} remained significant (p<0.001).

CONCLUSION: Cardiorespiratory fitness is a predictor of age-related changes in lung function. Among deconditioned adults, particularly in females, reducing sedentary time and increasing physical activity may lead to an increase in cardiorespiratory fitness and thus may attenuate the age-related decline in lung function.
in older adults, and if so to what extent such relationships are independent of PA behavior, remain unclear. **PURPOSE:** To examine cross-sectional associations of objectively assessed PA and sedentary behaviors on metabolic syndrome components and clustered metabolic risk in a sample of older community-dwelling women. **METHODS:** Components of the metabolic syndrome including waist circumference (WC), systolic and diastolic blood pressures, fasting levels of plasma glucose, HDL-cholesterol and triglycerides were assessed in 120 community-dwelling older women (65-70 yrs). Total amount of sedentary PA (total count per day) was measured in different intensities (sedentary, light (LPA), and moderate-to-vigorous PA (MVPA)). Continuous bouts of sedentary time and breaks in sedentary time were assessed with accelerometers. Isotemporal substitution models were used to examine influence of PA and sedentary behavior on each component of the metabolic syndrome and on a clustered metabolic risk score. **RESULTS:** Associations between variables of sedentary behavior and metabolic risk were lost once variation in total accelerometer counts per day was adjusted for. Replacement of a 10-min time block of MVPA with either LPA or time in sedentary behaviors was related to an increase in WC and clustered metabolic risk score (zMS) (WC: β = 0.71 to 2.19 p < 0.01; zMS: β = 0.06 to 0.08, p < 0.05). **CONCLUSIONS:** Detrimental influence of a sedentary lifestyle on metabolic health is likely explained by variations in amounts of PA rather than sedentary time per se. Given our findings, increased amounts of PA with an emphasis on increased time in MVPA should be recommended in order to promote a favorable metabolic health profile in older women.

**Oral red complex bacteria, including Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia, were significantly associated with the severity of chronic periodontal disease. Previous studies indicated that engaging in physical activity is associated with lower periodontitis prevalence. However, the association between physical activity and periodontal bacteria was not clear. **PURPOSE:** To determine whether physical activity is associated with red complex bacteria among Japanese adults. **METHODS:** We studied 226 adult employees aged 20–69 years. Analysis of bacterial species in saliva was conducted using 16s rRNA gene cloning and sequencing. Physical activity was assessed using the International Physical Activity Questionnaire. Total physical activity was calculated based on intensity and duration of physical activity and divided into three categories according to the Japanese guideline as follows: none (0 METs hours/week), low (0.1–22.9 METs hours/week), and high (≥23.0 METs hours/week). The association between physical activity and prevalence of saliva red complex bacteria was tested with multivariate logistic regression analysis after adjusting for sex, age, smoking, alcohol use, breakfast skipping, and body mass index. Data were expressed as odds ratios (OR) and 95% confidence intervals (CI). **RESULTS:** The prevalence of red complex bacteria was 46.0% for Porphyromonas gingivalis, 67.7% for Treponema denticola, and 78.3% for Tannerella forsythia, respectively. Multivariate analysis showed that physical activity was not associated with red complex bacteria (Porphyromonas gingivalis: low, 0.79 [0.40–1.55]; high, 1.13 [0.57–2.24]; P for trend = 0.717; Treponema denticola: low, 1.09 [0.48–2.48]; high, 0.76 [0.33–1.75]; P for trend = 0.816; Tannerella forsythia: low, 1.43 [0.69–2.97]; high, 1.09 [0.52–2.29]; P for trend = 0.520). On the other hand, participants with higher physical activity tended to have a better self-reported oral health than those with lower physical activity (low, 1.85 [0.88–3.89]; high, 2.20 [1.02–4.77]; P for trend = 0.044). **CONCLUSION:** This cross-sectional study demonstrated that physical activity was not associated with periodontal bacteria, such as Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia in Japanese adults.

**Overweight and obesity (OO) are risk factors of metabolic syndrome. Body Mass Index (BMI) is commonly used to evaluate OO rates. However, even though the OO rates by BMI in Chinese population are significantly lower than in other ethnics, the incidence of metabolic syndrome remain same. Therefore, it’s critical to find alternative methods to evaluate true obesity base on Body Fat Rate (BFR). **PURPOSE:** To compare the difference between BMI and BFR on the assessment of the obesity rate in Chinese urban white-collar population and to explore a rational of BFR in justifying the true OO rates. **METHOD:** From June 5, 2015 to August 14, 2016, a total of 2,195 white-collar employees (male 1049, female 1146) participated in this study in Zjiangjiang InnoPark of Shanghai, China. The mean age was 33.69±9.26 (18 to 66) years. BMI was obtained from each participant. BMI between 24 (kg/m2) and 27.9 (kg/m2) is defined as the obesity rate in Chinese urban white-collar population and to explore a rational of BFR to evaluate true obesity incidence among Chinese population, BFR may replace BMI as a better method for obesity measurement.
Physical activity (PA) has been associated with reduced breast cancer risk, which may be partially mediated through an effect on sex hormones. Prior studies of PA and sex hormones relied on self-reported measures of PA, thus the impact of PA duration and intensity remains unclear. PURPOSE: To evaluate the association between both objective (o-PA) and self-reported measures of PA (sr-PA) with circulating sex hormones.

METHODS: This cross-sectional analysis was conducted within the Women’s Lifestyle Validation Study, a sub-study of the Nurse’s Health Study I and II cohorts (n=525). A triaxial accelerometer was used for 7 days to assess average counts per day (CPD), minutes of light intensity PA (o-LPA), and moderate-vigorous intensity PA (o-MVPA). A modified Paffenbarger PA questionnaire was used to assess self-reported minutes of total, LPA (sr-LPA) and MVPA (sr-MVPA). Dehydroepiandrosterone sulfate (DHEAS), testosterone, and sex hormone binding globulin (SHBG) were assayed among all women; estradiol was measured in postmenopausal women not currently on hormone therapy (n=426). Multivariable linear regression models analyzed each PA measure with each biomarker adjusted for age, race, parity, age at menarche, oophorectomy status and BMI. RESULTS: In general, the associations between PA and sex hormones appeared stronger with o-PA than sr-PA. For example, women in the 4th (vs. 1st) quartile of CPD and o-MVPA had 13% and 19% lower SHBG levels respectively (p<0.001), whereas women in the 4th (vs. 1st) quartile of sr-PA (i.e., total, LPA, and MVPA) had 10% lower SHBG levels (p=0.05). Further, women in the 4th (vs. 1st) quartile of o-MVPA had 14% higher testosterone levels (p<0.001). There were no statistically significant relationships between any sr-PA measure with DHEAS. Specifically, women in the 4th (vs. 1st) quartile CPD had the strongest impact on DHEAS and estradiol. Specifically, women in the 4th (vs. 1st) quartile CPD had 13% higher DHEAS levels (p=0.001) and 22% lower estradiol levels (p=0.01). There were no statistically significant relationships between any sr-PA measure with DHEAS. Women in the 4th (vs. 1st) quartile sr-MVPA had 10% lower estradiol levels (p=0.01). CONCLUSIONS: PA was modestly related to sex hormones in women. CPD and o-MVPA showed the strongest and most consistent relationships with sex hormones.

CONCLUSIONS: The prevalence of elevated CRP was significantly lower in those reporting engaging in MSA using subjective and objective measures of DM.

Physical activity (PA) has been associated with reduced breast cancer risk, which may be partially mediated through an effect on sex hormones. Prior studies of PA and sex hormones relied on self-reported measures of PA, thus the impact of PA duration and intensity remains unclear. PURPOSE: To evaluate the association between both objective (o-PA) and self-reported measures of PA (sr-PA) with circulating sex hormones.

METHODS: This cross-sectional analysis was conducted within the Women’s Lifestyle Validation Study, a sub-study of the Nurse’s Health Study I and II cohorts (n=525). A triaxial accelerometer was used for 7 days to assess average counts per day (CPD), minutes of light intensity PA (o-LPA), and moderate-vigorous intensity PA (o-MVPA). A modified Paffenbarger PA questionnaire was used to assess self-reported minutes of total, LPA (sr-LPA) and MVPA (sr-MVPA). Dehydroepiandrosterone sulfate (DHEAS), testosterone, and sex hormone binding globulin (SHBG) were assayed among all women; estradiol was measured in postmenopausal women not currently on hormone therapy (n=426). Multivariable linear regression models analyzed each PA measure with each biomarker adjusted for age, race, parity, age at menarche, oophorectomy status and BMI. RESULTS: In general, the associations between PA and sex hormones appeared stronger with o-PA than sr-PA. For example, women in the 4th (vs. 1st) quartile of CPD and o-MVPA had 13% and 19% lower SHBG levels respectively (p<0.001), whereas women in the 4th (vs. 1st) quartile of sr-PA (i.e., total, LPA, and MVPA) had 10% lower SHBG levels (p=0.05). Further, women in the 4th (vs. 1st) quartile of o-MVPA had 14% higher testosterone levels (p<0.001). There were no statistically significant relationships between any sr-PA measure with DHEAS. Specifically, women in the 4th (vs. 1st) quartile CPD had the strongest impact on DHEAS and estradiol. Specifically, women in the 4th (vs. 1st) quartile CPD had 13% higher DHEAS levels (p=0.001) and 22% lower estradiol levels (p=0.01). There were no statistically significant relationships between any sr-PA measure with DHEAS. Women in the 4th (vs. 1st) quartile sr-MVPA had 10% lower estradiol levels (p=0.01). CONCLUSIONS: PA was modestly related to sex hormones in women. CPD and o-MVPA showed the strongest and most consistent relationships with sex hormones.

CONCLUSIONS: The prevalence of elevated CRP was significantly lower in those reporting engaging in MSA using subjective and objective measures of DM.
Low back pain is a major health problem worldwide. It is also the largest contributor to years of living with disability. Several studies have sought to explain the relationship between fitness and low back pain, especially in Western countries, but there are few studies clarifying this relationship among Japanese, for whom there is a different standard for obesity. **PURPOSE:** We evaluated whether obesity/overweight is a risk factor for chronic low back pain, by using body fat percentage (%FAT) and body mass index (BMI) as indices of fitness among Japanese male workers. **METHODS:** Participants underwent an annual health examination in 1986, and followed up in the 2009-2010 period. BMI was calculated based on height and weight. %FAT was estimated using the Brozek formula for body density, which was estimated by the Nagamine and Suzuki formula for skinfold thickness. Participants who had low back pain in 1986 were excluded. From annual health examinations in 2009-2010, participants who on our self-administered questionnaire responded “all the time” with regard to subjective back pain symptoms were considered as having chronic low back pain. These participants were divided into quartiles based on their %FAT and BMI. A logistic regression model was used to adjust the covariates and evaluate the relationship between presence of chronic low back pain and obesity. The multivariable-adjusted odds ratios and 95% confidence intervals (95%CI) were calculated for both %FAT and BMI, adjusting for age, cigarette smoking, and alcohol intake as the variables. **RESULTS:** Participants were 1,152, and median age (range) at baseline year was age 29 (18-43) years. Ninety nine percent of baseline low back pain in 2010. Following age, cigarette smoking, and alcohol intake adjustments, using the lowest %FAT (first quartile) group as a reference, the odds ratios (95%CI) for the second, third, and fourth quartiles were 0.72 (0.43-1.20), 1.46 (0.79-2.68), and 1.39 (1.05-1.83), respectively; for linear trend 0.006. Moreover, using the BMI (first quartile) group as a reference, the odds ratios (95%CI) for the second, third, and fourth quartiles were 1.33 (0.60-2.96), 1.39 (0.71-2.69), and 1.80 (0.95-3.39), respectively; for linearity = 0.011. **CONCLUSION:** Our findings suggest that both high %FAT and BMI are risk factors for chronic low back pain.

**Purpose:** The purpose of this study was to compare 10-year longitudinal changes in physical fitness (age 70 to age 80 years) between older Japanese adults who did and did not take medications over the ten years period. **METHODS:** Six hundred (n=306) and women (n=294), 70 years of age at baseline, residing in Niigata City, Japan, participated in this study. Baseline and follow-up physical fitness tests included hand-grip strength, isometric knee extension strength, leg extensor power, stepping rate, and one-leg standing time with eyes open, and had medical examinations by physicians. Only the individuals who completed the physical fitness test at age of 80 years were grouped into no-medication or medication groups over the past decade, and divided into three groups: Group A: no medication over the 10 years period; Group B: medication at age 70 to 80 years; Group C: medication during the 10 years period. Their physical fitness at ages 70 and 80 years were compared using Paired t-test and Chi Square test. **RESULTS:** 59% of baseline data (n=354) were compared with 10 years follow-up data. Among these subjects, the rate of no medication use at 70 years old was 35.8%, which declined to 15.3% by 80 years of age. The most commonly prescribed medications requiring medication was high blood pressure and cholesterol medication was high blood pressure (45.5% of men and women (n=122). The numbers of participants in each group were: A=56, B=104, and C=194. When compared the means of test results among these 3 groups at age 70 and 80 years, there were significant differences (p<0.05) in hand-grip strength (A: 33.0kg, B: 30.2kg, C: 28.8kg) and knee extensor strength (A: 1.19kg, B: 1.06kg, C: 0.97kg). There were also significant decline over the ten years period in the strength (A: -5.81kg, B: 0.45kg, C: -7.8kg) (p<0.05, 95%CI), and fat (%FAT) (A: -0.11%, B: -0.12%, C: -0.22%, and total cholesterol (A: -0.056mg/dl, B: -0.243mg/dl, C: -1.09mg/dl). Limitation of this study was significant decline of completion rate of the tests (leg extensor power, knew extensor strength) in participants in Groups B and C. **CONCLUSIONS:** The present study showed that the older adults with no medication use over the ten years period had higher physical fitness level than medication groups. The findings of this study may provide interesting insight regarding the physical fitness in the elderly population.

**Purpose:** It has been previously demonstrated that higher physical activity (PA) levels and better physical fitness (PF) were associated with higher health-related quality of life (HRQOL). However, Wanderley et al. did not take the differences between PA levels calculated as overall PA (MVPAall) or accumulated in bouts of at least 10 min (MVPA10) into account. Therefore, the aim of this study was to compare the different effects of MVPA10 and MVPAall on PF and HRQoL in a population of young and older adults. **METHODS:** 21 young adults (YA: age 22.6±2.9 yrs; BMI 22.5±2.6 kg/m²) and 21 older adults (OA: age 68.3±3.3 yrs; BMI 26.1±3.5 kg/m²) were on an activity monitor for 7 consecutive days to obtain time spent in MVPA, analyzed in bouts of at least 10 consecutive min (MVPA10) and in overall minutes (MVPAall). To assess maximal isometric strength (IMVC), they performed a hand-grip strength test. Cardiorespiratory fitness (VO2max) was determined by indirect calorimetry using a maximal treadmill test. HRQoL was measured with the Short-Form 36 Health Status Survey (SF-36v2) that provided the physical (PCS) and the mental (MCS) component summary score. **RESULTS:** Although young adults resulted fitter than older adults (YA: VO2max: 2.3±0.3 L*min⁻¹; IMVC: 190.6±60.2 N; OA: VO2max: 1.7±0.3 L*min⁻¹; IMVC 151.4±52.3 N; p<0.05), no differences were detected for MVPA (nor MVPA10) between groups. MVPAall was significantly lower than MVPA10 (MVPAall: 28.7±3.56 min/day; MVPA10: 61.5±7.5 min/day; p<0.01). The overall average PCS and MCS scores were 55.1±6.3 and 47.7±8.5, respectively. Regression analysis, adjusted for age and BMI, revealed that neither MVPA10 nor MVPAall were related to a higher PA or a higher HRQoL. Only VO2max was associated with a higher PCS (R²=0.095; β=4.216; p<0.05) each 1 L*min⁻¹ was associated with an increase of 4.5% in PCS. **CONCLUSIONS:** In contrast with Wanderley et al., this study showed that among relatively healthy, active but unfit older individuals HRQoL (PCS domain) is related only to VO2max. This observed positive association seems to be independent of age and BMI. This information will be useful for designing PA programs, aiming to improve cardiorespiratory fitness and that could also positively affect HRQoL. **REFERENCES** Wanderley, Qual Life Res. 2011 Nov;20(9):1371-8.
measurable difference (Seated-60%: 35.0 mg/dL, p=0.016), 20% LPA condition and 60% LPA condition (AUC mean difference (20%-60%): 17.3 mg/dL, p=0.010), and 40% LPA condition and 60% LPA condition (AUC mean difference (40%-60%): 9.8 mg/dL, p=0.023). CONCLUSION: These results provide experimental evidence to the importance LPA may play in the overall metabolic health of an older adult population. According to national data, LPA constitutes about 30% of the active day in older adults. Therefore, the translation of the current results suggest that if older adults, who spend on average 8 hours per day in LPA, increase LPA by 36 min/day, they could significantly benefit glucose control.

2761 Board #281
June 2 11:00 AM - 12:30 PM
Low Cognition and Prefrontal Cortex Oxygenation during High Intensity Exercise in Individuals with Substance Addiction
Kell Grandjean da Costa1, Wesley Quirino Alves da Silva1, Daniel Aranha Rego1, Alexandre Hideki Okano1, Hassan Mohamed Elsangedy1, Eduardio Caldas Costa1, Vanessa de Paula Soares Rachetti1, Erika Hussey1, Nathan Ward1, Eduardio Bodnaric Fontes1. 1Federal University of Rio Grande do Norte, Natal, Brazil. 2Tufts University, Boston, MA. Email: kellgrandjean@gmail.com

Substance addiction is a public health problem worldwide. Individuals with substance use disorder (SUD) have lower activity in the prefrontal cortex during resting state, which has been related to cognitive impairments and compulsive substance-seeking behavior. Exercise has shown to contribute in the treatment of SUD, however, its effects on the brain of these individuals is unclear, in particular under different intensities. PURPOSE: To verify the effects of an incremental exercise intervention on cognitive performance and oxygenation in the prefrontal cortex in individuals with substance use disorder (SUD). METHODS: The SUD group consisted of 14 patients (33.3 ± 5.6 years old) in a psychiatric hospital with substance use history (alcohol, marijuana, or crack cocaine) of 13.8 ± 5.6 years and classified as severe by DSM-V. The control group (CG) consisted of 15 subjects (age: 25.3 ± 3.1 years) without addiction classification by the DSM-V. Both groups were subjected to an incremental test on a cycle ergometer accompanied by spirometry and assessments of prefrontal cortex oxygenation by near-infrared spectroscopy (oxyhemoglobin; ΔHbO) and cognitive performance (response time in ms on the Stroop task). Assessments were conducted at the respiratory compensation point (RCP) and maximal oxygen consumption (VO2peak), and effects were evaluated with two-factor mixed-design ANOVAs with post hoc Sheffe's tests. RESULTS: Although the groups did not differ in attained VO2peak (p=0.267) or ΔHbO (CG: -3.4 ± 5.2%; UT: -2.2 ± 4.9%), in CG the VO2peak was higher than in UT (12.7 ± 2.6 vs. 10.5 ± 5.4 mL/kg/min). Moreover, the ΔHbO values were significantly lower in CG (51.1 ± 25.1 vs. 75.5 ± 23.1 mL/kg/min; p=0.025). CONCLUSION: Chronic addiction may impair prefrontal cortex oxygenation and cognitive during exercise. Interestingly, exercising at high intensities promotes higher oxygenation in the prefrontal cortex, indicating its potential for treatment of individuals with SUD.

2762 Board #282
June 2 11:00 AM - 12:30 PM
Acute And Chronic Immune Responses To Consecutive Or Non-consecutive Days Of Resistance Training
Pang Boon Bay1, Yongtai Raymond Wang1, Hilary Wei Jian Teo1, Junli Huang1, Jorming Goh1, Yifan Yang1. 1Nanyang Technological University, Singapore, Singapore. 2National University of Singapore, Singapore, Singapore. (No relationships reported)

Current exercise guidelines recommend resistance training (RT) 2 to 3 days per week (wk), spaced 48-72 h apart for optimal muscle growth and strength improvements. However, shorter rest periods between RT sessions has not been well studied. In addition, the immunological effects of RT due to different recovery periods are poorly understood. PURPOSE: To investigate the immune responses to two identical RT programs using different recovery period. METHODS: Two groups of 15 recreationally active men performed RT 3 times per wk for 12 wk either on consecutive (C) or non-consecutive days (NC). Both groups performed leg press, latissimus pulldown, leg curl, dumbbell shoulder press and leg extension for 3 sets of 10 repetitions at their pre-determined 10 repetition-maximum. Blood was sampled in untrained (UT) and trained (T) state in wk 1 and 12 before 1st day of RT (UT Pre and T Pre), immediately post 3rd day of RT (UT 0h and T 0h) and 24h after the 3rd day of RT (UT 24h and T 24h). Samples were analysed for counts of total white blood cells (WBC), neutrophils (NE), lymphocytes (LY), monocytes (MO), eosinophils (EO), basophils (BA) and platelets (PL). Generalized estimating equations analyses were performed. RESULTS: Both groups were similar in age [25 (SD 2) y], weight [65 (10) kg], height [1.72 (0.06) m], BMI [22.2 (2.7) kg/m2], systolic and diastolic blood pressures [114 (5) / 89 (8) mmHg], fasting glucose [4.5 (3.3) mmol/L] and physical activity level [2144 (1428) MET-min/wk] pre-RT. No interaction was found for all measures (p = 0.065 to 0.967). There were no group differences (p = 0.103 to 0.525) except MO, which was lower in C (528 ± 101%) than NC (641 ± 105%), 95% CI of difference (0.28%, 197%), p = 0.009. Significant main effects of time were found for all variables except MO (p = 0.170) and LY (p = 0.236). In wk 1, both groups increased WBC (C: -9.2%, NC: +7.0%; p = 0.025), LY (C: +12.4%; NC: +15.2%; p < 0.001), BA (C: +11.4%; NC: +23.1%; p = 0.003) and PL (C: +10.3%; NC: +12.1%; p < 0.001) at UT 0h compared to UT Pre. LY fell below UT Pre at UT 24h (p = 0.002). In wk 12, T 0h values for all measures were not significantly different from T Pre values (p = 0.772 to 0.999) except for an increase in PL (p = 0.001). There was no difference between T Pre and T 0h values for all measures (p = 0.335 to 0.999). CONCLUSION: Both groups had similar immune response to RT. Supported by NIE ACRF RI 5/14 YYF

2763 Board #283
June 2 11:00 AM - 12:30 PM
3 Week Behavioral Intervention Does Not Lower Urinary Bisphenol A Concentrations In Women With Obesity
Todd Hagogian, FACSM, Zoe Belli-Dovi, Adrian Mercado, Megan Guy, Suzanne Phelan. California Polytechnic State University, San Luis Obispo, CA. Email: thagobia@calpoly.edu

(No relationships reported)

Previous studies have shown that women with obesity have higher concentrations of Bisphenol A (BPA), but an intervention to reduce BPA is lacking in women. PURPOSE: To determine whether a theory-based behavioral intervention designed to reduce BPA would decrease urinary BPA concentrations over 3 weeks in women with obesity. METHODS: Thirty college-aged, women were randomly assigned to an intervention (N=15; 31.5 ± 5.6 kg/m2; 21.6 ± 3.3 yrs) or control (N=15; 30.8 ± 5.8 kg/m2; 21.5 ± 3.1 yrs). The intervention included weekly face-to-face meetings to reduce BPA exposures from food, cosmetics, and other packaged products. Women were provided with BPA-free cosmetics, hygiene, glass food/water containers and daily self-monitored major sources of BPA. Fasting urine BPA and creatinine concentrations, and weight were assessed at baseline and after 3 weeks. RESULTS: BPA was non-detectable (limit of detection 0.05 µg/L) in 26% of samples at baseline. No significant (P=0.55) treatment x time interaction effect was observed on creatinine-adjusted BPA concentrations from baseline to 3-weeks in the intervention (P=0.41, 0.05, 0.77 ± 0.66 µg/g Creatinine) using baseline BMI, age, and demographics as covariates. No significant treatment x time interaction effect (P=0.54) in weight was observed from baseline to 3-weeks in the intervention (P=0.87 ± 3.0, 39.3 ± 16.9 kg) or control group (81.4 ± 15.4, 81.1 ± 15.6 kg) and changes in creatinine-adjusted BPA concentrations were not significantly related (P=0.05). In sensitivity analysis, omitting subjects with non-detectable BPA concentrations at baseline, there was a trend for a significant treatment x time interaction (P=0.09). CONCLUSION: 3-week intervention had no effect on urinary BPA concentrations or weight in women with obesity. Future research is needed to examine intervention effects in individuals with high baseline urine BPA.

2764 Board #284
June 2 11:00 AM - 12:30 PM
Relationship Between Oxygen Consumption, Percentage Of Muscle Mass And Risk Of Cardiovascular Disease In Adult Men
Aura C. Zea-Robles1, Astrid Y. Rodriguez-Arboleda1, Diana P. Sanchez2, Henry H. Leon-Arizta2, Marulucio De Souza-Martins1, Sandra Posada-Bernal1. 1Santo Tomás University, Bogotá, Colombia. 2La Sabana University, Chia, Colombia. 3Pontificia Javeriana University, Bogotá, Colombia. Email: aureaza@usantotomas.edu.co

(No relationships reported)

Previous studies have shown that physical exercise of resistance and strength are related to cardiovascular health. PURPOSE: This study aims to establish the relationship between maximum oxygen consumption, percentage of muscle mass and cardiovascular risk disease in professors from the Santo Tomas University of Bogota - Colombia. METHODS: The population was 56 men with a mean age of 42.1 ± 9.5 years. The 10-year cardiovascular risk (10-YR) was calculated using the Framingham scale, considering the parameters of gender, age, presence of diabetes, smoking (cigarettes per day), total cholesterol (Total-C), HDL cholesterol (HDL-C) and systolic blood pressure (SBP). Pre-prandial blood samples were collected and blood pressure was evaluated after 15 minutes of rest. In a different session, the muscle mass percentage (MP) was evaluated by biopsiedme, a submaximal fitness test (modified Bruce protocol) was performed and the maximum oxygen consumption (VO2max) was calculated based on the test duration. The statistical analysis was
performed using the Pearson’s correlation coefficient (r) with a significance level of 0.05. RESULTS: In the evaluated subjects, one was diabetic and 16 men smoke up to 20 cigarettes per day. The Total-C was 5.58 ± 1.09 mmol/l, the HDL-C 1.27 ± 0.24 mmol/l and the SBP 106.7 ± 10.2 mmHg. The 10-yr-CVR was 5.5 ± 5.2%, with a range of 0.5 - 21.3%. The average of MP was 34.7 ± 3.1% and the relative VO_{max} 49.1 ± 1.1 ml/Kg/min. A negative correlation was observed between the MP and 10-yr-CVR (r = -0.38 p = 0.01) as well as between VO_{max} and RCV (r = -0.51 p < 0.01). CONCLUSION: This research evidences the protective effect on the risk of cardiovascular disease arising from a good aerobic capacity, especially by the reduction Total-C, lower SBP and a greater amount of MP. This work contributes to evidence the beneficial effects of combining aerobic and of strength exercise in reducing cardiovascular risk, which will be used in prevention programs within the Santo Tomas University population.

2765 Board #285
June 2 11:00 AM - 12:30 PM
Effect of Bikram Yoga on Heart Rate Variability and Associated Outcomes in Stressed and Sedentary Adults
Zoe L. Hewett, Kate L. Pumpa, Caroline A. Smith, Paul P. Fahey, Birinder S. Cheema. 1Western Sydney University, Sydney, Australia. 2University of Canberra, Canberra, Australia. Email: zoe.hewett@hotmail.com

PURPOSE: This study investigated the effect of a 16-week Bikram yoga intervention on the high frequency (HF) power component of heart rate variability (HRV) and associated physiological and psychological outcomes in stressed and sedentary adults.

METHODS: Eligible adults were randomized to an experimental group (n = 29) or a no-treatment control group (n = 34) after baseline testing. Experimental group participants were instructed to attend three to five Bikram yoga classes per week at local studios. All outcomes were collected at baseline (week 0) and completion (week 17), with psychological outcomes also collected at midpoint (week 8). Secondary physiological outcomes included additional HRV measures, blood pressure, augmentation index, body composition (via DEXA), waist circumference, fasting blood glucose, cholesterol, and C-reactive protein. Secondary psychological outcomes included the Perceived Stress Scale, the General- and Exercise Self-Efficacy Scales and health-related quality of life (HRQoL) measures (via Short-Form-36).

RESULTS: Sixty-three adults (37.2±10.8 years, 79% women) were enrolled in the study and included in the intention-to-treat analysis. The experimental group attended 27±18 classes. The HF component of HRV did not significantly change between groups over time, nor did any secondary physiological endpoints. However, higher attendance to the intervention was associated with significant reductions in diastolic blood pressure (p < 0.03), body fat percentage (p < 0.001), fat mass (p < 0.003) and body mass index (p < 0.05). Further, the experimental group improved several psychological outcomes including the control group including perceived stress (p = 0.003), general self-efficacy (p = 0.034), exercise self-efficacy (p = 0.003), and HRQoL ‘Vitality’ (p = 0.019) and ‘General Health’ (p = 0.034).

CONCLUSIONS: A 16-week Bikram yoga program did not increase the HF power component of HRV or any physiological outcomes evaluated. Low adherence possibly a potential predictor, and possible moderator effects.

Studies have shown that exercise improves cognitive function and that dual-task exercise, in particular, has neuroprotective effects in elderly individuals.

PURPOSE: The purpose of this study was to examine the improvement of cognitive function by a dual-task exercise intervention. We also tested if the improvement of cognitive function was associated with the number of steps and exercise duration at different exercise intensity levels.

METHODS: In all, 17 men and 25 women (mean [SD], age 73.8 [6.0] years, height 158.6 [7.0] cm, weight 56.0 [7.6] kg, and body mass index 22.2 [3.2] kg/m²) participated in a step-exercise (dual-task) once per week for 12 weeks. The number of steps was recorded from a waist-mounted accelerometer, and weekly data were classified into four levels based on the exercise intensity (inactivity, light, moderate, and vigorous). Participants performed the Cognitive Assessment for Dementia (CADi2) and Trail Making Test (TMT) before and after the exercise program to evaluate cognitive function.

RESULTS: The total reaction time determined by CADi2 was significantly shorter in the post-exercise test than that in the pre-exercise test (post: 89.3 [25.7] vs. pre: 96.1 [28.3], p = 0.025), which suggests that cognitive function improved during the 12-week exercise program.

CONCLUSIONS: These results demonstrate that the improved cognitive function was not primarily derived from changes in physical activity but, specifically, from involvement in dual-task exercise.
and BMI (P=−0.39, P=0.15), ST and MVPA (P=−0.23, P=0.42), and ST and BMI (P=−0.05, P=0.86). CONCLUSION: Obesity was highly prevalent (93%) in this group of Hispanic adults living with OSA in PR, probably obscuring its association with PA and ST. In general, these participants could be classified as physically inactive and sedentary, factors associated with reduced life expectancy and poor quality of life. Clinical treatment must integrate strategies to help control body weight, improve PA, and reduce ST in this population.

**RESEARCH RESULTS**

RESULTS: The 65% IRBT led to significantly greater increases in MAP from baseline in OW (15.9±8.1 mmHg) compared to YW (6.9±1.4 mmHg), but not (P=0.05) between OM (12.3±5.7 mmHg) and YM (10.8±5.7 mmHg). OV (20.2±7.2 %) had greater (P=0.05) decreases in Q, from baseline compared to YW (9.4±10.2 %), but no differences (P=0.05) were present between OM (−22.8±9.7 %) and YM (−22.7±11.3 %) during the 65% IRBT. The 65% IRBT led to greater (P=0.05) increases in LVR in OW (48.2±25.5 %) compared to YW (19.7±15.0 %), but no differences (P=0.05) existed among OM (54.4±17.8 %) and YM (47.1±23.3 %). No differences (P=0.05) were present in MAP, Q, or LVR between OM and OW. The 2% IRBT resulted in no changes (P=0.05) in MAP, Q, or LVR across time or among groups. CONCLUSIONS: These data suggest older women compared to younger women exhibit greater inspiratory muscle metaboreflex-induced cardiovascular consequences, while there were no differences between older and younger men. Lastly, sex differences in the inspiratory muscle metaboreflex are not present in older adults.
Pulmonary function tests were performed using a spirometry, including tidal volume (Vt), vital capacity (VC), forced vital capacity (FVC), Forced expiratory volume in 1 second (FEV1) and maximal voluntary ventilation (MVV). Endurance performance tests were examined during treadmill exercise testing with respiratory gas analysis, including maximal oxygen consumption (VO2 max) and time to exhaustion (TTE). Informed consent forms had been completed by all participants before the experiments started.

RESULTS: Baseline characteristics were not significantly different between two groups, except for the percentage of body fat (15.3±3.3 % and 19.70±4.73 %, p < 0.05 in triathletes and control groups). Triathletes had significantly higher pulmonary function in Vt (0.80±0.20 vs 0.63±0.13 L, p < 0.05), FVC (5.09±0.50 vs 4.53±0.43 L, p < 0.05), and MVV (181.7±21.70 vs 157.7±17.83 L/min, p < 0.05) compared with the control group. Moreover, they had greater VO2max (66.90±4.93 vs 47.00±8.43 ml·min⁻¹·kg⁻¹) and shunt group (1074.80±143.10 vs 782.40±92.30 s/e) compared with their counterpart (p < 0.05). We also found that FVC, FEV1, and MVV were significantly correlated with VO2max in all subjects (p < 0.05).

CONCLUSIONS: This study indicated that triathletes had higher pulmonary function and some correlations existed in pulmonary function and VO2max, which may provide useful information for triathlon training.

K. Shimizu, K. Katayama, K. Goto, H. I. Ishida, H. Akima, N. Nagoya University, Nagoya, Japan. (Sponsor: Craig A. Harms, FACSAM)

Email: shimizu.koari@h.mbox.nagoya-u.ac.jp

No relationships reported.

The diaphragm contributes approximately 70%–90% to whole inspiratory muscle force generation. In contrast, the neck inspiratory muscles are not always active during quiet breathing in healthy people but frequently active in patients with respiratory disease who has lower inspiratory muscle strength, probably due to help performing inspiration for a certain lung volume. Taken together, the recruitment onset for the neck inspiratory muscles during an inspiration may depend on the inspiratory muscle strength.

PURPOSE: To test whether inspiratory muscle strength is associated with the recruitment onset for the neck inspiratory muscles during an inspiration.

METHODS: First, eight healthy young subjects measured maximal inspiratory mouth pressure (MIP) as inspiratory muscle strength, and peak inspiratory flow rate (PIFR).

No relationships reported.
Then, subjects matched their flow rate to 20, 40, 60, 80, and 100% PIFR during volitional inspiration from residual volume (Flow rate-control task) to determine the index of recruitment onset for the neck inspiratory muscles. Flow rate-control task was performed with (W; 23cmH2O) and without (WO) inspiratory load. Mean %PIFR and EMG amplitude (aEMG) of the sternocleidomastoid (SCM) and scalene (SC) were calculated over the duration of every 10% of maximal lung volume (MLV) ranging from 20% to 60% of MLV. The index of recruitment onset for each muscle was determined by the power-law EMG curves at each %MLV. Finally, a linear regression analysis was performed between MIP normalized to body weight (MIP/BW) and index of recruitment onset for each muscle across subjects, for which the Pearson product-moment correlation coefficient (r) was calculated at each %MLV.

**RESULTS:** MIP was ranged from 124 to 205 cmH2O across subjects. When collapsed across %MLV, there were highly negative correlations between MIP/BW and index of recruitment for both muscles under W (SCM: \(r = -0.866; SC: r = -0.877, p < 0.01\)) and WO (SCM: \(r = -0.789; SC: r = -0.735, p < 0.05\)).

**CONCLUSION:** The current results indicate that the neck inspiratory muscles of a subject who has lower inspiratory muscle strength are recruited at lower flow rate with a certain lung volume, suggesting that MIP/BW becomes useful outcome for assessing not only inspiratory muscle strength but also recruitment onset of the neck inspiratory muscles.

**Background:** Pulmonary ventilation while swimming is constrained by the medium (water) and the timing associated with arm mechanics. Attempts at describing ventilatory strategies and pulmonary function while swimming. This is in contrast to the considerable data available for other exercise modes.

**Methods:** Ten trained, competitive men swimmers (age = 24.4 ± 1.91 years) were asked to perform six submaximal exercise tests on separate days, three on a cycle ergometer and three while swimming in a flume. Workloads were set to elicit 70, 80, and 90% VO_{2peak} based off previous incremental tests in both modes. Tidal volume (VT), breathing frequency (f), peak tidal flow expired (P_{Te}), time to inspire (T_{i}) and expire (T_{e}), total tidal time (T_{T}), and duty cycle (T_{i}/T_{Tot}) were assessed repeatedly in both conditions via the power-law aEMG curves at each %MLV. Finally, a linear regression analysis was performed between MIP normalized to body weight (MIP/BW) and index of recruitment onset for each muscle across subjects, for which the Pearson product-moment correlation coefficient (r) was calculated at each %MLV.

**RESULTS:** MIP was ranged from 124 to 205 cmH2O across subjects. When collapsed across %MLV, there were highly negative correlations between MIP/BW and index of recruitment for both muscles under W (SCM: \(r = -0.866; SC: r = -0.877, p < 0.01\)) and WO (SCM: \(r = -0.789; SC: r = -0.735, p < 0.05\)).

**CONCLUSION:** The current results indicate that the neck inspiratory muscles of a subject who has lower inspiratory muscle strength are recruited at lower flow rate with a certain lung volume, suggesting that MIP/BW becomes useful outcome for assessing not only inspiratory muscle strength but also recruitment onset of the neck inspiratory muscles.
sets of 20- s exercise at an intensity of 170% VO2 max with a 10-s rest between each bout: HIIE) from 10:30. Until 14:00, the subject stayed in the metabolic chamber, and were measured oxygen uptake, rectal temperature and temperature of the vastus laterialis which is a mainly recruited muscle during the bicycle exercise. For hypoxic experiment (H-E), the subjects followed the same protocol, except for inspiring the 60% O2 air during the exercise. The order of N-E and H-E were randomly assigned for each subject.

RESULTS: Compared with the N-E (81.0±15.5 ml/kg), total work during the HIIE was significantly higher on the H-E (880.7±141.0 ml/kg). From the end of the HIIE until 10:48, oxygen uptake was significantly higher on the H-E (146.4±26.4 ml/kg) than the N-E (130.7±24.7 ml/kg). However, no differences in oxygen uptake between N-E and H-E was observed after 10:49. Compared with the N-E (36.14±0.31 °C), the muscle temperature after the HIIE was significantly higher from the end of the HIIE until 10:48 on the H-E (37.05±0.74 °C), while no difference in rectal temperature between H-E and N-E was observed after HIIE to 10:48. The Δ oxygen uptake observed in H-E over N-E (15.7±14.3ml/kg) from the end of the HIIE to 10:48 was highly correlated with the Δ muscle temperature measured in H-E over N-E during the same time period after the HIIE (0.91±0.66°C, r = 0.95, p = 0.01).

CONCLUSIONS: The present investigation demonstrated that hypoxia elevates the total work during HIIE and EPOC after the HIIE. Furthermore, a significant part of the increased oxygen consumption observed until 15 min after the HIIE may be explained by the elevated muscle temperature which might enhance metabolism in the exercised muscle.

INTRODUCTION: Development of late-onset asthma and cardiovascular disease are associated with elevated lipid peroxidation in the airways and systemically. However, sex differences exist in development of these diseases. Using an exhaustive exercise bout as a physiological stressor may elucidate whether there is a sex difference in post-exercise lipid peroxidation in older adults. PURPOSE: To determine whether sex differences exist in airway and systemic 8-isoprostane responses to exhaustive exercise and establish whether changes in airway 8-isoprostane generation correlate with lung function from pre to post-exercise. We hypothesized that older women (OW) would have elevated post-exercise airway 8-isoprostane compared to older men (OM).

Also, we hypothesized that airway 8-isoprostane would be negatively associated with improvements in lung function from pre to post-exercise. METHODS: Twenty-four subjects aged 60 years and over completed the study (12 OW/12 OM). Subjects came to the laboratory for one testing session after a 2-hour fast, with no exercise for at least 24 hours. Baseline measurements included exhaled breath condensate (EBC) for assessment of airway 8-isoprostane, a blood draw for systemic 8-isoprostane, and standard pulmonary function testing (PFTs) to assess forced expiratory volume in 1-second (FEV1), forced vital capacity (FVC), FEV1/FVC, and forced expiratory flow at 25-75% of FVC (FEF25-75%). Participants then performed a VO2peak test on a cycle ergometer. Immediately post-exercise, PFTs, a blood draw, and EBC were performed.

RESULTS: The generation of airway 8-isoprostane from pre to post-exercise was different between OW and OM (p = 0.003), increasing ~74±77% in OW and decreasing ~60% in OM. Systemic 8-isoprostane did not change over time in either group (p = 0.81). In OW, FEV1 increased post-exercise (p = 0.02), but was not associated with 8-isoprostane. In OM, FEV1, FVC and FEF25-75% increased post-exercise (p < 0.05), and the decreased 8-isoprostane was associated with an increased FEV1/FVC and FEF25-75% (p < 0.05). CONCLUSIONS: OW had a greater airway 8-isoprostane response to exhaustive exercise compared to OM. These results suggest that sex differences in lipid peroxidation may play a role in the airway remodeling that is associated with disease development.

Gait assessment for persons with chronic obstructive pulmonary disease (COPD) is beneficial in assessing fall risk and potentially treating limitations with ambulation associated with the disease. Some of the studies that estimated gait parameters in persons with COPD used the 6-minute walk test whose objective is to cover as much distance as possible in 6 minutes rather than focusing on the pace at which they walk. There is a current lack of literature identifying fall risk among persons with COPD estimated using standard testing procedure for gait.

PURPOSE: To determine differences in gait parameters among individuals with COPD, healthy older adults, and older adults at high fall risk. METHODS: Seven persons with COPD (mean age 61.7±17.7 years), seven healthy older adults (mean age 70.4±6.8 years) and seven older adults at high fall risk (mean age 68.1±8.6 years) walked across a GAITRite walkway at their normal comfortable pace. Gait speed, stride length, % of swing phase of the three groups were compared using a one-way ANOVA. RESULTS: Persons with COPD had a significantly slower gait speed (75.6±17.3 cm/s) when compared to healthy older adults (132.4±14.6 cm/s; p < 0.001) and to older adults at high fall risk (111.4±16.0 cm/s; p = 0.002). Persons with COPD also had a significantly shorter stride length (94.3±19.6 cm) when compared to healthy older adults (138.4±17.4 cm; p < 0.001), but not to older adults at high fall risk (116.5±17.2 cm; p = 0.08). Persons with COPD spent less percentage of their gait cycle in swing phase (32.8±1.9%) when compared to healthy older adults (38.4±1.3%; p < 0.001) and to older adults at high fall risk (37.2±1.8%; p < 0.001). There were no significant differences between the healthy older adults and older adults at high fall risk. CONCLUSIONS: These results indicate that persons with COPD exhibit more conservative gait, walking slower, with a shorter stride length and less time spent in swing phase compared to healthy older adults and older adults at high fall risk. A gait-training program for this population may be beneficial. A randomized control trial with persons without COPD is also needed.
CONCLUSION:

Cyclin D1 mRNA abundance was higher in the LP group compared to the OP group (p<0.05). The LP group also had higher Cyclin D1 cross-sectional area (CSA) (p<0.05). Cyclin D1 mRNA content compared to its control counterpart (LC) (p<0.05). MyoD mRNA content compared to its control counterpart (LC) (p<0.05). The LP group also had higher MyoD mRNA content compared to its control counterpart (LC) (p<0.05). MyoD mRNA content compared to its control counterpart (LC) (p<0.05). The LP group also had higher MyoD mRNA content compared to its control counterpart (LC) (p<0.05). MyoD mRNA content compared to its control counterpart (LC) (p<0.05).

RESULTS: After heavy load exercise, the mitochondrial structure appeared to be abnormal and formed a large number of mitophagosomes; the CS content decreased 25.8%-50.1%; the expression of PINK1 (E12=2.552±0.141),Parkin (E24=2.353±0.100),LC3 (E12=2.757±0.180) and p62 (E12=1.000, p<0.05) was increased to p<0.01. Acupoint promoted the recovery of mitochondrial ultrastructure, alleviated the reduction of CS content, and lowered the expression of PINK1 (EA12=1.738±0.083),Parkin (EA24=2.053±0.117),LC3 (EA12=1.718±0.095) in mitochondria (C=1.000, p<0.05).

CONCLUSION: Heavy load exercise may activate the PINK1/Parkin pathway, promote the combination of LC3 and mitochondria, and result in mitophagy and mitochondrial damage within skeletal muscle. Acupuncture can decrease the expression of PINK1 and Parkin, and inhibit the combination of LC3 and mitochondria, thereby inhibiting excessive activation of mitophagy and alleviating mitochondrial damage within rat skeletal muscle. (Supported by Sports Medicine key laboratory of Sichuan province Foundation).

Pulmonary arterial hypertension (PAH) often leads to systemic hypoxic conditions that arise in the PAH, obese population. Previous data have shown that cyclooxygenase (COX) inhibiting drugs may interact with the cellular mechanisms governing the adaptive responses of skeletal muscle to exercise. PURPOSE: Determine if prior consumption of acetaminophen (APAP) alters skeletal muscle mammalian target of rapamycin (mTORC1) signaling in response to RE. METHODS: In a double-blinded, counter-balanced, crossover design, healthy young men (n=8; 25 ± 1 yr, BMI: 26 ± 2 kg/m²) performed two trials of unilateral knee extension (8 sets, 10 reps, 70% 1RM). For 24h prior to each trial, subjects ingested either APAP (100mg/6h) or placebo (PLA) (final dose consumed immediately post RE). Muscle biopsies (sagittal) were collected at rest and at each postexercise during each trial. Western blot was utilized to assess phosphorylation and total protein levels of mTORC1 signaling proteins. RESULTS: Total protein for all markers was unchanged with time or treatment (p>0.05). Relative phosphorylation (p/t) of mTORSer2448 was similarly increased from rest (p<0.05) in both trials at 1h (PLA, 1.5 ± 0.2; APAP, 1.8 ± 0.2 fold) and 3h postexercise (PLA, 1.6 ± 0.2 fold, APAP, 1.8 ± 0.2 fold), while the, relative phosphorylation of S6K1Thr389 was only increased (p<0.05) in APAP at 3h (PLA, 2.0 ± 0.3; APAP, 3.5 ± 1.2 fold). In contrast, absolute phosphorylation levels of mTORSer2448 and S6K1Thr389 were only increased from rest (p<0.05) following RE in PLA, while absolute phosphorylation levels of 4E-BP1Thr37/46 were reduced (p<0.05) postexercise in APAP. Absolute and relative phosphorylation of eEF2Thr56 were reduced (p<0.05) following RE only in APAP. CONCLUSION: Compared with other COX-inhibiting drugs (i.e., ibuprofen), prior APAP consumption may have a reduced impact on the relative phosphorylation of mTORC1 signaling proteins following RE. These findings further highlight the unique interaction between the consumption of different COX-inhibiting drugs and the adaptive cellular response of skeletal muscle to exercise. Supported by intramural funds from ASU and MU.
Table 1. Changes in fTBI with peak torque angular index (PTA) at exercising fast stretch (F) peak muscle type, and peak velocity (PV) for each muscle group. Preexercise value reported times PTB F, PV F for each muscle group.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>PTA (%)</th>
<th>PV (deg/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF</td>
<td>48.38 ± 10.07</td>
<td>45.58 ± 11.33</td>
</tr>
<tr>
<td>BP</td>
<td>42.06 ± 12.55</td>
<td>0.56 ± 0.01</td>
</tr>
<tr>
<td>KP</td>
<td>45.78 ± 15.06</td>
<td>40.20 ± 25.78</td>
</tr>
<tr>
<td>NF</td>
<td>61.22 ± 15.83</td>
<td>60.33 ± 12.82</td>
</tr>
<tr>
<td>KF</td>
<td>55.59 ± 17.77</td>
<td>55.79 ± 13.08</td>
</tr>
</tbody>
</table>

Recent meta-analysis has shown the association between FTO risk allele and the odds of obesity to be attenuated by 27% in physically active adults, which may suggest a possible relationship between exercise and FTO protein function. PURPOSE: To examine differences in FTO gene expression and function following high and low intensity exercise. METHODS: Twenty eight apparently healthy untrained males and females were genotyped for the FTO rs9939609 (T>A) polymorphism, prior to performing continuous isocaloric (400 kcal) cycle ergometer exercise on two separate occasions at 80% (HI) and 40% (LO) VO2peak. Skeletal muscle biopsies were sampled from the vastus lateralis at pre exercise (0 mins), 10 and 90 mins post exercise. Differences in FTO genotype, gene and protein expression, and m6A RNA methylation status before and/or after exercise were determined using an ANOVA. RESULTS: DISTRIBUTION: Of the FTO variant alleles was 36% homozygous (AA), 32% heterozygous (AT) and 32% wild-type alleles (TT). No significant differences between genotypes in time to expend 400 kcal during the HI (AA: 36:45 ± 2:00min:sec, AT: 39:29 ± 3:07min:sec, TT: 41:21 ± 3:02min:sec, p = 0.511) and LO intensity (AA: 54:28 ± 2:58min:sec, AT: 57:59 ± 4:06min:sec, TT: 61:04 ± 4:19min:sec, p = 0.472) exercise protocol, or for average RER, glucose utilization and fat utilization (g.kgLBM-1.T.I-1) (p<0.05) during each exercise protocol were noted. FTO mRNA expression was significantly increased at 10 mins post HI exercise (AA: 0.69-fold, AT:0.21-fold, TT: 0.23-fold, p = 0.003). No genotype or genotype by time interaction was observed (p <0.05). m6A on RNA was significantly decreased at 90 minutes (MD -3.2 µmol, 95% CI [-6.8, 0.2]), O2Hb (MD -3.5 µmol, 95% CI [-5.7, -1.2]) were reduced during massage when compared to baseline, but were unchanged at any other time point. TS1% was unchanged during and following massage (p > 0.05). CONCLUSION: A reduction in muscle perfusion during massage therapy likely reflects the mechanical action of massage inhibiting capillary inflow but aiding outflow from the muscle. Whilst a lack of change in perfusion, oxyhaemoglobin and TS1% following massage suggests a modest impact upon microcirculation, it is acknowledged that skeletal muscle perfusion but not blood flow was assessed. A lack of change in perfusion suggests that massage did not result in more capillaries being perfused; however, blood flow may still have been altered. Future studies should simultaneously assess blood flow through the macrocirculation, as well as microcirculation perfusion and blood flow.

In vitro studies have supported an important role for intracellular calcium ion concentration ([Ca2+]i) as an intracellular signal for protein synthesis and degradation. Eccentric contractions (ECC) facilitate Ca2+ influx from the extracellular space via stretch-activated channels and cause high-levels of [Ca2+]i accumulation. Accumulated [Ca2+]i activates protein-kinase-related enzymes and induces muscle damage. A few days after ECC, the damaged muscle fiber shifts from this proteolytic to a regenerative phase. Whether there is any temporal and/or spatial correspondence between [Ca2+]i accumulation and structural damage/repair during recovery from ECC is unknown. PURPOSE: Specifically, we tested the hypothesis that there would be a dynamic pattern of [Ca2+]i accumulation post-ECC that would relate temporally to the damage-recovery cycle. METHODS: In anesthetized adult Wistar rats, the tibialis anterior muscles (TA) were subjected to unexercised controls (CONT) and ECC (5 sets of 40 contractions). After 1day (1D), 3 days (3D), and 7 days (7D) of ECC, the TA was loaded with ratiometric dye Fura-2 AM. We used the 340/380 nm ratio to analyze alterations in [Ca2+]i, by in vivo fluorescence imaging. After in vivo observations, the TA muscles were dissected to identify the histological features of the damage-to-regeneration cycle. RESULTS: After ECC, there was profound swelling at 1D followed by infiltration at 3D and regeneration at 7D (i.e. appearance of central nucleus). The mean [Ca2+]i, was significantly increased after ECC at 1D (1.48 ± 0.09) and 7D (1.47 ± 0.04) but not at 3D (1.34 ± 0.05) compared with CONT (1.31 ± 0.05). Whereas there was a heterogeneous [Ca2+]i accumulation pattern evident among fibers it was interesting to note that [Ca2+]i was observed in very low levels at any other time period at 1D (mean variation range: 0.10 ± 0.07) than at any other time (CONT: 0.08 ± 0.03, 3D: 0.07 ± 0.02, 7D: 0.08 ± 0.02). CONCLUSIONS: We determined that: 1. There were peaks of [Ca2+]i accumulation during both swelling (1D) and regeneration (7D) phases. 2. The swollen and edematous fibers at 1D evidenced an oscillatory pattern. These profiles of [Ca2+]i accumulation may be key to controlling the extended pattern of protein synthesis and degradation that characteristically follows novel ECC.
GROWTH INHIBITION OF MESENCHYMAL STEM CELLS BY LAMINARIN, A β-D-GLUCAN: IMPACT ON CHONDROCYTE DIFFERENTIATION

ABSTRACT

Mesenchymal stem cells (MSCs) are multipotent adult stem cells that differentiate to form cartilage, bone, tendons, muscle, and skin. Usually found in the bone marrow and can also be isolated from other tissues including cord blood or adipose tissue. Given the innate ability of MSCs to promote cellular damage recovery and tissue repair, there is rising interest in their use in a broad repertoire of cell-based therapy for the treatment of several conditions. One of the most important tasks of MSCs therapy is to control cells proliferation and differentiation. These processes model and shape tissue and organ relationships in multicellular organisms. Previous investigations showed that cell growth pathways are mediated through protein-glycan interactions. We have adopted this approach to study the effect of laminarin, a β-1,3-D-glucans.

METHODS: MSCs were isolated from the bone marrow of six-week old male Wistar rats then cultured in MSC growth and chondrogenic differentiation media. Proliferation rate and apoptosis were explored by cell count, MTT assays and Annexin V staining. mRNA and protein expression of specific markers for MSCs and chondrocytes were studied using qPCR and immunofluorescence. Results: Laminarin treatment reduced cell proliferation of MSCs cultured in both growth and chondrogenic differentiation media. Annexin V staining showed no apoptosis. Cells in MSC growth medium showed no impact of laminarin for Thy1, nucleostemin and endoglin mRNA analysis. Conversely, in chondrogenic medium, laminarin had a negative effect on Thy1 levels and no change in nucleostemin and endoglin. Collagen II responded positively in chondrogenic medium in absence of laminarin and significantly reduced when laminarin was added. Conclusion: These results indicate that laminarin inhibited both cell proliferation and chondrogenic differentiation suggesting potential clinical applications in MSC therapy.

Leg Dominance and Fiber Type Composition Influence Landing Performance in Resistance-Trained Men

Jose A. Arevalo1, James R. Bagley2, Jakob J. Rosenzweig3, Scott K. Lynn2, Lee E. Brown, FACSM2, Pablo B. Costa3, Andrew J. Galpin1. 1California State University, Fullerton, Fullerton, CA. 2San Francisco State University, San Francisco, CA. 3University of California, Santa Cruz, CA. Email: jarevalo@fullerton.edu

Leg dominance may lead to asymmetrical performance and injuries. No study has investigated this issue at both the biomechanical and single muscle fiber level.

PURPOSE: Simultaneously investigate leg dominance, muscle fiber type composition, and landing performance in resistance-exercising men (RE men).

METHODS: Forty men (age=24.1±2.6yrs; height=181.6±6.6cm; mass=87.8±10.9kg) answered a leg dominance questionnaire (preferred kicking leg) and performed drop-jumps (30cm) onto two independent force plates (one foot per plate), alternating the step off leg. Muscle biopsies were performed on the vastus lateralis in both dominant (D) and non-dominant (ND) legs. Individual muscle fibers (107.8±34.3/leg/person) were isolated and sodium dodecyl sulfate polyacrylamide gel electrophoresis was used to identify myosin heavy chain fiber type (MHCI, MHCI/IIa, MHCI/IIa/IIx, or MHCIx). The percent of each fiber type in D and ND was compared for each fiber type. Results: The distribution of fiber type composition varied between ND and D legs. MHC IIa fibers were significantly more abundant in ND legs compared to D legs (P<0.001). A significant interaction existed between landing foot and step-off foot (F(11,99)=0.004). ND produced a significantly higher landing rate of force absorption (RFA) compared to D (p=0.003) when stepping off with ND. The RFA in ND (stepping off with ND) was negatively correlated with the percentage of fibers containing MHCI isoforms (p=0.029, r=−0.581) and positively correlated with the percentage of fibers containing MHCI isoforms (p=0.048, r=0.536).

CONCLUSIONS: The preferred kicking leg was not preferred to absorb landing force. The greater abundance of MHCIa fibers in the preferred force absorbing leg may provide an explanation for, or a result of, the observed asymmetry. These results enhance our understanding of leg dominance, performance, and muscle fiber type composition in RE men.

Body Weight Support Training Modulates Muscle NF-κB p65 Expression Induced By Spinal Cord Injury

Lloyd P. Ruiz, Erika J. Hinahon, Emanuel Ruiz, Christina A. Estrada, Silvia Villanueva, Ray D. de Leon, Stefan Keslcy. California State University, Los Angeles, Los Angeles, CA. Email: iruiz13@calstatela.edu

Purpose: To improve the efficacy of exercise rehabilitation following traumatic spinal cord injury (SCI), a better understanding of muscle-associated cellular signaling is imperative. The transcription factor NF-κB is a “master controller” of the inflammatory pathway with P65 being the main subunit. Thus we hypothesized that P65 is expressed in muscle of SCI rodents and that body weight supported treadmill training (BWSTT) modulates P65-related signaling cascade.

METHODS: A low-thoracic spinal cord contusion was performed on 16 Sprague Dawley rats and 8 were trained 5 days/week for 5 months. Proteins were extracted from quadricepsiceps, vastus lateralis, adductor magnus (GM), tibialis anterior (TA), and extensor digitorum longus (EDL) muscles. Immunoblot analysis for total NF-κB p65, and IκB-β was performed. Equal amounts of protein were analyzed by 4 to 12% SDS-polyacrylamide gel electrophoresis. Following transfer (TransBlot Turbo, Bio Rad), membranes were blocked in 5% milk and incubated overnight at 4°C with a primary antibody (p65, and IκB, Santa Cruz Biotechnology, Santa Cruz, CA). Following incubation with a peroxidase-conjugated secondary antibody, bands were visualized by ECL, imaged and densitometry was determined (QuantityOne, Versadoc Bio-Rad). Results: P65 was strongly expressed in all muscles of untrained animals. Training significantly decreased P65 only in TA muscles (P<0.05). P65 inhibitor IκB-β expression increased in EDL, and GM muscles (P<0.05) and decreased in Sol (P<0.05) following training. The ratio of P65/IκB-β significantly increased for Sol and decreased for EDL, GM, and TA for the trained group (p<0.05). Conclusion: P65 was expressed in all muscles of SCI rodents. The BWSTT modulation of P65 expression seems to be related to IκB interaction and is muscle-dependent.
lower fecundability compared to women with lower mean energy expenditure/working hour. Seven cohort studies reported associations between PA and assisted fertility (in TIA, Italy, and the United States), and assisted fertility remained in vitro fertilization (IVF) in 6 studies and intracytoplasmic sperm injections (ICSI) in 2 studies. PA was self-reported in all studies; one study also used accelerometry. Four studies found favorable associations, 1 found unfavorable associations, and two found no association between higher PA and assisted fertility.

CONCLUSION: The association between PA and natural and assisted fertility remains unclear. Future studies should incorporate objective PA measures and explore the PA volume and dose associated with fertility.

KRH supported by the Wellcome Trust. SGS supported by the Science Without Borders Program.

2796 Board #316 June 2 9:30 AM - 11:00 AM

A Meta-analytic Approach To Determine The Effectiveness Of Exercise Interventions On Abdominal Fat And Liver Enzymes In Overweight And Obese Youth

Robinson Ramirez-Vélez1, Katherine Gonzalez-Ruíz2, Jorge E. Correa-Bautista2, Antonio García-Hernández1, Mark D. Peterson1. 1Centro de Estudios para la Medición de la Actividad Física «CEMA», Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogota, Bogotá, Colombia. 2Centro de Estudios para la Medición de la Actividad Física «CEMA», Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogota, Bogotá, Colombia. 1Laboratorio de Ciencias de la Actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile. 2Department of Physical Medicine and Rehabilitation, University of Michigan, Ann Arbor, MI.

Email: robin640@hotmail.com

(No relationships reported)

PURPOSE: Interestingly, despite the prevalence of obesity and the multiple position stands promoting exercise for the treatment of obesity and hepatic function, a meta-analytic approach has not previously been used to examine the effects in the paediatric population. However, several studies also show inconsistent results particularly with respect to children and adolescents, where data are scarce. Due to heterogeneity between studies in terms of results, we used a meta-analytic approach to determine the effectiveness of exercise interventions on abdominal fat and liver enzymes in overweight and obese youth.

METHODS: A computerized search was made using three databases. The analysis was restricted to studies that examined the effect of supervised exercise interventions on abdominal fat (visceral and subcutaneous fat) and liver enzymes (alanine aminotransferase, aspartate aminotransferase and gamma-glutamyl transferase). Studies with mean difference (SMD) and 95% confidence intervals were included.

RESULTS: Fourteen clinical trials (1,231 youths) were eligible for inclusion in this systematic review and meta-analysis. Exercise was associated with a significant reduction in visceral (SMD=−0.661; 95% CI, −0.976 to −0.346; p<0.001), subcutaneous (SMD=−0.352; 95% CI, −0.517 to −0.186; p<0.001) and intraperitoneal fat (SMD=−0.802; 95% CI, −1.124 to −0.480; p<0.001), as well as gamma-glutamyl transferase (SMD=−0.726; 95% CI, −1.203 to −0.249), but did not alter other liver enzymes.

CONCLUSIONS: This meta-analysis supports current recommendation for physical exercise, mainly aerobic, as an effective intervention in the treatment of non-alcoholic fatty liver disease, through reduction on visceral and subcutaneous adipose tissue and infradepat fat. Systematic review registration: PROSPERO CRD42016042163
95% CI 0.67-0.85), Hispanics (RR 0.75, 95% CI 0.64-0.89), and American Indians (RR 0.73, 95% CI 0.60-0.88). The RR for African Americans did not attain statistical significance (RR 0.91, 95% CI 0.76-1.08). CONCLUSIONS: The results of this study indicate that PA (comparing most to least active groups) provides significant protection from T2D across the race/ethnic groups, with the exception of African Americans. Although the reason is not completely elucidated, this may be due to lower fat oxidation rates at-rest and during exercise, large increases in susceptibility to diabetes with small decreases in insulin sensitivity, and higher percentages of type 2 muscle fibers in African Americans. The results also suggest a need for race-specific reporting of T2D RRs related to PA dose among prospective cohort studies.

METHODS: An electronic search was conducted using the following databases: PubMed, EmbSCO host, Embase, PROquest, and Cochrane [1970 to January 2016]. Duplicates were removed within then across databases. A total of 11 full text articles were retained that evaluated the effects of RTB on KAM. Methodological quality was assessed using the PEDro scale. Standardized mean differences (SMDs) were calculated for 1st peak KAM. Gait modification strategy (medial weight shift, lateral trunk lean, and self-selected) and mode of RTB (haptic and visual) were used as moderators for separate meta-analyses of studies with healthy participants. An inverse variance with random effects model approach was used with SMDs to account for moderators for separate meta-analyses of studies with healthy participants. An inverse variance with random effects model approach was used with SMDs to account for moderators for separate meta-analyses of studies with healthy participants.

RESULTS: Mean PEDro score was 6.0±0.6 out of a possible 11 with internal validity scoring poorly across all studies. For studies including healthy participants, the I² index averaged 93% (95% CI 79-100%, with P<0.10, in the two meta-analyses. Gait modifications strategies presented: Tau² = 3.2644, Chi² = 180.6403, df = 14 (P<0.0001); F = 94.66%, z = 2.4552 (P<0.05). The overall SMD was 1.18 (0.24; 2.13). Self-selected gait modification strategies presented the greatest SMD. Mode of RTB results presented: Tau² = 2.4776, Chi² = 122.8985, df = 12 (P<0.0001); F = 92.31%, z = 3.7829 (P<0.0001) with an overall SMD of 1.19 [0.95; 1.43].

CONCLUSIONS: Evidence presented in this review suggests that gait modification via RTB is effective in reducing KAM in both symptomatic and asymptomatic individuals. However, evidence is limited and of low quality, meaning the optimal combination of gait modification strategy and mode of RTB delivery remains unclear.

ENDNOTE: Exercise seems to reduce carotid IMT in childhood obesity. However, evidence is limited and of low quality, meaning the optimal combination of gait modification strategy and mode of RTB delivery remains unclear.
A Systematic Review And Meta-analysis Physical Activity Intervention Fitness Of Female’S Middle Students In China

Yan Peng1, Ming Yang1, Yi Liu2, Hao Guo3, Minxi Guan3, Jindong Chang1, Southeast of University, Chongqing, China.
Chongqing Business Vocational College, Chongqing, China.
Email: 1049685056@qq.com

Purpose: It is reported that approximately 50% of Chinese weights are not reach the national standard. 2015 China Adolescent Weight Investigate Report. Approximately 70% of Chinese adolescent are not physically active enough to achieve health benefits. The purpose of this study was to systematically review and meta-analyze the effect of fitness for Chinese middle students interventions on physical activity.

Methods: CNKI, Wanfang Data, Weipu Data and Web of Science Database were systematically searched to identify all relevant randomized controlled trials that evaluated the effect of fitness for Chinese middle students on physical activity from 2011 to 2015 years. According to the study design, the data of the boys were selected for analysis. The studies were described and effect size data were included in meta-analyses.

Results: Eighteen studies were included in the review and ten reported statistically significant improvements in physical activity. A meta-analysis of ten studies showed that TL interventions which run ≥3 sessions/week in PC were effective at increasing FMS (SMD=0.26 [0.10, 0.42]; p=0.002), PA (SMD=0.30 [0.10, 0.50]; p<0.003), and moderate-vigorous PA (SMD=0.24 [0.02, 0.46]; p=0.03). There was no significant correlation between the % in FMS and % in PA in either age group.

Conclusion: FMS and PA are both significantly improved by TL interventions run ≥3 sessions/week in preschools. This information should be used in designing future programs to implement in pre-schools. Further research is required on the relationship between change in FMS and PA across childhood, as research is limited.
from fat), and (4) HF-RUN. Western blotting and immunofluorescence staining determined NLRP3 inflammasome-related signaling pathways and nitric oxide (NO) bioavailability-related pathways in the heart. RESULTS: Western blotting showed increased protein expression of NLRP3 in HF-SED (31%) compared to LF-SED, but it was reduced by voluntary wheel running. Immunofluorescence staining illustrated significantly higher expression of eNOS and IL-1β in coronary endothelial cells and arteries in HF-SED than LF-SED, RF-SED, and HF-RUN. Compared to LF-SED, decreased expression of endothelial nitric oxide synthase (eNOS; 32%) and increased NOX2 (NADPH oxidase 2; 51%) expression in HF-SED were normalized to the level of LF-SED by voluntary wheel running. CONCLUSION: Our findings suggest that voluntary running would oppose high fat-diet-induced vascular dysfunction in mice heart by suppressing NLRP3 inflammasome activation and possibly improving NO bioavailability via increased expression of eNOS and reduced oxidative stress.

2809 Board #329 June 2 9:30 AM - 11:00 AM Serum CTRPs Levels Are Associated With Exercise Training-induced Reduction Of Arterial Stiffness In The Elderly
Natsuki Hasegawa1, Shumpei Fujie1, Masataka Uchida1, Naoki Hori2, Toshiyuki Kurihara3, Kiyosu Sanada2, Takafumi Hamaoka, FACSM2, Motoyuki Iemitsu1. 1Ritsumeikan University, Kusatsu, Japan. 2Tokyo Medical University, Tokyo, Japan. (Sponsor: Takafumi Hamaoka, FACSM)

No relationships reported.

Habitual aerobic exercise reduces arterial stiffness and decreases fat accumulation, concomitant with an elevated serum level of adiponectin, as an adipokine of anti-inflammatory factor. Adiponectin regulates endothelial nitric oxide (NO) synthase in endothelial cells, promoting NO production. Recently, C1q/tumor necrosis factor-related proteins (CTRPs) have been identified as a novel adipokines and paralog of adiponectin. However, the association between exercise-training effects of arterial stiffness and circulating CTRPs levels remain unclear.

PURPOSE: This study aimed to clarify whether reduction of arterial stiffness by exercise training is associated with change in serum levels of CTRPs.

METHODS: Fifty-six middle-aged and older subjects were enrolled in this study. The study subjects were randomly divided into two groups: the training group (n = 28, 68 ± 1 years) and the control group (n = 28, 65 ± 2 years). Subjects in the training group completed 8-week of aerobic exercise training (60–70% peak oxygen uptake [VO2peak] for 45 min, 3 days/week). Before and after the intervention, we measured body composition by magnetic resonance imaging (MRI) and dual-energy x-ray absorption (DXA), carotid-femoral pulse wave velocity (cPWV) as an indicator of arterial stiffness, and serum CTRPs (adiponectin, CTRP3, CTRP5, CTRP9) concentrations using enzyme-linked immunosorbent assay (ELISA) method.

RESULTS: In the training group, %body fat, abdominal visceral fat area and cPWV were significantly decreased after the intervention (P < 0.05). Moreover, aerobic exercise training significantly elevated serum adiponectin and CTRP5 levels (P < 0.05) and tended to increase serum CTRP3 level. Additionally, the training-induced change in cPWV was negatively correlated with training-induced change in serum adiponectin, CTRP3 and CTRP5 levels (r = -0.46, r = -0.52, r = -0.39, respectively, P < 0.05). By contrast, none of these parameters changed significantly in the control group.

CONCLUSION: These results suggest that the exercise training induced increase in serum CTRPs levels may be associated with the reduction of arterial stiffness in middle-aged and older adults. Supported by Grants-in-Aid for Scientific Research (16H09313, N. Hasegawa) (No relationships reported).
Systemic arterial hypertension is a multifactorial disease with high prevalence in the elderly population. Resistance training has shown promising results in reducing hypertension; finding mainly explained by the post-exercise hypotensive effect. PURPOSE: The purpose of this meta-analysis was to determine the acute effect of the total resistance training load on blood pressure (BP). METHODS: A systematic search of articles evaluating post-exercise BP responses published until June 2016 was performed in 6 databases. Risk of bias was assessed using a 5 point Likert-type scale. Hedge’s standardized mean difference effect size (ES) was calculated for each result; then, ESs were combined using random-effects models. NON-OVERLAPPING 95% confidence intervals were considered statistically significant. Heterogeneity was assessed using Q and I², while funnel plots and Egger’s regression test were used to assess small-study effects (potential bias). The z-test was calculated to determine whether ESs were different from zero. RESULTS: Twelve studies were selected, representing 171 subjects for a total of 342 ESs. For systolic BP, the overall ES was -0.86 (CI$_{-}$95 = -0.73, -1.02; z = 0.0, p < 0.05), which translates to a reduction of 6.3 mmHg. For diastolic BP, the ES was -0.51 (CI$_{-}$95 = -0.62, -0.40; z = 0.0, p < 0.05), which translates to a reduction of 3.3 mmHg. Normotensive and physically-active participants who were prescribed exercise intensities based on submaximal tests showed higher reductions in BP than hypertensive, sedentary, and when one maximal repetition (1RM) was used for exercise intensity prescription (p < 0.05). Significant reductions in diastolic BP following exercise were observed with higher exercise session total training load (r = 0.40, p < 0.05). CONCLUSIONS: The total resistance training load is highly correlated to post-exercise BP reductions, providing significant clinical benefits for patients.
females; age 40 ± 15 years; height 170 ± 11 cm; mass 80 ± 19 kg; mean ± SD). Burn survivors had an average of 49 ± 23% (range: 16 - 85%) body surface area burned and were at least two years post burn injury. Results: Neither peripheral arterial stiffness (controls: 8.3 ± 0.5 m s⁻¹; burn survivors: 7.8 ± 0.4 m s⁻¹; P = 0.5) nor central arterial stiffness (controls: 6.6 ± 0.6; burn survivors: 6.7 ± 0.5 m s⁻¹; P = 0.9) differed between groups. Conclusions: These data suggest that arterial stiffness is not altered in well-healed burn survivors.

Supported by NIH Grant R01 GM08685.

2815 Board #335 June 2 9:30 AM - 11:00 AM
Effect Of Topical EMLA Application On Cutaneous Sympathetic C-fiber Function
Kevin W. Kunz, Gary W. Mack, S4602, FACSM. Brigham Young University, Provo, UT. (Sponsor: Gary W. Mack, FACSM) (No relationships reported)

Purpose: Activation of nociceptive afferents (small C-fibers) in the skin results in the activation of an axon reflex mediated increase in cutaneous blood flow. Topical lidocaine (EMLA) is often used to mitigate the axon reflex and its impact on the skin blood flow response to local heating. However, it is possible that EMLA would impact cutaneous sympathetic nerves which are also small C-fibers. Methods: To evaluate this hypothesis, we examined the effect of topical EMLA application on axon reflex mediated sweating induced by intradermal electrical stimulation in 10 subjects with and without EMLA application. Local sweat rate (SR) was measured by passing dry gas through a small sweat capsule mounted on the skin. The skin was stimulated at a constant current intensity of 2.5 mA for 30 s at frequencies of 0.2, 1, 2, 4, 8, 16, 32, and 64 Hz using two small stainless steel stimulating electrodes. This procedure produced a sigmoid shape stimulus-response curve when we plotted the area under the SR-time curve versus stimulus frequency. Results: In control conditions peak local SR during 64 Hz stimulation averaged 0.364 ± 0.219 mg • min⁻¹ • cm⁻² which was significantly (p<0.05) reduced by application of EMLA to 0.078 ± 0.098 mg • min⁻¹ • cm⁻². The stimulus-response curves were significantly different from each other with a significant reduction in the plateau with EMLA (11.7 ± 1.3 versus 2.6 ± 0.6, p<0.05) but with a similar EC₅₀ values (7.2 ± 0.11 versus 9.9 ± 0.2 Hz). Conclusion: These data support the hypothesis that topical application of EMLA does impact cutaneous sympathetic C fiber function. As such, topical EMLA cream should not be viewed as an appropriate method to selectively eliminate superficial sensory fiber activity from studies of human cutaneous blood flow.

Arterial stiffness that increases with aging is an independent risk factor for cardiovascular diseases. Interval walking is an effective way to prevent cardiovascular diseases.

2816 Board #336 June 2 9:30 AM - 11:00 AM
Effect Of Habitual Interval Walking On Arterial Stiffness In Older Adults
Takanobu Okamoto, Ryota Kobayashi, Yuto Hashimoto, Hiroki Hatakeyama. Nippon Sport Science University, Setagaya-ku, Tokyo, Japan. Email: tokamoto@nittai.ac.jp (No relationships reported)

METHODS: Fifty-four older adults (72.3±5 yrs) were randomly assigned to undergo interval walking (IW; n=26; male, n=14) or non-walking (NW; 9±2 vs. 4±1 %, p<0.05). The IW group was instructed to walk at high intensity (fast walking) for ≥60 min per week (total walking time per week: ≥120 min). The NW group walked each week (total walking time per week: ≥120 min). The NW group walked continuously at 50% (moderate intensity) peak aerobic capacity. Both groups repeated the walks 3-6 days/week for 20 weeks.

RESULTS: Interval walking (IW) for 20 weeks reduced central arterial stiffness (cfPWV) compared with NW in older adults. Therefore, risk factors for cardiovascular diseases may be decreased more effectively in IW than NW.

PURPOSE: Post exercise hypotension following resistance training has been reported in a variety of populations, though its mechanisms are not clear. The role of metabolism in post-exercise hypotension can be explored through the isolation of eccentric and concentric contraction, due to the greater metabolic cost of concentric contractions. Therefore the purpose of this study is to determine how metabolic activity, independent of mechanical work, influences post-exercise hypotension.

METHODS: Twelve healthy participants (6 male, 6 female) completed a traditional, a concentric, and an eccentric exercise session, each matched for total work. Participants performed 3 sets of 10 repetitions in the traditional session and 3 sets of 20 repetitions in the concentric and eccentric session, all at 65% of a predetermined 1 repetition max. Blood pressure was collected at baseline, after each exercise (6), and every 15 minutes after exercise for 2 hours. Brachial and femoral blood flow were also assessed at baseline, immediately after exercise, and at 30, 60, 90, and 120 minutes after exercise.

RESULTS: Repeated measures ANOVA results indicated a significant main effect of time (P<0.001), condition (P<0.05), and a significant main effect of time by condition (P<0.001; P<0.01 for mean arterial pressure (MAP)). Results also indicated significant main effects of time (P<0.01), condition (P<0.01), and a time by condition interaction (P<0.01; P<0.01 for brachial blood flow; and significant main effects of time (P<0.05), condition (P<0.01), and a time by condition interaction (P<0.05) for femoral blood flow. CONCLUSIONS: Results from this study indicate that metabolic activity does impact post exercise hypotension independently from factors related to force production. Furthermore, these data suggest that eccentric exercise may elicit a sustained post exercise hypertensive response.

Recent work suggests that reductions in posterior cerebral blood flow (CBF) rather than anterior CBF may be associated with orthostatic intolerance. Thus, we reasoned that the response of posterior CBF to post-exercise acute hypotension may be related to “grey- or black-out” after heavy exercise exercise.

PURPOSE: We tested the hypothesis that the response of posterior CBF to post-exercise acute hypotension is modified by orthostatic stress.

METHODS: Nine healthy subjects performed handgrip exercise (HG) for 3 min at 30% maximum voluntary contraction with and without lower body negative pressure (LBNP; ~40mmHg) applied before, during and for 1 min following HG. Vertebral artery (VA) blood flow was measured throughout using duplex Doppler ultrasound.

RESULTS: At rest, there was no difference in VA blood flow between with and without LBNP (P=0.39), while stroke volume was significantly decreased (P<0.01). HG increased VA blood flow similarly from resting baseline with (+31.7 ± 6.3 %baseline) and without (+30.9 ± 2.8 %baseline) LBNP. VA blood flow and mean arterial pressure decreased immediately after HG (recovery from 0 to 15sec) with LBNP; -40mmHg) applied before, during and for 1 min following HG. Vertebral artery (VA) blood flow was measured throughout using duplex Doppler ultrasound.

Recent work suggests that reductions in posterior cerebral blood flow (CBF) rather than anterior CBF may be associated with orthostatic intolerance. Thus, we reasoned that the response of posterior CBF to post-exercise acute hypotension may be related to “grey- or black-out” after heavy exercise exercise.

PURPOSE: We tested the hypothesis that the response of posterior CBF to post-exercise acute hypotension is modified by orthostatic stress.

METHODS: Nine healthy subjects performed handgrip exercise (HG) for 3 min at 30% maximum voluntary contraction with and without lower body negative pressure (LBNP; ~40mmHg) applied before, during and for 1 min following HG. Vertebral artery (VA) blood flow was measured throughout using duplex Doppler ultrasound.

RESULTS: At rest, there was no difference in VA blood flow between with and without LBNP (P=0.39), while stroke volume was significantly decreased (P<0.01). HG increased VA blood flow similarly from resting baseline with (+31.7 ± 6.3 %baseline) and without (+30.9 ± 2.8 %baseline) LBNP. VA blood flow and mean arterial pressure decreased immediately after HG (recovery from 0 to 15sec) with and without LBNP (P<0.01). However, the reduction in VA blood flow was larger with LBNP (~35.8 ± 4.2 ml/min) than without LBNP (~20.0 ± 3.3 ml/min; P<0.05). In contrast, there was no difference in VA vascular conductance between conditions at rest, during HG or recovery.

CONCLUSIONS: The application of LBNP augmented the reduction of posterior CBF to post-exercise acute hypotension. This reduction in VA blood flow appeared to be driven by the decrease in arterial blood pressure as there were no differences in VA vascular conductance with LBNP. Collectively, these findings suggest that posterior CBF is sensitive to orthostatic stress during post-exercise acute hypotension and may be associated with “grey- or black-out” after heavy exercise exercise.
Flow Mediated Dilation (FMD) has immense potential to become a clinical, non-invasive assessment of endothelial function. However, FMD analysis techniques could deviate significantly in different laboratories if a validation process is not involved. PURPOSE: To provide validation to the assessment of FMD analysis in our lab and to standardize this process as a first step in every lab before reporting results of FMD. METHODS: Brachial and femoral arteries FMD was performed on 30 young, apparently healthy participants (15 males). For the intratester reliability study, 10 subjects were asked to come to the lab for a second brachial FMD within 48 hours. All FMD procedures were performed by the same investigator, while the FMD analyses were performed by 2 independent testers who were blind to each other analyses. FMD analyses included baseline artery diameter measurements, peak artery diameter after 5 minutes of ischemia, and FMD. Analysis was completed via Brachial Analyzer for Research Software (Medical Imaging Applications LLC, Coralville, Iowa) by both testers. Intrater and interterter reliability were determined by using coefficient of variations (CV) between first and second visit (intrater) and between results obtained by both testers (interterter).

RESULTS: For tester 1, the intraterter CVs were 4.45% (±6.31%) for brachial baseline artery diameter, 5.23% (±6.47%) for brachial peak artery dilation, and for brachial FMD was 2.42% (±1.77%). For tester 2, the intraterter CVs were 5.08% (±6.64%) for baseline brachial artery diameter, 5.69% (±7.49%) for peak brachial artery dilation, and for FMD was 4.82% (±5.82%). The interterter CVs were 2.40% (±1.94%) for brachial baseline artery diameter, 3.16% (±3.00%) for brachial peak artery dilation, and 3.37% (±3.46%) for brachial FMD, and 4.52% (±9.42%) for femoral baseline artery diameter, 5.50% (±12.55%) for femoral peak artery dilation, and 3.46% (±3.36%) for femoral FMD.

CONCLUSIONS: All CVs were under or around 5%, confirming a strong reliability of the method. Our lab has illustrated the accuracy necessary to reproduce quality results from FMD procedures results due of the significantly low coefficient of variation. It is necessary for all labs to validate FMD procedures, to obtain a reproducible and validated value for future procedures utilizing FMD.


Following an extended sitting challenge of 1-6 hours, endothelial function measured via flow-mediated dilation (FMD) is impaired in the leg. Further, this impairment has been shown to be mediated by the reduction in shear stress that occurs in the legs with prolonged sitting. Interestingly, previous findings have demonstrated that prolonged periods of sitting result in a reduction in shear rate as early as 10 minutes into the sitting period. However, it is unknown whether this acute reduction in shear stress is sufficient to alter conduit artery endothelial function or if the decline in shear stress must be maintained for a longer period.

PURPOSE: We tested the hypothesis that 10 minutes of sitting would result in a reduction in popliteal artery shear stress and an impairment in FMD.

METHODS: Popliteal artery diameter and blood velocity were continuously recorded via duplex Doppler ultrasound in 10 healthy men before, during, and after a 10 minute sitting period. In addition, popliteal artery FMD was performed before and after the acute sitting period. Shear rate was calculated as [8 x mean blood velocity/diameter]. FMD was calculated as [(peak diameter – base diameter)/base diameter x 100] and was ANCOVA-corrected for hyperemic shear rate AUC.

RESULTS: Popliteal artery shear rate was significantly reduced with 10 minutes of sitting (P<0.001) in both PreSit: 57.11±11.2 s-1 vs. PostSit: 37.45±5.1 s-1; P = 0.034); however popliteal artery FMD was unaffected (PreSit: 4.5±0.6% vs. PostSit: 4.6±0.8%; P = 0.738). ANCOVA-corrected FMD yield similar results (P = 0.715). Interestingly, reactive hyperemia, a measure of microvascular dilator function, tended to be lower following the acute bout of sitting (PreSit: 59,243;9,642 a.u. vs. PostSit: 41,201;6,578 a.u.; P = 0.06).

CONCLUSIONS: These preliminary findings demonstrate that shear rate is diminished within the first 10 minutes of sitting, yet this stimulus is not sufficient to affect conduit artery endothelial function. However, microvascular function may be more sensitive to this brief reduction in shear stress, suggestive of a distinction between sitting-induced impairments in macrovascular and microvascular responsiveness. Supported by UTA College of Nursing and Health Innovation.

2821 Board #341 June 2 9:30 AM - 11:00 AM Habitual Endurance Exercise And Vascular Mechanical Biomarkers Derived From Arterial Reservoir Pressure Analyses Hsin-Fu Lin', Takashi Tarumi', Andreaina Haley', Hao-Min Cheng', Chen-Huan Chen', Hirofumi Tanaka, FACSM'. 1National Taiwan University, Taipei, Taiwan. 2University of Texas-Southwestern Medical Center, Dallas, TX. 3University of Texas at Austin, Austin, TX. 4Taipei Veterans General Hospital, Taipei, Taiwan. (Sponsor: Hirofumi Tanaka, FACSM) Email: datoc.lin@gmail.com (No relationships reported)

A number of vascular mechanical biomarkers have been developed and proposed to predict cardiovascular outcomes. Among them, systolic (SC) and diastolic rate constants (DC) of reservoir pressure waveform have recently been shown to predict future cardiovascular events in large cohort studies. Impairments in arterial reservoir functions can result in a larger reservoir pressure wave with accelerated reservoir filling rate (higher SC) and faster reservoir emptying rate (higher DC). Currently, the effects of regular exercise training on these vascular biomarkers are unknown.

PURPOSE: We determined the role of habitual aerobic exercise on well-established vascular function measures and novel arterial reservoir pressure parameters by using both cross-sectional and interventional approaches. METHODS: First, we studied 60 apparently healthy, normotensive adults who were either sedentary (SED) or endurance-exercise trained (ET). Second, we studied 16 sedentary healthy subjects before and after a 3-month endurance training, and their data were compared with a sedentary time control group (N=10). RESULTS: The cross-sectional analyses showed that ET had higher aerobic fitness, carotid artery distensibility, and lower pulse wave velocity compared with SED. Of the reservoir pressure waveform analysis, ET demonstrated a lower DC, the rate of reservoir pressure decay during diastole phase, than SED. DC was negatively associated with aerobic fitness and positively associated with central systolic pressure (cSBP) and pulse wave velocity. In the intervention approach, regular aerobic exercise reduced cSBP and DC. Changes in cSBP were positively associated with SC. CONCLUSIONS: Both cross-sectional and interventional approaches consistently demonstrate that regular aerobic exercise modulates diastolic constant of reservoir pressure waveform that represents reservoir emptying. This may be one mechanism by which habitual endurance exercise lowers the risk of vascular diseases.

2822 Board #342 June 2 9:30 AM - 11:00 AM High Fit Older Adults Maintain a Similar Endothelial Response to Acute Inflammation as Younger Adults Elizabeth C. Schroeder', Abbi D. Lane-Cordova', Sushant M. Ranadive', Tracy Baynard, FACSM', Bo Fernhall, FACSM'. 1University of Illinois at Chicago, Chicago, IL. 2Northwestern University, Chicago, IL. 3Mayo Clinic, Rochester, MN. (Sponsor: Bo Fernhall, FACSM) (No relationships reported)

Acute and chronic inflammation are associated with an increased risk of cardiovascular (CV) events in older adults and reduced endothelial function (flow-mediated dilation; FMD). Higher cardiorespiratory fitness levels are associated with lower risk of CV events and improved vascular function. Whether fitness plays a role in the endothelial response during acute inflammation is unknown. PURPOSE: To evaluate the role of fitness in the endothelial response to acute inflammation in younger (YA) and older (OA) adults. METHODS: An influenza virus induced acute inflammation in 23 YA (12 male, 2614 yrs, 24.0±35.5 kg/m2) and 60 OA (20 male, 65.5±15 yrs, 27.8±5.0 kg/m2). Blood pressure, FMD and serum inflammatory markers were measured before vaccination and 24 hours after. VO2max was measured via a treadmill test. Participants were divided into low and high fitness by age group. RESULTS: OA with high fitness reduced FMD more than OA with low fitness (p=0.04) at 24h even with similar C-reactive protein and interleukin-6 responses. Both high and low fit YA similarly decreased FMD at 24 hr (p=0.76). YA and high fit OA had a similar reduction (relative %) in FMD. There were no differences in baseline FMD or blood pressure changes in either group. Regression analyses indicated no association between VO2max and change in FMD (β=0.01, p=0.98) in YA, whereas an association existed in OA (β=0.36, p=0.04) after adjusting for age, sex, BMI and baseline FMD. CONCLUSION: In OA, higher fitness is associated with a greater decrease in endothelial function during acute inflammation; high fit OA had a similar endothelial response compared to YA. This suggests intact reactivity of the vasculature to stress in high fit OA, which indicates a healthier vesse in high fit versus low fit OA.

Abstracts were prepared by the authors and printed as submitted.
Individuals with Down syndrome (DS) commonly exhibit autonomic dysfunction, which may contribute to abnormal arterial function and partially explains low exercise tolerance in this population. Arterial stiffness, reduced arterial compliance and distensibility, is a strong predictor of future CV events and all-cause mortality. Individuals with DS also have alterations in arterial function and the effect of sympathetic stimulation on arterial distensibility is unclear in individuals with DS. Purpose: To examine potential differences in carotid artery distensibility, arterial compliance (AC), and hemodynamics to sympathoexcitation using hypovolemic (BP, carotid distensibility, AC and β-stiffness) were measured by ultrasonography at baseline, during and immediately after LBNP (-20 mmHg). Results: Compared with baseline, during and immediately after LBNP (-20 mmHg).

<table>
<thead>
<tr>
<th></th>
<th>DS (N = 9)</th>
<th>Control (N = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LBF (20 mmHg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>127 ± 6</td>
<td>87 ± 4</td>
</tr>
<tr>
<td>Recovery</td>
<td>122 ± 5</td>
<td>75 ± 4</td>
</tr>
<tr>
<td><strong>CardSBP</strong> (mmHg)</td>
<td>125 ± 4</td>
<td>117 ± 4</td>
</tr>
<tr>
<td><strong>CardBP</strong> (mmHg)</td>
<td>123 ± 4</td>
<td>113 ± 4</td>
</tr>
<tr>
<td><strong>AC (mL/mmHg)</strong></td>
<td>1.19 ± 0.10</td>
<td>1.23 ± 0.12</td>
</tr>
<tr>
<td><strong>Distensibility</strong></td>
<td>0.0042 ± 0.0012</td>
<td>0.0039 ± 0.0015</td>
</tr>
<tr>
<td>β-Stiffness</td>
<td>5.17 ± 1.61</td>
<td>5.56 ± 1.46</td>
</tr>
<tr>
<td>Mean ± SEM, p &lt; 0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions: Our results indicate that individuals with DS exhibit more compliant arteries than controls, which may be due to autonomic dysfunction with reduced sympathetic tone, as well as alterations in collagen and elastin, which are commonly observed in the skeletal muscle. Although vascular function is an independent predictor of cardiovascular disease risk, and therefore has significant prognostic value, there is currently not a single clinically accepted assessment of vascular function. The recently emerged passive leg movement (PLM) assessment of vascular function appears to reflect predominantly endothelial-dependent vasodilation and can identify changes in vascular health with both advancing age and pathology. However, the reproducibility of the PLM model has yet to be examined.

Methods: Seventeen healthy subjects (age: 24-37 yr) were studied on three separate experimental days, allowing five total trials of PLM to be performed on each subject, three within day (Trials 1-3) and three between day (Trials 1-3). The leg blood flow (LBF) response to PLM was assessed with Doppler ultrasound, and expressed as the change from baseline to peak (ΔLBFpeak). Results: The PLM-induced ΔLBFpeak was similar across all five trials (Trial 1: 1.06±0.13; Trial 2: 1.06±0.13; Trial 3: 0.96±0.13; Trial 4: 1.00±0.13; Trial 5: 0.95±0.13). The peak increase in blood pressure to CPT tended to be higher in T2D patients than in healthy controls (CON: 0.4158±0.21, T2D: 0.1862±0.21). Although the peak increase in blood pressure to CPT tended to be higher in T2D (T2D: 0.1862±0.21; CON: 0.1822±0.21; p=0.36). Conclusions: These blood flow responses to PLM in both consistent and reproducible between trials, whether performed repeatedly on the same day or on separate days. In combination with the growing evidence that PLM can distinguish between healthy individuals and populations with known vascular dysfunction (elderly, heart failure, sepsis, COPD, etc.), these findings support the continued movement to foster clinical acceptance of PLM as an effective assessment of vascular function and future cardiovascular disease risk.

Type 2 Diabetes patients (T2D) have been shown to have greater alpha-adrenergic sensitivity. How this impacts the transduction of muscle sympathetic nerve activity (MSNA) to arterial blood pressure under resting conditions using spontaneous fluctuations in MSNA, as well as during stressors known to elicit sympathoexcitation (e.g., cold pressor test (CPT)) is unclear.

**Purposes:**

1. To test the hypothesis that T2D patients would exhibit greater sympathetic transduction compared to age- and BMI-matched, healthy controls.
2. METHODS: MSNA (microneurography), heart rate (ECG), and beat-to-beat arterial blood pressure (finger photoplethysmography) were continuously recorded during a 10 minute baseline period, and in response to a 2-minute CPT in six T2D patients and six age- and BMI-matched, healthy controls (CON). To quantify sympathetic transduction at rest, the change in MAP was related to the change in MSNA from rest to the last minute of CPT.

**RESULTS:**

- There were no differences in resting sympathetic transduction between groups (CON slope: 0.0103±0.0023 mmHg/AU; T2D slope: 0.0095±0.0016 mmHg/ AU; p=0.78).
- Although signal averaging of MSNA bursts indicated a similar peak increase in blood pressure in CON (~4.2±0.6 mmHg) and T2D (~4.0±0.9 mmHg) (p=0.66), the peak increase in blood pressure to CPT tended to be higher in T2D (T2D: 3.1±1.34 mmHg; CON: 2.1±1.37 mmHg; p=0.096).
- The ΔMAP/ΔMSNA relationship during CPT was not different between groups (CON: 0.4158±0.21, T2D: 0.1862±0.21; p=0.36).

**Conclusions:**

- Although sympathetic-mediated increases in blood pressure in T2D patients and healthy CON subjects both rest and during the CPT, neither of the methodologies used to estimate sympathetic transduction, with respect to changes in arterial blood pressure, detected group differences. Supported by AHA-20160072.
PAPER: Exercise And Vascular Function In Overweight And Obese Adults: A Meta-analysis

Younsun Son1, Kyungun Kim1, Soecn Jeon1, Minsoo Kang1, FACSM®, Yoonjung Park1. University of Houston, Houston, TX. 1The University of Texas at Austin, Austin, TX. 2Texas A&M University-San Antonio, San Antonio, TX. 3Middle Tennessee State University, Murfreesboro, TN.

Email: xppzim@naver.com

No relationships reported

PURPOSE: Obesity is strongly associated with vascular dysfunction, including a reduction in flow-mediated dilation (FMD), and evidence has shown that exercise training improves vascular dysfunction and FMD. The objective of this meta-analysis is to summarize the effect of exercise intervention on FMD in overweight and obese adults, as well as to investigate the role of age, weight, body mass index (BMI), exercise type, and intervention period on the effects observed.

METHODS: We searched four electronic databases (PubMed, Scopus, CINAHL, and Medline) through June 2016 for relevant studies pertaining to the effectiveness of exercise intervention on FMD. Search terms were “obesity OR overweight” AND (Exercise OR training) AND (Flow-mediated dilation OR Flow mediated dilation OR FMD). Inclusion criteria were as follows: 1) included value of relative FMD, 2) included exercise intervention at least 7 days, 3) studied only obesity or overweight adult subjects, and 4) published in English language peer-reviewed articles. Comprehensive Meta-Analysis version 3 software was used to compute the mean effect size (ES) and 95% CI using a random effects model. Cochran’s Q statistic was also used to assess heterogeneity across individual studies. Subgroup analyses were conducted to identify moderator effects.

RESULTS: Of 91 citations identified by the search strategy, 17 studies met the inclusion criteria and 33 ESs were calculated. The results showed that the exercise interventions had moderate effects on FMD, with an overall effect size of 0.52 (95% CI = 0.26, 0.79). The results of subgroup analyses demonstrated that BMI (Qb = 8.11, df = 2, p = 0.017) and weight change (Qb = 13.11, df = 4, p = 0.011) explained the heterogeneity of ESs. The group with highest BMI (∼35) (ES = 1.98) and most weight loss (∼5kg) (ES = 1.41) appeared to be most effective in increasing FMD. No significant group differences were found by age, intervention period, and exercise type, but exercise interventions had significant effects on FMD for specific groups (e.g., over 12 months, aerobic training, and combined aerobic and resistance training).

CONCLUSION: Exercise training significantly improves vascular function in overweight and obese adults as measured by increased FMD, and this benefit is dependent on the exercise modality and degree of weight loss.
between PM+BR and MW+BR (P=1.0). Diastolic BP was lower in PM+BR (63 ± 5 mmHg) compared to MW+BR (67 ± 5 mmHg, P=0.018) but not different between other experimental arms (P=0.43). There were no differences in MCA Vmean, arterial BP, or cortisol levels. An elevated aortic blood velocity (MCA Vmean), calculated cerebral vascular conductance index (CVC) and cerebral reservoir function.

CONCLUSIONS:
- As expected, MW reduced plasma [NO2] but not [NO3], with and without ingestion of BR. Contrary to our hypothesis, however, MW did not alter BP or cortisol levels suggesting that it does not induce a stress response with short-term use.
- Further research employing a longer intervention and more extensive assessment of stress markers is required to confirm these observations.

2830 Board #350
June 2 9:30 AM - 11:00 AM
Aortic Reservoir Function of Lifelong Japanese Female Pearl Divers
Jun Sugawara1, Tsusaba Tomoto1, Keisei Kosaki2, Hirofumi Tanaka, FACSM3, 1National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan. 2University of Tsukuba, Tsukuba, Japan. 3University of Texas at Austin, Austin, TX.

(Sponsor: Hirofumi Tanaka, FACSM)
Email: jun.sugawara@aist.go.jp

(No relationships reported)

PURPOSE: Female pearl divers in Japan, called “Ama”, perform repeated breath-hold free-diving for collecting pearls in oysters, seaweed, and shellfish in the cold sea. In a typical day, they dive 50-200 times, 4-6 days/week throughout the year. We have previously reported significantly lower systemic arterial stiffness values in Ama compared with the age-matched sedentary peers living in the same fishing villages. As a follow-up study, the primary aim of the present study was to evaluate their aortic reservoir function and segmental arterial stiffness.

METHODS: We recruited 115 female pearl divers (mean age: 65±11 yr) as well as age-matched 50 physically inactive and 33 physically active female non-divers living in the same fishing villages in rural locations. Aortic reservoir and excess pressure were calculated from the synthesized aortic pressure waveforms derived from carotid arterial pressure waveforms obtained with arterialplanation tonometry. Pulse wave velocity from the heart to the brachial artery (hbPWV; partly reflecting proximal aortic stiffness) and between the brachial artery and the aorta (baPWV; reflecting stiffness of abdominal aorta and arteries) were measured.

RESULTS: There were no significant differences in age, body weight, and body mass index among the groups. Blood pressure and pulse pressure in the brachial artery and the aorta were not different among the groups. Aortic reservoir function, as measured by the normalized area under the curve of aortic reservoir pressure over area under the curve of aortic blood pressure, tended to be higher in physically active individuals (P<0.06) and significantly greater in Ama (P<0.05) compared with their sedentary peers. hbPWV was 8-9%lower in Ama and physically active adults than in sedentary adults (P=0.05 for both). hbPWV was 5% lower in physically active adults and 9% lower in Ama compared with their sedentary peers (P<0.05).

CONCLUSIONS: Our present findings suggest that life-long repetitions of breath-hold diving are associated with proximal aortic desstiffening and improved aortic reservoir function.

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

2831 Board #351
June 2 9:30 AM - 11:00 AM
The Effect of a High Fat Meal on Cerebral Vascular Function

Email: jordan.patik@uta.edu

(No relationships reported)

It is well known that a single high fat meal (HFM) causes a robust and transient elevation in serum triglycerides (TG). It is well known that a single high fat meal (HFM) causes a robust and transient elevation in serum triglycerides (TG). This elevation in serum TG is a primary contributor to the post-prandial attenuation of peripheral vascular endothelial function, as assessed by flow-mediated dilation in the brachial artery. Whether a similar impairment in vascular reactivity can be observed in the cerebral circulation remains unknown, and was the focus of this investigation. PURPOSE: To test the hypothesis that cerebral vascular function is impaired following a HFM.

METHODS: End-tidal carbon dioxide partial pressure (PETCO2), middle cerebral artery blood velocity (MCA Vmean), calculated cerebral vascular conductance index (CVC), central arterial pressure and cerebral vasodilator response to rebreathing induced hypercapnia (% increase in CVC from baseline at common maximal APETCO2) were assessed in 6 healthy young men (27 ±5 years). Measures were assessed during fasted baseline and again at 2 and 4h post meal consumption (HFM day) or at a similar time point in the fasted state (TC day). The two visits were separated by 2-7 days and were conducted in a randomized order. Blood lipids were assessed at baseline and at the 2 h time point into each respective condition.

RESULTS: As expected, consumption of the HFM significantly elevated serum TG concentrations relative to TC at 2 h (HFM: 101±38 to 169±77mg/dl, TC: 107±32 to 92±31mg/dl, P<0.007). However, the HFM had no effect of cerebral vasodilator capacity during rebreathing induced hypercapnia. The maximal increase in %CVC achieved at the highest common APETCO2, during all conditions within each subject was unchanged during 2hr and 4hr post HFM or TC (condition x time interaction: P=0.96). Similarly, the slope of the change in %CVC per change in APETCO2 was unaffected by HFM across time (P=0.49).

CONCLUSIONS: Contrary to our hypothesis, and unlike the peripheral vasculature, our preliminary data suggest that the cerebral circulation appears to be protected from the acute negative effects of a high fat meal.

2832 Board #352
June 2 9:30 AM - 11:00 AM
Vascular Peripheric Differences In Patients With Chagas Versus Ischemic Heart Failure
Alexandra C G B Lima1, Marianne Lucena da Silva1, Vinicius Z M da Silva1, Luis Tadeu Giolli Jr1, Ana Paula Silva1, Jose F. Vilela-Martin1, Gazpar R. Chiappa1, Gerson Cipriano Jr1, 1University of Brasilia, Brasilia, Brazil. 2Superior School of Health Science, Brasilia, Brazil. 3State Medical School of São José do Rio Preto, São José do Rio Preto, Brazil. 4State Medical School of São José do Rio Preto, Brasilia, Brazil.

(No relationships reported)

Purpose: Heart failure (HF) is characterized by a complex blend of central and peripheral pathophysiologic alterations, among which is vascular dysfunction and increased arterial stiffness. Applanation tonometry (AT) non-invasively assesses central blood pressure (CBP) and arterial stiffness [augmentation index (Alx)]. The presence of lower arterial compliance (higher Alx) represents an abnormal state and is a prognostic marker in HF. The influence of HF etiology on AT measures has not been explored. Thus, the aim of this study was compare AT measurements in patients with ischemic and Chagas HF.

METHODS: Three-two male subjects, 11 ischemic (IS) HF, 10 Chagas (CH) HF, and 11 healthy controls (HC) matched by age and body mass index were included in this analysis. The radial artery pulse wave was measured non-invasively by resting AT.

RESULTS: The Chagas group had a lower peripheral systolic (SBPp) and central blood pressure (CBP). While the ischemic HF group demonstrated a higher Alx (Table 1).

CONCLUSION: The ischemic HF group presented with greater arterial stiffness, reflected by a significantly higher Alx. Otherwise, chagasic patients as healthy control individuals had no increment arterial stiffness. These findings indicate assessment and treatment strategies for arterial stiffness may be more relevant in HF patients with an ischemic etiology. In conclusion, key AT differences were observed in patients with ischemic and Chagas HF, indicating these two HF etiologies present with unique pathophysiological mechanisms.

Table 1: Applanation Tonometry Measurements.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control (m ± sd)</th>
<th>Ischemic HF (m ± sd)</th>
<th>Chagas HF (m ± sd)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBPp</td>
<td>118 ± 12.44</td>
<td>113 ± 16.59</td>
<td>97 ± 14.23</td>
<td>0.010</td>
</tr>
<tr>
<td>CSP</td>
<td>108 ± 13.97</td>
<td>108 ± 15.29</td>
<td>88 ± 10.10</td>
<td>0.0074</td>
</tr>
<tr>
<td>Alx</td>
<td>80.27 ± 15.23</td>
<td>93.36 ± 10.74</td>
<td>80.60 ± 17.91</td>
<td>0.049</td>
</tr>
</tbody>
</table>

Legends: SBPp = Peripheral Systolic Blood Pressure; CSP = Central Systolic Blood Pressure; Alx = Augmentation index. * = significant difference between ischemic HF and control Groups; ≠ = Significant difference between ischemic HF and Chagas HF groups;

2833 Board #353
June 2 9:30 AM - 11:00 AM
Effect of Chronic Lower Limb Heating on Indices of Vascular Function and Functional Capacity in Aged Humans
Steven A. Romero1, Daniel Gagnon2, Amy N. Adams2, Matthew N. Cramer1, Manall N. Jaffery3, Ken Kouda4, Gilbert Moralez5, Craig G. Crandall1. 1University of Texas Southwestern Medical Center, Dallas, TX. 2Université de Montréal, Montreal, QC, Canada. 3Texas Health Presbyterian Hospital Dallas, Dallas, TX. 4Wakayama Medical University, Wakayama, Japan. (Sponsor: Craig G. Crandall, FACSM)

(No relationships reported)

In aged adults, acute lower limb heating increases leg blood flow, vascular shear stress, and improves macro- and microvascular dilator function. However, the effect of chronic lower limb heating on indices of vascular function and functional capacity remains unclear. PURPOSE: To test the hypothesis that chronic lower limb heating improves macro- and microvascular dilator function and functional capacity in aged adults.

METHODS: Five healthy aged adults (4 females; age 66 ± 4 years; height 163 ± 4 cm; weight 68 ± 7 kg; mean ± SD) were exposed to 8 weeks of chronic lower limb heating. Subjects immersed their lower limbs –33 cm into a heated (~42°C) and circulated water bath 4 days per week, for 45 min per session. Prior to and after the chronic limb heating regimen, duplex ultrasonography was used to assess macro-
A positive chronic effect of different exercise modalities on vascular endothelial diameter and function has been reported; however, little is known about the arterial vascular response to acute bouts of exercise. PURPOSE: The purpose of the study was to investigate the acute response of two exercise modes (aerobic and resistance training) on the endothelium and vascular diameter. METHODS: A meta-analysis was planned where the inclusion criteria for studies were: 1) experimental trials; 2) only human adults with no heart disease; 3) studies published only in English language; and 4) studies with pre and post and flow-mediated dilation (FMD) measurement. The electronic search was performed in six databases (PubMed, Springer Link, Science Direct, SAGE Journals, Sport Discus and Nature). cross-referencing, and hand searching, using the following combinations of words: “Acute exercise FMD”, “endothelial exercise function”, “vascular exercise endothelium”, and “FMD exercise”. Hedge’s standardized mean difference effect size (ES) was calculated for each result; then, ESs pooled using random-effects models. Non-overlapping 95% confidence intervals (CIs) were considered statistically significant. Heterogeneity was assessed using Q and I², while funnel plots and Egger’s regression test were used to assess small-study effects (potential bias). RESULTS: A total of 13 studies were meta-analyzed and 40 Es were computed from 378 (245 men and 133 women) participants. Of the 40 Es, 27 were on AE, 9 on RT and 4 on control groups (no exercise). The AE training revealed no significant effect on arterial diameter (ES=0.26; CI95%: 0.52; Q=14.2; p=0.11; I²=0%). The RT interventions indicated no significant effect (ES=0.29; CI95%: 0.08-0.66; Q=0.38; p=0.25; I²=0%). CONCLUSIONS: Neither aerobic or resistance training elicited an acute response on vascular function. More research is needed to better understand the physiological mechanisms responsible for this response.

**Board #354**

**June 2 9:30 AM - 11:00 AM**

**The Acute Effect of Aerobic and Resistance Training on Arterial Diameter: A Meta-Analysis**

Bricceho-Torres José Miguel, José Moncada-Jiménez. *University of Costa Rica, San Jose, Costa Rica.*

Email: josemiguez592@gmail.com

(No relationships reported)

**RESULTS:** A total of 13 studies were meta-analyzed and 40 Es were computed from 378 (245 men and 133 women) participants. Of the 40 Es, 27 were on AE, 9 on RT and 4 on control groups (no exercise). The AE training revealed no significant effect on arterial diameter (ES=0.26; CI95%: 0.52; Q=14.2; p=0.11; I²=0%). The RT interventions indicated no significant effect (ES=0.29; CI95%: 0.08-0.66; Q=0.38; p=0.25; I²=0%). CONCLUSIONS: Neither aerobic or resistance training elicited an acute response on vascular function. More research is needed to better understand the physiological mechanisms responsible for this response.

2834 Board #354

June 2 9:30 AM - 11:00 AM

**The Acute Effect of Aerobic and Resistance Training on Arterial Diameter: A Meta-Analysis**

Bricceho-Torres José Miguel, José Moncada-Jiménez. *University of Costa Rica, San Jose, Costa Rica.*

Email: josemiguez592@gmail.com

(No relationships reported)

A positive chronic effect of different exercise modalities on vascular endothelial diameter and function has been reported; however, little is known about the arterial vascular response to acute bouts of exercise. PURPOSE: The purpose of the study was to investigate the acute response of two exercise modes (aerobic and resistance training) on the endothelium and vascular diameter. METHODS: A meta-analysis was planned where the inclusion criteria for studies were: 1) experimental trials; 2) only human adults with no heart disease; 3) studies published only in English language; and 4) studies with pre and post and flow-mediated dilation (FMD) measurement. The electronic search was performed in six databases (PubMed, Springer Link, Science Direct, SAGE Journals, Sport Discus and Nature), cross-referencing, and hand searching, using the following combinations of words: “Acute exercise FMD”, “endothelial exercise function”, “vascular exercise endothelium”, and “FMD exercise”. Hedge’s standardized mean difference effect size (ES) was calculated for each result; then, ESs pooled using random-effects models. Non-overlapping 95% confidence intervals (CIs) were considered statistically significant. Heterogeneity was assessed using Q and I², while funnel plots and Egger’s regression test were used to assess small-study effects (potential bias). RESULTS: A total of 13 studies were meta-analyzed and 40 Es were computed from 378 (245 men and 133 women) participants. Of the 40 Es, 27 were on AE, 9 on RT and 4 on control groups (no exercise). The AE training revealed no significant effect on arterial diameter (ES=0.26; CI95%: 0.52; Q=14.2; p=0.11; I²=0%). The RT interventions indicated no significant effect (ES=0.29; CI95%: 0.08-0.66; Q=0.38; p=0.25; I²=0%). CONCLUSIONS: Neither aerobic or resistance training elicited an acute response on vascular function. More research is needed to better understand the physiological mechanisms responsible for this response.

2835 Board #355

June 2 9:30 AM - 11:00 AM

**Nitric Oxide (NO) is a vasodilator naturally produced by an oxygen dependent temperature (skin and inner tissue—2.5 cm deep) reaction on ankle joint during and**
CONCLUSIONS: When treating issues, especially located in 2.5 cm deep (e.g. ankle sprain), WLP may produce a similar effect as deep thermotherapy since it increases vascular response and inner tissue temperature. Application of MHP should be reconsidered as it does not affect vascular reaction at all.

E-41 Free Communication/Poster - Women- Exercise Responses

Friday, June 2, 2017, 7:30 AM - 12:30 PM
Room: Hall F

2838 Board #358 June 2 11:00 AM - 12:30 PM Effects of Aquarobic Exercise on Senior Fitness, Prostaglandin I2, And Thromboxane A2 in Elderly Korean Women

Do-Yeon Kim¹, Ji-Hyeon Kim¹, Jong-Won Kim², Su-Jin Hyun¹, Jung-Sook Kim¹, Su-Han Koh¹, Ji-Hoon Kim¹, Min-Seong Ha¹.
¹Pusan National University, Busan, Korea, Republic of. ²Busan National University of Education, Busan, Korea, Republic of.
(No relationships reported)

PURPOSE: The purpose of this study was to analyze the effects of aquarobic exercise on senior fitness, prostaglandin I2 (PGI2), and thromboxane A2 (TXA2) in elderly Korean women. METHODS: Thirty two healthy elderly women, aged 74 ± 11 to 4 ± 12 years, were randomly assigned to aquarobic exercise group (EX; n = 11) trained for 12-week or to a “non-exercise” control (Con; n = 11) group. The variables of senior health-related fitness, PGI2, and TXA2 were measured in all the participants before and after the 12-week study. This intervention trial was designed to compare pre- and post-exercise intervention variables. Changes from baseline to the end of the intervention was determined by a paired t-test and independent t-test. RESULTS: The results of the present study were consistent with the findings of the previous studies, as the cardiorespiratory endurance (492.5±73.92 vs. 414.50±19.87 m), muscular strength (24.99±1.93 vs. 19.29±1.96 kg), muscular endurance (24.05±5.38 vs. 19.38±5.39 times/30sec), and flexibility (13.32±5.00 vs. 11.56±5.04 cm) increased significantly in the aquarobic exercise group (p < 0.05). The results of the present study show no changes in prostaglandin I2 and thromboxane A2 levels in the present study show no changes in prostaglandin I2 and thromboxane A2 levels in elderly women. CONCLUSIONS: Results of the present study showed no significant difference in the levels of PGI2 and TXA2 in the elderly women. These results suggest that aquarobic exercise may have beneficial effects on senior health-related fitness and functionality.

2840 Board #360 June 2 11:00 AM - 12:30 PM Can The Lamberts Submaximal Cycle Test Reflect Overreaching In Professional Female Cyclists? Lieselot Decroix¹, Robert Patrick Lamberts², Romain Meuesen, FACSM¹, ¹Vrije Universiteit Brussel, Brussel, Belgium. ²University of Cape Town, Cape Town, Belgium. Email: lieselot.decroix@vub.ac.be
(No relationships reported)

PURPOSE: The Lamberts and Lambert Submaximal Cycle Test (LSCT) consists of 3 stages during which cyclists cycle for 6 minutes at 60%, 6 minutes at 80% and 3 minutes at 90% of their maximal heart rate, followed by one minute recovery. It was the aim of this study to determine if the LSCT is able to reflect a state of functional overreaching in professional female cyclists during an 8 day training camp and the following recovery days. METHODS: Six professional female cyclists performed an LSCT on day 1, day 5 and day 8 of the training camp and 3 days after the training camp. During each stage of the LSCT, power output and rating of perceived exertion (RPE) were determined. Training diaries and profile of mood status (POMS) were also assessed before and after the LSCT. Furthermore, the Lamberts and Lambert Submaximal Cycle Test (LSCT) was performed on day 1, day 5, day 8 and day +3. To investigate differences in performance parameters (P00, P08, RPE), a contemporary approach of data analysis using magnitude-based interferences was employed, where chances for meaningful changes (larger than normal day-to-day variability) were assessed as “likely” (> 75%), “very likely” (> 95%)—and “most likely”—by using PMR and the following recovery periods. Results: Power output and RPE during the 2nd stage of the LSCT were “likely” higher on day 5 and “very likely” (power) and “most likely” (RPE) higher on day 8 compared to day 1. During the 3rd stage of the LSCT, power output were “likely” higher on day 5 and “very likely” (power) and “likely” (RPE) higher on day 8 compared to day 1. On day 8, increased power output and RPE during these stages were accompanied by the inability to reach 90% of their maximal heart rate. All athletes reported increased feelings of fatigue (F(2,10)=17.43; p<0.001) and muscle soreness (F(2,10)=6.5; p=0.02). No significant changes were found in any of the parameters of the POMS (anger, vigor, fatigue, depression), nor in the energy-balance (vigor-fatigue) during and after the training camp. After 3 days of recovery, all parameters of the LSCT returned to baseline, indicating a state of functional overreaching during the training camp. Conclusion: The LSCT can be used to reflect a state of functional overreaching in elite professional female cyclists during an 8 day training camp and the following recovery days.
Several chronic illnesses are characterized by low-grade chronic inflammation, resulting in increased levels of circulating pro-inflammatory cytokines. Exercise has been shown to reduce the levels of circulating cytokines, as well as create an anti-inflammatory environment through the release of interleukin-6 from skeletal muscle. PURPOSE: The current study was designed to investigate whether or not family history of hypertension affected levels of interleukin-6 (IL-6) and systolic blood pressure (SBP) in young, physically active females, in response to an acute bout of resistance exercise. METHODS: A totally of 14 females (age = 23.14 ± 2.28 years) completed the study. Subjects were split into two groups of seven based on familiar pre-disposition of hypertension. Subjects completed a resistance protocol of three sets of 10 at 67% of 1 repetition maximal. Blood samples and SBP was taken pre-exercise, post-exercise, and 1-hr post exercise. RESULTS: No significant interaction (p > .05) was found for levels of IL-6 or SBP between both groups. No change in IL-6 was found from pre to post exercise (p = .942). A significant main effect (p < .05) was found for SBP across the time periods. Post-systolic blood pressure was higher immediately following exercise (Mpre = 110.28, Mpost = 123.00) and decreased to baseline or lower after 60-minutes of recovery (Mpost = 107.71). CONCLUSIONS: The results of this study indicate that family history of hypertension does not affect the levels of IL-6 or SBP in young, healthy females following resistance exercise. However, systolic blood pressure can decrease following a 60-minute recovery, after an acute bout of resistance exercise to levels at baseline or below.

The risk factors of stress urinary incontinence (SUI) are obesity, diabetes, metabolic syndrome, and pelvic floor dysfunction in postmenopausal women. Combined exercise with aerobic and resistance training included core exercise would be effective intervention for the SUI. PURPOSE: To investigate the effect of combined exercise program (CEP) on SUI in postmenopausal women. METHODS: This study was conducted with stratified random sampling, random assignment and a pre-post test design. Forty-two postmenopausal women with SUI (58.95 ± 4.16 years old) were divided into an exercise group (EG) and control group (CG) and categorized for metabolic syndrome (MAG, N=17; MCG, N=7), obesity (OEG, N=10; OCG, N=7), and normal (NEG, N=17; NCG, N=7) conditions, respectively. The CEP consisted of 12 weeks aerobic (40-75% of Heart Rate Reserve and 11-13 based on Rate of Received Exertion, 50-70 minutes, 3 times/week) and resistance training to strengthen the core muscles for total body training. Control groups maintained their daily lifestyle. Vaginal contraction, HOMA-IR, estradiol (E2), and body composition were assessed. Repeated measures ANOVAs were used to determine differences between each condition. RESULTS: Duration of vaginal contraction (F=15.410, p<.002) and HOMA-IR (F=5.372, p=.034) in the MEG were significantly improved compared with MCG. Peak pressure of vaginal contraction (F=14.706, p<.002), average pressure of vaginal contraction (F=20.839, p=.001), and % fat (F=13.440, p<.000) in the OEG were significantly improved compared with OCG. CONCLUSION: The CEP has efficacy for SUI prevention and alleviation by increasing pelvic floor muscle contraction, specifically for postmenopausal women with metabolic syndrome and obesity, as improving insulin resistance and body fat.
Circadian clocks, driven by the transcription factors Clock (circadian locomotor output cycles kaput) and Bmal1 (brain and muscle arnt-like 1), are sophisticated mechanisms that regulate 24-hr rhythms in numerous physiological processes ranging from gene expression to behavior. The clockwork of the circadian clock has been shown to regulate cardiac metabolism and function, and its disruption decreases lifespan. However, the role of the circadian clock in regulating cardio-circadian growth remains unknown. PURPOSE: To determine the role of the circadian clock in regulating hypertrophic growth of the heart. METHODS: We used mice with genetically disrupted clocks specifically within the heart (Cardiomyocyte-specific Bmal1 Knockout; CBK) and littermate control mice (CON) to investigate the role of the circadian clock on cardiac growth/size. Signaling was assessed through Western blotting, while rates of protein synthesis were measured using radiolabeled tracers (both in vivo and ex vivo). Rapamycin feeding (14 ppm and 42 ppm, 10 days) was utilized to pharmacologically inhibit mTOR. RESULTS: We found that disruption of the circadian clock leads to increased activation of the Akt/mTOR/S6 signaling axis in the heart. Rates of protein synthesis displayed a diurnal rhythm in CON mice (highest at ZT10) in vivo, which was chronically elevated in CBK mice; the same genotype effect was seen in ex vivo perfused hearts. CBK hearts exhibited increased heart size (relative to CON hearts), which was normalized by rapamycin feeding. CONCLUSION: Genetic disruption of the circadian clock leads to chronic activation of the Akt/mTOR/S6 signaling axis in the heart, associated with increased protein synthesis and size.

Molecular clocks are comprised of interlocking transcriptional-translational feedback loops that promote circadian rhythms in physiology through controlling downstream gene expression in a temporal and tissue-specific fashion. The mechanisms in which the core clock factors (ubiquitously expressed in all tissues) target skeletal muscle specific gene expression are poorly understood. PURPOSE: Here we investigate the role of the muscle specific factor MYOD1 in regulating skeletal muscle circadian gene expression. METHODS: Dual-luciferase assays and real-time bioluminescence (Lumicycle) were performed in C2C12 myotubes to determine transcriptional responses and rhythmic expression patterns of the muscle specific circadian gene, Titin-cap (Tcap), with over expression of the core-clock genes BMAL1:CLOCK with

MYOD1. To identify genome-wide binding sites for BMAL1:CLOCK and MYOD1 we performed chromatin immunoprecipitation and ultra-high throughput sequencing (ChIP-Seq) in wildtype C57BL/6 quadriceps and C2C12 myotubes. HOMER software was utilized for Next-Gen sequencing analysis. RESULTS: We utilized a bioinformatics approach to identify Tcap as a skeletal muscle specific, circadian gene. Interestingly, we found that MYOD1 transactivates Tcap in a synergistic fashion with BMAL1:CLOCK and enhances T-cap's circadian amplitude. Three e-box elements within the Tcap promoter are required for cooperativity between the clock factors and MYOD1. ChIP-Seq analysis in skeletal muscle indicated that MYOD1 targets a large subset of the skeletal muscle circadian transcriptome. CONCLUSION: These findings support the hypothesis that MYOD1 is a key regulator of circadian gene expression in skeletal muscle.

Molecular clocks are comprised of interlocking transcriptional-translational feedback loops that promote circadian rhythms in physiology through controlling downstream gene expression in a temporal and tissue-specific fashion. The mechanisms in which the core clock factors (ubiquitously expressed in all tissues) target skeletal muscle specific gene expression are poorly understood. PURPOSE: Here we investigate the role of the muscle specific factor MYOD1 in regulating skeletal muscle circadian gene expression. METHODS: Dual-luciferase assays and real-time bioluminescence (Lumicycle) were performed in C2C12 myotubes to determine transcriptional responses and rhythmic expression patterns of the muscle specific circadian gene, Titin-cap (Tcap), with over expression of the core-clock genes BMAL1:CLOCK with

MYOD1. To identify genome-wide binding sites for BMAL1:CLOCK and MYOD1 we performed chromatin immunoprecipitation and ultra-high throughput sequencing (ChIP-Seq) in wildtype C57BL/6 quadriceps and C2C12 myotubes. HOMER software was utilized for Next-Gen sequencing analysis. RESULTS: We utilized a bioinformatics approach to identify Tcap as a skeletal muscle specific, circadian gene. Interestingly, we found that MYOD1 transactivates Tcap in a synergistic fashion with BMAL1:CLOCK and enhances T-cap's circadian amplitude. Three e-box elements within the Tcap promoter are required for cooperativity between the clock factors and MYOD1. ChIP-Seq analysis in skeletal muscle indicated that MYOD1 targets a large subset of the skeletal muscle circadian transcriptome. CONCLUSION: These findings support the hypothesis that MYOD1 is a key regulator of circadian gene expression in skeletal muscle.

Molecular clocks are comprised of interlocking transcriptional-translational feedback loops that promote circadian rhythms in physiology through controlling downstream gene expression in a temporal and tissue-specific fashion. The mechanisms in which the core clock factors (ubiquitously expressed in all tissues) target skeletal muscle specific gene expression are poorly understood. PURPOSE: Here we investigate the role of the muscle specific factor MYOD1 in regulating skeletal muscle circadian gene expression. METHODS: Dual-luciferase assays and real-time bioluminescence (Lumicycle) were performed in C2C12 myotubes to determine transcriptional responses and rhythmic expression patterns of the muscle specific circadian gene, Titin-cap (Tcap), with over expression of the core-clock genes BMAL1:CLOCK with

MYOD1. To identify genome-wide binding sites for BMAL1:CLOCK and MYOD1 we performed chromatin immunoprecipitation and ultra-high throughput sequencing (ChIP-Seq) in wildtype C57BL/6 quadriceps and C2C12 myotubes. HOMER software was utilized for Next-Gen sequencing analysis. RESULTS: We utilized a bioinformatics approach to identify Tcap as a skeletal muscle specific, circadian gene. Interestingly, we found that MYOD1 transactivates Tcap in a synergistic fashion with BMAL1:CLOCK and enhances T-cap's circadian amplitude. Three e-box elements within the Tcap promoter are required for cooperativity between the clock factors and MYOD1. ChIP-Seq analysis in skeletal muscle indicated that MYOD1 targets a large subset of the skeletal muscle circadian transcriptome. CONCLUSION: These findings support the hypothesis that MYOD1 is a key regulator of circadian gene expression in skeletal muscle.

Molecular clocks are comprised of interlocking transcriptional-translational feedback loops that promote circadian rhythms in physiology through controlling downstream gene expression in a temporal and tissue-specific fashion. The mechanisms in which the core clock factors (ubiquitously expressed in all tissues) target skeletal muscle specific gene expression are poorly understood. PURPOSE: Here we investigate the role of the muscle specific factor MYOD1 in regulating skeletal muscle circadian gene expression. METHODS: Dual-luciferase assays and real-time bioluminescence (Lumicycle) were performed in C2C12 myotubes to determine transcriptional responses and rhythmic expression patterns of the muscle specific circadian gene, Titin-cap (Tcap), with over expression of the core-clock genes BMAL1:CLOCK with

MYOD1. To identify genome-wide binding sites for BMAL1:CLOCK and MYOD1 we performed chromatin immunoprecipitation and ultra-high throughput sequencing (ChIP-Seq) in wildtype C57BL/6 quadriceps and C2C12 myotubes. HOMER software was utilized for Next-Gen sequencing analysis. RESULTS: We utilized a bioinformatics approach to identify Tcap as a skeletal muscle specific, circadian gene. Interestingly, we found that MYOD1 transactivates Tcap in a synergistic fashion with BMAL1:CLOCK and enhances T-cap's circadian amplitude. Three e-box elements within the Tcap promoter are required for cooperativity between the clock factors and MYOD1. ChIP-Seq analysis in skeletal muscle indicated that MYOD1 targets a large subset of the skeletal muscle circadian transcriptome. CONCLUSION: These findings support the hypothesis that MYOD1 is a key regulator of circadian gene expression in skeletal muscle.
POSCUO AOT NIOC THE AMERICAN COLLEGE OF SPORTS MEDICINE

Changes in Brain Perfusion Following Weight Loss are Associated with Changes in BMI Mass Index

Chelsa M. Stillman, Jennifer C. Watt, Renee J. Rogers, John M. Jakicic, FACSM, Kirk I. Erickson. "University of Pittsburgh School of Medicine, Pittsburgh, PA. "University of Pittsburgh, Pittsburgh, PA. "University of Pittsburgh, Pittsburgh, PA. (Sponsor: John Jakicic, FACSM)" (No relationships reported)

PURPOSE: Being overweight or obese, defined as having a body mass index (BMI) of 25 or greater, is associated with brain hypoperfusion. However, it is unknown to what extent obesity-related hypoperfusion can be reversed following weight loss. Further, the relative contributions of diet and physical activity (PA) on brain perfusion are poorly understood. The aim of the present study was to examine changes in brain perfusion following weight loss, and to relate changes in perfusion to changes in BMI.

METHODS: 121 healthy adults (M±SD = 44.3±8.6 years old; 95 female) completed a 12-month randomized controlled trial involving an energy restricted diet (diet-only), a diet + 150 minutes of moderate intensity PA per week (Mod-PA), or diet and 250 minutes of moderate intensity PA per week (High-PA). Participants also completed MRI scans before and after the intervention, including a pseudocontinuous arterial spin labeling (pCASL) scan. Changes in brain perfusion were assessed with a voxelwise linear regression to examine regions where changes in brain perfusion covary with changes in BMI. Results were corrected for multiple comparisons at a threshold of p < .05; k > 15. RESULTS: There was a significant reduction in BMI following the intervention, suggesting that it was effective at facilitating weight loss, regardless of group (M(ΔBMI) = 4.2+3.3 kg/m2, p = .001). Brain perfusion following the intervention increased across the brain, particularly in the medial temporal lobe and prefrontal cortex. Changes in BMI were correlated with baseline-to-post intervention increases in brain perfusion in the right medial prefrontal cortex (r(155) =-.21, p =.03, peak MNI xyz = 43,98,40, k = 42; r(105) =.21, p = .03, peak MNI = 42, 80, 27, k = 37).

CONCLUSIONS: A 12-month intervention involving diet alone, or diet combined with PA effectively increased brain perfusion across the brain. Collapsing across intervention groups, the magnitude of weight loss (via changes in BMI) was positively correlated with changes in prefrontal brain perfusion. The regional specificity of this later finding is important as it suggests that weight-loss may have the greatest effects on brain health in regions that are particularly vulnerable to obesity. Future work will identify whether these effects are being driven by changes in PA, diet, or both.

Effect of Sex on arterial hemodynamics and Cerebral Blood Flow Dynamics Following Acute Resistance Exercise.

Alexander J. Rosenberg, Sang Ouk Wee, Elizabeth C. Schroeder, Kanokwan Bunswat, Georgios Grigoriadis, Badea M. Saed, Bo Fernhall, FACSM, Tracy Baynard, FACSM. "University of Illinois at Chicago, Chicago, IL. Email: arosenb12@gmail.com" (No relationships reported)

Resistance exercise (RE) is recommended for men and women and is important for improving cardiovascular (CV) and metabolic disease risk factors. High-intensity RE acutely increases arterial stiffness and blood pressure (BP), coupled with reduced cerebral blood flow velocity (CBFv) and greater flow pulsatility in the cerebral circulation, which may be detrimental to cerebral microvasculature. Because females have different CV control mechanisms, it is important to assess potential sex differences in cerebral vascular responses to acute RE. PURPOSE: To examine the effect of sex on hemodynamics and cerebral vascular responses following acute RE in young recreationally active men and women. METHODS: Healthy men (n = 11, 28 yrs, BMI = 24.6) and women (n = 9, 25 yrs, BMI = 23.2) performed 3 sets of 10 repetitions of isokinetic concentric/concentric unilateral knee flexion/extension). 28 yrs, BMI = 24.6) and women (n = 9, 25 yrs, BMI = 23.2) performed RE (3 sets of 10 repetitions of isokinetic concentric/concentric unilateral knee flexion/extension).

Carotid BP (cSBP, cDBP, cMAP) measurements were obtained using applanation tonometry. Central pulse wave velocity (PWV) was measured by an automated ambulatory BP monitor (REVEAL). See table. Mean CBFv increased 1 min-post-exercise and decreased below baseline 5 min-post-exercise (p < 0.01) in both groups. CBFv pulsatility increased following RE and was elevated above baseline 5 min-post-exercise (p < 0.01) in both groups. PWV increased 1 min-post-exercise (p < 0.01) in both groups. Most variables returned to baseline at 30 min. CONCLUSION: RE increased central arterial stiffness, mean CBFv and CBFv pulsatility similarly for both sexes. Although CO increased at 5 min, CBFv dropped below baseline and pulsatility continued to rise above baseline. This temporary disruption in cerebral autoregulation may impact brain health in both sexes.

Hypohydration exceeding 2% body mass is known to impair endurance capacity. It is hypothesized that the central nervous system, specifically the brain, is negatively affected by hypohydration, leading to a decline in endurance capacity.

PURPOSE: To investigate the effects of exercise-induced hypohydration on the brain.

METHODS: Ten trained endurance males (mean±sd: age 23.3±1.1 years; body fat 10.5±2.4%; VO2max 65±5 ml kg⁻¹ min⁻¹) were dehydrated to ~3% body mass by running on a treadmill at 65% VO2peak in a 25°C environment, before drinking to replace 100% or 0% of fluid losses in two randomized, counterbalanced trials. Participants underwent MRI scans at baseline and post-fluid replacement to examine brain volume, functional activity and cerebral perfusion. Magnetic resonance spectroscopy was used to measure brain temperature (at primary motor cortex) before and during the dehydration run. Endurance capacity was assessed by running to exhaustion at 75% VO2peak. Results were assessed using paired sample T-test with p<0.05 considered significant.

RESULTS: MRI results demonstrated a reduction in total brain volume in hypohydration (HH) as compared to euhydration (EU) trials (EU: 1.007, HH: 0.993; p=0.003). BOLD (blood-oxygen-level dependent) activation in the primary motor (M1) and somatosensory cortex (S1) during a plantar flexion task were similar between conditions (M1: p=0.314, S1: p=0.332). Global and regional cerebral perfusion remained unchanged between conditions (Global: p=0.055, M1: p=0.447, S1: p=0.458). Brain temperature measured at baseline was higher than core temperature (Brain: 37.7±0.5°C, Core: 36.7±0.3°C; p<0.0001). However, both temperatures were similar during exercise (Brain: 38.2±0.4°C, Core: 36.8±0.3°C; p=0.110). Endurance capacity was reduced with hypohydration (EU: 45.2±9.3 min, HH: 38.4±10.7 min: p=0.033).

CONCLUSION: Under hypohydration, the endurance capacity is impaired and total brain volume is reduced. Brain functional activity and cerebral perfusion are notably well-preserved. Brain temperature could be regulated within a narrower homeostatic range than the core temperature. Supported by DIPR Grant, PA No. 9015102335 and funding from ERGOTECH, South Africa.
Cardiorespiratory fitness (CRF) and physical activity (PA) are positively associated with cognition and may mitigate pathological changes that occur with age and Alzheimer’s disease (AD). However, there is limited information on the interaction between CRF and PA in predicting brain health in older adults. Throughout aging and the AD cascade, patterns of decreased cerebral blood flow (CBF) are apparent and vascular health abnormalities have been postulated as a precursor to downstream pathologies such as amyloid-beta accumulation and neuronal dysfunction. Limited research suggests that CRF is positively associated with CBF. However, no study to date has examined CRF and PA concomitantly with CBF. PURPOSE: To determine the unique contributions of CRF and moderate-vigorous physical activity (MVP) when predicting CBF in an older adult population at-risk for AD. METHODS: 159 cognitively healthy (MMSE ≥ 24) adults (mean age = 63.8, SD = 5.4) from the Wisconsin Registry for Alzheimer’s Prevention participated in this study. Participants performed a graded maximal exercise test to measure CRF (VO2 max) and a triaxial accelerometer on their hip for seven consecutive days to quantify their PA behaviors. Participants also underwent MRI scanning where CBF was measured using arterial spin labeling (ASL). CBF was sampled from 5 brain regions implicated in AD using the Alzheimer’s Disease Neuroimaging Initiative FDG Meta-ROI suite. Statistical analyses: Pearson correlation was used to examine the association between CRF and MVP. Multiple linear regression was used to determine whether CRF and/or MVP were significant and independent predictors of CBF. RESULTS: CRF and MVP were moderately correlated (r = .37; p < .05), suggesting these two constructs may provide unique contributions to CBF. Regression analysis revealed CRF was significantly and positively associated with CBF while accounting for minutes of MVP, accelerometer wear time, age, gender, and global cerebral blood flow (p < .05). Conclusions: Results suggest fitness level, independent of physical activity, is associated with greater CBF in regions that decline with aging and AD. Cardiorespiratory fitness appears to be an important physiological component of brain health in older adulthood that is not explained by physical activity behaviors.

Cerebrovascular responsiveness (CVR) to alterations in arterial carbon dioxide (PCO2) content is a common test to assess brain health. Traditionally, higher CVR is associated with higher aerobic fitness, while natural aging and brain-related diseases are associated with lower CVR. However, recent findings challenge some of these relations, but may be related to inconsistent neuroimaging methodologies. PURPOSE: 1) to examine fitness effects on CVR between active and sedentary individuals using functional magnetic resonance imaging (fMRI) and transcranial Doppler (TCD), and 2) compare different stimulus concentrations for CVR measures between fMRI and TCD. METHODS: Fourteen volunteers participated (26 ± 7 yrs; 8 active, 6 sedentary), with 10 pair-matched for age and sex to examine fitness effects (5 active, 5 sedentary). Following medical screening, participants completed an aerobic fitness test (VO2 max) and the CVR protocol familiarisation. Participants then completed two experimental sessions on separate days (randomized and counterbalanced). For both sessions, CVR was assessed using two concentrations of CO2 via the same Douglas bag open circuit (4-min cycles of room air, 5% CO2, room air, 7% CO2). CVR was measured using fMRI (EPI-based sequence allowing simultaneous acquisition of blood-oxygen level dependent (BOLD) and perfusion responses) and TCD (middle cerebral artery (MCA) blood flow velocity). CVR measures were correlated (Pearson’s) with fitness and differences between stimulus concentration within and between approaches compared. RESULTS: 1) Higher VO2 max was associated with higher CVR derived from 5% and 7% CO2 stimuli, but were higher for fMRI (5%: r = .64, p < .006; 7%: r = .69, p = .04) than TCD (5%: r = .20, p = .30; 7%: r = .36, p = .17). When comparing CVR between fMRI and TCD, values obtained from the 5% stimulus correlated (r = .626, p < .05); while there was no correlation between values obtained from the 7% stimulus (r = .252, p > .46). Paired t-tests comparing CO2 concentration (5% vs 7% CO2) revealed no difference for fMRI-derived CVRs (p = .93), but a trend between TCD-derived CVRs (p = .10). CONCLUSION: Both fMRI and TCD-CVR approaches differentiated active and sedentary groups. The CVR measure between and within neuroimaging approaches was differentially influenced by CO2 concentration.
**F-09 Thematic Poster - Cardiovascular Regulation**

**Friday, June 2, 2017, 1:00 PM - 3:00 PM**

Room: 403

2884

**Chair:** Russell S. Richardson, University of Utah, Salt Lake City, UT.

(No relationships reported)

**PURPOSE:** To investigate the combined effect of hypoxia and altered arterial perfusion pressure on vascular conductance (VC), muscle blood flow (MBF), and O2 delivery (DO2) during exercise. **METHODS:** Ten healthy volunteers repeated planar flexion contractions at 20% (low power output = LPO) of their maximal voluntary contraction in 15° head-down-tilt (HDT) and 45° head-up-tilt (HUT) to modify muscle perfusion pressure (MPP) while breathing normoxic and then hypoxic air. Popliteal diameter and muscle blood flow velocity were measured by ultrasound to determine MBF. VC was estimated by dividing MBF by MPP and DO2 was estimated from MBF and saturation. **RESULTS:** From normoxia to hypoxia in LPHDT, DO2 was increased from 180.9 ± 53.3 mL·min⁻¹·m⁻² to 201.0 ± 60.8 mL·min⁻¹·m⁻² (p < 0.05). In hypoxia, there was an increase in VC from 2.9 ± 0.8 mL·min⁻¹·m⁻²·mmHg⁻¹ in normoxia to 3.3 ± 0.8 mL·min⁻¹·m⁻²·mmHg⁻¹ (p < 0.05) and MBF from 146.3 ± 34.2 mL·min⁻¹ in normoxia to 167.3 ± 38.1 mL·min⁻¹ in hypoxia (p < 0.05), maintaining DO2 (142.2 ± 33.2 mL·min⁻¹·m⁻² and 152.6 ± 34.3 mL·min⁻¹). From normoxia to hypoxia in LPHOTHUT, there were no changes in VC (1.4 ± 0.5 mL·min⁻¹·m⁻²·mmHg⁻¹ and 1.4 ± 0.6 mL·min⁻¹·mmHg⁻¹), MBF (203.3 ± 74.3 mL·min⁻¹ and 210.3 ± 84.2 mL·min⁻¹), and DO2 (197.0 ± 72.4 mL·min⁻¹ and 201.0 ± 68.0 mL·min⁻¹). In hypoxia, VC reached its upper functional limit and the consequence was revealed by increased muscle activation. A greater metabolic stress and advance of muscle fatigue. During LPOHDT, LPOHUT, and -40 Torr LBNP, there was a significant decrease from baseline at 56.0±21.6 mL·min⁻¹·m⁻²·mmHg⁻¹ to 55.7±17.7 mL·min⁻¹·m⁻²·mmHg⁻¹ (p<0.05) on oxygen uptake appeared to reach a critical level at ~80% of WRmax and be regulated by blood flow. This implies that high, but not maximal, exercise intensity may be an optimal stimulus for shear stress-induced small muscle mass training adaptations.

2885

**Board #1 June 2 1:00 PM - 3:00 PM**

**Are Vascular Conductance and Muscle Blood Flow During Exercise Affected by Hypoxia and Arterial Perfusion Pressure?**

Rodrigo Villar, Richard L. Hughson, Franklin Pierce University, Rindge, NH; University of Waterloo, Waterloo, ON, Canada.

(No relationships reported)

**INTRODUCTION:** Exercise intolerance is a hallmark characteristic of obesity, which may be related to an impaired ability to appropriately increase blood flow to the contracting muscles. Limited evidence suggests that steady-state vasodilation responses to dynamic forearm exercise are preserved or even increased in young obese humans compared with lean peers, but this topic still remains poorly understood. **PURPOSE:** To evaluate exercise-induced changes in hemodynamics in young obese adults compared with lean adults. **METHODS:** Thirteen lean (female=6; 26.0±1 yrs; 22.4±0.5 kg·m⁻²) and 14 obese adults (female=7; 27.2±1 yrs; 32.6±0.6 kg·m⁻²) performed 2-min of dynamic forearm exercise at 15 and 30% of maximal voluntary contraction (1-s contraction: 2-s relaxation). Ultrasoundography [brachial diameter, forearm blood flow (FBF), forearm vascular conductance (FVC)], and beat-to-beat hemodynamics [mean arterial pressure (MAP), heart rate (HR), stroke index (SI), systemic vascular resistance index (SVRI), cardiac index (CI), systemic arterial compliance index (SACI)] were collected. FBF and FVC were normalized to lean forearm mass, and hemodynamics were indexed to body surface area. **RESULTS:** There were no group differences in any variable at baseline. Brachial arterial diameter, FBF, FVC, and HR increased from baseline at 15% and 30% of MVC similarly in both groups (P<0.05). There was an interaction for SVRI during MVC only in the lean group (P<0.05). **CONCLUSION:** Although young obese adults did not exhibit an impairment in exercise-induced increases in...
blood flow, systemic vascular resistance did not decrease with exercise in obese adults. Future studies in an older population may reveal more consistent obesity-related impairments, whereas our current cohort is young and lack comorbidities.

### Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Baseline</th>
<th>15MVC</th>
<th>30MVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brachial Artery Diameter (mm) *</td>
<td>Lean</td>
<td>3.45±0.15</td>
<td>3.51±0.15</td>
<td>3.63±0.14</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>3.60±0.14</td>
<td>3.49±0.14</td>
<td>3.76±0.14</td>
</tr>
<tr>
<td>FBF (mL/min*100 g tissue) *</td>
<td>Lean</td>
<td>11±1</td>
<td>13±1</td>
<td>30±2</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>11±1</td>
<td>14±1</td>
<td>27±2</td>
</tr>
<tr>
<td>FVC (mL/min<em>100mmHg</em>100 g tissue) *</td>
<td>Lean</td>
<td>11±1</td>
<td>14±1</td>
<td>30±2</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>11±1</td>
<td>13±1</td>
<td>27±2</td>
</tr>
<tr>
<td>MAP (mmHg)</td>
<td>Lean</td>
<td>101±2</td>
<td>103±2</td>
<td>102±3</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>100±2</td>
<td>99±2</td>
<td>103±3</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>Lean</td>
<td>62±2</td>
<td>66±2</td>
<td>67±2</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>64±2</td>
<td>63±2</td>
<td>67±2</td>
</tr>
<tr>
<td>SI (mL/min/m²)</td>
<td>Lean</td>
<td>53±1</td>
<td>54±1</td>
<td>55±1</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>48±1</td>
<td>46±1</td>
<td>47±1</td>
</tr>
<tr>
<td>CI (L/min/m²)</td>
<td>Lean</td>
<td>3.3±0.2</td>
<td>3.5±0.2</td>
<td>3.7±0.2</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>3.0±0.2</td>
<td>3.2±0.2</td>
<td>3.3±0.2</td>
</tr>
<tr>
<td>SVRI (L/min/mmHg/m²)</td>
<td>Lean</td>
<td>32.2±1.9</td>
<td>30.2±1.9</td>
<td>29.2±1.8</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>33.9±1.8</td>
<td>34.5±1.9</td>
<td>33.8±1.8</td>
</tr>
<tr>
<td>SACI (mL/mmHg/m²)</td>
<td>Lean</td>
<td>0.96±0.04</td>
<td>0.97±0.04</td>
<td>0.99±0.04</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>0.88±0.04</td>
<td>0.86±0.04</td>
<td>0.86±0.04</td>
</tr>
</tbody>
</table>

Data are mean±SE. *P<0.05, time effect. †P<0.05, interaction. ‡P<0.05, different from baseline.

### References

Multiple Sclerosis (MS) is a demyelinating disease of the central nervous system characterized by a variety of symptoms including fatigue, reduced exercise capacity, and autonomic nervous system (ANS) dysfunction. PURPOSE: The purpose of this study was to determine whether persons with MS (PwMS) demonstrate reduced skeletal muscle blood flow during exercise compared to age matched controls. METHODS: The first analysis included 7 PwMS (age: 52.0 ± 9.8, 6 women) and 6 controls (age: 51.3 ± 9.5) for the second analysis. Mean blood velocity was measured during submaximal single leg knee extension with a modified cycle ergometer on the right leg at 20% and 40% of work-rate max (WRmax). FBF and FVC were normalized per 100g of thigh fat free mass. Comparisons for analysis 1 were made with unpaired 1-tailed T-Tests and comparisons for analysis 2 with paired t-1ailed T-Tests. RESULTS: Analysis 1: FVC tended to be lower in the MS group at 20% WRmax (P = 0.13) and 40% WRmax (P = 0.13). However, there was no difference in FVC when absolute workloads were matched (MS 40% WRmax vs. Con 20% WRmax: MS: 6.3 ± 1.6 watts, Con: 5.0 ± 0.8 watts) between groups (P = 0.41). Analysis 2: Absolute and relative workloads were matched for each group (20% WRmax, MS: 4.2 ± 0.8 watts, Con: 4.0 ± 1.0 watts; 40% WRmax, MS: 8.3 ± 1.7 watts, Con: 8.0 ± 2.0 watts). FBF was lower at 40% WRmax (P = 0.05), while FBF at 20% WRmax (P = 0.13) and FVC at both workloads tended to be lower in MS (20% WRmax, P<0.10, 40% WRmax, P = 0.14). CONCLUSIONS: These results suggest that PwMS exhibiting ANS dysfunction may have reduced blood flow during exercise at similar relative and absolute workloads compared to age/sex matched controls. These findings warrant further investigation into the regulation of skeletal muscle blood flow in PwMS to determine whether impaired blood flow contributes to common symptoms of MS such as reduced exercise capacity and fatigue.
Purpose: As nitric oxide (NO) is both an important vasodilator and considered antiatherogenic, inhibiting nitric oxide synthase (NOS), to assess the role and bioavailability of NO, is commonplace. However, the physiologic window of effect in the human vasculature for the often used NOS inhibitor, L-NMMA, has not been well characterized and hence, this form of NOS inhibition is typically employed last in experimental protocols or on a separate day. Therefore, this study sought to quantify the duration of the measurable physiologic effects of L-NMMA in the peripheral vasculature. Methods: The passive leg movement (PLM) assessment of vascular function, which has been documented to be predominantly NO mediated, was performed in 7 young male subjects under baseline conditions, immediately following L-NMMA infusion (0.24 mg/dl/min) into the common femoral artery and then again at 45-60 and 90-105 minutes post infusion. The leg blood flow (LBF) response to PLM, assessed with Doppler ultrasound and expressed as the change from baseline to peak (ΔLBFpeak) and area under the curve (AUC), was utilized to assess the effect of L-NMMA on NO-mediated vascular function over the course of the experiment. Results: Immediately after the L-NMMA infusion, ΔLBFpeak and LBF AUC were significantly attenuated by 38% and 69%, respectively. However, within 45-60 minutes following the L-NMMA infusion neither PLM-induced ΔLBFpeak nor LBF AUC were significantly different from baseline to peak. Conclusion: These findings reveal that the potent reduction in NO bioavailability afforded by NO inhibition with L-NMMA has a window of effect of less than 45-60 minutes in the human vasculature. These data can be used to guide experimental design using this pharmacological approach.

**F-10**

**Thematic Poster - Don’t be a Cry Baby: Research in Pregnancy, Child Birth, and Early Life**

**Board #1**  
**June 2 1:00 PM - 3:00 PM**  
**Longitudinal Trends for Pregnancy Physical Activity as Assessed through Objective and Self-Report Methods**  
Taylor E. Heppner, Christopher P. Connolly, Robert D. Catena. Washington State University, Pullman, WA.  
(No relationships reported)

Previous investigations have suggested an overall decrease in physical activity (PA) as pregnancy progresses. Longitudinal investigations of these trends are scarce and have primarily utilized self-report assessments, rather than objective methods. **PURPOSE:** To 1) longitudinally examine month-specific trends in PA during pregnancy and to 2) compare self-report and objective methods of assessing month-specific PA. **METHODS:** Pregnant women (N=23) were recruited to participate in a longitudinal investigation examining anthropometric change, dynamic balance, and PA levels throughout gestation. The assessment of PA occurred each month of pregnancy via self-report. **RESULTS:** Immediately after the L-NMMA infusion, ΔLBFpeak and LBF AUC were significantly attenuated by 38% and 69%, respectively. However, within 45-60 minutes following the L-NMMA infusion neither PLM-induced ΔLBFpeak nor LBF AUC were significantly different from baseline to peak. **Conclusion:** These findings reveal that the potent reduction in NO bioavailability afforded by NO inhibition with L-NMMA has a window of effect of less than 45-60 minutes in the human vasculature. These data can be used to guide experimental design using this pharmacological approach.

**Board #2**  
**June 2 1:00 PM - 3:00 PM**  
**Wrist-Worn Accelerometry Usage in Primiparous Early Postpartum Women**  
Ali E. Wolperm, 84112, Kyle J. Sherwin, 84112, Whitney D. Moss, Ingrid E. Nygaard, Marlene J. Egger, Timothy A. Brussseau, Janet M. Shaw, FACSM. University of Utah, Salt Lake City, UT.  
(No relationships reported)

The early postpartum period (6 weeks) presents major lifestyle change to new parents. Is wearing a wrist-worn accelerometer acceptable to first-time mothers in early postpartum? **PURPOSE:** To describe wrist-worn accelerometer usage in primiparous, early postpartum women. **METHODS:** We analyzed wear characteristics, including mean ±(SD) days of wear and the mean minutes ±(SD) of wear/day, of women enrolled in the first year of the Motherhood And Pelvic Health Study and determined the proportion of women who met the wear time standards of large published surveillance studies. We asked women to wear a tri-axial accelerometer continuously on the non-dominant wrist (1440 minutes=24 hours) over two specific 7-day periods, 12 to 25 days (T1) and 33 to 46 days (T2) postpartum. Study staff delivered accelerometers to women and verbally reinforced the protocol. We used the Choi et al. (2011) algorithm to determine wear/ non-wear time. We assigned 0 days and 0 minutes of wear to women who wore the device outside of prescribed time periods. We excluded from analysis women that we were unable to contact before T1/T2 and those who had device failure. **RESULTS:** For T1, 201 were eligible; 17 could not be contacted and 6 had device failures, leaving 178 women for analysis. For T2, 161 were eligible; 10 could not be contacted and 5 had device failures, leaving 146 women for analysis. At T1, most women (N=166, 93.3%) wore the device for 7 days (mean=6.8±1.0 days) with an average wear time of 1348.0±135.8 minutes/day. A slightly lower proportion of women (N=126, 86.3%) wore the device for 7 days (mean = 6.7±.88 days) at T2 with an average wear time of 1311.3±148.0 minutes/day. Two women at T2 and 1 woman at T1 did not wear the device during the prescribed time intervals. Nineteen women at T1 and 17 at T2 averaged 1440 minutes per day (perfect wear). At T1, 96.1% (N=171) and at T2, 93.2% (N=136) of women met the NHANES wear standards. At T1, 90.4% (N=161) and at T2, 82.2% (N=120) of women met the Whitehall II Study wear standards. **CONCLUSION:** Despite the challenges inherent in conducting research about physical activity in newly postpartum women, our results indicate that adherence to wrist-worn accelerometer in this population is high. Supported by NIH Grant Number 1P01HD080629 from the Eunice Kennedy Shriver National Institute of Child Health and Development.
Reduced Physical activity (PA) levels have been associations with female-specific life events including pregnancy. Studies in adult women suggest that decreases in PA may persist after childbirth. However, there is little understanding of post-birth PA trends in adolescent females.

Purpose: To examine changes in PA after childbirth in adolescents.

Methods: The Pittsburgh Girls Study collected time-stamped step count data for 7 days, annually from 2010-2013 with a validated monitor, in a local population representative sample of 1045 adolescent females in Pittsburgh, PA (baseline age: 14-17 years). This analysis examines PA in the 95 participants with ≥3 days of valid step data who gave birth for the first time between 2009 and 2013. Change in average total steps/day over the 4 years was determined with mixed models (using a step down approach). All models were adjusting for, age cohort, winter wear time (y/n), weekend wear time (y/n), and average daily wear time (minutes/day). The effects of age at pregnancy and race/ethnicity [Non-Hispanic African American (NH AA) / All Others] were also examined.

Results: At baseline, girls that gave birth during the study period were more likely to identify as black or Hispanic (24.6% vs. 14.6% in the year before pregnancy). There was a non-significant upward trend in step counts from year before pregnancy to year after pregnancy (26.09±7.89 in the year before pregnancy vs. 29.06±8.81 in the year after pregnancy). Overall, 61% of the girls reported > 5000 mean steps/day in the year after pregnancy versus 41% in the year before pregnancy. There was a significant upward trend in mean step counts in subsequent post-pregnancy years. For comparison, girls not experiencing a pregnancy had little change in step counts over the 4 year follow-up period.

Conclusions: There was a significant drop in PA levels post-pregnancy in this cohort. More than half of these girls could be considered sedentary post-pregnancy (<5000 steps/day). Based on this cohort, efforts to improve post-pregnancy PA levels are warranted in adolescent mothers.

The Pregnancy Physical Activity Questionnaire (PPAQ) is a commonly used tool to assess pregnant women’s current physical activity levels. However, few studies have evaluated the level of agreement between the PPAQ and physical activity measurement devices during free living conditions at multiple time points throughout pregnancy.

Purpose: The purpose of this study was to compare the PPAQ and device based physical activity assessment across phases of pregnancy and postpartum.

Methods: Physical activity behaviors of 38 women were quantified by the PPAQ and accelerometers worn at the right hip and ankle, at approximately 21 and 32 weeks of pregnancy, and 12 weeks postpartum. Women were evaluated at least eight hours per day for at least five days of a week. Percent time spent in light, moderate, and vigorous physical activity were compared between the PPAQ and accelerometers using a two-way repeated measures analysis of variance (ANOVA).

Results: Percent of total physical activity time spent in light and moderate activity levels was similar between hip (93.1, 5.7%, respectively) and ankle (89.4, 5.7%, respectively) accelerometers, compared to 47.8, 40.3%, respectively, for the PPAQ (P<0.01). Specifically, the PPAQ results indicated significantly less time in light physical activity and more time in moderate activity. In addition, the hip and ankle accelerometers and the PPAQ showed significantly different percent of total physical activity time spent in vigorous activity (1.0, 4.7, 11.8%, respectively, P<0.01).

Conclusions: In free living conditions, accelerometer placement at hip and ankle resulted in significant percent wear time among physical activity intensities, regardless of pregnancy time point. In contrast, greater moderate and vigorous physical activity was recorded with nonpregnant adults (Troiano et al., 2008). Researchers should use caution when utilizing and comparing the results of these two physical activity measurement modalities during pregnancy and the postpartum period.
Leisure time physical activity (LTPA) during pregnancy is associated with pregnancy complications and fetal outcomes. Epigenetic mechanisms potentially play key roles in these associations. Few studies have investigated epigenetic biomarkers in relation to LTPA.

**Purpose:** To determine if maternal LTPA in early pregnancy is associated with candidate circulating miRNAs (miRNAs), epigenetic biomarkers with post-transcription regulatory roles.

**Methods:** This was a cross-sectional study conducted among participants (N=74) of the Omega study, a pregnancy cohort study. Participants self-reported LTPA duration (hours/week) and energy expenditure (MET-hours/week) during an interview in early pregnancy (16 weeks gestation on average). LTPA was considered both as a continuous variable and categorized according to current American College of Sports Medicine recommendations for physical activity (not active, active<150 minutes/week, active≥150 minutes/week). Levels of circulating miRNAs (miR-126-3p, 146b-5p, miR-155-5p, miR-21-3p, miR-210-3p, miR-223-3p, miR-513-5p, miR-518a-3p, miR-20a-3p), selected based on their role in pathophysiologic pathways (e.g. inflammation, oxidative stress, and placental function) related to pregnancy complications and outcomes, were measured using qRT-PCR. Linear regression adjusted for maternal age and gestational age at blood draw was used to determine beta estimates and 95% confidence intervals.

**Results:** Each additional hour or MET-hour/week of LTPA was not associated with levels of circulating miRNAs (all P>0.05). Compared to women who were not active, women who were active but did not meet recommendations had higher levels of circulating miR-157-5p (β=0.24; 95% CI: 0.06, 1.0; P=0.05). Compared to women who were active below recommended levels, meeting or exceeding recommendations was associated with higher levels of circulating miR-157-5p (β=3.7; 95% CI: 0.99, 14; P=0.05). Early pregnancy LTPA was not associated with levels of other circulating miRNAs.

**Conclusion:** Maternal LTPA in early pregnancy may be associated with circulating levels of miR-157-5p, a placenta-specific miRNA related to placental growth, development, and function.
differ between EUH and HYP trials ($P < 0.05$). Cyclists completed the 5 km time trial faster in the EUH trial compared to the HYP trial (777±47 vs. 822±55 sec; $P < 0.05$), while producing higher power output (295±29 vs. 270±26 W; $P < 0.05$). During the 5 km time trial, core temperature was higher in the HYP trial (39.2±0.3 °C) compared to the EUH trial (38.8±0.2 °C; $P < 0.05$). CONCLUSIONS: These data indicated that hyohydration decreased cycling performance and impaired thermoregulation in the absence of thirst, while the subjects were unaware of their hydration status.

It has been suggested that thirst can influence exercise performance independently of hydration. PURPOSE: Therefore, the purpose of this study was to examine the effect of thirst on exercise performance during cycling exercise in the heat in dehydrated subjects.

METHODS: Six male cyclists (weight: 71.8±8 kg, body fat: 14.1±0.4%, VO2peak: 54.6±1 mL/kg/min) exercised for 2 hours on a cycle ergometer at 55% VO2peak, in a hot-dry environment (35 °C, 30% rh), while wearing a nasogastric tube. Two experimental trials were performed: Dehydration without thirst (DEH-NT) which participants drank 25 mL every 5 min (300 mL) with no infusion in nasogastric tube, and b) Dehydration with thirst (DEH-T) which participants were infused with 25 mL every 5 min via nasogastric tube but without drinking. Following the 2 hours of steady state cycling, the cyclists completed a 5-kilometer cycling time trial at 4% grade. During the study, cyclists were unaware of the trial that were participating, the amount of water infused via the nasogastric tube and could not get any feedback regarding their cycling performance or their heart rate. RESULTS: Following 2 hours of steady state cycling, post-exercise body mass loss for the DEH-NT trial was -2.2±0.4% compared to the DEH-T trial which was -2.8±0.5%. Thirst (42±12 mm vs. 61±15 mm; $P = 0.007$) and stomach fullness (35±8 mm vs. 54±10 mm; $P = 0.007$) were both significantly different between DEH-NT and DEH-T trials. Finishing time in the 5-km time trial was faster in the DEH-NT trial (784±35 s) compared to the DEH-T trial (795±47 s), however, two out of six participants in the DEH-T trial felt exhausted and could not even start the 5-km time trial following 2 hours of steady state cycling.

CONCLUSION: The data suggested that thirst had detrimental effect on cycling performance independent of hydration.

It has been suggested that thirst can influence exercise performance independently of hydration. PURPOSE: Therefore, the purpose of this study was to examine the effect of thirst on exercise performance during cycling exercise in the heat in dehydrated subjects.

METHODS: Six male cyclists (weight: 71.8±8 kg, body fat: 14.1±0.4%, VO2peak: 54.6±1 mL/kg/min) exercised for 2 hours on a cycle ergometer at 55% VO2peak, in a hot-dry environment (35 °C, 30% rh), while wearing a nasogastric tube. Two experimental trials were performed: a) Dehydration without thirst (DEH-NT) which participants drank 25 mL every 5 min (300 mL) with no infusion in nasogastric tube, and b) Dehydration with thirst (DEH-T) which participants were infused with 25 mL every 5 min via nasogastric tube but without drinking. Following the 2 hours of steady state cycling, the cyclists completed a 5-kilometer cycling time trial at 4% grade. During the study, cyclists were unaware of the trial that were participating, the amount of water infused via the nasogastric tube and could not get any feedback regarding their cycling performance or their heart rate. RESULTS: Following 2 hours of steady state cycling, post-exercise body mass loss for the DEH-NT trial was -2.2±0.4% compared to the DEH-T trial which was -2.8±0.5%. Thirst (42±12 mm vs. 61±15 mm; $P = 0.007$) and stomach fullness (35±8 mm vs. 54±10 mm; $P = 0.007$) were both significantly different between DEH-NT and DEH-T trials. Finishing time in the 5-km time trial was faster in the DEH-NT trial (784±35 s) compared to the DEH-T trial (795±47 s), however, two out of six participants in the DEH-T trial felt exhausted and could not even start the 5-km time trial following 2 hours of steady state cycling.

CONCLUSION: The data suggested that thirst had detrimental effect on cycling performance independent of hydration.

F-12 Thematic Poster - Neuromechanics of Concussion

Friday, June 2, 2017, 1:00 PM - 3:00 PM
Room: 101

2908 Chair: Kevin Guskiewicz, FACSM, University of North Carolina, Chapel Hill, NC.

(No relationships reported)

A head-up tackling style has been recommended to decrease head contact experienced during tackle. Specific performance metrics have been set to describe and instruct this tackling style including: extended neck position, vertical trunk, head across the front of the target, short steps, and low center of gravity. However, limited information exists regarding the effectiveness of the components of this tackling style on the head accelerations experienced by youth tacklers.

PURPOSE: Determine the effect of components of a head-up, tackling style on head accelerations.

METHODS: Youth football players ages 9-13 (11.8±0.8 age, 2.5±2 years of experience) were fitted with the xPatch monitoring system (X2 Biosystems, Seattle WA) and tackled a weighted dummy in a laboratory setting. Out of 470 tackles the xPatch system recorded 231 tackles with a peak head acceleration over 6g. Motion data during these tackles were analyzed for cervical angle, trunk angle, pelvic height, step length, and head acceleration.
and pelvic velocity. Correlational analyses were performed between each movement variable and peak linear acceleration (PLA), peak rotational acceleration (PRA) and Head Impact Criterion over 15ms (HIC15) measures from the V-Path. RESULTS: Significant correlations were found between shoulder extension and PLA (r=−.141, r2= .020, p=.033), trunk angle and PLA (r=−.224, r2= .050 p=.001), trunk angle and PRA (r=−.202, r2= .040 p=.002), trunk angle and HIC15 (r=−.156, r2= .023, p=.018), step length and PLA (r=.138, r2= .019, p=.037) and step length and HIC15 (r=−.131, r2= .018, p=.048). CONCLUSIONS: The positive correlations suggests a relationship between head acceleration and shoulder extension, trunk angle and step length the linear relationship between these values appears clinically negligible. The low strength of these relationships indicate these performance variables may not be responsible for the amount of head acceleration in low speed tackles. Additional analysis on this data should be completed to identify non-linear relationships and identify the interdependence of these variables. Measurements of live tackles during games and identification of other biomechanical parameters best correlated with head acceleration should also be determined, which could lead to more specific and effective tackling instruction.

Male high school lacrosse has the second highest incidence of concussion in high school sports. Limited research has identified modifiable risk factors that may reduce head impact kinematics. Cervical muscle strength is a proposed modifiable risk factor for head impact kinematics. PURPOSE: To assess the effects of isometric cervical muscle strength (ICMS) on head impact kinematics in high school boys' lacrosse. METHODS: Thirty-one male high school varsity lacrosse players volunteered for this study (age = 16.5 ± 1.3 years, height = 1.76 ± 0.1 m, mass = 69.9 ± 10.6 kg). ICMS was measured for forward flexion, extension, and bilateral flexion. Data were collected for neck circumference, head circumference, and neck length. Participants' helmets were instrumented with an accelerometer for an entire season of game play. Video of all game play was captured and time synchronized with accelerometer data. All ICMS measures were normalized to the participants' body mass. Normalized ICMS tertiles were calculated and compared to impact kinematic data using a MANOVA. The relationship of neck anthropometric data and ICMS was investigated using a Pearson’s correlation. An alpha level 0.05 was used for all analyses. RESULTS: 12 games with 367 confirmed impacts (linear acceleration = 54 ± 36 g, rotational velocity = 1362 ± 1258 °/s) were recorded during the 2015 season. No correlation showed a positive moderate to strong relationship with ICMS in extension (r=−.63, p=.02). No significant difference existed between ICMS tertiles for linear acceleration and rotational velocity (p>0.05). CONCLUSIONS: Our findings contradict previous research that identified ICMS as a modifiable risk factor for mitigating head impact kinematics. Results suggest that cervical muscle strengthening programs for the reduction of head impact kinematics are not indicated at this time. However, our sample size was small and cervical muscle strengthening may have other potential benefits. Therefore, cervical muscle strengthening programs and potentially modifiable risk factors for reducing head impact kinematics should be further investigated. Supported by the US Lacrosse Sports Science and Safety Committee.

Purpose (EF) is characterized as an individual’s ability to control complex cognition during non-routine tasks. While EF is comprised of several cognitive domains, the ability to maintain task goals and decision making, and to direct attention, knowledge as working memory, is one of the critical components. If a task has sufficient cognitive load to tax working memory, individual’s compromise speed for accuracy, known as speed accuracy trade-off (SAT). However, the effect of concussion on SAT, and the ability to perform a physical task has not been well studied. PURPOSE: To identify the relationship between neurocognitive and postural control deficits post-concussion. METHODS: 15 NCAAs Division I athletes (11 male, 4 female; 20.5± 1.1 yrs) with diagnosed concussions underwent computerized neurocognitive testing, and a postural control assessment battery within 24-48 hrs of injury. The postural control assessment consisted of 3 trials of eyes open (EO) and eyes closed (EC) quiet standing for 30 sec and the Wii Fit Soccer Heading Game (WFS). The WFS requires
participants to shift their weight in the appropriate medial-lateral direction to hit targets and avoid obstacles. As such, the WFS provides a sport relevant task while simultaneously examining a cognitive load. Raw Center of Pressure (CoP) was collected using a force platform (1000Hz). From the raw CoP data 95% Confidence Ellipse (CE), along with Peak Excursion Velocity (PEV), and Sample Entropy (SampEn) in anteroposterior (AP) and mediolateral (ML) directions were calculated. RESULTS: The results of a Pearson’s Product Correlation, indicate a negative relationship between verbal recall performance (VBMC) and EO PEV ML (r = −0.611, p = 0.016), and 95% Confidence Ellipse (CE) (r = −0.555, p = 0.016). There was a positive relationship (r = 0.778, p = 0.001) between impulse control and EO PEV AP. During WFS there was a positive relationship between PEV ML and VBMC (r = 0.532, p = 0.041), and visual motor speed (r = 0.532, p = 0.041) and CE (r = 0.531, p = 0.042). Finally, a negative relationship was observed found during the WFS between SampEn ML and Total Symptom Score (r = −0.582, p = 0.023). CONCLUSIONS: The results of the study suggest that participants did have a SAT, sacrificing postural stability for enhanced memory processing while attempting to accomplish an unfamiliar task.

PURPOSE: To evaluate differences in knee kinematics during the impact phase between young adult participants with and without a concussion history.

METHODS: 10 controls (6 males, 4 females) and 9 concussed (4 males, 5 females) between the ages of 18 and 26, capable of completing a jump cut motion. All participants were former high school athletes and right foot dominant. Concussed subjects were tested on average 3.3 years post-injury (SD=0.65 years). Measures of knee rotation were taken in the X, Y and Z orientation during single limb support of a cutting maneuver. All values are presented as the mean and standard error of the mean.

RESULTS: An initial analysis of variance showed a significant group by gender interaction in peak right knee abduction/adduction [F=92.0, p<.01] and peak internal/external rotation [F=17.9, p<.01] between control and concussed groups. Accordingly, post-hoc tests were performed, adjusting for all pairwise comparisons using a Bonferroni correction. The aforementioned post-hoc tests revealed that males and females with a concussion history were differentially affected; with concussed males showing increased peak abduction (Controls: 9.7±0.5 degrees, Concussed: 3.2±0.3 degrees) and females showing increased peak adduction (Controls: 5.6±0.3 degrees, Concussed: 7.2±0.5 degrees). Concussed males showed an increase in peak internal rotation (Controls: 3.1±0.3 degrees, Concussed: 5.5±0.3 degrees) whereas concussed females showed a slight increase in peak external rotation of the knee (Controls: 7.3±0.4 degrees, Concussed: 6.4±0.5 degrees).

CONCLUSION: Our findings, showing small but significant gender specific changes between groups, advise future researchers to use prudence when generalizing post-concussive kinematics across genders as they may not be equally affected. This may have implications for injury risk, however further work is needed, especially in the understudied female population. Collectively, these findings cautiously provide a possible biomechanical underpinning to support recent reports that individuals are at a much higher risk of lower body injuries post-concussion.

CONCLUSIONS: Differences between concussed and control groups in the eyes closed condition may suggest continuing low-grade vestibular impairment detectable when visual feedback is removed, even after clinical symptoms have resolved. Past work indicates changes in COP velocity are related to vestibular dysfunction. In addition, these data allude to a higher sensitivity of COP measures than clinical BESS scoring when assessing balance deficits, particularly these deficits are subtle. These data are part of a large prospective investigation (current enrollment: n=207), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.

POSTURAL INSTABILITY AND VISUAL SYSTEM DYSFUNCTION FOLLOWING CONCUSSION

In a separate study, 18 post-concussed NCAA Division I athletes (20±1.3 years of age) and 18 matched athletes (19±0.9 years of age) completed two trials of a sport-like antisaccade postural control task, the WiiFitt Soccer Heading Game (WFS). During play, all participants were instructed to minimize gaze deviations away from a central fixed area, while simultaneously swaying in a medial-lateral direction to direct an on screen avatar to meet the demands of the game. Monocular raw ocular point of gaze coordinates (240Hz, Argus Science) and raw center of pressure (1000Hz, AMTI) data were collected simultaneously and further analyzed using a custom algorithm.

Independent t-tests analyzed gaze Resultant Distance (RD), Prosaccade Errors (PE), Peak Vertical Velocity (VV) and Peak Horizontal Velocity (HV) along with center of pressure Root Mean Square (RMS) and Peak Velocity (PV) in the anteroposterior (AP) and mediolateral (ML) directions between groups. RESULTS: CONC had a significantly greater RD (CONC= 2075±415.4 pixels/s, NORM=1078±135.6 pixels/s; p=.018), and VV (CONC= 3654±154.4 pixels/s, NORM=1708±135.6 pixels/s; p=.018) and HV (CONC= 2128±481 pixels/s, NORM=979±144.6 pixels/s; p=.044) compared to NORM. No significant differences were observed for RMS in the AP (p=.838) and ML (p=.543) directions and PV in the AP (p=.284) and ML (p=.115) directions between groups. CONCLUSION: These results suggest that CONC gaze travelled a greater distance and had less control of gaze in the horizontal and vertical directions during play of the WFS. Conversely, no postural deficits were present during play of the WFS. This could indicate that gaze instability is present even in the absence of postural instability following concussion when comparing CONC to NORM.

CONCLUSIONS:

Postural instability and visual system dysfunction are two of the highest reported signs immediately following a sport-related concussion. However, little research has examined both systems simultaneously using sensitive measurements such as visual system dysfunction following concussion in the same sample. PURPOSE: To investigate and compare postural and gaze stability between a control group of healthy non-injured athletes (NORM) and a group of athletes with concussions (CONC) 24-48 hours post-injury.

METHODS: 18 post-concussed NCAA Division I athletes (20±1.3 years of age) and 18 matched athletes (19±0.9 years of age) completed two trials of a sport-like antisaccade postural control task, the WiiFitt Soccer Heading Game (WFS). During play, all participants were instructed to minimize gaze deviations away from a central fixed area, while simultaneously swaying in a medial-lateral direction to direct an on screen avatar to meet the demands of the game. Monocular raw ocular point of gaze coordinates (240Hz, Argus Science) and raw center of pressure (1000Hz, AMTI) data were collected simultaneously and further analyzed using a custom algorithm.

Independent t-tests analyzed gaze Resultant Distance (RD), Prosaccade Errors (PE), Peak Horizontal Velocity (HV), and Vertical Horizontal Velocity (VV) along with center of pressure Root Mean Square (RMS) and Peak Velocity (PV) in the anteroposterior (AP) and mediolateral (ML) directions between groups. RESULTS: CONC had a significantly greater RD (CONC= 6.98±0.5 pixels, NORM=5.2±0.3 pixels; p=.013), PE (CONC= 7.1±1.2 errors, NORM=5.2±0.7 errors; p=.040), HV (CONC= 2075±415.4 pixels/s, NORM=1708±135.6 pixels/s; p=.018), and VV (CONC= 2128±481 pixels/s, NORM=979±144.6 pixels/s; p=.044) compared to NORM. No significant differences were observed for RMS in the AP (p=.838) and ML (p=.543) directions and PV in the AP (p=.284) and ML (p=.115) directions between groups. CONCLUSION: These results suggest that CONC gaze travelled a greater distance and had less control of gaze in the horizontal and vertical directions during play of the WFS. Conversely, no postural deficits were present during play of the WFS. This could indicate that gaze instability is present even in the absence of postural instability following concussion when comparing CONC to NORM.

CONCLUSIONS: Differences between concussed and control groups in the eyes closed condition may suggest continuing low-grade vestibular impairment detectable when visual feedback is removed, even after clinical symptoms have resolved. Past work indicates changes in COP velocity are related to vestibular dysfunction. In addition, these data allude to a higher sensitivity of COP measures than clinical BESS scoring when assessing balance deficits, particularly these deficits are subtle. These data are part of a large prospective investigation (current enrollment: n=207), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.

CONCLUSIONS: Differences between concussed and control groups in the eyes closed condition may suggest continuing low-grade vestibular impairment detectable when visual feedback is removed, even after clinical symptoms have resolved. Past work indicates changes in COP velocity are related to vestibular dysfunction. In addition, these data allude to a higher sensitivity of COP measures than clinical BESS scoring when assessing balance deficits, particularly these deficits are subtle. These data are part of a large prospective investigation (current enrollment: n=207), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.

CONCLUSIONS: Differences between concussed and control groups in the eyes closed condition may suggest continuing low-grade vestibular impairment detectable when visual feedback is removed, even after clinical symptoms have resolved. Past work indicates changes in COP velocity are related to vestibular dysfunction. In addition, these data allude to a higher sensitivity of COP measures than clinical BESS scoring when assessing balance deficits, particularly these deficits are subtle. These data are part of a large prospective investigation (current enrollment: n=207), and athletes who sustain a concussion over the course of the study will be re-evaluated at regular intervals to observe changes in postural control during recovery.
PURPOSE: Xenon is an inhalation anesthetic, which has the potential to increase plasma erythropoietin, red cell mass and thus endurance performance. This study aimed to describe the sedative effects, detection rates and cardiovascular responses of an open circuit breathing system to deliver increasing concentrations of Xenon.

METHODS: On three occasions, participants breathed increasing concentrations of xenon (Xenon, 30% for 20 min; Xenon, 50% for 5 min; Xenon, 70% for 2 min and oxygen, 21% with balance Nitrogen) in a blinded design. Xenon inhalation has been completed in 6 (30%), 5 (50%) and 4 (70%) subjects to date. The level of sedation was monitored by a board certified anesthesiologist (Richmond Agitation and Sedation Scale (RASS)). Over 48 hours post administration, Xenon was measured in blood and urine by gas chromatography-mass spectrometry. All reported beat-by-beat hemodynamics were measured continuously by photoplethysmography (Nexfin; BMEYE, Netherlands) for 10 minutes prior to and throughout xenon administration.

RESULTS: Xenon caused variable levels of sedation and restlessness between subjects (e.g. 50% xenon RAAS, -2, briefly awakens to voice to +2 frequent nonpurposeful movements), with the greatest symptoms occurring at 50 and 70%. Xenon was detected, albeit in trace amounts, up to 6 hours post xenon inhalation in blood (e.g. 30% 6 hours post, 2.2±2.7 nmol/mL) and urine (e.g. 30% 1.5±0.82 nmol/mL) in all subjects. Over the first minute, xenon cause a substantial reduction in total peripheral resistance (Δ2.7±0.49,mmHg·L·min⁻¹), which caused a reflex increase in heart rate, cardiac output and systemic vascular resistance.

CONCLUSIONS: We show that three different conceivable dosages of xenon inhalation cause a level of sedation incompatible with self-operation of breathing apparatus and a persistent hypertensive state. Dispute begin acute (<5 mins), high dosages (50 and 70%) of xenon caused near anesthesia and thus could present a life threatening condition in the absence of an anesthesiologist. Xenon can be reliably detected in blood and urine up to 6 hours post dosing.

Supported studies were supported in part by funding from the Partnership for Clean Competition Research Collaborative.

Table 1. Effect of two-years of supervised endurance training on hemodynamics and arterial function

<table>
<thead>
<tr>
<th>Table 1. Effect of two-years of supervised endurance training on hemodynamics and arterial function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>24 hr SBP, mmHg</td>
</tr>
<tr>
<td>24 hr DBP, mmHg</td>
</tr>
<tr>
<td>24 hr HR, bpm</td>
</tr>
<tr>
<td>Brachial SBP, mmHg</td>
</tr>
<tr>
<td>Brachial DBP, mmHg</td>
</tr>
<tr>
<td>HR, bpm</td>
</tr>
<tr>
<td>aPWW, m/sec</td>
</tr>
<tr>
<td>AIX HR75, %</td>
</tr>
<tr>
<td>Tpe ms</td>
</tr>
</tbody>
</table>

Values are mean ± SEM, *P<0.05 compared to Pre. SBP, systolic blood pressure; DBP diastolic blood pressure; HR, heart rate; bpm, beats per minutes; PWW, pulse wave velocity; AIXHR75, augmentation index heart rate corrected; Tpe, time to reflected wave.

Healthy, sedentary aging is associated with marked increased risk for developing (systolic) hypertension, which is partially driven by changes in arterial stiffness. In contrast, lifelong exercise training mitigates the effects of aging on arterial stiffness. A comprehensive assessment of arterial function including aortic PWV and indices derived from the central BP waveform, plus resting hemodynamics were performed at baseline (Pre), 10 months (Mid) and two-years (Post). Ambulatory blood pressure was measured at Pre and Post. Ambulatory blood pressure was not improved in the ExT group. Consequently, ambulatory and resting HR were significantly reduced in the ExT group (Table 1). In contrast to our hypothesis, large artery function (AIx75, T1R, ms 150.4 ± 2.0, 1R, time to reflected wave, aortic PWV) was not improved following exercise training. Despite improved exercise capacity and excellent training adherence, we show that three different conceivable dosages of xenon inhalation cause a level of sedation incompatible with self-operation of breathing apparatus and a persistent hypertensive state. Dispute begin acute (<5 mins), high dosages (50 and 70%) of xenon caused near anesthesia and thus could present a life threatening condition in the absence of an anesthesiologist. Xenon can be reliably detected in blood and urine up to 6 hours post dosing.

There is considerable inter-individual variation in the ability to improve VO2max in response to regular exercise. Thus, identifying individuals who do not experience clinically significant gains in cardiorespiratory fitness with aerobic training (i.e., VO2max low response) is of interest.

PURPOSE: To assess the prevalence of VO2max low response across nine large aerobic exercise interventions.

METHODS: The prevalence of VO2max low response was examined in 1,432 previously sedentary adults (461 males, 971 females) who completed one of nine exercise programs from five exercise training studies: DREW (n=361), E-MECHANIC (n=117), Energy Flux (n=65), GERS (n=171), and HERITAGE (n=715). The training programs delivered kg·min⁻¹ doses of 4-35 kcal kg⁻¹ week⁻¹, intensities of 50-85% VO2max; and durations of 20-24 weeks. Baseline and post-training VO2max was assessed via maximal exercise testing. VO2max low response was defined in both absolute (gain <120 ml/min from baseline value) and relative (gain < 5% of study-specific baseline average VO2max) terms based on technical error and coefficient of variation values derived from three repeatability studies in HERITAGE.

RESULTS: All studies showed significant mean increases in VO2max with training. Using the above definitions, 32.6% (absolute) and 21.3% (relative) of the total sample
was considered low responsive for \( \text{VO}_{2}\text{max} \). The distribution of low response across the individual exercise programs is shown in Table 1. Prevalence of low response ranged from 7.4% (DREW 4 & KKW).

**CONCLUSION:** Our study found a high prevalence of \( \text{VO}_{2}\text{max} \) low response across five diverse exercise training studies, which differed based on how low response was defined. These results underscore the need for further investigation to refine the identification of low \( \text{VO}_{2}\text{max} \) low response to enhance future exercise program development.

---

**2921 June 2 1:45 PM - 2:00 PM**

**Skeletal Muscle Mitochondrial and Whole-Body Metabolic Performance After An Ultra Endurance Mountain Bike Race**

Adam R. Konopka, William M. Castor, Jaime L. Laurin, Christopher A. Wolf, Karyn L. Hamilton, FACSAM, Benjamin F. Miller, FACSAM. Colorado State University, Fort Collins, CO. (Sponsor: Karyn Hamilton, FACSAM)

(No relationships reported)

At the annual Colorado Trail Race (CTR), participants cycled for up to 24 hours per day to complete 70,000 ft of elevation gain over 50 miles between the altitudes of 5,500 to 13,200 feet. **PURPOSE:** To characterize skeletal muscle mitochondrial and whole-body metabolic performance after prolonged stress (exercise, sleep deprivation, hypoxia).

**METHODS:** One race participant (43yr male; \( \text{VO}_{2}\text{max} \), 58 ml/kg/min; BMI, 21 kg/m\(^2\)) was studied before and after completing >360 miles of the CTR and was significantly reduced at W1 (45.5±2.3, p=0.015) vs. W2 (46±2.6) and W12 (46±3.1) values suggest that values returned to PS levels (p<0.05) later in season. Additional markers of anemia, mean corpuscular volume, mean corpuscular hemoglobin concentration, red cell distribution width were reduced at W12 vs. all time points (all p<0.007). We observed reductions in cardiovascular/metabolic health markers (mg/dL) LDL, LDL, HDL (no unit), non-HDL, direct LDL, and Apolipoprotein B at W1 (77±2.0, 3.2±0.5, 106±24, 96±25, and 71±17) than at PS (87±22, 2.8±0.5, 93±22, 81±22, and 64±15, all p<0.007). HDL (mg/dL) was significantly greater at W4 (56±10), W8 (55±10), and W12 (58±11) than at PS (50±8, all p<0.05). Total cholesterol (mg/dL) was significantly elevated at W8 (163±28, p=0.012) and W12 (168±31, p=0.007) vs. W1 (145±26).

**CONCLUSIONS:** Our panel detected a decrease in HCT beginning at W1, but improved cardiovascular/metabolic health throughout the season. Ongoing analysis aims to optimize this general health panel for practical use by correlational analysis to performance data.

---

**2923 June 2 2:15 PM - 2:30 PM**

**Stretching Combined With Tens Or Self-massage Has Differential Effects On Ankle Flexibility**

Robyn A. Capobianco, Awad M. Almuklass, Roger M. Enoka. University of Colorado Boulder. Boulder, CO. Email: roca8157@colorado.edu (No relationships reported)

Many studies evaluating the effect of stretching conclude that gains in flexibility are probable due to improved strength (force-distance) relationship. Use of pain reduction therapies while stretching should provide greater improvements in flexibility than stretching alone. Transcutaneous electrical nerve stimulation (TENS) is a modality commonly used to mitigate pain. Self-massage with a foam roller, which may modulate the mechanical properties of connective tissues, has been shown to improve flexibility.

**Purpose:** To compare the influence of TENS and self-massage on ankle joint flexibility and force capacity of the plantar flexors muscles after a stretching intervention.

Methods: 20 healthy young adults (10M, 10F, mean (SD) age 25 (3) y) underwent 3 sessions of ankle plantar flexor stretching: stretching alone (SS), stretching with concurrent application of TENS (TS), and stretching after self-massage using yoga therapy balls (BS). Each visit was separated by one week. All subjects performed SS at the first visit; the remaining 2 visits were counterbalanced. At every visit, subjects performed isometric maximum voluntary contractions (MVCs) for the plantar flexors before and after the intervention. Stretching involved three 30-s standing calf stretches, separated by 30-s rest. TENS was applied at a comfortable current without muscle contraction for 1-min prior to, and for the duration of stretching. Massage with yoga balls was performed for 60-s immediately prior to each of the 3 stretches. Ankle dorsiflexion range of motion (ROM) was assessed before, immediately after, and at 1, 5, 10, and 15 min after the intervention.

Results: All 3 interventions significantly increased ankle dorsiflexion ROM (all p<0.001). The mean (SD) change in ROM was 13 (%) for SS, 25 (%) for TS, and 25 (%) for BS, respectively. The mean (SD) change in ankle torque was -13 (%) for SS, -10 (%) for TS, and 11 (%) for BS, respectively. In contrast to TENS (TS), the use of yoga therapy balls significantly increased ROM and MVC torque (both p<0.001, effect size 0.6, 0.75 for ROM and MVC, respectively).

Conclusion: The addition of TENS to a stretch intervention did not improve ankle joint range of motion or after MVC force. In contrast, self-massage with yoga therapy balls prior to stretching significantly improved range of motion and MVC force.

---

**2924 June 2 2:30 PM - 2:45 PM**

**Lower Limb Power Training to Enhance Locomotor and Muscular Function Poststroke**

Jennifer L. Hunicutt, Stacey E. Aaron, Aaron E. Embry, Chris M. Gregory, FACSAM. Medical University of South Carolina, Charleston, SC. (Sponsor: Chris Gregory, FACSAM) Email: hunicuttj@musc.edu (No relationships reported)

Training to improve muscle power generation has functional benefits beyond strength training in an aging population. Individuals following stroke show pronounced deficits in muscle power generation as well as function (i.e. gait speed), though data on specific adaptations following muscle power training are not available. **PURPOSE:** The purpose of this analysis was to determine the effects of the Poststroke Optimization of Walking Using Explosive Resistance (POWER) training on the paretic limb’s contribution to walking. **METHODS:** Twenty individuals (13 male; 51 yrs; 36 mos poststroke) with chronic poststroke hemiparesis participated in this study. Subjects completed 24 training sessions that included a series of progressive, intensive leg presses and jump training exercises, sit-to-stands, step-ups, and calf raises. Subjects also performed progressive overground fast walking to emphasize task-specific lower extremity power generation. Kinetic data was collected via a split-belt instrumented treadmill during three walking trials at self-selected (SSWS) and fastest comfortable walking speeds (FCWS). Using the anterior-posterior ground reaction forces (A-P...
GRFs), the percentage of total propulsion generated by the paretic limb was calculated by dividing the propulsive impulse of the paretic leg by the sum of the paretic and nonparetic propulsive impulses. Other outcomes included overground SSWS and FCWS, maximum voluntary isometric contractions (MVIC), and peak isometric power of the knee extensors. Subjects underwent pre-testing, post-testing, and 12-week follow-up testing. One-way repeated measures ANOVAs were used to determine main effects of time. 

RESULTS: Significant effects for time were observed for SSWS (p<0.01), FCWS (p<0.01), and nonparetic knee extensor MVIC (p<0.05) and power (p<0.01). Although peak A-P GRFs of the paretic limb significantly increased following training (p<0.01), no changes were observed in paretic propulsion. 

CONCLUSION: Subjects improved gait speed, but those improvements were not accompanied by enhanced symmetry following POWER training. Future data will look into other potential underlying kinetic and kinematic mechanisms contributing to the significant and clinically meaningful improvements in gait speed (>0.16 m/s) observed in this cohort.

2925 June 2 2:45 PM - 3:00 PM
Acute Effects of Speed-Dependent Interval Training Versus Continuous Training on Post-Stroke Locomotor Function
Stacey E. Aaron, Chris M. Gregory, FACSM. Medical University of South Carolina, Charleston, SC. (Sponsor: Chris Gregory, FACSM)
Email: aarons@musc.edu
(No relationships reported)

The benefits of interval training (IT) compared to continuous training (CT) have been shown on a variety of functional and health-related outcomes. To date, the feasibility of IT has been demonstrated in individuals following stroke, though investigations of its effectiveness are still lacking. Purpose: To compare acute changes in locomotor function following single bouts of continuous (CT) and interval (IT) treadmill training, matched for total work, in ambulatory individuals with chronic stroke. Methods: Participants completed 20 minute sessions of CT and IT treadmill exercise separated by a minimum of 48 hours. Overground self-selected walking speed (SSWS) was used for CT while IT involved a 1:1 ratio (1 min slow : 1 min fast walking) with the goal of fast walking at 150% of SSWS and slow walking at 50% of SSWS. If subjects could not achieve 150% SSWS then speed was reduced and slow walking speed was adjusted to ensure matched-work between conditions. Overground SSWS was assessed prior to, immediately following as well as 20, 40 and 60min post-training. Subjects also walked at self-selected speed on a split-belt, instrumented treadmill to collect ground-reaction force data at the same time points. Results: Six subjects completed both sessions. Average CT treadmill speed was 0.92 m/s; average IT speeds were 0.57 m/s (slow) and 1.26 m/s (fast). Immediate post-training increases in SSWS were realized following CT (+6%) but not IT (-2%). SSWS following CT remained 6% faster than pre-training SSWS over time. In contrast, IT showed a delayed increase in speed with +6% following CT (+6%) but not IT (-2%). SSWS following CT remained 6% faster than pre-training SSWS over time. In contrast, IT showed a delayed increase in speed with +6% following CT (+6%) but not IT (-2%). SSWS following CT remained 6% faster than pre-training SSWS over time.

CONCLUSIONS: These preliminary results suggest single bouts of IT and CT treadmill walking appear to elicit acute increases in SSWS as well as propulsive forces in individuals following stroke. The potentially greater relative improvements following IT suggest its potential effectiveness over CT if changing walking function is the goal.

Funding source NIH COBRE: Stroke Study P20-GM109040

Previous studies have shown that the first and second lactate threshold are associated with a rating of perceived exertion (RPE) of 11 and 14 on the Borg 6-20 RPE scale. However, it remains unclear how the RPE is associated with the ventilatory breakpoints and whether this relationship is altered by sympathetic blockade. Purpose: To determine the association between the RPE and ventilatory breakpoints, and whether the relationship is altered by acute sympathetic blockade. Methods: The oxygen uptake (VO2) at the ventilatory threshold (VT) and respiratory compensation point (RCP) were determined from a graded exercise test in eleven healthy participants (6 male, 26±5 y) under a β1 receptor antagonist and placebo. Treadmill speed increased by 2 km h−1 every two minutes until exhaustion. The VO2 was measured continuously and RPE recorded in the final 10s of each min. Linear regression modelled the RPE:VO2 relationship and predicted the RPE associated with VT and RCP. The VO2 associated with RPE 13 and 15 were also predicted and expressed relative to the VT and VO2 peak. Paired samples t-tests assessed differences between RPE and VT and VO2 peak exercise were significantly lower under β-blockade (32±3 vs 30±3 and 52±5 vs 49±7 mL·kg−1·min−1, p<0.05), while the VO2 at RCP

F-14 Free Communication/Slide - Exercise and Chronic Disease
Friday, June 2, 2017, 1:00 PM - 3:00 PM
Room: 401

2926 Chair: Matthew Harber, FACSM. Ball State University, Muncie, IN.
(No relationships reported)

2927 June 2 1:00 PM - 1:15 PM
Exercise Training Improves Ventilatory Efficiency in Patients With Small Abdominal Aortic Aneurysm: A Randomized Controlled Study
Ricardo M. Lima1, Baruch Vainselboim2, Rucha Ganatra2, Ronald Dalman2, Khin Chan2, Jonathan Myers, FACSM2.
1University of Brasilia, Brasilia, Brazil. 2VA Palo Alto Healthcare System and Stanford University, Palo Alto, CA. 3Stanford University, Stanford, CA. (Sponsor: Jonathan Myers, FACSM)
(No relationships reported)

PURPOSE: To investigate the effects of exercise training on ventilatory efficiency and other physiological responses to submaximal exercise in subjects with small abdominal aortic aneurysm (AAA).

METHODS: Sixty five patients (72.3±7.0 yr) were randomized to exercise training (n=33) or usual care groups (n=32). Exercise subjects participated in a training program for 3 months. Cardiopulmonary exercise testing was performed before and after the study period and peak VO2, the ventilatory threshold (VT), the oxygen uptake efficiency slope (OUES) and the VT:VO2 slope were identified. Baseline work rates at VT were matched to examine cardiopulmonary responses before and after training. ANOVA was used to assess time by group interactions.

RESULTS: Significant interactions indicating improvements in the exercise group were observed for time (p<0.01), VO2 (p<0.01), and work rate (p<0.01) at the VT. At peak effort, significant interactions were noted for time (p<0.01) and work rate (p<0.01), while borderline significance was noted for absolute (p=0.07) and relative (p=0.04) VO2. Significant interactions were observed for the OUES both when using all exercise test data (Exercise: 2.03 to 2.16, and Usual care: 2.10 to 1.98; p for interaction=0.04) and when calculated up to the VT (Exercise: 2.07 to 2.23, and Usual care: 2.13 to 1.95; p for interaction=0.01). For the VT:VO2 slope, significance was only noted when calculated up to the VT (Exercise: 30.4 to 29.2, and Usual care: 29.2 to 30.3; p for interaction=0.04). After training, heart rate (104.5 to 97.3 bpm), V̇E (34.2 to 32.0 L/min), V̇CO2 (1013.6 to 910.6 ml/min) and respiratory exchange ratio (0.85 to 0.82) were significantly attenuated for the same baseline workrate in the exercise group (all p<0.01), but no changes were observed in the usual care group.

CONCLUSIONS: Exercise training improves ventilatory efficiency in patients with small AAA. In addition, exercised patients exhibited less demanding cardiorespiratory responses to submaximal effort, with potential clinical significance for activities of daily living.

2928 June 2 1:15 PM - 1:30 PM
Associations Between Perceptual and Ventilatory Responses to Exercise: Effect of Sympathetic Blockade
Braden L. Mitchell, Kade Davison, Gaynor Parfitt, Simon Spedding, Roger G. Eston, University of South Australia, Adelaide, Australia.
Email: braden.mitchell@mymail.unisa.edu.au
(No relationships reported)

PURPOSE: To determine the association between the RPE and ventilatory breakpoints, and whether the relationship is altered by acute sympathetic blockade. Methods: The oxygen uptake (VO2) at the ventilatory threshold (VT) and respiratory compensation point (RCP) were determined from a graded exercise test in eleven healthy participants (6 male, 26±5 y) under a β1 receptor antagonist and placebo. Treadmill speed increased by 2 km h−1 every two minutes until exhaustion. The VO2 was measured continuously and RPE recorded in the final 10s of each min. Linear regression modelled the RPE:VO2 relationship and predicted the RPE associated with VT and RCP. The VO2 associated with RPE 13 and 15 were also predicted and expressed relative to the VT and VO2 peak. Paired samples t-tests assessed differences between RPE and VT and VO2 peak exercise were significantly lower under β-blockade (32±3 vs 30±3 and 52±5 vs 49±7 mL·kg−1·min−1, p<0.05), while the VO2 at RCP

Abstracts were prepared by the authors and printed as submitted.
remained unchanged. The RPE associated with VT and RCP were 13±1 and 17±1, respectively, and not significantly different during β-blockade (13±1 and 18±0.6 respectively, p>0.05). The VO2peak associated with RPE 13 was significantly lower under β-blockade compared to control (28±6 vs 32±6 mL·kg⁻¹·min⁻¹, p<0.05). However, when expressed relative to VT (94±15 and 99±14%) and VO2peak (58±6 and 62±10%) differences were no longer significant (all p>0.05). For RPE 15, associated VO2 was significantly lower during β-blockade (53±6 vs 39±9 mL·kg⁻¹·min⁻¹; p<0.05), but no longer significantly affected relative to control (72±6 and 75±8%; p>0.05). Conclusion: Despite changes in the VT and VO2peak with β-blockade, the RPE associated with VT and RCP remain constant. Further, the exercise intensity associated with RPE 13 and 15 appear to scale in accordance with changes in VT and VO2peak.

2930 June 2 1:45 PM - 2:00 PM

**Effect of Different Exercise Intensities on Interleukin-22 in Metabolic Syndrome**

Joyce S. Ramos,1 Lance C. Dalleck, FACSM,2 Gregoire I. Mielke,3 Shelley E. Keating,1 Michael McGuckin,4 Lydia S. Murray,1 Sumaira Hasnain,1 Robert G. Fassett,1 Jeff S. Coombes,1,2 Veterans Affairs Medical Center and Georgetown University School of Medicine, Washington, DC. (Sponsor: Robert Ross, FACSM)

Email: mary.ramos@uq.net.au

(No relationships reported)

Elevated serum interleukin-22 (IL-22) concentration is independently associated with the incidence of type 2 diabetes and coronary artery disease. Individuals with metabolic syndrome (MetS) are at increased risk of developing both conditions. Preclinically, evidence also exists demonstrating that IL-22 may have a role in the alleviation of MetS. PURPOSE: We investigated the impact of moderate-intensity continuous training (MICT) and different volumes of high-intensity interval training (HIIT) on IL-22.
METHODS: This was a sub-study of the ‘Exercise in prevention of Metabolic Syndrome’ (EX-MET) multi-center randomized trial, based on data collected at the Brisbane site. Thirty-nine MetS individuals were randomized to one of three 16-wk interventions: i) MICT (n=10,30min at 60-70%HRpeak, 3x/wk); ii) HIIT (n=13, 4x4min at 85-95%HRpeak interspersed with 3min of recovery at 50-70%HRpeak, 3x/wk); or iii) HIIT (n=16, 1x4min at 85-95%HRpeak, 3x/wk). Serum IL-22 concentration was measured following a 12-h fast via enzyme linked immunosorbent assays, before/after the intervention. MetS severity, cardiorespiratory fitness (CRF), insulin resistance (IR), and visceral adipose tissue (VAT) were also measured via MetS z-score, HOMA-IR, dual-energy x-ray absorptiometry, and indirect calorimetry, respectively.

RESULTS: The median (IQR) IL-22 percent changes from pre- to post-intervention in the MICT, HIIT, and 1HIIT groups were: -17% (-43.0%; 31.3%), +16.5% (-21.1%; 45.2%), and +15.9% (-28.7%; 46.1%) respectively. Although there was no significant between-group difference in IL-22 change, there was a medium-to-large group x time interaction effect on this cytokine (F(2,35) = 2.08, p = 0.14, η² = 0.14). There were similar reductions in MetS severity (MICT: -0.5±1.8; HIIT: -0.5±1.9; 1HIIT: -1.3±1.8), IR (MICT: -2.1±1.4; HIIT: -2.0±1.2; 1HIIT: -1.0±2.0), and VAT (MICT: -47.2±152.6g; HIIT: -68.2±106.0g; 1HIIT: -44.9±102.3g) following all interventions. 4HIIT (+5.7±4.7ml/kg/min) significantly improved CRF more than MICT (+2.7±1.9ml/kg/min) and 1HIIT (+2.9±2.2ml/kg/min).

CONCLUSION: Although there was no significant between-group difference in IL-22 change, the study suggests that different exercise intensities may have different effects on IL-22 in MetS individuals.

F-15 Free Communication/Slide - Perception of Effort, Pain and Fatigue

June 2 1:00 PM - 3:00 PM
Room: 103

Chair: Dane B. Cook, FACSM. University of Wisconsin-Madison, Madison, WI.

(Purpose: To compare the perceptual and affective responses to self-selected and imposed load resistance exercise performed with the same load. Methods: 15 young male college students with at least 6 months experience in resistance training (age: 24.5 ± 3.4 yrs; height: 176.3 ± 5.8 cm; body mass: 79.0 ± 10.3 kg) participated in the study. All subjects completed three exercise sessions: 1. familiarization and 1RM test; 2. self-selected exercise intensity; & 3. imposed exercise intensity. All exercises (chest press, leg extension, lat pulldown, & leg curl) were performed using machines. Each experimental exercise session consisted of 3 sets of 10 repetitions for each of the 4 exercises with 1 min of rest between sets and 2 min of rest between exercises. In the self-selected exercise session, participants were instructed to choose a load in which they could perform three sets. The participants were able to adjust the load at the end of each set. In the second exercise session, the same load was used, but without the individuals’ knowledge. Subjects were informed that the investigators selected the load. Affect (Feeling Scale) and Ratings of Perceived Exertion (RPE) - OMNI-RES were assessed after each exercise. Results: RPE was similar in 3 of the 4 exercises, but Affect was lower (p < 0.05) in all of the exercises in the imposed intensity exercise.

Abstracts were prepared by the authors and printed as submitted.
sessions. CONCLUSION: Self-selected intensity results in a more favorable affective response to resistance exercise than imposed intensity in college men with at least 6 months of resistance training experience.

Exercise can alter pain sensitivity among Gulf War Veterans with chronic muscle pain (CMP). Anticipation of a painful experience can influence perceptual and neural responses to non-painful thermal stimuli among Fibromyalgia patients and this may extend to other patient groups with CMP. However, the association between physical activity or sedentary behavior and anticipation-related pain sensitivity has not been adequately studied. PURPOSE: To determine if (i) anticipation of pain influences perceptual and neural responses to thermal stimuli among Veterans with CMP and (ii) anticipation-related pain sensitivity was associated with physical activity or sedentary behavior. METHODS: Gulf War Veterans with (n=29; 46±6.5 years) and without (n=29; 45±6.7 years) CMP were randomly assigned to conditions in which they were told that they would receive a painful or non-painful heat stimulus. Following one week of physical activity monitoring (ActiGraph GT3X), functional MRI responses to a 20-second warm stimulus (40°C) applied to the left palm were measured on a 3T MRI scanner (GE MR750). Participants were then asked to provide ratings of pain intensity and unpleasantness following thermal stimulus administration. RESULTS: Factorial ANOVA with group and condition as between-subjects factors revealed significantly higher pain intensity (p = 0.003, r = 0.35) and unpleasantness (p = 0.006, r = 0.76) ratings in the pain anticipation condition. A main effect for group and condition for group interaction was not found. Analyses of MRI responses showed significantly different lateral postcentral gyrus activation in the pain anticipation condition. Linear regression analyses on Veterans in the pain anticipation condition showed that physical activity (e.g., moderate-vigorous physical activity) and sedentary behavior (e.g., average sedentary bouts of 30 or 60 minutes) did not significantly predict perception of pain intensity or unpleasantness. CONCLUSION: Pain anticipation influences perceptual and neural responses to non-painful stimuli among Gulf War Veterans with or without CMP; however, physical activity or sedentary behavior may not be related to anticipation-related pain sensitivity in this population. Supported by Dept. of Veterans Affairs grant: 561-00436.

Previously, our group have shown that interacting with peers and/or parents, relative to playing alone, increases physical activity behavior in children without altering perceived exertion. It is possible that the enriching nature of interacting with peers and parents distracts children from how intense their physical activity is thus disrupting their ability to accurately perceive exertion. PURPOSE: To determine if playing with a friend or parent moderates the association between a child playing alone, playing with a friend or parent and their friend or parent’s ratings of perceived exertion (RPE) on different days. METHODS: Twenty children (8.3 ± 1.3 years old, n = 10 girls) participated in three simulated recess conditions (alone, friend, parent) on separate days. During each of the conditions, children had 30 minutes of free access to an outdoor playground (e.g., slides, crawl tubes, etc.) and a chair with a table of sedentary activity options (e.g., books, toys, coloring sheets, etc.) situated within the playground property. Only a single recess and their friend or parent (during the friend and parent conditions) were present during each condition. Average heart rate was recorded during each condition via a telemetry monitor and self-reported RPE was obtained via the children’s OMNI walk/run scale. RESULTS: Pearson’s correlation analyses revealed that the association between heart rate and RPE will weaken from the alone condition to both the parent and friend condition (p=0.006) and 62% greater than when children were playing with their friend (r = 0.31) and parent (r = 0.21), respectively. CONCLUSION: Playing with a parent and, to a lesser extent, with a friend present moderates the association between heart rate and RPE relative to a condition when children were playing alone. It is possible that when children played with a parent or friend it was more difficult to perceive effort because they were distracted by their exercise partner. That distraction may come in the form of greater enjoyment of or motivation for participating in physical activity.

Gulf War Veterans with fatigue-related illness often perceive exercise as more effortful in comparison to controls despite similar exercise capacity. Breathing pattern responses may contribute to this perception, but have not been thoroughly examined in this group of Veterans. PURPOSE: To evaluate breathing patterns during a maximal cardopulmonary exercise test (CPX) between deployed Veterans with fatigue-related illness and controls. METHODS: CPX was performed on a cycle ergometer in 17 deployed Veterans (mean ± SD; 49:6±6.2 years) with clinical fatigue (Fatigue Severity Scale [FSS]; 54.7±6.1) and 14 non-fatigued controls (53.5±5.8 years; FSS; 18.2±7.9). Ventilatory parameters were obtained breath-by-breath throughout exercise and compared at relative intensities (20, 40, 60, 80 and 100% of peak oxygen consumption [VO2peak]). Primary variables of interest included both tidal volume (VT) and respiratory frequency (RF) at increasing exercise intensities and were compared between- and within-groups using repeated measures ANOVA. RESULTS: Demographics (Veterans vs. controls: 30:3:4:4 kg/m² vs. 30:3:4:4 kg/m²), baseline physical activity levels (108.3±45.9 vs. 154±52.6 min wk⁻¹), and peak VO2 (22.5±4.7 vs. 20.8±5.9 ml/kg/ min) were similar between groups. A significant main effect for exercise intensity was observed for both VT and RF (p < 0.05), but only VT demonstrated a significant group-by-time interaction (p < 0.05). Veterans with fatigue-related illness had significantly higher VT at each exercise intensity level (p < 0.01) in comparison to controls, but RF was similar across all intensities. Bivariate associations were observed between VT at each exercise intensity with FSS (r = 0.39, p < 0.01) and a measure of physical health-related functioning (physical composite score; r = -0.35 to -0.45, p < 0.01), but not for RF (p > 0.05). CONCLUSIONS: Despite similar peak exercise capacity, Veterans with fatigue-related illness adopt a unique breathing pattern characterized by high tidal volumes throughout exercise. Higher exercise tidal volumes may encroach on vital capacity and contribute to perceptions of fatigue and effort. Additional studies are needed to confirm a neurophysiological basis of exercise discomfort in this group of Veterans, but evaluating breathing patterns during exercise may afford unique insight.
CONCLUSION: Using a sit-stand desk during daily work activity resulted in better ratings of sleepiness and physical discomfort compared to sitting all workday. These measures are important for presenteesim of office workers and should be explored over a longer duration.

2941 June 2 2:15 PM - 2:30 PM
Perceptions At Moderate Work Intensity In Temperate And Hot Conditions Trained And Untrained Individuals
Aitor Coca, Tyler Quinn, Yongsuk Soo, Tianzhou Wu, Amanda Strauch, Raymond Roberge, Jun-Hyun Kim. NIOSH/NPPTL, Pittsburgh, PA.
Email: esq6@cdc.gov
(No relationships reported)

Ratings of perceived exertion (RPE) and thermal comfort (TC) scales are used to assess exercise intensity, subjects’ exertion and heat perception. For the safety of workers in the heat, it has been proposed that increased fitness levels may have a protective effect and could be associated with benefits to work in the heat, but it remains unclear if trained individuals perceive exertion and heat differently than untrained individuals at moderate work intensities. **PURPOSE:** This study compares RPE and TC in trained (TR) versus untrained (UT) individuals at a cycling intensity of 75%VO2max in the heat.

**METHODS:** Twelve young healthy males were categorized into two groups, TR (n=6, age=26.3±5.9 years, BMI=23.6±2.0 kg/m², aerobic exercise minutes=265±115 minutes/week) and UT (n=6, age=23.0±2.7 years, BMI=25.6±1.4 kg/m², aerobic exercise minutes=55±72.0 minutes/week) based on their self-reported exercise behaviors. Each individual completed a graded exercise test on a cycle ergometer to maximal exertion in a neutral (NORM; 25°C, 50% relative humidity) or hot (HYPER; 40°C, 50% relative humidity) environment. During the HYPER condition, participants also wore a heating garment with 45°C circulating water until their rectal temperature (Tre) increased by 0.5°C from baseline.

**RESULTS:** At the start of exercise or at 75% VO2max, neither HR nor Tre showed significant differences between TR and UT in either condition. RPE and TC did not differ between TR and UT in either condition at 75% VO2max - NORM: TR: RPE: 14.1±1.8, UT: 15.0±2.2, p=0.458; TC: 0.8±0.7, UT: 1.6±1.1, p=0.141; HYPER: TR: RPE: 13.6±0.5, UT: 12.6±2.3, p=0.369; TC: 1.8±0.4, UT: 1.6±0.5, p=0.649. RPE did not show differences between NORM and HYPER at 75% VO2max in TR (p=0.577) nor UT (p=0.152).

**CONCLUSIONS:** Trained individuals perceive exertion and heat similarly to untrained individuals at 75%VO2max in normal or hot conditions. This conclusion has implications for workers safety and the risk for heat injuries in hyperthermia across individuals of varying fitness levels.

2942 June 2 2:30 PM - 2:45 PM
Comparison of Mood Response Through Five Weeks of a High Intensity Functional Training Competition
Allyson G. Box1, Gerald Mangine1, Linda Lager1, Brian Kliszczewicz2, Steven J. Petruzello1, Yuri Feito, FACSM1, 1Kennesaw State University, Kennesaw, GA; 1University of Illinois Urbana-Champaign, Urbana, IL. (Sponsors: Yuri Feito, FACSM) (No relationships reported)

Mood is known to be affected by exercise, as well as the predictability of an event. By design, high-intensity functional training (HIFT) incorporates a wide variety of exercise modalities. Further, competitive HIFT events generally incorporate a unique and unpredictable combination of fitness challenges that may elicit varying mood responses. **Purpose:** Examine mood prior to and following 5 unique, competitive HIFT events during a worldwide fitness competition. **Methods:** Physically active adults (N=11; 34.9±5.1 years, 77.9±15.1 kg, 166.1±10.6 cm) with HIFT experience (≥6 months) completed a baseline (BL) Profile of Mood States (POMS) questionnaire prior to the HIFT competition. During each week of the 5-wk competition, the competitors completed a unique HIFT fitness challenge. For each challenge, the POMS was completed prior to (PRE), immediately post (IP), 30-min post- (30P), and 60-min post-exercise (60P). The POMS yields measures of tension, depression, anger, confusion, fatigue (FAT), and vigor (VIG). Additionally, Total Mood Disturbance (TMD; sum of other 5 subscales minus VIG) and Energy Index (EI; VIG - FAT) were also calculated and analyzed. **Results:** Repeated measures analysis of variance revealed no differences between BL and PRE values across weeks. Week 1 x Time (PRE, IP, 30P, 60P) interactions were observed for EI (p=0.025) and FAT (p=0.002). Compared to Week 3, EI was higher (increased VIG and/or decreased FAT) in Week 3 at 30P (WKS: 12.3±3.6; WKS: 4.0±5.4, p=0.003), and higher than Wk1 (p=0.005) and Wk3 (p=0.005) and Wk5 (p=0.005) and Wk4 (p=0.001), and Wk5 (p=0.008) at IP (WKS: 10.3±4.0; WKS: 4.4±5.2; WKS: 9.1±5.9; WKS: 10.4±7.3). No other significant interactions were observed between weeks. **Conclusions:** The unique design of the HIFT competition did not seem to impact pre-exercise mood, but the different workouts resulted in differing mood responses, particularly for vigor and fatigue.

Human movements are characterized with different coordination patterns. The ability to visually discriminate the coordination pattern is important for people to recognize the other’s movement and plan for the response. Two coordination patterns are known to be intrinsic for humans: in-phase (0°) and anti-phase (180°). They can be perceived and produced easily without practice. Any coordination pattern between 0° and 180° has to be learned through significant amount of practice. Neurological diseases or traumatic brain injury may result in decreased ability to perceive and produce the intrinsic coordination patterns, as well as to learn novel coordination patterns. **PURPOSE:** To establish threshold for healthy controls to visually discriminate the intrinsic and novel coordination patterns. **METHODS:** A total of 15 healthy adults aged from 20-40ths were tested (23.47 ± 3.87). They were tested on the ability to visually discriminate three coordination patterns: 0°, 90°, and 180°. A computer display of a target pattern was shown, followed by displays of a pair of patterns, in which one was the target pattern and the other was the distracting pattern. Participants had to press a key to indicate whether the first or second of the pair was the target pattern. Logistic curve fitting was performed to calculate the individual threshold for discriminating each target coordination pattern. **RESULTS:** One-way repeated measure ANOVA was performed to examine the difference of mean thresholds among three coordination patterns. A significant difference was shown (F_{1,14} = 54.88, p<.001). The threshold for discriminating 90° was the greatest with the largest variability (25.64±12.39°). Although thresholds for discriminating the two intrinsic coordination patterns were smaller, discriminating 180° (4.97±3.79°) was more challenged and variable than discriminating 0° (0.56±1.00°). **CONCLUSION:** For health controls, visually discriminating intrinsic coordination patterns is easier and more consistent than discriminating novel coordination patterns. Establishing the normal thresholds for visual discrimination of intrinsic and novel coordination patterns helped to develop visual-motor coordination tests to screen the neurological diseases or traumatic brain injury.

**F-16 Free Communication/Slide - Prospective Studies of Physical Activity and Health**

2943 June 2 2:45 PM - 3:00 PM
Establishing Thresholds for Visual Discrimination of Intrinsic and Novel Coordination Patterns
Shaochen Huang, Qin Zhu. University of Wyoming, Laramie, WY.
Email: shuang5@uwyo.edu
(No relationships reported)

There is little knowledge of the association between physical activity (PA) level and the mortality risk post myocardial infarction (MI). Smaller studies have indicated, that individuals who remain active or increase their level of PA after MI have a lower risk of death. However, in order to confirm this and adjust for confounders larger studies are needed. **PURPOSE:** Explore any association between PA level after MI and all-cause mortality during follow-up in a large MI-cohort.

**METHODS:** A national cohort study including all patients <75 years of age, with a diagnosis of MI between 1991-2014 (Swedish MI register SWEDEHEART). From the register self-reported PA, 6-10 weeks post MI, (i.e. number of sessions during the past seven days with moderate and/or vigorous PA lasting ≥20 minutes) was obtained. The answers were grouped into 0-1 sessions (inactive), 2-4 sessions (moderately active) and 5-7 sessions (highly active). Associations were first assessed unadjusted, stratified by potential confounders (sex, age, smoking status, ejection fraction, ST-

FRIDAY, JUNE 2, 2017

Abstracts were prepared by the authors and printed as submitted.
elevation and quality of life). Thereafter, a multiple logistic regression was performed to control for possible confounders. RESULTS: Complete data was obtained from 37 655 individuals (mean age 63 years, 74% men). A total of 2512 deaths occurred during a mean of 4.1 years of follow-up. The mortality rate was 17.0 cases/1000 person-years. Moderate activity (n = 10 601) and high activity (n=18 545), was associated with a lower risk of all-cause mortality at follow-up (OR 0.356 95% CI 0.320-0.396 and OR 0.334, 95 CI 0.305-0.366), compared to being physically inactive (n=8519). The OR’s remained unchanged when stratifying for age, sex, non-ST elevation MI, ST-elevation MI and ejection fraction. However, active smokers had a lower OR, for subsequent death, as had patients with a low EQ5D. The associations persisted in the multiple logistic regression, after adjustment for the possible confounders above.

CONCLUSIONS: A higher level of physical activity 6 -10 weeks after myocardial infarction, is associated with a lower risk of all-cause mortality at follow-up. These results suggest that physical activity assessment is important post-MI, not least as an important predictor of subsequent mortality.

June 2 1:15 PM - 1:30 PM

Effect Of Cardiorespiratory Fitness On Blood Glucose Trajectory With Aging: A Cohort Study Of Japanese Men

Haruki Momma1, Susumu S. Sawada, FACSMM, Kazunori Shimada1, Yuko Gando, Motohiko Miyachi3, Chihiro Kinugawa1, Takashi Okamoto1, Koji Tsukamoto1, Cong Huang1, Ryoichi Nagatomi1, Tohoku University, Sendai, Japan. 1National Institutes of Biomedical Research, Sendai, Japan. 2University of Michigan Medical School, Ann Arbor, MI. 3University of Michigan Medical School, Ann Arbor, MI.

Email: h-momma@med.tohoku.ac.jp

There has only been one study examining the effect of cardiorespiratory fitness (CRF) on blood glucose with aging among Americans. Whether CRF also has a similar effect on aging-associated change in blood glucose among Japanese with have lower prevalence of obesity as compared with Americans.PURPOSE: To investigate whether the aging-related increase of glucose in Japanese men with higher CRF is smaller than that of those with lower CRF.METHODS: We studied 6,153 Japanese men (age: 20-69 y) of diabetes, cardiovascular disease and stroke in 1986. The participants completed annual health examinations including fasting blood glucose until 2009. CRF was measured by a submaximal exercise test between 1979 and 1986. The results suggest that physical activity assessment is important post-MI, not least as an important predictor of subsequent mortality.

June 2 1:30 PM - 1:45 PM

Associations Of Sarcopenia And Low Muscular Strength With All-cause Mortality Among Us Older Adults

Ran Li1, Jin Xia2, Xi Zhang2, Jianjun Guo1, Yiqing Song2. 1China Institute of Sport Science, Beijing, China. 2Richard M. Fairbanks School of Public Health, Indiana University, Indianapolis, IN.

Email: liran@ciss.cn

Sarcopenia is defined as aging-related loss of muscle mass and knee extension strength serves as a marker of lower extremity muscular strength in populations. Sarcopenia and low muscular strength (LMS) may be important but understudied risk factors for aging-related morbidity and mortality in the older and elderly populations. PURPOSE: We aimed to prospectively examine individual or joint associations of sarcopenia and LMS with all-cause mortality in a nationally representative sample of US older adults in the National Health and Nutrition Examination Survey (NHANES). METHODS: Data sources included the NHANES 1999-2002 with public-use 2011 linked mortality files, which comprised 4,449 participants aged 50 years and older with complete data on body composition by dual-energy x-ray absorptiometry and isokinetic knee extensor strength measurement. Sarcopenia was defined by two definitions proposed by the National Institutes of Health Sarcopenia Project according to appendicular lean mass (ALM) and ALM divided by BMI (ALM/BMI). LMS was defined as the lowest 25% of measurements of knee extensor strength. Weighted multivariable logistic regression models were used. RESULTS: The weighted prevalence of sarcopenia was 23.1% defined by ALM and 17.0% defined by ALM/BMI; the weighted prevalence of low muscular strength was 19.4%. In the multivariate-adjusted models, sarcopenia was significantly associated with increased risk of all-cause mortality for both ALM and ALM/BMI. The hazard ratio for incident diabetes was 1.16 (95% confidence interval [CI]: 1.06-1.97) but not for ALM definition (OR: 1.37; 95% CI, 0.90-2.09) while LMS was strongly associated with all-cause mortality (OR: 2.32; 95% CI, 1.70-3.18). In the joint analyses, a significantly increased all-cause mortality was observed only among participants with LMS and non-sarcopenia (OR range: 2.03-2.50) and those with LMS and sarcopenia (OR range: 2.15-2.56) while those without sarcopenia and LMS were the reference. Low knee extensor strength indicative of low muscular strength was independently and significantly associated with an increased risk of all-cause mortality among US older adults regardless of the presence or absence of sarcopenia.

June 2 2:00 PM - 2:15 PM

Examining The “Weekend Warrior” And Mortality Using Accelerometer-assessed Physical Activity In NHANES

Eric J. Shirma1, I-Min Lee, FACSMM, Mitchell A. Schepps2, Masamitsu Kamada2, Osorio Meirelles1, Tamara B. Harris1. 1National Institute on Aging (NIA), Bethesda, MD. 2Brigham & Women's Hospital / Harvard Medical School, Boston, MA.

Email: eric.shirma@nih.gov

A natural decline of muscle strength occurs during the aging process; however, preserving muscle strength may reduce the risk of many preventable diseases such as diabetes, especially in higher risk populations. PURPOSE: The purpose of this study was to examine the sex-specific association between muscle weakness and incident diabetes in older Mexican Americans. METHODS: A subsample of 1,903 Mexican Americans aged at least 65 years at baseline was followed for 13 years. Muscle strength was assessed with a hand-held dynamometer and was normalized to body weight (normalized grip strength (NGS)). Male and female participants were categorized as weak if their NGS was <0.46 and <0.30, respectively. Diabetes status and age of diabetes diagnosis was self-reported by participants. Sex-stratified Cox proportional hazard regression models were used to determine the association between muscle weakness and incident diabetes when using age as an entry variable and after adjusting for marital status, employment status, and education. A sensitivity analysis was performed to account for influential outliers in the outcome variable (time to incident diabetes) and the model was re-run. If a >10% change in the hazard ratios was identified, the results of the model that underwent the sensitivity analysis would be presented.RESULTS: The hazard ratio for incident diabetes was 1.16 (95% confidence intervals: CI: 1.12-1.20; p<0.001) in weak vs. strong males and 1.24 (CI: 1.21-1.27; p<0.001) in weak vs. strong females, after adjusting for marital status, employment status and education. CONCLUSIONS: Muscle weakness was robustly associated with an increased risk of incident diabetes in older Mexican American males and females. Health professionals should encourage physical activities and healthy behaviors that preserve or improve muscle strength, thereby reducing the risk of incident diabetes in older Mexican Americans. NGS may also be used to assess and monitor muscle weakness in older populations, especially because it is inexpensive and non-invasive.
old and have worn the accelerometer for 6 or 7 days (n = 4206). Weekly moderate-to-
toruous physical activity (MVPA) was categorized based on the US Federal Physical Activity Guidelines: 1) ≥75 minutes; 2) 75-150 minutes; 3) ≥150 minutes per week (recommended). Of those in the ≥150 minutes group, participants who performed >50% of their weekly activity on only 1 or 2 days were classified as “weekend warriors”, and the rest as “regularly active”. To compare mortality rates based on physical activity category, we calculated hazard ratios (95% confidence intervals) using Cox survival analysis and adjusting for relevant covariates. RESULTS: Over an average of 79.4 (SD = 18.6) months of follow-up, there were 419 deaths. Participants with some activity, but insufficient to meet the guidelines (75-150 minutes per MVPA), had a 61% reduction (HR: 0.39 (95% CI: 0.26, 0.58)) in mortality risk compared to those with <75 minutes per week. Participants meeting the guidelines had a similar mortality risk reduction, ~50%, compared to those with the least activity, whether “weekend warriors” (HR = 0.50 (0.32, 0.81)) or regularly active participants (HR = 0.48 (0.28, 0.81)). CONCLUSIONS: Active participants and those with some activity, but insufficient to meet the guidelines, both had reduced mortality risk during follow-up compared to the least active participants. “Weekend warriors” were observed to have comparable magnitude of risk reduction as regularly active participants.

Despite over 7 million participants in rugby union (‘rugby’) globally, the effect of rugby on health, in terms of increasing or decreasing the prevalence of long-term morbidity amongst players, has not yet been established. Where sport may be associated with decreased morbidity, participation can be recommended as improving specific health outcomes. Where former players are seen to demonstrate health deficits, potential targets for population interventions may become evident. PURPOSE: To determine the prevalence of self-reported physician-diagnosed morbidity amongst former elite rugby players, and compare this with an age and gender-standardised potential targets for population interventions may become evident. METHODS: A cross-sectional study was conducted. The Epidemiology of Health and Morbidity Amongst Former Rugby Union Players

Madeleine A.M. Davies¹, Andrew Judge¹, Antonella Delmestri², Simon Kemp³, Keith A. Stokes⁴, Julia L. Newton¹, Nigel K. Arden¹. ¹University of Oxford, Oxford, United Kingdom. ²Rugby Football Union, Twickeham, United Kingdom. ³University of Bath, Bath, United Kingdom. Email: madeleine.davies@lmh.ox.ac.uk

(No relationships reported)

2950 June 2 2:15 PM - 2:30 PM
The Epidemiology of Health and Morbidity Amongst Former Rugby Union Players
Madeleine A.M. Davies¹, Andrew Judge¹, Antonella Delmestri², Simon Kemp³, Keith A. Stokes⁴, Julia L. Newton¹, Nigel K. Arden¹. ¹University of Oxford, Oxford, United Kingdom. ²Rugby Football Union, Twickeham, United Kingdom. ³University of Bath, Bath, United Kingdom. Email: madeleine.davies@lmh.ox.ac.uk

(No relationships reported)

2951 June 2 2:30 PM - 2:45 PM
Longitudinal Associations Of Adiposity And Grip Strength With Physical Activity Assessed With Wrist-worn Accelerometers In 84,779 Adults: The Uk Biobank Study
Youngwon Kim, Tom White, Stephen J. Sharp, Katrien Wijndaele, Soren Brage. University of Cambridge School of Clinical Medicine, Cambridge, United Kingdom. Email: Youngwon.Kim@nrc-epid.cam.ac.uk

(No relationships reported)

PURPOSE: To determine the longitudinal associations of body mass index (BMI), waist circumference (WC) and grip strength (GS) with objectively measured physical activity (PA) in adults.

METHODS: This study utilized data from the UK Biobank study, an ongoing prospective cohort of over half a million UK adults aged 40-69yrs at recruitment (2006 to 2010). Each participant underwent baseline measurements of BMI (kg/m²), WC (cm) and GS (kg). GS was measured using a hand dynamometer. Values from the two hands were averaged. Between 2013 and 2015, a sub-sample of over 100,000 participants each wore a tri-axial accelerometer on the dominant wrist for 7 days. Measurements taken at baseline were not repeated during the follow-up accelerometer protocol. Mean acceleration levels were calculated, and moderate-to-vigorous PA (MVPA) was estimated as time when acceleration was above 125mg. BMI, WC and GS were standardized, and PA outcomes were log-transformed.

RESULTS: A total of 84,812 participants (46,947 women) with ≥72 hours of wear and no missing covariates were included in the analysis. The median follow-up was 5.7 years (interquartile range: 4.9-6.5). Using multiple linear regression adjusted for GS and various potential confounders (demographic, lifestyle, disease status, seasonality), every 1 standard deviation increase in BMI and WC was associated with 0.071 (95% confidence interval [CI]: -0.073, -0.069) and 0.070 (95% CI: -0.073, -0.068) lower log of mean acceleration at follow-up, respectively, in women: in men, BMI (b: -0.066; CI: -0.069, -0.063) and WC (b: -0.076; CI: -0.079, -0.073). Positive associations were found between baseline GS and follow-up acceleration levels after adjusting for confounders and BMI, in women (b: 0.013; CI: 0.010, 0.01) and men (b: 0.004; CI: 0.001, 0.007).

Marginal means (adjusted for confounders) of follow-up acceleration were lower in individuals with higher adiposity levels and/or lower GS at baseline. Similar results were observed with MVPA as an outcome.

CONCLUSIONS: BMI, WC and GS at baseline predicted objectively measured PA at follow-up. Findings of our study provide compelling justification for interventions and policies to focus on improving body composition and muscle strength to increase or prevent decline in PA at the population level.

2952 June 2 2:45 PM - 3:00 PM
Energy Expenditure From Light And Moderate-Vigorous Intensity Physical Activity And All-cause Mortality
Pedro F. Saint-Maurice¹, Steven C. Moore¹, Sarah Keadle², Charles E. Matthews, FACSM¹. ¹National Cancer Institute, Rockville, MD. ²California Polytechnic State University, San Luis Obispo, CA. (Sponsor: Charles E. Matthews, FACSM) Email: pedro.saintmaurice@nih.gov

(No relationships reported)

PURPOSE: It has been suggested that light intensity activity may have health benefits however, it is still uncertain whether 1 MET-hr of light intensity activity confers similar benefit as 1 MET-hr of moderate-to-vigorous (MV) activity. This study examined the mortality benefits of light and MV intensity activity, while accounting for the volume of activity. METHODS: Accelerometer (ActiGraph 7164) records were extracted from the NHANES 2003-2006 adult database (n=6355). Participants were followed prospectively for mortality through 2011 via the National Death Index. Volume of light and MV activity was determined by classifying monitored time into light (100-759 cts/m) and MV (760+ cts/m) intensity activity and by estimating energy expenditure (MET-hrs/d) within each intensity category. Cox proportional hazard models were used to estimate hazard ratios and 95% confidence intervals (HR [95% CI]) for mortality associated with 1 MET-hrd increase in light or MV activity adjusted for age, sex, ethnicity, education, smoking, alcohol, health status (diabetes, cancer, heart disease, stroke, mobility), BMI, and with and without mutual adjustment for light and MV activity. To account for non-linear mortality associations we examined both exposures among low- (n=2588) and highly-active adults (n=2251).

RESULTS: There was complete data on 4839 adults (≥40yrs) followed over a period of 6.5 years. There were 572 deaths registered among the low-active group and 128 deaths in the highly-active group. Initial models in the low-active group without mutual adjustment revealed significant associations for light (HR=0.85 [0.80, 0.90]) and MV activity (HR=0.70 [0.64, 0.77]). After mutual adjustment for each activity intensity, among low-active adults, a 1 MET-hrd increase in light activity was associated with 9% lower mortality (HR=0.91 [0.86, 0.97]; p < 0.002), while a 1 MET-hrd increase in MV activity was associated with 26% lower mortality (HR=0.74 [0.67, 0.81]; p < 0.001). There were no significant reductions in mortality risk among the high-active group (p > 0.05).

CONCLUSIONS: The findings support the idea that greater amounts of light activity are associated with lower mortality among less active individuals after considering MV energy expenditure. However, for a given MET-hrd of activity, MV may provide more benefit.
Exogenous and endogenous oxidation was quantified using CO2 tracing techniques. Performance was measured in a 5 km TT.

**RESULTS:** CHO ingestion shifted fuel use to predominantly CHO (79.51 ± 7.11, 79.45 ± 1.88 and 56.66 ± 20.18% in glucose plus fructose, glucose alone and placebo, respectively) was the dominant fuel. Co-ingestion of glucose and fructose led to significantly (p< 0.001; ES= 3.82) greater peak exogenous CHO oxidation rates compared to glucose alone (1.51 ± 0.14 g.min⁻¹ compared with placebo where fat (20.49 ± 7.11, 20.55 ± 11.88 and 43.34 ± 20.18% in glucose plus fructose, glucose alone and placebo, respectively) was the dominant fuel. Co-ingestion of glucose and fructose led to significantly (p= 0.001; ES= 3.82) greater peak exogenous CHO oxidation rates compared to glucose alone (1.51 ± 0.14 g.min⁻¹ and 0.96 ± 0.07 g.min⁻¹, respectively) and this result in a significantly (p= 0.007; ES= 1.01) lower contribution from endogenous CHO oxidation (49.15 ± 8.85% and 59.65 ± 1.80%, respectively). Co-ingestion of glucose and fructose did not improve performance in the 5 km TT (25.37 ± 03:01 minutes) compared to glucose alone (25:13 ± 02:53 minutes). However, time to complete the 5 km TT was significantly (p= 0.002; ES= 0.47) faster in the glucose only trial compared to placebo (26:33 ± 2:59 minutes).

**CONCLUSION:** CHO ingestion reduced the reliance on fat oxidation compared to placebo and the co-ingestion of glucose and fructose increased exogenous and spared endogenous CHO oxidation over glucose alone. However, the co-ingestion of glucose and fructose did not provide an ergogenic benefit at 2500m.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**F-30 Thematic Poster - Altitude/Hypoxia/Supplementation**

Friday, June 2, 2017, 3:15 PM - 5:15 PM  
Room: 404

2996 Chair: Roy Salgado, US Army Research Institute of Environmental Medicine, Natick, MA.  
(No relationships reported)

**PURPOSE:** To investigate how carbohydrate (CHO) (glucose and fructose) ingestion effects fuel utilization during exercise at 2500m and the impact of this on performance. **METHODS:** Ingestion of 1.2 g·min⁻¹ glucose plus 0.8 g·min⁻¹ fructose was compared to 1.2 g·min⁻¹ glucose and a placebo during 120 minutes running at 70% VO2max performed by eight males in a normobaric hypoxic chamber set at 2500m altitude. As exogenous and endogenous oxidation was quantified using 13C stable mass isotopic tracing techniques. Performance was measured in a 5 km TT. **RESULTS:** CHO ingestion shifted fuel use to predominantly CHO (79.51 ± 7.11, 79.45 ± 1.88 and 56.66 ± 20.18% in glucose plus fructose, glucose alone and placebo, respectively) was the dominant fuel. Co-ingestion of glucose and fructose led to significantly (p< 0.001; ES= 3.82) greater peak exogenous CHO oxidation rates compared to glucose alone (1.51 ± 0.14 g.min⁻¹ and 0.96 ± 0.07 g.min⁻¹, respectively) and this result in a significantly (p= 0.007; ES= 1.01) lower contribution from endogenous CHO oxidation (49.15 ± 8.85% and 59.65 ± 1.80%, respectively). Co-ingestion of glucose and fructose did not improve performance in the 5 km TT (25.37 ± 03:01 minutes) compared to glucose alone (25:13 ± 02:53 minutes). However, time to complete the 5 km TT was significantly (p= 0.002; ES= 0.47) faster in the glucose only trial compared to placebo (26:33 ± 2:59 minutes).

**CONCLUSION:** CHO ingestion reduced the reliance on fat oxidation compared to placebo and the co-ingestion of glucose and fructose increased exogenous and spared endogenous CHO oxidation over glucose alone. However, the co-ingestion of glucose and fructose did not provide an ergogenic benefit at 2500m.

The reduction in partial pressure of oxygen (O2) leading to reduced O2 delivery impacts physical performance such that A-HA duration > SL and C-HA, and C-HA duration was > SL (P<0.05). There were also no differences (P=0.05) at SL, A-HA and C-HA between CHO and PLA in exercise intensity (% SL VO2peak), and pacing at 0.5 m. increments during the TTs. **CONCLUSIONS:** CHO supplementation did not provide any benefit to TT performance when volunteers were unacclimatized or acclimatized to HA. Chronic HA exposure/acclimatization did improve performance compared to that after acute HA exposure, but performance remained worse than at SL. Authors’ views not official U.S. Army or DoD policy.

Numerous studies investigate the ergogenic effects of normobaric and hypobaric hypoxic acclimatization on endurance performance in normobaria. Likewise, numerous studies assessed the ergogenic effect of sodium bicarbonate ingestion on performance. Diuresis of bicarbonate ions induced by altitude exposure may reduce the extracellular buffering of H+, compromising the performance at high altitude. Purpose of this study was to investigate the effect of Sodium Bicarbonate ingestion during hypobaric hypoxic acclimatization on performance in hypobaric environment. Eight, eight, and twelve subjects were exposed to hypobaric hypoxia (525mmHg) for 6, 8, and 12 hours, respectively. Sodium bicarbonate supplementation took place at 4.5 and 1.5 hours (200 mg kg⁻¹) and 250 mg kg⁻¹ of body mass, respectively) before performance test (525 mmHg). Subjects were tested in 4 conditions: Normobaric placebo (NPBO); Normobaric Bicarbonate (NNBBO); Hypoxic Placebo (HBPO); and Hypoxic Bicarbonate (HBBC). Time trials consisted of performing 360 revolutions of pedals as fast as possible against a resistance equal to 5% of body weight. Blood samples were collected from a venous catheter before the exposure, 15 min before the exercise, and 3.5 min after the exercise. Urinary bicarbonate excretion was measured during the exercise. There were no differences in performance time, serum bicarbonate and lactate concentrations, as well as total urinary bicarbonate excretion between the 6-, 8-, and 12-hour acclimatization. Therefore the data were pooled and analyzed together. Serum bicarbonate concentration was significantly lower (26.4±2.8 vs 24.1±2.5 P<0.001) and urinary bicarbonate excretion was significantly higher (613±480.1 vs 322±264.5, p<0.001) in HBPO than in NBBBO at the end of acclimatization. Bicarbonate supplementation significantly improved cycling performance (2.0±2.42%) in hypobaric hypoxia, while the improvement was not significant in normobaria. It was concluded that sodium bicarbonate supplementation during short-duration acclimatization improves high intensity cycling performance.
supplementation on step test performance in a group of college students. The duration of the exercise bout, as well as the dosage and timing of nitrate supplementation may explain our inability to observe an ergogenic effect.

CONCLUSIONS: Acute NaNNO3 supplementation does not alter SmO2 or SBO2 during steady state or maximal exercise at altitude, but may lower frontal lobe ΔHbO2 only at maximal exercise.

F-31 Thematic Poster - Nutritional Status of Athletes II
Friday, June 2, 2017, 3:15 PM - 5:15 PM
Room: 101

3003 Chair: Kelly L. Pritchett. Central Washington University, Ellensburg, WA.
(No relationships reported)

3004 Board #1 June 2 3:15 PM - 5:15 PM
Comparison Of High And Low 25(OH)-Vitamin D Concentrations On Recovery From Resistance Exercise In Men
Leonardo P. Oliveira1, Sandro Bartolomei1, Eliab Sadres2, David Church1, Eliott Arroyo1, Joseph A. Gordon, III1, Alyssa N. Varanoske1, Ran Wang1, Kyle S. Beyer2, Jeffrey R. Stout, FACSM1, John A. Rathmacher3, Jay R. Hoffman, FACSM3, "University of Central Florida, Orlando, FL. *Metabolix Technologies, Inc., Ames, IA. (Sponsor: Jay Hoffman, FACSM)
Email: loliveira@bsd.ucchicago.edu
(No relationships reported)

BACKGROUND: Vitamin D status (VITD) has been related to impaired skeletal muscle function, and may be associated with recovery after muscle injury. Limited data exists on the relationship between VITD concentrations, muscle damage and inflammatory markers from an acute bout of exercise.

PURPOSE: Examine the effect of VITD concentrations on acute physiological responses and recovery indices from resistance exercise. METHODS: 15 resistance trained men (24±4 y) with at least 2 years of resistance experience volunteered to participate in this study. Participants were grouped into a low 25(OH)-VITD (LVD; 26.7±3.1 ng·ml⁻¹) vs. high 25(OH)-VITD (HVD; 37.2±7.2 ng·ml⁻¹) group based upon baseline (BL) 25(OH)-VITD concentrations. Participants performed 8 sets of 10-12 repetitions at 70% of the maximal strength of the squat exercise, with 75 s of rest between sets. Performance [counter movement jump (CMJP), endocrine (testosterone [T] and cortisol [C]), inflammatory (IL-6 and C-reactive protein [CRP])], and muscle damage (creatine kinase [CK], and myoglobin [MB]) assessments were performed at BL, 30-min, 24-h, 48-h and 72-h post-exercise. Data was analyzed using a repeated measures ANOVA. To complement this procedure, magnitude based inferences were used to provide additional interpretation of the differences that VITD concentrations may have had on the recovery response. RESULTS: No significant interactions were noted between LVD and HVD in CMJP (p=0.26), C (p=0.97), T (p=0.21), CRP (p=0.30), IL-6 (p=0.58) or CK (p=0.16) responses to the exercise protocol. However, a significant interaction was observed in MB (p=0.05) responses. Although post-hoc analyses failed to see any significant differences between the groups at any time point, inferential analysis indicated that MB concentrations was “likely” higher at 30-min for LVD (87.2±57.4 ng·ml⁻¹) than HVD (51.3±21.9 ng·ml⁻¹) CRP levels were “likely” lower at 24-h (549±373 mg·L⁻¹ vs.1344±1654 mg·L⁻¹) and 48-h (565±386 mg·L⁻¹ vs.1079±1077 mg·L⁻¹) for HVD. Inferences for all other comparisons were unclear. CONCLUSIONS: Results indicated that HVD provides a degree of resiliency towards acute muscle damage and enhances recovery of high velocity resistance exercise compared to LVD. Further research using greater sample size appears warranted.

3005 Board #2 June 2 3:15 PM - 5:15 PM
Exploring the Relationship between Soluble Fiber Intake and Bone Mineral Density in Athletes
Anneliese M. Kuenemmerle1, Jody L. Herman1, Emily N. Werner, FACSM1, Jacqui Van Grouw1, Rachel C. Kelley2, Francesco Alessio1, Michael L. Bruneau, 19102, Stella L. Volpe, 19102, FACSM1, Drexel University, Philadelphia, PA. "University of Florida, Gainesville, FL. (Sponsor: Stella Lucia Volpe, FACSM)
Email: annk46@ drexel.edu
(No relationships reported)

Short chain fatty acids (SCFAs) produced by bacterial fermentation of soluble fiber in the gut enhance mineral absorption. SCFAs reduce luminal pH, affect signal pathways, after epigenetic regulation, and foster the proliferation of immune-modulating gut bacteria, suggesting a positive correlation between soluble fiber intake and bone mineral density (BMD). PURPOSE: To evaluate the relationship between soluble fiber intake and total body BMD in athletes 18 years of age and older. METHODS:
Thirty-one participants (16 females, 15 males) who volunteered for a cross-sectional study underwent dual energy X-ray absorptiometry (DEXA) scans and completed self-administered Block Food Frequency Questionnaires (FFQ). RESULTS: Participants’ mean age was 35.7±10.9 years, and mean body mass index (BMI) was 25.32±3.77 kg/m². Participants consumed an average of 1960.3±644.2 kilocalories/day. Mean daily soluble fiber intake was 7.1±2.3 grams/day. Average total body BMD was 1.286±0.12 g/cm². There was no significant correlation between soluble fiber intake and BMD (r = 0.188, p = 0.312). No significant correlation was found between soluble fiber intake and BMD for women (r = 0.057, p = 0.835) or men (r = 0.477, p = 0.073). A multiple linear regression was calculated to predict BMD based on soluble fiber intake controlling for intakes of calcium, vitamin D, and protein. No significant regression equations were found for the total sample (p = 0.357), women (p = 0.617), or men (p = 0.177).

CONCLUSIONS: Soluble fiber intake was not correlated with BMD in this sample of athletes. Directions for future research include recruiting a larger sample and exploring the possibility of a synergistic relationship between soluble fiber and intake of minerals. These represent data from an unfunded research project.

Food insecurity (FI), lacking access to food for an active healthy life, is associated with poor nutrition and health outcomes. Collegiate athletes may have experienced FI during childhood (CH) or high school (HS) and may also experience it at college (COL), which may negatively impact food acquisition and habits. A brief CH food security status (FSS) screening tool was previously validated by Hager et al. (2010) in low-income families with children. PURPOSE: To develop a brief FSS screening tool and to examine its sensitivity (SENS) and specificity (SPEC) in a sample of NCAA Division 1 male, collegiate athletes (28 years of age (y)). METHODS: A cross-sectional survey of NCAA athletes from a Southeastern Conference (SEC) university was approved by the Institutional Review Board and conducted during August-September, 2016. The questionnaire included the USDA food security survey module and a 2-item measure to assess CH, HS, and COL FSS. USDA and Hager et al. methods were used to calculate SENS and SPEC, respectively. RESULTS: Participating athletes (n=93) were 19.7±1.4 y and primarily white, female players: race: white (n=45, 48.4%); black (n=38, 40.9%); other (n=10, 10.9%). [sport: football (n=65, 69.9%); baseball (n=20, 21.4%); cross country/track (n=5, 5.4%); golf (n=3, 3.2%)]. The CH 2-item measure was highly SENS (92.9%) and SPEC (91.1%) for HS FSS, as was the HS 2-item method (SENS 92.9%, SPEC 94.9%). The COL 2-item measure was highly SENS (100%) and SPEC (88.9%) for COL FSS. CONCLUSION: A 2-item FSS can be used to screen for FI in male collegiate athletes. Further research to validate its use in a larger sample that includes females is warranted, as is research to assess the relation of FI to eating behaviors in athletes.

The most common goals included 1) adding >/=1 snacks/day (45.8% of runners), 2) adding a meal/day (29.2%), 3) increasing intake of energy dense foods; increasing intake of carbohydrate rich foods; adding or modifying a pre/post workout snack; consuming more runners with low BMI (< 18.5 kg/m²) compared to >/=18.5 kg/m², 4) choosing with greater intake of energy dense foods (50.0% vs. 12.7%, p = 0.05). Runners characterized with “moderate” vs. “low” or “high” risk for the Female Athlete Triad (or comparable Male Triad) were more likely to report receiving no professional advice on or off-season from a licensed nutritionist or dietitian.
to the goal of increasing intake of carbohydrate-rich foods (30.8% vs. 3.7% and 0%, respectively, p= 0.02). A larger proportion of runners with “high” vs. “moderate” or “low” risk selected the goal of adding a meal/day (40.0% vs. 11.5% vs. 3.7%, p= 0.05).

**CONCLUSIONS:** While the most common goal runners selected focused on adding >/=1 snacks/day, those classified with “high” risk for the Triad or low BMI prioritized adding a meal/day or increasing the energy density of foods consumed. These findings may aid nutritionists and their sport dietitians in selecting goals for optimizing nutrient intake, which may benefit health and performance.

---

**Board #7**

**June 2 3:15 PM - 5:15 PM**

**Influence of a Nutrition Recovery Station Following Exercise on Acute Dietary Intake.**

Ben Desbrow, 4222, Katelyn Barnes1, Gregory Cox2, Caroline Young1, Chris Irwin1. 1Griffith University, Gold Coast, Australia. 2Australian Institute of Sport, Gold Coast, Australia. (Sponsor: Professor Louise Burke, FACSM)

Email: b.desbrow@griffith.edu.au


**PURPOSE:** Immediate post-exercise access to fluid/food/via a recovery station is a common feature of mass participation sporting events. Yet little evidence exists examining their impact on improving recovery or influencing subsequent dietary intake. This study aimed to determine if access to food/fluid during exercise recovery period significantly alters dietary and fluid intakes over a 24hr period.

**METHODS:** 127 (79 males) healthy participants (mean±SD, age=22.5±3.5y, body mass index [BMI]=21.4±3.5kg/m²) completed two self-paced morning 10km runs separated by 1 week. Immediately following the first run, participants were randomly assigned to enter a “recovery station” (ad libitum water, sports drink and fruit) for 30min or leave without access to the recovery area. All participants completed the alternate recovery option the following week. Participants recorded nude BMI before and after each session and measured Urine Specific Gravity (U₆₆) before running and the following morning. Additionally, participants recorded all food and fluid consumed for both runs day via a food diary and photographs which were analysed by a qualified dietitian.

**RESULTS:** No difference in pre-exercise U₆₆ or BMI change during exercise were observed between intervention groups (p’s>0.05). Attending the recovery zone resulted in a greater total daily fluid intake (Recovery=3.37±1.4L, No Recovery=3.16±1.3L, p=.009) but had no influence on daily total energy (Recovery=10.15±4.2MJ, No Recovery=10.15±3.9MJ), carbohydrate (Recovery=276±131g, No Recovery=264±128g) or fat (Recovery=118±61g, No Recovery=122±54g) (p’s>0.05) intakes. Next day morning U₆₆ values were not different between groups (Recovery=1.01±0.07, No Recovery=1.01±0.09, p>0.05). A larger proportion of runners with “high” vs. “moderate” or “low” risk selected the goal of adding a meal/day (40.0% vs. 11.5% vs. 3.7%, p= 0.05).

**CONCLUSIONS:** Attending the recovery station immediately following a 10km run has little impact on 24hr exercise day dietary intake or rehydration in recreational runners.

---

**F-32 Thematic Poster - Physical Activity and Mental Health**

**Friday, June 2, 2017, 3:15 PM - 5:15 PM**

**Room: 304**

**Chair:** Matthew P. Herrington, University of Limerick, Limerick, Ireland.

(No relationships reported)

**Board #1**

**June 2 3:15 PM - 5:15 PM**

**Promoting Mental Among Urban Adolescents Through Physical Activity: Open-trial of Leaders@Play 2.0**

Eduardo E. Bustamante1, Tara G. Mehta1, Angela L. Walden1, Hannah Munson1, Aneisha Dunmore2, Grace Gu2, Stacy L. Frazier1. 1University of Illinois at Chicago, Chicago, IL. 2Florida International University, Miami, FL.

Email: ebusta2@uic.edu

(No relationships reported)

**PURPOSE:** Early adolescence is characterized by decreasing parental monitoring and increasing peer pressure to engage in risky behaviors that may initiate a trajectory toward poor school outcomes, association with deviant peers and stressful life events. High-quality physical activity programs can promote mental and physical health of urban youth by providing refuge from neighborhood violence and opportunities for social skills development and positive peer relations. **METHODS:** Middle school youth across 5 Chicago Park District parks participated in an open trial of Leaders@Play 2.0, a 1-2 hour biweekly component of a 6-week Summer Camp. Leaders (No relationships reported) were developed via university-community partnership, co-facilitated by park staff and mental health staff, and designed to teach and reinforce life skills (i.e., effective communication, emotion regulation, and problem solving) through physically active games and relaxation activities. The Strengths and Difficulties Questionnaire (SDQ) was completed by parents at baseline and post-test. The SDQ reports a prosocial scale, total problems scale, and 4 subscales (emotional problems, conduct problems, peer, and hyperactivity/ inattention). Descriptive statistics were analyzed for all participants at baseline and paired t-tests and within-group effect sizes (Cohen’s d) were calculated for participants providing both baseline and post-test data. **RESULTS:** Youth (N=38) were 31% Hispanic; 26% African American; 55% low-income, 57% male, and M=13.2 years-old. Effect sizes demonstrated a moderate effect on prosocial behavior ([t(1,14)=2.0, p=.06, d=.70]) and a small effect on total problems ([t(1,14)=2.00, p=.066, d=.43). Among subscales, emotional problems improved significantly ([t(1,14)=2.66, p=.05, d=.70), a small non-significant effect size was evident for conduct problems ([t(1,14)=1.19, p=.253, d=.31], while peer problems ([t(1,14)=0.37, p=.719, d=0.07] and hyperactivity/ inattention ([t(1,14)=7.91, p=442, d=16]) were unaffected. **CONCLUSIONS:** Findings provide preliminary support for the potential of physical activity programs that systematically challenge and reinforce social skills to improve prosocial behaviors and decrease emotional problems amongst adolescents in urban settings.

---

**Board #2**

**June 2 3:15 PM - 5:15 PM**

**Is There A Shift In The Ideal Body in The Adolescents?**

Christine Sundgot-Borgen1, Kethe Engen1, Elin Kollle1, Jorunn Sundgot-Borgen, FACSJM. 1Monica Klungland Torstveit, 2Sofrid Bratlund-Sandå, 3Norwegian School of Sport Sciences. Oslo, Norway. 2University of Agder, Kristiansand, Norway. 3University College of Southeast Norway, Bo Telemark, Norway. (Sponsor: Jim Skinner, FACSJM)

Email: c.s.borgen@nih.no

(No relationships reported)

**PURPOSE:** A healthy body image is important for adolescents. It serves as a predictor of good quality of life and should be given focus when working to improve health in adolescents. Unfortunately, previous studies have reported that a high prevalence of male and female adolescents are dissatisfied with their bodies, and especially females have high drive for thinness. However, a muscular and lean body is presented as the new ideal body in the social media. Therefore, it is expected that this might affect the ideal body in the adolescents. The purpose is therefore to investigate how male and female adolescents report that a muscular and lean body is important, if there are differences between what male and females report, and whether this drive for muscularity and leanness is more prevalent than drive for thinness among male and female high-school students.

**METHODS:** We used baseline data from an ongoing RCT aiming to enhance positive social skills to improve prosocial behaviors and decrease emotional problems amongst adolescents in urban settings.**

---

**Board #3**

**June 2 3:15 PM - 5:15 PM**

**Subjective and Physiological Predictors of Anxiety at Rest and During a Working Memory Task**


Email: brooksleitner@gmail.com

(No relationships reported)

**PURPOSE:** Prior research has suggested that an acute bout of moderate exercise is associated with reduced state anxiety in healthy adults and patients with anxiety disorders. However, it is unclear if low-intensity exercise would have the same or
Reduced impact on state anxiety as compared to moderate. Our aim was to combine subjective ratings of exertion and physiological measures to ascertain if low and moderate acute exercise influences anxiety at rest and during a working memory (WM) task.

Methods: In an ongoing study, 21 healthy adults (9 female; age: 26.5±1.25 yrs, VO2Max: 35.3±10.8 mL/kg/min.) performed three exercise sessions on a cycle ergometer: one maximal exercise test and two subsequent randomized 30-minute exercise sessions at moderate and low (60-70% and 10-20% heart rate reserve, respectively) intensities separated by approximately 1 week. Ratings of perceived exertion (RPE) were obtained every 5 minutes during each submaximal exercise session. 30 minutes after exercise, subjects performed a WM task (n-back) under standardized threat of electric shock and safe conditions. Anxiety was assessed subjectively by ratings on a scale from 1-10 before the task and after each of four runs of the n-back (3 difficulty levels: 0-back, 1-back, 3-back). Paired T-tests were used to test the difference in state anxiety following submaximal exercise and linear mixed effects tests were used to assess the influence of RPE on these findings.

Results: Anxiety scores post-exercise were lower following moderate exercise during the 3-back while under threat of shock only after the first run (5.5±2.3 vs. 4.1±2.4, p=0.03). T-tests did not show anxiety scores to differ at any other time points nor conditions (p>0.05). RPE scores during moderate and low intensity exercises were negatively associated with anxiety 30-min post-exercise (before the n-back, B=-0.38±0.17, p=0.04), during the 3-back while under threat of shock (B=-0.51±0.17, p=0.01), and during the 3-back safe condition (B=-0.32±0.12, p=0.02).

Conclusion: Moderate exercise led to lower state anxiety than low intensity exercise during the highest difficulty WM task, yet these effects were short lasting. Higher RPE during exercise, up to 60-70% HRR, predicted lower anxiety at rest and during a cognitively challenging WM task under both anxiogenic and normal conditions.

3017 June 2 3:15 PM - 5:15 PM Use of a Sit-Stand Desk Reduces Wake Time During the Subsequent Night’s Sleep
Christopher E. Kline, Robert J. Kowalsky, Sophia J. Perdomo, Bethany Barone Gibbs. University of Pittsburgh, Pittsburgh, PA. (Sponsor: John M. Jakicic, FACSM)
Email: chriskline@pitt.edu
Reported Relationships: C.E. Kline: Contracted Research – Including Principal Investigator; HumanScale.

Acute bouts of leisure-time physical activity commonly improve sleep on the subsequent night. However, the impact of sedentary behavior on sleep is unclear. Further, whether breaking up sedentary time during the workday improves the following night’s sleep is unknown. Purpose: To examine whether breaking up prolonged sedentary time by standing during the workday leads to better sleep the following night in comparison to a sedentary workday. Methods: 25 inactive adults with no diagnosed pre- or stage 1 hypertension (16 males, 42.2±12 years, body mass index: 31.9±5.0 kg/m²) participated in a randomized crossover trial consisting of two simulated 8-h workdays: one with continuous sitting (SIT) and one with alternating periods of sitting and standing every 30 min (SIT-STAND). Sleep was assessed on the night following each simulated workday. Participants completed a diary to indicate sleep onset latency (SOL), number of awakenings, wakefulness after sleep onset (WASO), and depth and quality of sleep. Participants also wore an accelerometer on the non-dominant wrist (Philips ActiWatch Spectrum) to objectively assess sleep (bedtime, out-of-bed time, total sleep time, SOL, WASO). Paired t-tests and effect size calculations were used to evaluate differences in sleep following the two conditions. Results: Diary-based WASO was significantly lower following SIT-STAND compared to SIT (31.9±30.1 min vs. 23.2±38.6 min; P=0.03, d=0.47). Self-reported SOL, awakenings, sleep depth, and sleep quality were not significantly different between conditions, though SIT-STAND led to small-sized reduction in SOL and awakenings (d=0.33 and d=0.29, respectively). There was a small-sized reduction in actigraphic WASO following SIT-STAND compared to SIT (30.2±12.7 min vs. 37.7±25.0 min; d=0.39), though this difference was not statistically significant (P=0.9). Actigraphic estimates of bedtime, out-of-bed time, total sleep time, and SOL did not differ between conditions (P>0.61, d>0.11). Conclusion: Alternating sitting and standing during the workday leads to small improvements in sleep on the night following the simulated workday, particularly in reduced wake time. Whether this effect on sleep remains or is enhanced with long-term reduction in workplace sedentary behavior deserves further exploration.
Physical activity (PA) may reduce depression and stress. While Latinas have unique risk factors and buffers for depression and stress, there is limited research regarding the effects of PA on these outcomes within this population.

**PURPOSE:** The aim of this study is to investigate the potential mediating role of PA in the effects of a culturally and linguistically tailored intervention for Latinos on depression scores and perceived stress.

**METHODS:** Data are from a sample of 266 Latina women who participated in the Seamos Saludables intervention. Two product of coefficient mediation models were used to assess whether increases in Moderate to Vigorous PA (MVPA, as measured by the 7-day Physical Activity Recall) mediated the effect of the intervention on depression scores and perceived stress (measured by the Center for Epidemiologic Studies Short Depression Scale and the Perceived Stress Scale, respectively).

**RESULTS:** The Seamos Saludables PA intervention, which was successful in helping participants increase their PA, had no direct effect on change in depression scores, nor on change in perceived stress. Nevertheless, among completers, a significant indirect effect on depression scores (ab = -0.44; CI = -.08, -.02) and perceived stress (ab = -0.98; CI = -1.75, -0.22) was observed through PA. The intervention significantly increased MVPA at 12 months (B = 57.96, p < 0.001), and MVPA significantly reduced depression scores (B = -6.008, p < 0.018) and perceived stress (B = -0.02, p < 0.001), controlling for baseline depression and stress, respectively, and baseline MVPA.

**CONCLUSION:** Even though there was no direct effect of the PA intervention on depression scores and perceived stress, higher levels of MVPA among participants were associated with reduced depression scores and perceived stress. Given that depression and stress are associated with negative mental and physical health outcomes, these findings represent a promising approach to improving health among Latinas.
Impaired balance and weak muscle strength are common deficits associated with stroke. These deficits increase the risk of fall among people post-stroke. The relationship between muscular strength and balance was previously reported to be weak. However, the conclusion was made based on clinical balance assessments instead of biomechanical data. Limited research examined the relationship between balance and strength in people post-stroke. PURPOSE: To investigate the relationship between muscular strength and functional balance in people post-stroke. METHODS: A total of 20 people post-stroke completed balance and strength assessments over two separate visits. A computerized dynamic posturography system (NeuroCom International, Clackamas, OR, 2010) was used to perform four balance tests including limits of stability test (LOS), sit to stand test (STS), walk across test (WA), and step up and over test (SUO). In addition, participants completed isometric muscular strength tests of the trunk, hip, knee, and ankle. Peak torque was measured with a computerized dynamometer (Biodex Medical Systems Inc, Shirley, NY, 2012). Pearson’s correlation test was used for statistical analysis. RESULTS: There was a strong correlation between max excursion (LOS test) and muscle strengths of knee flexor/extensor on the affected side (r values ranged between 0.721 and 0.793, p<0.04). A strong correlation was also found between step width (WA test) and muscular strengths of trunk extensor, knee flexor, ankle plantar-flexor, hip flexor and extensor on the unaffected side (r values ranged between 0.797 and 0.902, p<0.01). STS and SUO did not show any significant correlation with muscle strength. CONCLUSIONS: Our findings suggest that strengthening of the knee flexor/extensor may help people post-stroke to shift the weight to maximum range without losing balance. Also, our results indicate that the strength of the core and lower extremities muscles is strongly associated with gait stability.
CONCLUSION The metabolic cost of running is similar for athletes with unilateral and bilateral transtibial amputations, indicating that distance running performance may be the same for both groups.

This project was supported by the BADER Consortium, a DoD CDMRP cooperative agreement (W81XWH-11-2-0222).

Technology has traditionally limited research on wheelchair racing (WCR) to simulated training studies based on heart rate and speed. Practical technology is now available to examine actual physiological responses in real-time. PURPOSE: The purpose of this study was to characterize physiological responses across a 25-km time trial in WCR athletes with paraplegic spinal cord injury. METHODS: Eight internationally-elite WCR athletes (27.5±4.0 yrs, 162.5±18.6 cm, 53.5±10.9 kg, 21.5±6.7 yrs post injury) completed a maximal exercise test and 25-km time trial separated by three to five days. Energy expenditure and related variables were measured continuously during the time trial with a portable metabolic unit (COSMED K4b2, in Chicago, Illinois) with field conditions of 21°C, 39.6% humidity, and wind at 22.4 km/hr. Blood samples were collected before and immediately after the cessation of the time trial to determine blood lactate concentration. RESULTS: Mean VO2 and HR were 73% and 92% of peak values, respectively. There was a significant increase in blood lactate concentration from 0.8±0.2 at baseline to 7.2±3.3 mmol/L after the race (P<0.001). Blood glucose concentrations did not differ from pre- (83.2±1.8 mg/dL) to post-race (91.0±6.6 mg/dL, P=0.30). Core temperature increased from 37.2±0.3 to 37.8±0.2°C immediately after exercise (P<0.007). DISCUSSION: We demonstrate the physiologic response to competitive conditions in elite WCR athletes. Similar to elite able-bodied endurance athletes, WCR athletes sustained a high exercise intensity predominantly through carbohydrate metabolism. Our findings enable more accurate estimates of energy expenditure and have implications for the design of effective training strategies.

Table 1. Acute Physiological Responses (Mean±SD)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rest</th>
<th>25-km Time Trial</th>
<th>Trial Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2 (mL/kg*min^-1)</td>
<td>5.0±1.2</td>
<td>32.8±4.6</td>
<td>31–37</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>72.2±11.3</td>
<td>172.7±11.4</td>
<td>161–184</td>
</tr>
<tr>
<td>VE (L*min^-1)</td>
<td>9.3±1.1</td>
<td>86.9±21.0</td>
<td>65–124</td>
</tr>
<tr>
<td>Caloric Expenditure (kcal*min^-1)</td>
<td>1.2±0.2</td>
<td>8.4±2.1</td>
<td>6–9</td>
</tr>
<tr>
<td>RER</td>
<td>0.80±0.04</td>
<td>0.98±0.03</td>
<td>93–102</td>
</tr>
<tr>
<td>CHO Utilization (%)</td>
<td>30.1±18.7</td>
<td>84.9±8.3</td>
<td>73–92</td>
</tr>
<tr>
<td>FAT Utilization (%)</td>
<td>58.9±12.0</td>
<td>13.6±7.0</td>
<td>6–24</td>
</tr>
</tbody>
</table>

PURPOSE: To understand the reliability of peak VO2 testing for individuals with spinal cord injury (SCI) in deep water and on land arm cycle ergometer; and to determine the relationship between these two testing conditions. METHODS: Nineteen participants (15 men, 4 women) with SCI enrolled in a pilot study to assess peak VO2, using both an aquatic treadmill and land arm cycle ergometer (Aquatrainer). Participants randomized into either aquatic or arm cycle ergometer measurements, separated by 48 hours both conditions. Seventeen individuals (13 men and 4 women) completed both testing conditions and two others completed only arm cycle ergometer sessions.

RESULTS: Peak oxygen consumption correlated clinically and statistically significantly for both conditions, aquatic (r=0.70, P<0.001) and arm cycle ergometer (r=0.91, P<0.001); and a Pearson correlation between aquatic and arm cycle peak VO2 existed (r=0.70, P<0.002). We hypothesized a priori lower extremity motor score (LEMS), age, gender, and weight could potentially impact peak VO2 outcomes. For these participants only LEMS influenced supported deep water peak VO2, n=14, B=0.66, p<0.008, and arm cycle ergometer peak VO2, n=16, B=0.54, P<0.025.

CONCLUSIONS: Determining peak VO2 for individuals with SCI is highly reproducible for arm cycle ergometer and in supported deep water with the metabolic cart Aquatrainer connection. Additionally, supported deep water peak VO2 testing is reliable (r=0.93) and valid (r=0.70) compared to arm cycle ergometry (gold standard). Clinically it is important to assess peak VO2 after an aquatic intervention using the same conditions as the treatment conditions, and both supported deep water and arm cycle ergometer provide reliable and valid peak VO2 outcomes.

F-34 Thematic Poster - Sports Injuries: Friend or Foe? Friday, June 2, 2017, 3:15 PM - 5:15 PM Room: 505

Purpose: Describe the epidemiology of sudden death (SD) in organized American youth sport. METHODS: SD surveillance was conducted from 8/1/2011 to 10/27/2016 via LexinNexis and other publicly available news or media reports. A certified athletic trainer reviewed each case to confirm the official cause of SD and/or confirm a speculated cause of SD if official cause was unknown. Cases of SD that occurred in youth athletes 17 years of age and younger in organized sports were included. Cases of athletes at the high school level or higher were excluded. Details of the athlete (age, gender, level of play), event (sport, event type, activity), and death (date of incident, date of death, location of death, official and speculated cause of death) were examined. Results: From 2007-2015, 45 SDs (average = 5 deaths/yr) were reported in American youth sports. The age range of SD was from 8-17 years old. The mean age of SD was 13 ± 2 years old. The overall incidence rate was 0.23 deaths/100,000 participants. The deadliest year was 2015 with 11 cases. When broken down into three-year segments, 6 SDs occurred from 2007-2009, 16 from 2010-2012, and 23 from 2013-2015. From 2007-2015, males experienced a greater number of SD compared to females (n=36, 80% of all deaths). Basketball had the highest number of SDs from 2007-2015, with a total of 16 occurrences. The most frequent cause of SD was cardiac-related (n=34, 76% of all deaths). Furthermore, 15 of the 16 basketball deaths (94%) were cardiac related. Conclusions: From 2007-2015 45 youth athletes died while playing organized sport, with an increasing number of SDs in more recent years. Males experienced a greater number of SDs than females. The sport and condition with the greatest SDs were basketball and cardiac-related SDs, respectively. With an overall incidence of 0.23 SDs/100,000 participants, these rates are on par with reported high school SD rates from 2007-2014 school years as reported by the National Center for Catastrophic Sport Injury Research (average=0.24/100,000). This study sets a precedent for further examination into youth sport SD and supports the need for mandated health and safety guidelines in this population.
Concussion prevention strategies are of particular need at the youth level to prevent recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability of age at the time of first concussion (RR=0.90, 95% CI: 0.88,0.92). Adolescence. Subsequent concussion risk decreased by 10% for each additional year (95% CI: 1.49,2.21) compared to those that sustained their first concussion during adolescence. Of the 3,819 participants with a concussion histories (n=3,819) were categorized as females, 15 missing; age: 19.9±1.4 years, mass: 77.4±17.2 kg, height: 177.3±21.0 cm). Balance Error Scoring System at baseline were CC: 27.34, NCC: 27.38. Limitations: Data are collected from history of concussion, neurological symptoms (SCAT2), the medical check among 18-19 years old students were analyzed. METHODS: To describe the epidemiology of SRC in Japanese high school athletes. PURPOSE: To describe epidemiology of SRC in Japanese high school athletes. METHODS: SRC data from the medical check among 18-19 years old students in total 368 athletes were analyzed. Data are collected from history of concussion, neurological symptoms (SCAT2), Balance Error Scoring System(BESS) by the assessment of concussion held in Zurich (McCroy P et al. 2012). Incidence are obtained to estimate the experience rate of three person-years among the subjects. Cases of concussion are ascertained by certificated Japanese athletic trainer and sports doctors. Symptoms comparisons were made using two-way ANOVA with repeated measures. RESULTS: Experience rate of concussion during high school three years were 2.72 percent of ascertain cases, and 4.08 percent of total cases (ascertain and uncertain). Incidence rates of ascertained cases were estimated to be 0.013 person-year, rates of total cases be 0.020. Injury rate per 1000 Athletic-Exposures were 0.42 with Men’s basketball, 0.22 with Men’s concussion predicted concussion in basketball were higher than Americans (Daneshvar DH, 2011 and Giza CC, 2013). The rates in succor were lower. Headache, Pressure in head, Dizziness were statistically increased the number from the result of SCAT2. Higher Incidence among sports are observed in Men’s basketball and Men’s Succor. There were not significant different from annual practice time between concussion(CC) and non-concussion(NCC) cases; cases: basketball CC: 1364.0 hours/year. NCC: 1155.8 hours/year. Balance Error Scoring System at baseline were CC: 27.34, NCC: 27.38. Limitations: We could not evaluate the rate of Rugby, American-football and Judo because of a few cases. CONCLUSIONS: Incident rates of concussion of Japanese high school students were estimated to be 0.013 person-year at least. Injury rate per 1000 Athletcity-Exposures were 0.42 with Men’s basketball, 0.22 with Men’ssuccor. Sustaining a single concussion increases the risk of sustaining a subsequent concussion. Individuals that sustain their first concussion during childhood may be at greater risk for sustaining multiple concussions throughout their lifetime, due to a longer window of vulnerability. PURPOSE: To determine whether developmental stage and age at first concussion influence risk of subsequent concussion. METHODS: A total of 23,582 collegiate athletes from 26 universities and military cadets from 3 military academies completed a concussion history questionnaire (15,232 males, 8,335 females, 15 missing; age: 19.9±1.4 years, mass: 77.4±17.2 kg, height: 177.3±21.0 cm). Participants were asked to self-report the number of concussions and age at time of each injury. Participants with concussion histories (n=3,819) were categorized as having sustained their first concussion during childhood (<10 yo) or adolescence (≥10 yo ≤18 yo) based on World Health Organization criteria. We then determined the number of subsequent concussions sustained prior to age 18. We used a Poisson regression to model developmental stage predicting risk of subsequent concussion. A second model was developed to determine whether age at first concussion predicted subsequent concussion risk (α = 0.05). RESULTS: Of the 3,819 participants with a previous concussion, 251 (6.6%) sustained their first concussion during childhood and 3,568 (93.4%) during adolescence. Participants that sustained their first concussion during childhood had 81% higher risk of sustaining subsequent concussions (RR=1.81, 95% CI: 1.49,2.21) compared to those that sustained their first concussion during adolescence. Subsequent concussion risk decreased by 10% for each additional year of age at the time of first concussion (RR=0.90, 95% CI: 0.88,0.92). CONCLUSION: Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments. Sustaining a concussion at a young age seems to lengthen the window of vulnerability to sustaining subsequent concussions, resulting in higher risk of sustaining multiple concussions in a lifetime. Sustaining multiple concussions may cause prolonged recovery, early medical disqualification from sport, and late life cognitive impairments.
Injuries in dance are commonplace and distressing in terms of human and financial impact. It is the hope of dance medicine healthcare professionals and educators to detect risk for injury prospectively, often through screening efforts. It is known that screening has been very useful for rapport building, improving health literacy and facilitating entryways to local healthcare systems. However, screening, as we have been conducting it, has still not proven to be predictive of injury despite implementation of preventative interventions such as pre-season conditioning programs. PURPOSE: To test the predictive validity of four patient reported outcome measures (PRO) in addition to an array of motor control designed clinical performance-based outcome measures (CPBO) collected during preseason screening in predicting subsequent season time loss injury. METHODS: 241 elite classical dancers (21.5±5.0 years; 69 men, 172 women) who received regular onsite care consented to participate in PRO and CPBO-based preseason screenings and ongoing, healthcare practitioner documented injury surveillance. The PRO’s utilized in this study were the Discomfort Rating Scale (DRS); the World Health Organization Functioning Scale (WHO); the Profile of Mood States total score (POMS) and the Eating Attitudes Test-26 (EAT). Data were analyzed with a multivariate logistic regression model for the outcome variables “injured in subsequent season” and “number of therapy visits in subsequent season”. RESULTS: All PRO variables were associated with the primary outcome variables (p<0.001) and foot/ankle (FA) injury (OR = 14.3; 95% CI: 2.0, 102.9). Adjusted Crude and adjusted odds ratios (OR) were calculated to identify the risk association during mass recreational sport events, with a higher risk for females to sustain traumatic injuries, and encounter central nervous system and eye complaints. The majority of admissions for traumatic injuries were followed by hospitalisation. The majority of admissions for traumatic injuries had the most complaints, 80.7%. Males 10-16yrs (p=0.0013) and females 23-39yrs (p=0.0336) and >30yrs (p=0.0002), had a higher risk for traumatic injuries.

CONCLUSIONS: A reported ratio of 1:26 (females=1:26, males=1:28) of all starters developed medical complaints; with 1:84 cyclists (females=1:61, males=1:93) that developed adverse events and did not finish the race; and 1:769 participants (females=1:374, males=1:1163) developing serious adverse events that required hospitalisation. The majority of admissions for traumatic injuries were followed by cardiovascular complaints. A wide spectrum of medical complaints can be expected during mass recreational sport events, with a higher risk for females to sustain traumatic injuries, and encounter central nervous system and eye complaints. The majority of disorders involved the musculoskeletal system. Information regarding the pattern and type of medical encounters can prove useful during planning and management of similar future events.

INTRODUCTION: The Momentum 94.7 Cycle Challenge is an annual recreational long distance cycling event in South Africa. Medical support at such an event is imperative, with little known regarding the risk of acute traumatic injuries and acute medical illness. PURPOSE: To describe the incidence and patterns of acute injury and medical illness and difference between sexes during a mass community cycling race. METHODS: A descriptive study of the 2014 Momentum 94.7 Cycle Challenge, documenting the incidence of acute traumatic injuries and acute non-traumatic medical illness in 23055 race starters (males=17520, females=5236, not specified=299) during the 94.7km distance.

RESULTS: An incidence (per 1000 starters) of 38.69 (females=38.39, males=36.52) for all medical illness; with an incidence of 11.88 (females=16.42, males=10.73) for adverse medical events and of 1.3 (females=2.67, males=0.86) for serious adverse events, were reported. The incidence of non-traumatic medical complaints was 32.48 (females=31.32, males=33.39) and of traumatic injuries was 3.99 (females=7.07, males=3.14). Females had a higher risk of sustaining traumatic injuries (p<0.001), central nervous system (p=0.0062) and eye complaints (p=0.0107). The musculoskeletal system had the most complaints, 80.7%. Males 10-16yrs (p=0.0013) and females 23-39yrs (p=0.0336) and >30yrs (p=0.0002), had a higher risk for traumatic injuries.

CONCLUSIONS: A reported ratio of 1:26 (females=1:26, males=1:28) of all starters developed medical complaints; with 1:84 cyclists (females=1:61, males=1:93) that developed adverse events and did not finish the race; and 1:769 participants (females=1:374, males=1:1163) developing serious adverse events that required hospitalisation. The majority of admissions for traumatic injuries were followed by cardiovascular complaints. A wide spectrum of medical complaints can be expected during mass recreational sport events, with a higher risk for females to sustain traumatic injuries, and encounter central nervous system and eye complaints. The majority of disorders involved the musculoskeletal system. Information regarding the pattern and type of medical encounters can prove useful during planning and management of similar future events.
Mindfulness-Based Stress Reduction (MBSR) and aerobic exercise training (AET) have emerged as robust programs to improve health and wellbeing. Physical activity may be enhanced to a similar degree by MBSR and AET, although their relative effects on physical activity have not been objectively assessed.

**PURPOSE:** To compare the effects of 8-weeks of MBSR and AET on objectively measured physical activity.

**METHODS:** Participants underwent 7-days of physical activity monitoring (Actigraph GT3x) at baseline prior to randomization, and again following completion of 8-weeks of MBSR or AET, or neither (no-treatment control group). Actigraph-based average daily minutes of sedentary, light, moderate, vigorous and moderate-to-vigorous (MVPA) activities were calculated. Weekly time spent in MVPA lasting longer than 10 minutes (MVPABouts) was calculated to assess physical activity engagement sufficient to meet national recommendations. Groups were compared via pairwise comparisons of changes in MVPA and MVPABouts from pre-randomization to post-intervention (November).

**RESULTS:** Sufficient data for analysis (≥3 week and ≥1 weekend day, >10 hours/day) were obtained from 49 participants (18 MBSR, 14 AET, 17 control) out of 66 who enrolled. Reflecting a seasonal decline (Aug to Nov), daily MVPA decreased in all groups; control: −22.7 ± 36.1 min/day, MBSR by 5.7 ± 7.5 min/day, and AET by 7.4 ± 14.3 min/day, without statistically significant differences among the groups (all ps > 0.05). MVPABouts decreased 77.3 ± 106.6 min/week in the control and 15.5 ± 37.0 min/week in the MBSR group, with a nonsignificant difference favoring MBSR (p = 0.29) but not MBSR (p = 0.56).

**CONCLUSIONS:** This pilot study showed that while exercise training leads to more minutes of MVPA sufficient to meet physical activity guidelines compared to a no-treatment control, MBSR training may mitigate seasonal decline with similar effects to exercise training on daily MVPA and MVPA in 10+ min bouts. As these findings indicate that MBSR training has beneficial effects on MVPA, future research is needed to determine if MBSR improves wellbeing through changes in physical activity.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**June 2 3:30 PM - 3:45 PM**

Both MBSR and Aerobic Exercise Training can Affect Physical Activity Behavior in Sedentary Individuals

Jacob Meyer, Elisa Torres, Maggie Grabow, Aleksandra Zgierska, Christopher Coc, Bruce Barrett.

**University of Wisconsin - Madison, Madison, WI.** (Sponsor: Dana Cook, FACSM)

Email: jdmeyer3@wisc.edu

(No relationships reported)

Regular moderate-intensity physical activity has been shown to improve sleep duration and quality in individuals with mild to moderate sleep complaints. It is not known whether more vigorous exercise may have similar, more pronounced, or even detrimental effects on sleep. **PURPOSE:** To examine the effects of high-intensity interval training vs. moderate-intensity continuous training on objectively- and subjectively-measured sleep parameters.

**METHODS:** Fifteen volunteers (35.1 ± 8.1 y; BMI = 36.0 ± 5.0 kg/m²) completed 8 weeks (3 d/wk) of either high-intensity interval training (HIIT (n=8): 10, 1-min intervals at 90-95% of heart rate max (HRmax)) or moderate-intensity continuous training (MICT (n=7): 30 min at 70-75% of HRmax) on cycle ergometers. Subjects wore accelerometers (Actigraph GT3x+) on the non-dominant wrist during sleep periods for seven consecutive days at baseline, week 5, and week 8. Measures of total sleep time (TST, min), sleep onset latency (SOL, min), and sleep efficiency (SE, %) were derived. Participants also completed the Pittsburgh Sleep Quality Index (PSQI) at baseline and after training. **RESULTS:** For Actigraph-measured sleep, SOL was marginally improved in HIIT (−1.92 ± 3.9 min) compared to MICT (−4.4 ± 8.15 min, p = 0.09, d = 0.61). SE was also marginally improved in HIIT ( +2.5 ± 5.2%) compared to MICT (−3.8 ± 4.6, p = 0.06, d = 0.65). No changes were observed for TST. For PSQI-measured sleep, MICT showed favorable improvements compared to HIIT for sleep latency (−p = 0.09, d = 0.51), sleep duration (p = 0.06, d = 0.57), sleep efficiency (p = 0.07, d = 0.55), and the global score (p = 0.03, d = 0.67), but no differences were observed for sleep quality, disturbances, medication use, or daytime dysfunction.

**CONCLUSION:** This study is the first to compare HIIT vs. MICT on sleep using both actigraphy and subjective measures. Our results suggest that in comparison to moderate-intensity continuous training, high-intensity interval training may lead to the perception of poorer sleep quality. Conversely, objectively measured sleep quality may respond more favorably to HIIT than MICT.

**June 2 4:00 PM - 4:15 PM**

Six Months of Aerobic Fitness Training on Daily Affect in High-Stressed Family Caregivers

Benjamin Hives1, Jordan Weiss2, Samantha Schilf1, Adam Caplin1, Elissa Epel1, Kirsten Johansen1, Eli Puterman1.

1University of British Columbia, Vancouver BC, Canada. 2University of Pennsylvania, Philadelphia, PA. 3University of California - San Francisco, San Francisco, CA.

Email: ben.hives@ubc.ca

(No relationships reported)

Interventions to prevent excessive weight gain and promote postpartum weight loss have modest results, particularly in overweight and obese women. **PURPOSE:** To describe the rationale and design of the HIPPI trial; discuss recruitment strategies, challenges, and yield to date; and present baseline demographic and physical activity (PA) data.
RESULTS: To date, 95 participants have enrolled, representing 16% of women who completed a screening form and were initially eligible. Eight (16%) have withdrawn, two due to medical ineligibility. Barriers to enrollment include failure to reach women for telephone screening, ineligibility, and no shows to baseline visits. These challenges led to increasing recruitment sites and replacing group intervention sessions with individual telephone counseling. At baseline, participants were 10.0 ± 2.1 wks gestation, 30.2 ± 5.6 yrs old, 44% nulliparous, 34% African American, 60% college graduates, and 48% obese. Baseline armband average wear-time was 23.5 ± 0.3 hrs/d. Participants accumulated 36 ± 22 total mins/d of MVPA and 5399 ± 2303 steps/d. 32-wk data show trends favoring the intervention group (40 vs. 26 mins/d MVPA, 5078 vs. 4620 steps/d).

CONCLUSION: HIPP is an innovative study that addresses gaps in the literature. Recruitment posed challenges necessitating study modifications. Primary outcome results are expected in 2019. Funded by NIH/NICHD.

3045 June 2 4:30 PM - 4:45 PM

Effects of a Long-Term Physical Activity Program on Activity Patterns in Mobility Impaired Older Adults

Amal A. Vanigatunga,1 Robert S. Axtell, FACSM2, Roger A. Fielding1,2, Nancy W. Glynn1,2, Abby C. King, FACSM1,3, Mary M. McDermott1,2, Catrin Tudoor-Locke1, FACSM1, Marco Pahor1, Todd Manini, FACSM4. 1University of Florida, Gainesville, FL. 2Southern Connecticut State University, New Haven, CT. 3Tufts University, Boston, MA. 4University of Pittsburgh, Pittsburgh, PA. 

Funded by NIH/NICHD.

Purpose: To examine the effect of a long-term structured physical activity intervention on accelerometer-derived metrics of activity composition changes in older adults at high risk for mobility disability.

Methods: Participants were randomized to either a physical activity (PA) or health education (HE) program. The PA intervention included a walking regimen with strength, flexibility, and balance training. The HE program featured health-related discussions and a brief upper body stretching routine. Participants (n = 1,341) wore a Fitbit Alta tracker (Fitbit, San Francisco, CA). At baseline and at 24 months post-randomization, total physical activity (TPA)—defined as movements registering 100+ counts/min—was segmented into the following intensities: low light (LLPA; 100-759 counts/min), high light (HLPA; 760-1,040 counts/min), low moderate (LMPA; 1,041-2,019 counts/min), and high moderate and greater (HMPA; 2,020+ counts/min). One week's worth of daily activity data was used to calculate the mean counts per minute (CPM). Data were analyzed using Multilevel Mixed Effects Regression Models. All models were adjusted for age and sex.

Results: TPA-4+ bouts: 10.5±1.0 minutes/day, but the PA intervention reduced this effect compared to HE (PA vs HE: +6.4±2.1 minutes/day, p<0.001). This attenuation shifted TPA composition by increasing daily time in HLPA (1+ bouts: 0.8±0.3; 5+ bouts: 0.2±0.04; 10+ bouts: 0.1±0.02 minutes), LMPA (1+ bouts: 2.7±0.4; 2+ bouts: 2.4±0.3; 5+ bouts: 2.0±0.2; 10+ bouts: 1.1±0.1 minutes), and HMPA (1+ bouts: 2.8±0.4; 2+ bouts: 2.5±0.3; 5+ bouts: 2.1±0.3; 10+ bouts: 1.7±0.2 minutes). All findings were statistically significant at p<0.001.

Discussion: The PA intervention increased physical activity by shifting the composition of activity toward higher intensity activity in longer duration bouts. However, a long-term structured physical activity intervention did not completely eliminate overall declines in total daily activity experienced by mobility impaired older adults.

CONCLUSIONS: HIPP is an innovative study that addresses gaps in the literature. Recruitment posed challenges necessitating study modifications. Primary outcome results are expected in 2019. Funded by NIH/NICHD.

3046 June 2 4:45 PM - 5:00 PM

Effects of Supervised and Unsupervised Physical Activity Programs for Weight Loss

Seth A. Creasy1, Renee J. Rogers2, Kelliann K. Davis, FACSM2, Bethany Barone Gibson3, Erin E. Kershaw3, Sara J. Kovacs3, Meghan R. Maher4, Robert J. Kowalsky5, Matthew O’Dell6, Katherine A. Collins1, Shawn D. Raybuck7, Marissa L. Marcin2, Patrick T. Donahue8, John M. Jakicie, FACSM2,9. 1University of Colorado Anschutz Medical Campus, Aurora, CO. 2University of Pittsburgh, Pittsburgh, PA. 

Sponsor: John M. Jakicie, FACSM

Email: Seth.Creasy@ucdenver.edu

Both supervised and unsupervised physical activity programs have been shown to improve weight loss outcomes compared to no treatment or control conditions, however, few studies have directly compared supervised and unsupervised physical activity within the context of a SBWI.

PURPOSE: This study examined changes in moderate-to-vigorous physical activity (MVPA), fitness, and weight in response to a supervised physical activity program prescribed in minutes per week (SUP-PA), an unsupervised physical activity program prescribed in minutes per week (UNSUP-PA), and an unsupervised physical activity program prescribed in steps per day (STEP) during a SBWI.

METHODS: Adults (N=52, age: 43.5±10.1 yrs, BMI: 31.5±3.5 kg/m²) participated in a SBWI and were randomized to STEP (n=18), UNSUP-PA (n=17), and SUP-PA (n=17). Subjects were prescribed a calorie-restricted diet (2000-2200 kcal·day⁻¹) and to progressively increase physical activity (SUP-PA and UNSUP-PA: 150 min·week⁻¹; STEP: 10,000 total steps·day⁻¹ with 2500 brisk steps·day⁻¹). All groups attended weekly in-person group intervention sessions for 12 weeks. SUP-PA also attended supervised activity sessions, whereas UNSUP-PA and STEP engaged in unsupervised physical activity.

RESULTS: MVPA in bouts of ≥10 minutes significantly increased over the 12-week intervention by 11.5±3.2 min·day⁻¹ in STEP, 16.1±2.5 min·day⁻¹ in UNSUP-PA, and 21.6±2.4 min·day⁻¹ in SUP-PA (p<0.001) with no differences between groups (p=0.94) or group by time interaction (p=0.81). Weight significantly decreased (p<0.001) with no significant difference between groups (STEP=-5.3±3.6 kg, UNSUP-PA=-5.1±3.3 kg, SUP-PA=-3.8±3.0 kg) (p=0.81). Fitness increased significantly more in both SUP-PA (3.8±1.6 ml·kg⁻¹·min⁻¹; 0.22±0.23 L·min⁻¹) and UNSUP-PA (3.8±3.2 ml·kg⁻¹; 0.17±0.24 L·min⁻¹) compared to STEP (1.3±2.4 ml·kg⁻¹; -0.04±0.19 L·min⁻¹) (p<0.05).

CONCLUSIONS: Unsupervised physical activity prescribed in min·week⁻¹ or steps·day⁻¹ may elicit a similar increase in MVPA and reduction in weight compared to supervised physical activity within a SBWI. However, physical activity prescribed in steps·day⁻¹ may elicit less favorable changes in fitness. Whether results are consistent across a longer intervention period warrants further investigation.
Obesity is a worldwide epidemic despite volumes of information while overwhelming evidence exists suggesting exercise and calorie restriction helps manage obesity. Studies have shown significant differences in weight loss between high-intensity interval training and moderate continuous training potentially due to compensatory eating behaviors. PURPOSE: To determine how aerobic exercise (AEx) training influences appetite, energy intake, and food-related behaviors following high intensity intervals (HI) and continuous steady state (SS) running.

METHODS: Nine lean (BMI=23.90±2.15 kg/m²) exercise trained college-aged (23.56±3.78 years) males (n=5) and females (n=6) participated in this study. Preliminary assessment included informed consent, medical history, body composition, and VO2max (ParvoMedics, Sandy, UT). Subjects were randomized to one of three trials: control, HI or SS. Subjects arrived fasted to the lab between 6:00-8:00 am. Subjects were given a 20oz sports drink and rested for 30 minutes

RESULTS: Caloric expenditure was higher during exercise than control (CON: 77.42±3.48kcal, HI: 321.06±24.16kcal, SS: 345.04±24.28kcal, p<0.001) but not different between HI and SS (p=0.49). Caloric intake was not different between trials (CON: 1957.11±172.48kcal, HI: 1849.78±149.80kcal, SS: 1683.11±142.73kcal, p=0.23). Carbohydrate intake was not different between trials (CON: 186.22±25.03g, HI: 224.89±24.28g, SS: 201.44±22.98g, p=0.41). Fat intake was not different between trials (CON: 55.44±8.31g, HI: 72.50±9.05g, SS: 63.44±4.66g, p=0.16). Protein intake was not different between trials (CON: 78.33±28.36g, HI: 69.33±10.18g, SS: 70.00±13.96g, p=0.64). CONCLUSION: Subjects did not differ in total energy or macronutrient intake after HI and SS exercise.

CONCLUSIONS: EEE at intensities differing by a factor of two, suppresses hunger after the mid-day meal, PP insulin after morning and mid-day meals and leptin over 12-hr period in lean, but not the obese women. Obesity blunts detection, hormonal responses, and dietary compensation to EEE.
METHODS: Participants (N=383; Age=44.7±8.2 yr, BMI=32.4±3.8 kg/m^2) were randomized to a reduced calorie diet (DIET, N=127), diet plus a moderate dose of physical activity (MOD-EX, N=129), or diet plus a high dose of physical activity (HIGH-EX, N=127). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. MOD-EX was prescribed physical activity that progressed to 150 min/wk with HIGH-EX progressed to 250 min/wk. Physical activity, weight, waist circumference, and resting blood pressure were assessed at 0 and 12 months.

RESULTS: Retention at 12 months was 86.6% in DIET, 80.6% in MOD-EX, and 83.5% in HIGH-EX. Physical activity at 0 and 12 months was 65.4±73.8 and 88.2±104.3 min/wk in DIET; 68.7±93.8 and 179.1±125.3 min/wk in MOD-EX; and 71.5±84.4 and 228.8±148.3 min/wk in HIGH-EX (Group X Time p<0.001). Weight decreased in at 12 months (DIET: -9.9±8.2 kg, MOD-EX: -10.8±8.2 kg, HIGH-EX: -9.5±7.3 kg (p<0.001), with no difference between groups. There were also significant and similar changes across groups in waist circumference at 12 months (DIET: -8.8±8.1 cm, MOD-EX: -10.4±8.8 cm, HIGH-EX: -9.3±7.4 cm) (p<0.001). Resting systolic and diastolic blood pressure decreased significantly (p<0.001) by 4.3±10.1 mmHg and 2.6±6.6 mmHg, respectively; however, there was no difference between groups.

CONCLUSIONS: MOD-EX and HIGH-EX in physical activity that was consistent with the prescribed doses of physical activity; however, this did not improve weight loss, waist circumference or resting blood pressure compared to DIET at 12 months. It is likely that compensation in energy balance occurred in response to physical activity that limited additional weight loss or changes in body composition; however, this did not differ between groups.

Metabolic flexibility is the ability to adjust substrate oxidation according to nutrient availability. For example, one that fails to increase fat metabolism in response to a high fat meal would be characterized as metabolically inflexible. This metabolic inflexibility may lead to weight gain and the development of metabolic disease. Previous studies have shown that obese women are metabolically inflexible in response to short-term high fat diets compared to lean women. However, the acute response to a single high fat meal has not been described.

PURPOSE: To determine if obese women are metabolically inflexible in response to a single high-fat meal, compared to lean. METHODS: Baseline (T1), fasting glycemia, resting energy expenditure (REE), lipid and carbohydrate oxidation (estimated using indirect calorimetry), were assessed for lean (n=4; Age=26.5±4.43 yrs; BMI=23.6±1.7) and obese (n=2; Age=35.5±2.1 yrs; BMI=34.7±7.6) Caucasian women. Participants then consumed a high fat shake (975 kcal, 62% fat). Additional REE, lipid and carbohydrate oxidation measurements were taken at 120 (T2) and 240 (T3) minutes post shake.

RESULTS: There were no significant differences in age between groups. T1 REE was significantly higher (p<0.05) among obese (1930.2±179.3 kcal) compared to lean (1607.7±120.0 kcal). There was a significant time effect on lipid and carbohydrate oxidation (p<0.05) and a significant BMI effect (p<0.05) on lipid oxidation. Lipid oxidation increased among both groups, but was significantly higher among obese (T1=0.1±0.01, T2=0.1±0.01, T3=0.1±0.01) compared to lean (T1=0.0±0.01, T2=0.1±0.01, T3=0.1±0.01) at all three time points. Although not significant, there was a trend for the lean women to increase lipid oxidation to a greater extent from T1 to T2 (lean 38.3±13.8% increase vs. obese 16.7±10.0% increase; p=0.11). CONCLUSIONS: Current preliminary data suggest that lipid oxidation is higher among obese women compared to lean after consuming a single high fat meal. The obese women appear to respond similarly in terms of metabolic flexibility, compared to lean women. A single high fat meal may not be enough of a stimulus to elicit the metabolic inflexibility previously reported among obese women in response to a high fat diet. Supported by WKU Graduate School Research Grant.
**TREATMENT AND OUTCOMES:**
1. Weight reduction with goal of BMI 30-32 (approximately 10-15kg)
2. If symptoms persist after weight reduction will consider speech therapy referral
3. Full activity as tolerated without limitation

Abdominal injuries are rare in sports. However, unrecognized, they can be serious and even life threatening. A 16-year-old F. soccer player presented with worsening RUQ abdominal pain after being struck in the abdomen by a soccer ball. Two days prior she had been kicked by a goalie in the abdomen, although she did not experience much pain with that incident. In the ED the patient denied chest pain or pressure, cough, congestion, shortness of breath, vomiting, diarrhea, constipation, black or bloody stools. PMH: allergic rhinitis. PSH: none. Allergies: NKDA. Meds: Flonase.

**PHYSICAL EXAMINATION:** Temp 98.4 deg, HR 85, BP 116/60, Sat 100%, normal room air. Well-developed and well-nourished. Alert and oriented to person, place and time. Head normocephalic and atraumatic. Pupils equal, round, reactive to light and accommodation. sclera anicteric. No conjunctiva injection. Extraintravascular movements intact. Trachea midline. Lungs clear to auscultation with normal breath sounds bilaterally. Abdomen soft with tenderness in the RUQ and voluntary guarding. No rigidity, rebound, abrasions, Grey-Turner sign, or Cullen’s sign. No masses or hepatosplenomegaly. No CVA tenderness. No focal or neurological deficits.

**DIFFERENTIAL DIAGNOSIS:**
1. Rib contusion/fracture
2. Liver contusion/laceration
3. Bowel perforation
4. Traumatic pancreatitis
5. Pancreatic laceration/pseudocyst
6. Retroperitoneal hematoma
7. Rectus sheath hematoma
8. Pulmonary contusion
10. Kidney hematoma/laceration

**TESTS AND RESULTS:**
- WBC count of 14.6, Hgb and hematocrit of 13.7 and 41. Urine preg. negative, BUN and Cr 21 and 1.03, alk phos 109, ALT 304, AST 436, Total Bilirubin 0.6, Lipase 76, CRP <0.29, lactic acid 0.9, monospot neg, UA positive for trace ketones.
- CT abdomen and pelvis with contrast: - Three hepatic contusions without laceration or hemoperitoneum

**FINAL WORKING DIAGNOSIS:**
Liver contusions

**HISTORY:** A 21-year-old football wide receiver sustained a hit to his left ribs by an opposing player’s helmet during the last quarter of a mid-season game. After being tackled, the athlete was able to get up and walk off the field.

**EXAMINATION:** Athlete was assessed on the sidelines shortly after injury and found to have localized tenderness along the lower left ribs. He reported mild nausea but no dizziness or shortness of breath. Pain was made worse by twisting movements of the torso and deep inspiration. He was given a bag of ice to place on his ribs. At the end of the game his exam and symptoms had not changed. A few hours later he noticed the pain was worse with supine position. Pain did not improve with Tylenol. Late in the evening, the intensity of pain did not subside and began to radiate to his left shoulder.

**DIFFERENTIAL DIAGNOSIS:**
1. Rib contusion
2. Lower rib fracture(s)
3. Splenic injury
TEST AND RESULTS:
On the advice of his trainer, the athlete went to ED that night. X-rays of the ribs were negative for fracture. No further studies were done. He was diagnosed with rib contusion and discharged home with pain medication. The following morning, his pain had worsened and he developed emesis with attempts to eat. Again on the advice of his trainer he returned to Urgent Care. The examining physician noted abdominal bloating and left upper quadrant tenderness. He was then sent to the ED where a CBC drawn was notable for anemia. Ultrasound and CT abdomen confirmed diagnosis of splenic laceration.

FINAL/WORKING DIAGNOSIS:
Splenic laceration, grade IV

TREATMENT AND OUTCOMES:
1. After reviewing the CT scan, it was determined that immediate surgical intervention was not needed
2. Athlete was admitted to ICU where serial Hb/Hct was monitored for the next 48 hours. Hct stabilized and athlete remained hemodynamically stable
3. Athlete was discharged from hospital with restrictions on return to play until 3 months post injury. He is feeling well but unable to return to football before the end of this season.

June 2 4:55 PM - 5:15 PM
Blunt Abdominal Trauma at Pre-season Scrimmage
Brian J. Schutzbach 1, Mark Lavallee, FACSM 2, 3, GreenVille Health System, Greeneville, SC. 4, WellSpan Health, York, PA. (Sponsor: Mark Lavallee M.D., FACSM)

History: 17 year old male wide receiver came to the sideline with severe 7/10 sharp, stabbing, mid abdominal pain at a high school scrimmage after he had caught a pass and was tackled. He was unaware if a body part or a helmet struck him in the abdomen. Another teammate came over and said he was sandwiched by two players. He denied any radiation of his pain. He noted associated difficulty breathing and numbness in his fingers bilaterally. He alsoitches for baseball team with aspirations of playing college baseball.

Physical Examination: Sideline examination of abdomen showed a soft, non-distended, thin abdomen with normal bowel sounds and maximal tenderness in the left upper quadrant. He also displayed guarding. Patient was mentating well but was tachycpeic with normal lung sounds. His skin was cool in the distal extremities.

TEST AND RESULTS: X-ray of the abdomen revealed no evidence of fracture, dislocation or other abnormality. MRI of the shoulder revealed narrow contusion of the greater tuberosity, mild subchondral subdeltoïd bursitis and no rotator cuff or labral tear appreciated.

FINAL WORKING DIAGNOSIS: Transient axillary nerve palsy with osseous contusion of humerus.

TREATMENT AND OUTCOMES: Over the following two weeks, he regained full strength and motion. Axillary nerve palsy, commonly associated with shoulder dislocations, is rare following a simple fall to the ground.

June 2 3:35 PM - 3:55 PM
A New Frontier for the Medial Clavicle
Sam Hwu 1, Garry W.K. Ho, FACSM 2, Keith W. Lawhorn 3. Sports Medicine Fellowship Program, Virginia Commonwealth University - Fairfax Family Practice, Fairfax, VA. 1 OrthoVirginia, Fairfax, VA

History: A 63 year-old male presented with a 2-week history of left upper extremity pain after being hit by a car on his left side while riding his bicycle. He sustained fractured ribs, an extraarticular fracture-dislocation of the left medial clavicle, a minimally displaced oblique fractured left scapular body, and a displaced, comminuted fractured left distal radius for which he underwent ORIF. While hospitalized, he was informed there were no surgical options to treat his left clavicle fracture-dislocation.

Physical Examination: Examination revealed a male with his left arm in a sling. He had a prominent anterior sternoclavicular joint and deformity of his medial clavicle. His range of motion was limited due to pain and guarding. He had 2+ radial pulses, intact sensation to light touch, and no obvious motor dysfunction of his upper extremities.


Tests and Results: Left shoulder CT scan: 1. Comminuted, anteriorly angulated fracture of the medial aspect of the left clavicle with severe shortening and subluxation of sterno-clavicular joint. 2. Minimally displaced oblique fracture through scapular body. Multiple anterior and posterior ribs. No pneumothorax.


Treatment and Outcomes: He underwent an ORIF of his medial clavicle fracture-dislocation using a 7-hole 15-mm hook plate. The plate was placed under the inferior border of the medial head of the clavicle and superior to the first rib to push the lateral clavicular fragment posteriorly to reduce the fracture. Screws were placed in the hook plate to stabilize the fracture and maintain the clavicle out to length as much as possible. The arm was ranged with mild motion of the hook plate under the sternum and the fracture stable. His scapular and rib fractures were treated nonoperatively. A hook plate is designed for fixation of a lateral clavicle fracture, but its use in medial clavicle fractures has not been well established. We offer this case as an example of a successful outcome using this novel operative approach.
HISTORY:
A 60-year-old woman sustained a right shoulder injury after falling from a chair onto an outstretched arm 2 years ago. She immediately had severe right lateral shoulder pain, worse with abduction. Outside facility workup included normal x-rays, C Spine MRI with a small annular posterior disc bulge at C6-7. Shoulder MRI with mild increased T2 signals at insertional sites of supraspinatus and long head biceps tendons. NCS of median/ulnar nerves were normal and needle EMG of deltoid, infraspinatus, serratus anterior and rhomboid major also normal. She was treated with a subacromial corticosteroid injection and therapy with minimal improvement, and is now presenting with unresolved chronic symptoms impacting her ADLs.

PHYSICAL EXAMINATION:
On inspection decreased muscle bulk in right trapezius on shoulder shrug and scapular retraction. No tenderness to palpation. Passive range of motion full in all planes, and notable for right scapular hump with abduction greater than 60 degrees and loss of abduction control of scapula, as it rides into anterior/superior supraclavicular region. Active shoulder abduction limited to 54 degrees when standing due to weakness, but able to obtain full 170 degrees when supine. Strength of right trapezius is 4/5, remaining muscles 5/5 with scapula stabilized. Sensation intact to light touch and shoulder impingement maneuvers are negative.

TEST AND RESULTS:
Our repeat NCS done personally was significant for an abnormal right scapulohumeral nerve CMAP to the trapezius with significantly decreased amplitude and onset latency comparable to the left side. Needle EMG was evident for normal right deltoid, infraspinatus, serratus anterior, rhomboid major but markedly abnormal right upper and middle trapezius findings with increased insertional activity, fibrillation potentials, positive sharp waves, polyphasic MUAPs and reduced recruitment.

FINAL WORKING DIAGNOSIS:
Right incomplete spinal accessory neuropathy - mostly affecting upper fibers.

TREATMENT AND OUTCOMES:
1. Collaboration with sports medicine orthotist for molding of a customized scapular stabilizer/retraining brace.
2. Physical Therapy Rx for shoulder girdle complex strengthening and range of motion exercises.
3. Patient with significant improvement in pain, range of motion, and general function with brace.

June 2 4:15 PM - 4:35 PM
Shoulder Injury - Ground Level Fall
Kevin M. Mullins, Brian A. Davis, FACSM.
University of California, Davis, Sacramento, CA.
Email: kevmullins@ucdavis.edu
(No relationships reported)

HISTORY:
A 17 year old male presented to our clinic with a complaint of left shoulder pain after an injury that he sustained while participating in ballet practice. He reports that his partner lost her balance during a lift which caused him to overcompensate and shift positions quickly. During this maneuver he felt a sudden, sharp pain in his left shoulder and discontinued practicing. Following this incident he was unable to elevate his arm although he did not complain of any numbness or paresthesia's.

PHYSICAL EXAMINATION:
Upon exam, there was no evidence of swelling or ecchymosis around the neck/shoulder deltoid and he was neurovascularectly intact. He had increased pain with deep inspiration but no shortness of breath or additional rest chest abnormalities. Forward flexion and abduction of the arm were limited to approximately 45° due to pain. Passive range of motion was diminished to 90° with inability to reach end range due to pain. There was no pain to palpation along the clavicle or AC joint; however palpation of the first rib at the base of the neck elicited significant pain.

June 2 4:35 PM - 4:55 PM
shoulder injury

June 2 3:55 PM

June 2 3:55 PM

June 2 4:15 PM

June 2 4:15 PM

June 2 4:15 PM

June 2 4:15 PM

June 2 4:15 PM
F-51 Basic Science World Congress/Poster - Stress and Behavior
Friday, June 2, 2017, 1:00 PM - 6:00 PM
Room: Hall F

3096 Board #1 June 2 2:00 PM - 3:30 PM Anxiety Level Moderates the Acute Impact of Light and Moderate Intensity Aerobic Exercise on Working Memory
Olgia G. Berwid1, Sarah C. O’Neill1, Nacima Chen1. York College of the City University of New York, Jamaica, NY. 2The City College of New York, New York, NY.
Email: olgag.berwid@gmail.com

PURPOSE: Accruing evidence suggests that there is an improvement in working memory immediately after a single bout of moderate-intensity aerobic exercise with smaller and more variable effect sizes in healthy young adults than in other groups (Ludyga et al., 2016). Individual differences in the impact of exercise on cognition mediated by a variety of different factors may account for some of this variability. The aim of the current study was to determine whether the impact of both light- and moderate-intensity aerobic exercise on verbal and nonverbal working memory differs by anxiety level.

METHODS: 125 young adults were administered Operation Span (O-SPAN) and Symmetry Span (S-SPAN) tasks twice; once after spending approximately 40 minutes completing questionnaires including the State-Trait Anxiety Inventory (STAI-T); and once after 40 minutes of either moderate-intensity (60% of age-predicted maximum HR) or light-intensity (55% of age-predicted maximum HR) aerobic exercise. Session order was counterbalanced across participants and participants were randomly assigned to exercise intensity. A median split on the STAI-T was used to separate participants into lower and higher anxiety groups. The impact of exercise and anxiety on WM was examined in individuals who report higher versus lower levels of trait anxiety.

RESULTS: For S-SPAN performance, there was a significant Anxiety x Session interaction (F = 4.04; p = .047; partial eta-squared = .032) indicating that those reporting higher levels of trait anxiety may benefit slightly more from exercise than those with lower levels of anxiety. For O-SPAN performance, there was a significant 3-way Intensity x Anxiety x Session interaction (F = 6.27; p = .014; partial eta-squared = .05) revealing differing patterns of moderate- and low-intensity exercise for the higher and lower anxiety groups. There were no other significant effects.

CONCLUSIONS: The data suggest that light- and moderate-intensity aerobic exercise may exert different impacts on working memory in individuals reporting lower versus higher levels of trait anxiety; however, effect sizes are small.

3097 Board #2 June 2 2:00 PM - 3:30 PM Physical Fitness, Physiological and Sleep Responses to Stress in Women
Email: al206393@my.ncwc.edu

PURPOSE: Stress-related psychiatric disorders (such as depression) are twice as common in women as in men and have been linked to aberrations in physiological and psychological stress responding. Being physically fit may be protective against the development of adverse symptoms related to stress, however, to date, there has been limited investigation of the relationship between physical fitness and behavioral and physiological responses to stress which considers the profound influence of the ovarian cycle on physiological and behavioral stress responding. This study aims to investigate the relationship between physical fitness and physiological and behavioral (sleep disturbances) responses to stress in women during the follicular phase of the menstrual cycle (when ovarian hormones are low and stable).

METHODS: Following a two-tiered screening process, 10 healthy women (18-45y) who were medication-free and had regular menstrual cycles were enrolled. Participants 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 hemodynamic [blood pressure (SBP, DBP) and heart rate (HR)] and hormonal stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can influence the physiological response to stress.

RESULTS: Though not significant at this time, preliminary results from this ongoing study show that higher levels of physical fitness may be associated with lower sleep reactivity to stress (r = -.43; p = .17) and reduced wake after sleep onset (WASO: r = -.58; p = .07). Consequently, increased WASO was significantly associated with increased SBP and DBP reactivity to an acute psychosocial stressor (r’s = .78, .65; p’s = .01, .05 respectively). CONCLUSIONS: If confirmed in our larger sample results suggest that, in women, physical fitness may be protective against the physiological response to stress, perhaps via reduction in stress-related sleep disturbances.

3098 Board #3 June 2 2:00 PM - 3:30 PM Physical Fitness, Hemodynamic and Affective Responses to Psychosocial Stress in Women
Email: ch215189@my.ncwc.edu

PURPOSE: Studies suggest that adaptations resulting from regular physical exercise training might positively impact physiological adaptations to psychological stressors. A reduced psychosocial sensitivity to psychosocial stressors may be one mechanism by which physical fitness may serve to buffer the deleterious effects of chronic stress. However, to date, there has been limited study of the relationship between physical fitness and psychosocial and affective stress responding in women which considers the profound influence of the ovarian cycle on physiological and affective responses to stress. This study aims to investigate the relationship between physical fitness and physiological and affective responses to stress in women, while considering ovarian cycle phase effects on the stress response.

METHODS: Following a two-tiered screening process, 10 healthy women (18-45y) who were medication-free and had regular menstrual cycles were enrolled. Participants completed an enrollment visit, (including perceived stress assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); and a psychosocial stressor protocol for the collection of hemodynamic [blood pressure (SBP, DBP) and heart rate (HR)], affective, and hormonal stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can influence the physiological response to stress.

RESULTS: Preliminary results from this ongoing study show a trend for higher levels of physical fitness to be associated with lower SBP (r = -.58; p = .008) and DBP (r = -.56; p = .009) reactivity to stress. Interestingly, higher physical fitness was significantly associated with a more negative affective response to the psychosocial stressor tasks (speech: r = -.70, p < .02, math: r = -.71, p < .02). CONCLUSIONS: If confirmed in our larger sample, results suggest a possible dissociation of the physiological and psychological stress responses associated with physical fitness in women during the follicular phase of the menstrual cycle.
**Symptoms in Response to a Carbon Dioxide Inhalation**

Clara V. Etter, Mary Jane DeSouza, FACSMS, Jay L. Lieberman, Nancy I. Williams, FACSM. The Pennsylvania State University, State College, PA.

**PURPOSE:** Our previous findings have shown a significant relationship between the severity of exercise-related menstrual disturbance and an increase in perceived stress. In this analysis, we examined underlying factors that contribute to changes in psychological stress with the induction of exercise-related menstrual disturbances in a 3-month exercise and caloric restriction intervention in sedentary, regularly menstruating women (n = 36).

**METHODS:** Women (age 18-24 yrs, BMI 18-28 kg/m²) were randomized to either an exercise only group or one of four groups designed to induce an energy deficit through varying combinations of caloric restriction and exercise over 3 menstrual cycles preceded by a Baseline cycle. The intervention included exercise (5 d/wk, 50-85% VO2max, 20-75 min) and controlled diet.

Menstrual function and reproductive hormones were characterized using daily urinary estrosten-1-glucuronide (E1G), pregnanediol glucuronide (PgD), lutenezizing hormone, and menstrual calendars. Depressive symptoms were assessed with the Beck Depression Inventory (BDI). Presence of eating disorders was assessed using the Eating Disorder Inventory (EDI). Psychological stress was determined using the Perceived Stress Scale. Other factors investigated were anthropometrics, fitness, age, and reproductive factors.

**RESULTS:** The intervention caused moderate weight loss (2.59 ± 0.35 kg), increases in fitness, declines in body fat and declines in E1G and PgD (p < 0.006). Perceived stress increased significantly across the intervention (p < 0.001). Changes in perceived stress were associated with baseline luteal phase PGD AUC (r = 0.387, p = 0.024), change in body weight (r = 0.017, R = 0.401), change in body mass (r = 0.419, p = 0.012) such that higher baseline PGD concentrations and greater reductions in BMI and body weight were associated with lower increases in perceived stress. Baseline scores of BDI and EDI were not significantly related. Age, fitness, body composition, luteal phase length, and follicular phase E1G were also not significantly predictive of PSS.

**CONCLUSION:** Stress sensitivity as defined by changes in perceived stress and related menstrual disorders may depend on baseline ovarian status and changes intervention induced changes in anthropometrics.
Acute aerobic exercise has been shown to reduce craving for various addictive substances like cigarettes and alcohol. A similar effect has been seen in children when examining brain MRI responses to fatty foods. **PURPOSE:** The purpose of this investigation is to examine the impact of acute aerobic exercise on cue reactivity to fatty and healthy foods in typical college-aged women. **METHODS:** Six women (Age: 24.7±0.9 years, BMI=26.6±2.5, VO2 peak=35.3±4.1 ml kg⁻¹ min⁻¹) completed 2 experimental sessions. During one session subjects rested for 30 minutes and during the other session subjects exercised for 30 minutes at a moderate exercise intensity (77±1% of Peak HR) on a semi-recumbent bike. Treatments were applied in a counterbalanced fashion and subjects fasted for 4 hours prior to each session. Prior to and immediately following each session, EEG data were collected using a 64-channel EGI Geodesic EEG System. Images were presented in a random order and proceeded by a fixation stimulus using a variable time span (0.5 to 1.5 sec). After collection, data were processed to calculate the mean and peak voltage associated with the P300 (200-500 ms post stimulus) in all electrodes. For this investigation, only the electrodes associated with the parietal lobe of the brain were used for comparison and average EEG responses in these electrodes are presented here. **RESULTS:** Reaction time to distractor stimuli was reduced following exercise (Pre=513±8 ms, Post=483±10 ms, p=0.004) as compared to resting (Pre=530±17 ms, Post=522±15 ms, p=0.02) and Acute aerobic exercise had no impact on the EEG response to FAT (Mean Response: Pre=0.35±1.42 μV, Post=0.42±1.66 μV, Peak Response: Pre=1.71±4.11 μV, Post=2.08±6.68 μV) or HEALTHY (Mean Response: Pre=0.39±0.76 μV, Post=0.42±1.28 μV, Peak Response: Pre=1.74±0.82 μV, Post=2.63±1.52 μV) images. **CONCLUSION:** These findings suggest that acute aerobic exercise of moderate intensity does not influence cue reactivity to images of fatty and healthy foods in normal college-aged women.

**PURPOSE:** Sedentary behavior and obesity increase the risk of endometrial cancer (EC), particularly Type I forms, which are increasing in the U.S. Further, although death rates from most cancers are decreasing, overall mortality rates for EC are increasing; and, obese EC patients have significantly poorer survival rates compared to normal weight EC patients. No prior studies have examined neural activation in response to food cues as well as sedentary behavior and cognition in obese EC survivors. **METHODS:** Therefore, we evaluated appetitive behavior using a visual food cue functional magnetic resonance imaging (fMRI) task as well as sedentary behavior and cognition using Trails A & B and Symbol Digits Modalities Tests in 42 obese EC survivors seeking weight loss. **RESULTS:** We found increased activation in response to high-calorie food cues after eating a meal in brain regions associated with food-related reward (dorsolateral prefrontal cortex, amygdala; whole brain cluster corrected, p<0.05) in obese IC survivors. In addition, cognitive tests suggest scores in obese EC patients are lower than normative data for similar age and gender. We are currently evaluating correlations between sedentary behavior, cognitive scores and neural signals in differentially activated brain regions. **CONCLUSIONS:** To our knowledge, this is the first study to evaluate cognitive and sedentary behavior correlates of neural activation in response to food cues in obese EC survivors and, this data may also help inform future work in other adult obese populations with and without cancer.

This work was supported by NIH NCI R01-CA175100.

**PURPOSE:** Obesity is associated with decreases in cognitive function, including changes in working memory and executive control. Yet, we know very little about whether weight loss through an energy-restricted diet and increased physical activity (PA) improves cognitive function. The aim of this study was to evaluate whether weight loss following a 12-month dietary and physical activity intervention was associated with improved cognitive performance. **METHODS:** 115 overweight and obese adults (89 female) participated in a 12-month diet and PA intervention. Participants were middle-age (mean at baseline=44.7±8.5 years) and well educated (mean=16.5±2.5 years). Participants were assigned to one of three groups: One group engaged in dietary restriction alone, while the other two groups engaged in either 150 minutes per week or 250 minutes per week of moderate intensity exercise, in addition to an energy-restricted diet. All participants completed neuropsychological tests measuring decision-making (Iowa Gambling Task; IGT), inhibitory control (color-word Stroop), working memory (N-Back), and processing speed (set shifting; Trail Switch). Paired-samples t-tests compared baseline with post-intervention cognitive performance. The results reported below are collapsed across group, as the investigators remain blind to group assignment. **RESULTS:** Following the intervention, participants’ BMI decreased by 2.4±3.3 kg/m², p<.001. Participants performed significantly better post-intervention on the IGT [(t(114)=2.4, p=.016)], N-Back [2-Back RT (t(114)=2.686, p=.008], and Task Switch [RT (t(113)=3.726, p=.0001); accuracy (t(113)=3.606, p=.0001)] compared to baseline. There were no significant changes in Stroop Task performance from baseline to follow-up. The changes in cognitive task performance were not significantly associated with change in BMI. **CONCLUSIONS:** A 12-month diet and physical activity intervention in overweight and obese adults is associated with improved cognitive performance across multiple cognitive domains. **FUNDING:** This research was supported by funding from NIH/NIDDK grants R01095172 (PE. Erickson) and R01HL103646 (PJ. Jakicic).
3107 Board #12 June 2 3:30 PM - 5:00 PM Improvements in Family Nutrition and Physical Activity during FitKids360: Associations with Adiposity Changes Kim Delafuente1, Jared Tucker2, Kathy Howard1, Jill Graybill1, Gregory Welk, FACSM1, Spectrum Health, Grand Rapids, MI. 1Helen DeVos Children’s Hospital, Grand Rapids, MI. 2Forest Hills Pediatrics, Grand Rapids, MI. 3Iowa State University, Ames, IA. (Sponsor: Gregory Welk, FACSM)
Email: kimberly.delafuente@spectrumhealth.org

Purpose
The Family Nutrition and Physical Activity survey (FNPA) is a validated health behavior survey for assessing childhood obesity risk, but it has not been evaluated as a tool to track behavior change over time. The current study assessed FNPA in youth who completed a pediatric weight management program, and compared associations between FNPA and adiposity changes.

Methods
Youth 5-16 years old with a BMI≥85th percentile participated in FitKids360, a 6-week, multidisciplinary, family-based intervention aimed at improving physical activity, nutrition, and sedentary behaviors. The FNPA was parent-reported pre and post intervention, and height and weight were assessed via trained program staff. Total FNPA and subscale scores were calculated, including screen time, physical activity, family meals, food and beverage choices, parental food restrictions and rewards, and sleep routines. Participants were grouped based on BMI percentile (BMI%) changes during treatment, after which FNPA scores were compared across genders, age groups, and BMI-change categories.

Results
A total of 1102 youth (10.7±3.0 years) initiated treatment, and 790 completed the program (72% retention). Mean FNPA scores significantly increased 5.6±7.2 points (p<0.001) while BMI% decreased -0.43±2.12 percentile points (p<0.001). After adjusting for baseline FNPA, youth <11 years of age had higher post FNPA scores than older youth (p<0.001), but FNPA did not differ between genders. When grouped by high (≥5.5%), moderate (0.5 to 0.0%), and low (<0.5%) BMI% changes, youth with high reductions had healthier FNPA scores (63.2±7.8) than those with low BMI% changes (59.6±8.1) (p<0.005), and a trend towards higher scores than those with moderate reductions (61.7±7.3) (p=0.080). FNPA subscales also differed between BMI% groups, such that greater adiposity reductions were associated with healthier beverage choices (p=0.034) and lower screen time (p<0.005).

Conclusions
FitKids360 completers improved FNPA scores and reduced age- and sex-adjusted BMI. After adjusting for baseline differences, youth with the highest post-treatment FNPA scores had the greatest improvements in adiposity. The FNPA appears to be a useful tool for tracking progress in obesity-related health behavior changes during family-based pediatric weight management.

3108 Board #13 June 2 3:30 PM - 5:00 PM The Experimental Effect Of Parental Attentiveness On Children’s Physical Activity Michael J. Reboud1, Cody Croll1, Emily Cumberledge2, Melanie Hall1, Lindsey Raumikaitis1. 1Hiram College, Hiram, OH. 2Bloomsburg University of Pennsylvania, Bloomsburg, PA.
Email: reboldmic@gmail.com

Purpose
It is heretofore unknown what the causal impact of a parent being actively attentive during bouts of physical activity, versus non-attentive may be on the amount and intensity of their child’s physical activity engagement. To assess the amount, intensity, enjoyment (i.e., liking), and preference of children’s physical activity under two conditions: parent actively attentive and parent non-attentive. METHODS: Ten children (n = 6 boys, 4 girls) between the ages of 3-6 years old participated in each condition for 30-minutes in which they were taken to a gymnasium and had free-choice access to a variety of physical and/or sedentary activities. In addition to accelerometry data, at the end of each 30-minute session children were asked to indicate their liking. Children were then asked if they would like to play for an additional 10-minutes. After both conditions were completed, each child indicated which condition was their favorite. RESULTS: More counts (p = 0.04) were accumulated during the parent actively attentive (96,347 ± 33,075.26 counts) condition than the parent non-attentive (48,316.30 ± 46,101.47 counts). More time (p = 0.01) was allocated to sedentary activities during the parent non-attentive (19.50 ± 13.30 minutes) condition than the parent actively attentive (2.80 ± 3.55 minutes) condition. Children liked (p = 0.004) the parent actively attentive (9.05 ± 1.21 cm) condition more than the parent non-attentive (4.42 ± 3.18 cm) condition. There was no significant difference (p = 0.56) between the proportion of children who chose to participate in the additional 10-minute bonus period during the parent actively attentive (50%) condition and the parent non-attentive (40%) condition. CONCLUSION: When parents are actively attentive children’s physical activity increased by 99.82% and reduced sedentary behavior by 85.64%. Parental attentiveness during bouts of physical activity may be an important component to consider when children are engaging in physical activity.

Email: Connie.Tompkins@uvm.edu

Purpose
More than half of preschool-aged U.S. children spend their time in a structured preschool setting largely engaged in sedentary behaviors. Given the low levels of importance of physical activity (PA) for prevention of obesity, preschools may be an ideal environment to engage a large number of children at an early age. PURPOSE: To examine whether a teacher-led PA intervention increased moderate-to-vigorous physical activity (MVPA) in preschool-aged children. METHODS: An evidence-based PA curriculum was implemented in a local preschool over 12-weeks, 3 times per week by classroom teachers with assistance provided by UVM students enrolled in a service-learning course. Main outcomes were objectively measured, MVPA by accelerometry. Measures were performed at baseline, 2 intervention points, and 1-week post-intervention. A total of 35 children (4-5 years, 12 females, 23 males) who had at least 3 days of valid data were included in the analyses. RESULTS: Significant (p<0.05) changes were observed in minutes of MVPA/day, sedentary minutes/hour and MVPA/hr. Minutes of MVPA/day significantly increased from pre- to post-intervention (36.5 ± 3.9 vs. 72.61±3.9). Significant increases were observed from baseline to both intervention point 1 and post-intervention (8.45±0.4 vs. 10.9±0.4, respectively). Sedentary time also significantly decreased from 43.42±6.0 min/hr at baseline to 40.61±5.0 min/hr at post-intervention. CONCLUSIONS: The findings from this study support a teacher-led intervention to increase MVPA in preschool-aged children. These findings are promising as teacher-led PA interventions may be a potentially viable and cost-effective means to accomplish a myriad of health-related goals. Further evaluation of the PA curriculum in a larger cohort and over a longer period of time is warranted.

3110 Board #15 June 2 3:30 PM - 5:00 PM Effectiveness Of A Low-cost Exercise Intervention For Pediatric Obesity Andrea M. Jacobo, Ryan G. Moran, Dana Kimberly, E Thomaseo Burton, Webb A. Smith. University of Tennessee, Memphis, TN.
Email: jacobo.andrea@gmail.com

Purpose
Regular physical activity improves health profiles and quality of life in youth with obesity (YWO), and participation in sport-specific events reportedly improves self-efficacy among youth with little athletic experience. This project retrospectively evaluated the feasibility and efficacy of an ongoing low-cost physical activity intervention to prepare YWO for an athletic event (5K run/walk).

Methods
The Healthy Lifestyle Clinic (HLC), a multidisciplinary weight management clinic at Le Bonheur Children’s Hospital, hosted a race team for a 5K run/walk event. HLC patients were offered a training program designed to be engaging, minimally burdensome for clinical staff, and focused on preparing exercise-naïve YWO to complete a 5K. Training included 3 weekly training sessions (20-45 minutes) with duration and intensity increased based on rating of perceived exertion. Participants completed workout logs and were invited to workouts in the community with HLC staff members. Weekly phone calls were made to monitor progress, engagement, and individualize the program. On average, phone calls lasted <10 minutes. Retrospective review of medical records and patient communications, was IRB approved.

Results
Initially 28 YWO expressed interest in the training program. Twelve YWO (11.4±2.6 yrs, 151.3±41.3 cm tall, 88.2±24.5 kg, 99.1±7.6 BMI %ile) actively engaged (reporting >70% adherence) with the training, and 6 participants completed...
the 5K race (all 1st time racers). Almost 60% of participants attended all community workouts and those who completed the 5K had greater parent engagement than those who did not. Similarly, those who engaged in more frequent phone contact were more engaged in the training program. More than 80% of families who participated requested the program become a recurring HLC offering, indicating a desire for more exercise interventions. Themes of improved physical appearance, self-worth, and athletic competence emerged from patient reports. All those who completed the race expressed likelihood of entering another race.

**CONCLUSIONS:** This program was feasible, minimally burdensome, and cost-effective. It had a positive effect on self-reported motivation, physical fitness, and self-efficacy. Parental involvement was a driving factor for program adherence and race completion.

### Tables

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Board #</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>3111</td>
<td>June 2:30 PM - 5:00 PM</td>
<td>Effects Of 5-week Summer School Program On Inflammatory Markers And Oxidative Stress In Female Adolescents</td>
</tr>
<tr>
<td>3112</td>
<td>June 2:30 PM - 5:00 PM</td>
<td>Different Exercise Doses On Fitness, Fatness And Inhibition Control Of Adolescents</td>
</tr>
<tr>
<td>3113</td>
<td>June 2:30 PM - 5:00 PM</td>
<td>Exercise Intensity and Sleep in Obese Youth Before, During and After Weight Management Camp</td>
</tr>
</tbody>
</table>

### Abstracts

**Purpose:** To study the effects of different dose of exercise training on cardiorespiratory fitness, body fat percentage and inhibition control of adolescents. **Methods:** A physical activity intervention program was conducted among 12–14 years’ adolescents. 78 students (38 boys) were recruited into the plan after the approval of parents and teachers. According to the classes, we divided the participants into 3 groups. They were low-dose (30min/d×20) or high-dose (60min/d×23) aerobic training (12wk, 5d/wk), or control condition (usual physical activity, n=24). The mean VO₂peak of control group was 38.78±10.10 in low-dose and 38.46±10.4 in high-dose. But the VO₂peak in control group was 34.98±10.03. There was no significant difference between low-dose and high-dose group. For girls, the decrease in body fat percentage in the high-dose physical training group, but not in the low-dose group, was significantly greater than that in the control group (F=3.94, P<0.05). But there were no significant changes in fatness values of boys from baseline to 3 months. After adjustment for the baseline value, there were no significant changes in inhibition control values from baseline to 3 months in any of the exercise groups vs. control group. **Conclusion:** Three months of 30 or 60 min/d aerobic training improved fitness, and demonstrated dose-response benefits on general adiposity for girls. However, the effects of exercise intervention on inhibition control for 12–14 aged students should do further research.

**Purpose:** To compare overall sleep time, sleep efficiency and exercise intensity of participants before, during and after a weight management camp for youth with obesity. **Methods:** Fifteen obese youth, ages 9 to 13 years, were recruited at an open house for an overnight weight management camp. Informed consent/assent was obtained. Subjects wore GENActiv accelerometers 24 hours/day for approximately one week before, during, and after camp. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), moderate (MPA) and vigorous (VPA), as well as total sleep time (TST) and sleep efficiency (EFF). The participants’ activity levels, and other subject characteristics were compared during the week of camp and weeks at home. **Results:** Complete usable data was obtained from 10 (67%) participants (6 boys, 4 girls). Mean age (±SD) was 11.7±1.2 years. Mean BMI was 32.25±5.1 kg/m². TST and EFF were significantly higher during the week of camp compared to weeks at home (TST: 328.38±63.20 minutes, p<0.0003) and more MPA (363.4±38.63, p=0.0001) and VPA (55.05±33.96, p=0.0055). There was no significant difference in TST between weeks. There was a significant difference in EFF between weeks (p=0.04), with the highest EFF occurring during camp (86.7%). Neither BMI nor age were correlated to TST or EFF. **Conclusion:** Obese youth exercise longer at higher intensities while participating in a summer weight management camp versus on their own at home. Sleep efficiency also improves while at camp. This suggests that accumulating more daily MVPA leads to improved sleep, and further studies are needed to more closely examine this relationship in obese youth.

**Purpose:** To compare overall sleep time, sleep efficiency and exercise intensity of participants before, during and after a weight management camp for youth with obesity. **Methods:** Fifteen obese youth, ages 9 to 13 years, were recruited at an open house for an overnight weight management camp. Informed consent/assent was obtained. Subjects wore GENActiv accelerometers 24 hours/day for approximately one week before, during, and after camp. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), moderate (MPA) and vigorous (VPA), as well as total sleep time (TST) and sleep efficiency (EFF). The participants’ activity levels, and other subject characteristics were compared during the week of camp and weeks at home. **Results:** Complete usable data was obtained from 10 (67%) participants (6 boys, 4 girls). Mean age (±SD) was 11.7±1.2 years. Mean BMI was 32.25±5.1 kg/m². TST and EFF were significantly higher during the week of camp compared to weeks at home (TST: 328.38±63.20 minutes, p<0.0003) and more MPA (363.4±38.63, p=0.0001) and VPA (55.05±33.96, p=0.0055). There was no significant difference in TST between weeks. There was a significant difference in EFF between weeks (p=0.04), with the highest EFF occurring during camp (86.7%). Neither BMI nor age were correlated to TST or EFF. **Conclusion:** Obese youth exercise longer at higher intensities while participating in a summer weight management camp versus on their own at home. Sleep efficiency also improves while at camp. This suggests that accumulating more daily MVPA leads to improved sleep, and further studies are needed to more closely examine this relationship in obese youth.

**Purpose:** To compare overall sleep time, sleep efficiency and exercise intensity of participants before, during and after a weight management camp for youth with obesity. **Methods:** Fifteen obese youth, ages 9 to 13 years, were recruited at an open house for an overnight weight management camp. Informed consent/assent was obtained. Subjects wore GENActiv accelerometers 24 hours/day for approximately one week before, during, and after camp. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), moderate (MPA) and vigorous (VPA), as well as total sleep time (TST) and sleep efficiency (EFF). The participants’ activity levels, and other subject characteristics were compared during the week of camp and weeks at home. **Results:** Complete usable data was obtained from 10 (67%) participants (6 boys, 4 girls). Mean age (±SD) was 11.7±1.2 years. Mean BMI was 32.25±5.1 kg/m². TST and EFF were significantly higher during the week of camp compared to weeks at home (TST: 328.38±63.20 minutes, p<0.0003) and more MPA (363.4±38.63, p=0.0001) and VPA (55.05±33.96, p=0.0055). There was no significant difference in TST between weeks. There was a significant difference in EFF between weeks (p=0.04), with the highest EFF occurring during camp (86.7%). Neither BMI nor age were correlated to TST or EFF. **Conclusion:** Obese youth exercise longer at higher intensities while participating in a summer weight management camp versus on their own at home. Sleep efficiency also improves while at camp. This suggests that accumulating more daily MVPA leads to improved sleep, and further studies are needed to more closely examine this relationship in obese youth.

**Purpose:** To compare overall sleep time, sleep efficiency and exercise intensity of participants before, during and after a weight management camp for youth with obesity. **Methods:** Fifteen obese youth, ages 9 to 13 years, were recruited at an open house for an overnight weight management camp. Informed consent/assent was obtained. Subjects wore GENActiv accelerometers 24 hours/day for approximately one week before, during, and after camp. Data were analyzed to determine the amount of time each participant spent in sedentary (SED), moderate (MPA) and vigorous (VPA), as well as total sleep time (TST) and sleep efficiency (EFF). The participants’ activity levels, and other subject characteristics were compared during the week of camp and weeks at home. **Results:** Complete usable data was obtained from 10 (67%) participants (6 boys, 4 girls). Mean age (±SD) was 11.7±1.2 years. Mean BMI was 32.25±5.1 kg/m². TST and EFF were significantly higher during the week of camp compared to weeks at home (TST: 328.38±63.20 minutes, p<0.0003) and more MPA (363.4±38.63, p=0.0001) and VPA (55.05±33.96, p=0.0055). There was no significant difference in TST between weeks. There was a significant difference in EFF between weeks (p=0.04), with the highest EFF occurring during camp (86.7%). Neither BMI nor age were correlated to TST or EFF. **Conclusion:** Obese youth exercise longer at higher intensities while participating in a summer weight management camp versus on their own at home. Sleep efficiency also improves while at camp. This suggests that accumulating more daily MVPA leads to improved sleep, and further studies are needed to more closely examine this relationship in obese youth.
to examine the benefits of a preschool PA intervention by utilizing longer intervention periods, additional bouts of academically-tailored PA, and more comprehensive measures of preschool cognitive skills.

Few studies have examined the impact of physical activity (PA) programs during the preschool day, with only two curriculum-based PA studies. PA has been shown to improve components of classroom behavior in preschoolers. Poor classroom behavior can be indicative of early attention-deficit/hyperactivity disorder (ADHD) symptomology, which is seen in children as young as three years old. However, no studies have examined curriculum-based PA to improve classroom behavior. PURPOSE: To examine the impact of a curriculum-based PA intervention on classroom behavior variables in preschoolers. METHODS: Children (n=52, mean±sd: age=3.6±0.8 years, BMI percentile=50±1.27) attending two preschools were randomized to the Preschool Activity, Diet, and Sleep (PADS) intervention or the health tracking (CON) group. PADS consisted of integrating PA lessons into the personal and social learning curriculum. The Strengths and Difficulties Questionnaire (SDQ) behavioral screening tool was used to assess classroom behavior which includes a total difficulties score and subscales encompassing hyperactivity/inattention, emotional problems, conduct problems, peer problems, and prosocial behavior. The SDQ was completed by classroom teachers for each child at baseline, 6 weeks, and 12 weeks. A repeated measures ANOVA was utilized to examine intervention effects on children’s classroom behavior variables. RESULTS: Children at the CON school exhibited greater hyperactivity/inattention (PADS=2.3±2.5, CON=4.1±3.5), emotional problems (PADS=3.0±6.0, CON=2.6±2.4), conduct problems (PADS=0.8±1.3, CON=2.9±3.2), peer problems (PADS=0.3±1.0, CON=1.2±1.4), and total difficulties (PADS=4.0±3.8, CON=10.9±6.0) at baseline compared to the PADS school. There were no statistically significant effects of time or intervention by time for classroom behavior variables. CONCLUSION: These data suggest a curriculum-based PA intervention did not lead to change in teacher-reported classroom behavior variables. Lack of intervention effect in this population could be due to lack of specificity of intervention components targeting classroom behavior. Future studies should incorporate cognitive skills linked to early ADHD symptomology in PA lessons, include objective behavior measures, and utilize a larger sample size.

A number of healthy eating determinants such as area deprivation, family involvement, knowledge, and attitudes are associated with obesity prevention in children. School-based interventions improved weight status, health knowledge, attitudes, and behaviors. PURPOSE: Therefore, the purpose of this study was to determine immediate and long-term changes in body mass index and psychosocial variables following a 10-week school-based lifestyle intervention designed to improve weight status in children. METHODS: One hundred and thirty eight participants (8.67 ± 0.51 years of age, 64 boys and 74 girls) took part in the study. All participants had height, weight, and psychosocial variables assessed at pre-intervention, post-intervention, and 6-months post-intervention. The Papil Questionnaire which measured healthy eating attitudes, knowledge and behaviors was used. A repeated measures study design was employed such that participants served as their own control and then completed a 10-week intervention consisting of healthy eating and physical activity education, physical activity, parental involvement, and behavior change. Changes in outcome measures within the group across time was assessed using a one-way repeated measures analysis of variance (RMANOVA) with adjustment for covariates where appropriate. RESULTS: Results from the RMANOVA revealed no significant within-group main effect for time. Subsequent analysis of the data indicated a significant within group effect of the intervention at different time points such that from pre-intervention to post-intervention, fruit attitudes (CI = -0.20 to -0.02, ES = -0.26, p = 0.02), vegetable attitudes (CI = -0.081 to -0.009, ES = -0.34, p = 0.005), and healthy eating attitudes (CI = -0.42 to -0.02, ES = -0.29, p = 0.006) improved. From post-intervention to 6-months, vegetable attitudes approached a significant decrease (CI = -2.53 to -5 to 0.07, ES = -0.13, p = 0.02) and HVE attitudes decreased (CI = 0.005 to 0.19, ES = 0.26, p = 0.03). CONCLUSION: Fit for School may be an effective means for improving healthy eating attitudes and behaviors in primary school children in the short-term if the duration of the intervention is increased, but these changes may not be sustained without on-going support.

ACSM May 30 – June 3, 2017
Denver, Colorado
Purpose: Active Video Game (AVG) has potential in increasing children’s physical activity participation. However, it is not clear whether AVG can help improve individuals’ health-related physical fitness. The purpose of this study was to examine the effectiveness of Sports, Play, and Active Recreation for Kids (SPARK) and AVG on children’s health-related fitness.

Methods: A total of 63 third and fourth graders participated in the study. The third graders (n = 29, 10 for boys) experienced the SPARK curriculum taught by a student teacher while the fourth graders (n = 34, 14 for boys) engaged in the AVG group practicing XBOX Kinect™ dance games. All participants completed three, 50-minute exercise sessions per week for six weeks. Health-related fitness was measured using FitnessGram including 15-meter PACER test, curl-ups, and push-ups tests prior to and immediately after the intervention. A one-way MANOVA with repeated measures by controlling for BMI and gender was conducted to assess the effects of time and interventions on fitness variables.

Results: No group difference in the pre-tests was found. There is a significant effect of time (F (14, 2, p < 0.01; n² = 0.70) and the interaction between time and intervention groups on the performance of the PACER test (F (22, 2, p < 0.001, n² = 0.56). The participants in both groups increased their PACER test scores with the AVG group demonstrating significantly higher improvement than the SPARK group. No time or intervention effects were found on the muscular strength and endurance tests.

Conclusion: AVG using XBOX Kinect™ seems to be effective in improving children’s aerobic fitness performance. Schools can use AVG as an alternative way to traditional physical activities for children to receive health benefits.

3119  Board #24  June 2 3:30 PM - 5:00 PM  Examining The Effectiveness Of Spark And Active Video Games On Children’S Health-related Physical Fitness
Han Chen1, Haichun Sun2, Eugene Asola1, Lauren Griner1, 1Valdosta State University, Valdosta, GA; 2University of South Florida, Tampa, FL.
Email: hanchen1@valdosta.edu

Purpose: To determine the differences in time spent in two outdoor environments (playground and garden) in preschool children. METHODS: Ten children (4.7 ± 0.6 years) enrolled in a university laboratory preschool participated in this study. PA was assessed using an ActiGraph GT3X+ accelerometer that was worn on the right hip. Each child completed four randomly ordered free living conditions (30 min each), which included two bouts of unstructured PA on the playground and two bouts of semi-structured PA in the garden. Accelerometer data were classified into different minutes in sedentary behavior and combined PA of varying intensities (light, moderate, and vigorous) using the Pate cut points. Data were combined to make one 60 min bout for each environment. Sessions were combined in order to determine the number of minutes per hour spent in sedentary and PA. This variable is consistent with the Institute of Medicine (IOM) recommendation of 15 minutes of PA per hour in order to determine whether these types of outdoor activity are supportive of meeting PA goals. Paired samples T-Tests were conducted to look at differences in PA (min/hour) between the playground and garden. RESULTS: On average, the children spent 35.8 min/hour in PA on the playground and 29.0 min/hour PA on the garden. The children spent less time in sedentary behaviors (24.2±6.8 vs. 31.0±8.4 min/hour; p=0.025) and more time in moderate PA (15.3±5.1 vs. 10.8±6.1 min/hour; p=0.034) on the playground than in the garden. There were no differences in light (18.0±2.4 vs. 17.0±3.4 min/hour; p=0.365) or vigorous PA (2.6±1.2 vs. 1.2±1.9 min/hour; p=0.131) between the playground and the garden. CONCLUSIONS: Children spent less time being sedentary and more time in moderate PA on the playground than the garden. However, the children exceeded IOM activity guidelines in both environments. These results suggest that gardens may be a conducive environment to provide an opportunity for children to meet PA recommendations.

3120  Board #25  June 2 3:30 PM - 5:00 PM  Establishing Classification Criteria for an Energy Balance Knowledge Test for Fourth and Fifth Grade Children
Yang Liu, Senlin Chen. Iowa State University, Ames, IA.
Email: yliu1@iastate.edu

Purpose: To develop criteria to determine the knowledge levels.

Methods: Six Iowa schools participated in this study, with 570 children completing the pre-test and 587 completed the post-test. An obesity prevention program was implemented between the two assessments. Data were screened for outliers and examined for normal distribution. Cluster analysis was conducted to establish three levels of energy balance knowledge: high, moderate, and low. ANOVA was implemented between the two assessments. Data were screened for outliers and examined for normal distribution. Cluster analysis was conducted to establish three levels of energy balance knowledge: high, moderate, and low. ANOVA was implemented between the two assessments.

Results: No group difference in the pre-tests was found. There is a significant effect of time (F (14, 2, p < 0.01; n² = 0.70) and the interaction between time and intervention groups on the performance of the PACER test (F (22, 2, p < 0.001, n² = 0.56). The participants in both groups increased their PACER test scores with the AVG group demonstrating significantly higher improvement than the SPARK group. No time or intervention effects were found on the muscular strength and endurance tests.

Conclusion: AVG using XBOX Kinect™ seems to be effective in improving children’s aerobic fitness performance. Schools can use AVG as an alternative way to traditional physical activities for children to receive health benefits.

3122  Board #27  June 2 3:30 PM - 5:00 PM  Physiological Change During a 13-Week Aerobic Dance Class Among College Age Women
Stephanie M. Otto. Gustavus Adolphus College, St. Peter, MN.
(Sponsor: Robert Pettitt, FACSM)
Email: sottoto@stgust.edu

Purpose: To evaluate the physiological changes in female college students during an 13-week aerobic dance class.

Methods: Thirty one women with an average age of 20.53 (±1.11) years participated. Participants were enrolled in either a 13-week aerobic dance fitness (FIT) course (n = 19) or a non-fitness course, which served as the control group (n = 12). Pre-test assessments were completed during the first week of class. To be included in the study, participants must not have been absent for more than two days during the semester. RESULTS: Paired sample t-test statistics were conducted to determine significant changes in each group (p < 0.05). A significant decrease in rSBP (-4.63 9.11 mm/hg) was observed in the FIT group (p = 2.22, p = 0.041). Significant increases in HR (0.83 1.51 inches) as well as ABcurl (9.05 14.50) performance (r = 0.73) were observed in the non-fitness group. The study was supported by the Society of Health and Physical Educators, United States of Agriculture, and Iowa State University College of Human Sciences.
3.29, p = .028; r = -.72, p = .014) respectively. No significant change was seen in the control group. However, when a Repeated Measures ANOVA analysis was conducted, all significant differences were found. This was likely due to the large standard deviations and non-normal distribution of the sample data. CONCLUSION: During a 13-week aerobic dance course, this study was unable to find statistically significant differences in a variety of physiological variables among a group of college age women when compared to a control group. More research is needed to determine if a larger sample size might uncover significant changes and whether these changes are sustained among this group. IRB#: 1415-0009

3123 Board #28
June 2 3:30 PM - 5:00 PM
Effects of Hypoxic/Altitude Training on Bone Health in Obese Adolescents under Weight Loss
Lianshi Feng, Huan Gao, Li Zhang, Jianfang Xu, Yingli Lu. China Institute of Sport Science, Beijing, China. (Sponsor: Tongjian You, FACSM)
Email: fengls98@126.com

(Purpose) To explore the effects of short-term stimulated hypoxic training or altitude training on body weight, bone mineral content (BMC), bone mineral density (BMD) and bone area (BA) in obese adolescents undergoing dietary weight loss.

Methods: Forty seven healthy obese adolescents (BMI=30.82±35.93 kg/m²) were included in this study. The interventions lasted for four weeks. The group (PG, n=18) lived in nomobaric hypoxia 8~10 hours every night and trained 2 hours in hypoxia and 3 hours in normoxia every day. All groups underwent dietary restriction and the energy intake ranged from 1322 to 2081 kcal/day. Heart rate was monitored every ten minutes during exercise to ensure that the intensity was in the target range, which was 40% of the heart rate reserve and determined by the Karvonen equation. BMC, BMD and BA were measured by dual x-ray absorptiometry before and after intervention. A three (PG, AG and HG) by two (Pre and Post) analysis of variance (ANOVA) was used for statistical analysis.

Results: Body weight decreased significantly after four weeks in all three groups (all p<0.05). There were significantly more weight reductions in the HG and PG groups than in the AG group (10.18% and 9.34% vs. 7.56%, both p<0.05). There was no significant group difference between the HG and PG groups. Total BMC increased significantly in the PG group (p<0.05) but not in the HG and AG groups. There were no significant group differences in changes of BMC. Total BMD increased significantly in all 3 groups (all p<0.05), but no significant group differences were seen on the BMD changes. Total BA did not change over the 4-week intervention in all groups.

Conclusions: Four weeks of diet plus training, diet plus stimulated hypoxic training and diet plus altitude training resulted in weight loss and improvements in bone health. Future studies are needed to identify the health benefits of hypoxic/altitude training for this population. (Supported by NSFC 31471139 and CISSRF 16-18)

3124 Board #29
June 2 3:30 PM - 5:00 PM
A New Racket Sport That Provokes Similar Heart Rate As Soccer And Basketball In Children
Juan C. Colado1, Alvaro Juesas1, Fatima Campaña1, Faccio Giulia1, Alejandro bruñó2, Juan F. Lisión3, Rosa M. Baños3, Victor Tellá4, Michael E. Rogers, FACSM3. 1University of Valencia, Valencia, Spain. 2Cardenal Herrera University, Valencia, Spain. 3Wichita State University, Wichita, KS. (Sponsor: Michael E. Rogers, FACSM)
Email: Juan.Colado@uv.es

(Purpose) To explore the effects of short-term stimulated hypoxic training or altitude training on body weight, bone mineral content (BMC), bone mineral density (BMD) and bone area (BA) in obese adolescents undergoing dietary weight loss.

Methods: Forty seven healthy obese adolescents (BMI=30.82±35.93 kg/m²) were included in this study. The interventions lasted for four weeks. The group (PG, n=18) lived in nomobaric hypoxia 8~10 hours every night and trained 2 hours in hypoxia and 3 hours in normoxia every day. All groups underwent dietary restriction and the energy intake ranged from 1322 to 2081 kcal/day. Heart rate was monitored every ten minutes during exercise to ensure that the intensity was in the target range, which was 40% of the heart rate reserve and determined by the Karvonen equation. BMC, BMD and BA were measured by dual x-ray absorptiometry before and after intervention. A three (PG, AG and HG) by two (Pre and Post) analysis of variance (ANOVA) was used for statistical analysis.

Results: Body weight decreased significantly after four weeks in all three groups (all p<0.05). There were significantly more weight reductions in the HG and PG groups than in the AG group (10.18% and 9.34% vs. 7.56%, both p<0.05). There was no significant group difference between the HG and PG groups. Total BMC increased significantly in the PG group (p<0.05) but not in the HG and AG groups. There were no significant group differences in changes of BMC. Total BMD increased significantly in all 3 groups (all p<0.05), but no significant group differences were seen on the BMD changes. Total BA did not change over the 4-week intervention in all groups.

Conclusions: Four weeks of diet plus training, diet plus stimulated hypoxic training and diet plus altitude training resulted in weight loss and improvements in bone health. Future studies are needed to identify the health benefits of hypoxic/altitude training for this population. (Supported by NSFC 31471139 and CISSRF 16-18)

Physical inactivity often increases during childhood as does the risk for early-onset of lifestyle-related diseases. The development of new sports, if deemed to be of sufficient interest, may attract children who are not participating in traditional sports. In addition, SP can be played in a smaller area that makes it more appealing to SP. However, SP is a new sport that appears to provide heart rate responses within the healthy threshold of intensity for children so it could be a good alternative to traditional sports. In addition, SP can be played in a smaller area that makes it more appealing to children when compared to traditional sports. In addition, SP can be played in a smaller area that makes it more appealing to children when compared to traditional sports.

CONCLUSION: SCP and BK both elicit slightly higher HRP compared to SP. However, SP is a new sport that appears to provide heart rate responses within the healthy threshold of intensity for children so it could be a good alternative to traditional sports.

() No relationships reported

3125 Board #30
June 2 3:30 PM - 5:00 PM
Can a Parental Modeling Physical Activity Intervention Improve Physical Activity and Body Composition in Adults and Young Children
Katarina D. DuBose, FACSM, Deirdre Dlugonski, Kelli Soos. East Carolina University, Greenville, NC.
Email: dubosek@ecu.edu

(Purpose) This study examined the impact of an 8-week parental modeling physical activity (PA) intervention on parent and child PA and body composition.

Methods: Twenty-six parents participated in an 8-week PA intervention with their 1 - 5 year old child. The adults were randomly placed into an intervention (n=19) or control (n=7) group. The intervention group received weekly phone calls with a coach. The coach discussed strategies to change parent and child PA. PA (activity monitor) and body composition (height, weight, and circumferences) were assessed before and after the intervention. Body mass index (BMI) and BMI z-scores were calculated. Time spent in sedentary behavior, light, moderate, and vigorous PA was determined using cut points by, Freedson et al. (adult), Trost et al. (1 - 2 year old children), and Butte et al. (3 - 5 year old children). Data analyses were conducted using the intention-to-treat method. A series of 2 (group: control/intervention) X 2 (time: pre/post) ANCOVAs were run to examine the effect of the intervention on PA levels on the parents and children adjusting for weight at baseline. A series of 2 (group: control/intervention) X 2 (time: pre/post) ANCOVAs were run to examine the effect of the intervention on body composition (weight, BMI, waist circumference) in the parents and children (BMI z-score). Effect sizes (ES) were calculated and significance was set at p<0.05.

Results: Among the parents, group, time, and interaction effects were non-significant for PA levels, weight, BMI, and waist circumference (p>0.05). ES indicated the intervention group had medium reductions in sedentary behavior (-.57) and increases in vigorous PA (.65), whereas controls had small reductions in sedentary behavior (-.14) and medium reductions in vigorous PA (-.76). Regarding the children’s data, the PA levels and BMI z-scores were similar by group and time (p>0.05). Small decreases in sedentary behavior (-.18), light (-.21), and mod (-.11) PA were observed in the post group ANCOVAs were run to examine the effect of the intervention on body composition (weight, BMI, waist circumference) in the parents and children (BMI z-score). Effect sizes (ES) were calculated and significance was set at p<0.05.

Conclusions: A parental modeling PA intervention may have positive effects on parent’s and children’s PA levels. Supported by: Research/Creative Activity Award, East Carolina University

3126 Board #31
June 2 3:30 PM - 5:00 PM
The Effects of Different Exercise on Chronic Inflammatory Markers in Obese Youth
XU JIANFANG, ZHANG LI, FENG LIANSHI, LU YINGLI. CHINA INSTITUTE OF SPORT SCIENCE, BEIJING, China.
Email: xujianfang@cisss.cn

(Purpose) With the increasing number of overweight and obese individuals around the world, it is not only a mental stress to the one who is overweight or obese, but also economic and social burden to the society. It is known to us that the obesity is a chronic inflammatory status, so the aim of this research is aimed to discuss the effects of aerobic and resistance exercise on chronic inflammatory in obese youth by testing some key chronic inflammatory markers.

Methods: With the diet controlling, 37 volunteers (male-18, female-19) were divided into 2 groups, such as the aerobic exercise (AE, with the intensity of 30%-40% heart rate reserve) and resistance exercise (RE, with the intensity of 80%-90% heart rate for 1 hour per day for 4 weeks, 6 days/week for aerobics and 4 days/week for acrobics) group (male-10, female-10, 21±1.0±2.0 years, BMI=30.28±2.17) and resistance exercise (RE, with intensity of 80%-90% heart rate for 1 hour per day for 4 weeks, 6 days/week by resistance exercise) group (male-8, female-9, 21±1.1±1.6 years, BMI=30.10±1.23). The exercise lasted for 4 weeks and there had three times to take the venous blood samples of the volunteers to test the contents of TNF-α and IL-6 by using ELISA AE the beginning, 4 weeks later and 8 weeks later (the last 4 weeks without diet controlling and exercise).

Results: The body weight of AE and RE groups decreased significantly after 4 weeks, and it maintained AE a low level after 8 weeks (AE: 92.13±13.68 kg to
84.08±11.90 kg, then to 83.86±11.59 kg, RE: 86.68±13.91 kg to 79.79±11.82 kg (p<0.01) then to 79.72±12.66 kg). In addition, the body fat rate of the subjects also has the same tendency as the body weight (AE: 38.71±5.79% to 34.21±6.91%; p<0.01), then to 33.09±7.42%; RE: 38.84±5.54% to 34.65±6.51%, p<0.01, then to 33.99±7.33%.

The level of TNF-a decreased significantly after 8 weeks in both groups (AE: 16.29±2.55 mg/ml to 14.93±2.84 mg/ml, RE: 16.60±2.22 mg/ml to 14.13±1.82 mg/ml; p=0.05). The contents of IL-6 decreased significantly after 4 weeks, but increased after 8 weeks.

CONCLUSIONS: Both aerobic and resistance exercise are helpful to lose weight by reducing the body fat. And the chronic inflammatory of the body is inhibited after 4 weeks aerobic and resistance exercise by decreasing the level of TNF-a and IL-6.

3128 Board #33
June 2 3:30 PM - 5:00 PM
High-Intensity Circuit-training Improves Physical Capacity And Cardiometabolic Risk Factors In Overweight Adolescents
Daniel Gonçalves1, Joaquin Fontoura2, Cristina Schmidt3, Maria João Neuparth1, Carolina Canotilho1, Melissa Fothergill4, Pamela L. Graham5, Scott Lloyd1. 1Leeds Beckett University, Leeds, United Kingdom. 2Northumbria University, Newcastle upon Tyne, United Kingdom. 3Redcar and Cleveland Borough Council, Redcar, United Kingdom. Email: daniel.morris@leedsbeckett.ac.uk

Introduction: Despite the well-known benefits of exercise training of moderate intensity for improving cardiometabolic health in overweight adolescents, it remains to be determined the extent of benefits provided by high intensity exercise.

Purpose: to evaluate how much a high-intensity circuit-training (HICT) program would change health related fitness and cardiometabolic risk factors in overweight adolescents.

Material and Methods: 18 students (age 16±0.9 yrs and BMI 28.2±0.26) were submitted to HICT program (3 days/week, 1 hour/session, for 9 weeks in their school facilities). Before and after the HICT program, anthropometrics and body composition [body weight (BW), waist circumference (WC), and fat mass (FM) and free fat mass (FFM)], physical fitness (Fittnessgram), blood pressure (during biochemical analysis) (Glucose (Gluc), low density lipoprotein-cholesterol (LDL-C), triglycerides (TG), alanine aminotransferase (ALT) and aspartate transaminase (AST)) were assessed.

RESULTS: HICT induced significant reductions in BW (77.15±13.01 vs. 75.96±12.35 Kg), WC (93.10±10.43 vs. 90.31±11.66 cm), FM (27.80±6.61 vs. 24.64±6.29 Kg) and an increase in FFM (49.37±9.33 vs. 51.33±9.29 Kg) (p<0.001). Both systolic (128.72±7.7 vs. 117.7±2.6 mmHg) and diastolic (66.4±7.8 vs. 62.4±4.4 mmHg) blood pressure were also significantly reduced (p<0.001). Regarding physical fitness, the HICT resulted in a significant improvement in the curl-up (38.1±2.6 vs. 59.5±2.9 rep), push-up (9.7±6.9 vs. 16.0±6.4 rep), horizontal jump (131.3±25.3 vs. 141.1±28.9 cm) and 20m shuttle run test (29.1±11.9 vs. 38.9±6.4 laps) (p<0.001). Finally, Gluc (85.9±12.4 vs. 76.8±12.3 mg/dL), LDL-C (151.7±25.8 vs. 93.1±27.8 mg/dL), TG (66.5±21.4 vs. 62.3±23.5 mg/dL), ALT (18.1±5.5 vs. 12.0±4.1 U/L) and AST (18.0±6.5 vs. 13.9±3.1 U/L) were all significantly reduced (p<0.001) after the HICT program.

Conclusion: Our results support the evidence that a short-term high-intensity circuit-training program improves physical fitness and modulate positively physiological health markers in overweight adolescents.

FUNDING: CIAFEL: European Regional Development Fund through the Operational Competitiveness Programme and CTF (UD/TDP/00617/2013).

Moreira-Gonçalves, D. C. FST (SRH/BPD/90010/2012).

Schmidt, C: CAPES (BEX 0554.14-6).

3130 Board #35
June 2 3:30 PM - 5:00 PM
The Influence Of Contextual Factors On Recess Physical Activity Among Elementary School Children
Gabriella M. Mcloughlin, Alicia Covello, Caitlyn Edwards, Nicholas Baumgartner, Morgan Curran, Toni Burkharter, Kim Graber, Amanda M. Woods, Naiman Khan. University of Illinois, Urbana, IL. Email: gmc1oug2@illinois.edu

PURPOSE: Childhood obesity remains a major public health concern in the United States. Physical activity (PA) opportunities, particularly within the school day, can prove particularly potent in attenuating childhood obesity etiology. Given the rapid decline in physical education in elementary schools, school recess has increasingly become a vital unstructured time during the school day that may facilitate positive behavior change and maximize opportunities for PA. However, the child characteristics and contextual/environmental factors that may influence engagement in PA during recess are unclear. Therefore, the aims of the present study were: (1) assess the...
relationship between sex, weight status, and PA during recess; and (2) determine the influence of recess duration (15min vs. 30min) and timing (i.e., before lunch vs. after lunch) on recreational adjustment of individual factors.

METHODS: Children in fourth and fifth grade (N=151, 91 females) were recruited from two public suburban schools in the Midwest. PA during recess was measured using accelerometry (ActiGraph GT3X+) over five days. Height and weight measurements were used to determine BMI (kg/m²). Recess was offered either prior to or immediately following lunch in each school, two 15 minute periods. RESULTS: A negative relationship was found between BMI and vigorous PA (r = -0.207, p<0.05). Significant interaction effects for sex and BMI were found in the average MVPA during 30-minute period using a structured program designed for achieving moderate-to-vigorous physical activity (MVPA) for children. For the afterschool time has been identified as an important opportunity to achieve MVPA. In contrast, for children in the shorter recess group, MVPA was significantly lower when recess was scheduled after lunch rather than beforehand. These interactions persisted even after adjusting for sex and BMI. CONCLUSION: These findings reveal that individual and contextual factors such as recess timing and duration may influence the level of activity during recess; longer recess periods may yield greater MVPA outcomes when scheduled after lunch. Future experimental research is warranted to determine whether modification of these variables improves children’s PA in the school setting.

### RESULTS

Children in the parent-support group had significantly lower height, weight, BMI, waist circumference, WHR and screen time compared to parent-non-support group (p <0.05). Compared to the children in parent-support group, the children in parent-non-support group had a significantly higher proportion of obesity (p=0.6), proportion of finding exercise partner was 11.8% lower (p<0.05). The proportion of children who don’t do exercise without partner was also significantly higher in parent-non-support group. CONCLUSIONS: Parental support is an important factor which affects children obesity status and physical activity. More importantly, the parents’ obesity prevalence will affect whether they support their children to exercise or not. Our results suggest that parental participation and parental weight management may be included in the strategy of children obesity prevention.

### RESULTS

Physical activity self-efficacy has been considered as an important correlate of physical activity behaviors. However, evidence on association between physical activity-related self-efficacy with different domains and physical activity engagement is still limited. PURPOSE: To investigate the association between physical activity self-efficacy for learning efficiency, physical fitness, psychological functioning, and overall health status and physical activity engagement in college students. METHODS: This cross-sectional study was comprised of 1,836 college students (1,138 males, 698 females) in China. Physical activity engagement and physical activity self-efficacy were assessed by a self-administered questionnaire. For physical activity engagement assessment, the duration of physical activity in each physical activity participation was divided into four categories as follows: <20, 20−40, 40−60, and >60 minutes; and the frequency of physical activity was divided into six categories as follows: 0, 1, 2, 3, 4, and >5 times/week. Furthermore, physical activity self-efficacy for learning efficiency, physical fitness, psychological functioning, and overall health status was evaluated by five scales (1−5) from “not effective” to “effective”. Higher scores indicate higher levels of physical activity self-efficacy. The association between physical activity self-efficacy and physical activity engagement was examined using chi-squared test. RESULTS: In male students, participants with higher physical activity self-efficacy for learning efficiency (P for trend = 0.006), physical fitness (P for trend = 0.006), psychological functioning (P for trend < 0.001), and overall health status (P for trend = 0.023) tended to have higher physical activity engagement. These findings were also observed in association between physical activity self-efficacy and duration of physical activity engagement (P for trend < 0.05 for all). Similarly, physical activity self-efficacy was also significantly associated with physical activity engagement in female students. CONCLUSION: This study indicates that higher physical activity engagement was associated with higher physical activity engagement in Chinese college students. Prospective studies are warranted to confirm these findings.

### RESULTS

An increasing number of young adults with physically vulnerable conditions are entering college each year (Maslow et al. 2011). Since only 50.4% of college students meet the physical activity (PA) recommendation, it is essential to find out the differences of college students who are healthy and who are vulnerable.

### RESULTS

For trend (P = 0.006), physical fitness (P = 0.006), psychological functioning (P < 0.001), and overall health status (P = 0.023) tended to have higher physical activity engagement. These findings were also observed in association between physical activity self-efficacy and duration of physical activity engagement (P for trend < 0.05 for all). Similarly, physical activity self-efficacy was also significantly associated with physical activity engagement in female students. CONCLUSION: This study indicates that higher physical activity engagement was associated with higher physical activity engagement in Chinese college students. Prospective studies are warranted to confirm these findings.
RESULTS: A descriptive discriminant analysis (Hubery, 1994) revealed that the four subgroups (gender x group) differences accounted for 19% of the variance among the eight variables, whereas differences in self-perception group were significantly different from the other three subgroups. Among these, intensity (88.9%) and time (27%) in PA behaviors, and intention (15.4%) and attitude (4.7%) in psychosocial perceptions emerged as the promising dominant contributors to the group differences.

CONCLUSIONS: Consistently with previous studies, males in healthy group more likely participate in intensive PA and persist longer than other subgroups, and they have more positive attitude and intention to engage in PA. Colleges need to focus on PA interventions among females on both conditions and males with vulnerable conditions.

3135 Board #40 June 2 3:30 PM - 5:00 PM Using Theory of Planned Behavior to Examine Chinese Adolescents’ Moderate and Vigorous Physical Activities
Hongxin Li1, Tao Zhang2, Tsz Lun Chu1, Gene Lee Farren1, Zhendong Zhang1. 1University of North Texas, Denton, TX. 2Zhejiang University, Zhejiangou, China. Email: Hongxin.Li@unt.edu (No relationships reported)

In China, academic excellence is often considered the most important indicator of success in adolescents, while physical activity (PA) is often discouraged because it drains energy and gains time away from academic study (Yu et al., 2006). However, recent research has indicated vigorous PA (VPA) rather than moderate PA (MPA), emerges as the significant predictor of cardiovascular health, as well as a protective factor against mental health complaints (Gerber et al., 2014). The theory of planned behavior (TPB; Ajzen, 1985) is a prominent theoretical model that examines the antecedents (i.e., attitude, subjective norm, perceived behavioral control, and behavioral intention) of planned behaviors such as PA. As such, research has indicated higher VPA demonstrated higher behavioral intention, while higher MPA demonstrated lower behavioral intention in Western cultures (Rhodes & de Brujin, 2010). PURPOSE: To test the measurement and structural parameters of the TPB among a sample of Chinese adolescents in a MPA and a VPA context. METHODS: Participants were 219 ninth grade students (53% female, M = 16.33 ± .55) from three high schools in Zhengzhou, China. Participants completed validated questionnaires that assessed their attitudes, subjective norms, perceived behavioral control, behavioral intention, and self-reported MPA and VPA behaviors. RESULTS: Correlation analyses revealed a pattern of positive relationships among the study variables. Confirmatory factor analyses and structural equation models revealed good-fitting models within both the MPA model (χ² [84] = 180.77, p < .01, CFI = .94, RMSEA = .07, SRMR = .06) and VPA model (χ² [84] = 189.37, p < .01, CFI = .93, RMSEA = .08, SRMR = .06). Standardized path coefficients indicated attitude (γ = .15), subjective norm (γ = .18), and perceived behavioral control (γ = .46) were significantly positively associated with behavioral intention (p < .01). In addition, standardized path coefficients indicated behavioral intention was significantly positively associated with VPA (β = .23, p < .01), but not MPA (β = .04, p = .55). CONCLUSION: This study further supported the heightened relationship between behavioral intention and VPA in Chinese adolescents. Thus, the findings highlighted the importance of enhancing TPB constructs to foster VPA in Chinese adolescents.

3136 Board #41 June 2 3:30 PM - 5:00 PM The Effects of Resistance Training Programs on the Physical Self-Perceptions of College Females
Kelsey L. Zachman, James Whitehead, FACSM, John Fitzgerald, Jesse Rhoades. University of North Dakota, Grand Forks, ND. (Sponsor: James Whitehead, FACSM) (No relationships reported)

While it is generally accepted that exercise enhances physical self-perceptions (PSPs), the impact of resistance training programs on females’ self-perceptions is unclear. Because exercise is an important public health behavior, and because PSPs have motivational associations, research on this topic may have important implications for exercise promotion. PURPOSE: To investigate the effects of two different types of resistance training programs on the PSPs of college age females. METHODS: College students with no background in resistance training (n = 20) were randomized to a moderate intensity strength training (MISTR) program (MEN = 10) or a moderate endurance training group. A comparison (COM) group (n = 10) was recruited from inactive college students. The resistance training groups followed strength- or endurance-oriented progressive resistance training programs for nine weeks. Participants completed the Physical Self-Perception Profile (PSPP) pre- and post-intervention. Height, weight, skinfolds and circumference measurements were also taken pre and post. RESULTS: Analyses utilized ANCOVAs followed by Bonferroni-adjusted (p set at < .017) pairwise comparisons. The only physical change was a significant reduction in the sum of skinfolds in the MSTR group (p = 0.013). Analyses of PSPP changes showed significant effects for MSTR on the physical condition subscale (p = 0.004), and on the strength competence subscale (p = 0.015) and a near-significant effect on the attractive body adequacy subscale (p = 0.018) that may be practically significant.

CONCLUSION: Strength-oriented resistance training produced improvements in some aspects of college females’ physical self-perceptions.

3137 Board #42 June 2 3:30 PM - 5:00 PM Family Factors Associated with Physical Activity and Sedentary Time in Children Living in Puerto Rico
Mario A. Muñoz1, Scott E. Crouter, FACSM. 1University of Massachusetts Boston, Boston, MA. 2The University of Tennessee, Knoxville, TN. Email: mario.munoz@umb.edu (No relationships reported)

PURPOSE: The purpose of this study was to examine associations among parental perceptions of their children’s skills and participation in physical activity (PA) and parental intentions of changing health behaviors with objectively measured PA in Puerto Rican children. METHODS: Seventy-three children (mean±SD; age, 8.9±1.3 yrs; BMI 33.1±10.4 kg/m²) wore an Actigraph GT3X accelerometer on their right hip for seven days to estimate time spent in sedentary behaviors (SB), light (LPA) and moderate-to-vigorous (MVPA) PA, and total activity counts for the vertical axis (TAC_v) and vector magnitude (TAC_vm). Children also completed a motor proficiency test (MPT), a sit-up test (SUT), and sum of skinfolds (SOS) from two sites (triceps and sub-scapular) were obtained. Parents completed questions on their perceptions (PP) of their child’s abilities and parental intentions (PI) to modify family health related behaviors. Partial correlations, controlling for accelerometer wear time, were used to examine relationships between PP, PI, MPT, SOS and SUT, with time spent in SB, LPA, MVPA, and TAC_v and TAC_vm. RESULTS: Significant differences were found between boys and girls for time spent in SB (239.3±74.6 vs. 296.2±128.4, respectively, p = 0.024), and MVPA (126.4±40.7 vs. 85.7±42.3, respectively, p < 0.001). In girls, PP of child’s speed while running was associated with TAC_v (r=0.43) and TAC_vm (r=0.39, p<0.05). PP of how eating behaviors of the family influence eating habits of their children was correlated with SB (r=0.43), MVPA (r=0.41), TAC_v (r=0.50), and TAC_vm (r=0.52; all p<0.01). PI of limiting the amount of sweetened beverages was correlated with SB(r=0.47) and TAC_vm(r=0.37, all p<0.05). In boys, MVPA and TAC_v was negatively correlated with SOS (r=-0.38 and 0.35, respectively, p<0.01). MVPA was positively correlated with PI to engage in 30-min of PA at least 5 days (r=0.36, p<0.05). TAC_vm was positively correlated with parental report of age that their child first walked without support (r=0.36, p<0.05). CONCLUSIONS: Several modifiable factors related to PP and PI are related to time spent in SB and PA in Puerto Rican children. Parents with intentions to positively make changes in behaviors could affect positively impact time spent in PA.

3138 Board #43 June 2 3:30 PM - 5:00 PM Physical Activity Level Increased Follow Up Health Educational Program In Overweight And Obese Children: Pilot Study
Suliane B. Rauber1, Henrique Lima Ribeiro1, Alcyane Marinho2, Bibiano Madrid1, Joyce Bomfim Vicente1, Carmen Silvia Grubert Campbell1. 1Universidade Católica de Brasília, Águas Claras, Brazil. 2Universidade do Estado de Santa Catarina (UDESC), Santa Catarina, Brazil. 3Universidade Paulista (UNIP, Brasília, Brazil. (No relationships reported)

PURPOSE: This study aimed to investigate the impact of a Health Educational Program for Children at 5 days of Camp and 12weeks follow up on the physical activity level (PAL) and sedentary behaviour (SB) in overweight and obesity children. METHODS: The Health Educational Program In Overweight And Obese Children (HEPchild) designed for children who are overweight or obese and was divided into two phases: The first phase (PHASE 1) consisted of pre assessments and five-day camp (CAMP); and PHASE 2 corresponded to the 3 months follow-up, and a post follow-up assessments. Thus, the sample that attended the PHASE 1 was 20 children (9.4 ± 1 years; 9 boys; 10.2 ± 0.9 years; 11 girls; 9.2 ± 1.3 years), 5-days summer camp on a campus to develop educational, with interdisciplinary team (Physical Educator, Endocrinologist, Psychologist, Educator and Nutritionist). The Phase 2 children and family’s were followed for 3 months (a weekly meeting for two hours in a total of 12 meetings). The end of the study composed by 12 children (8 girls and 4 boys, 9.4 ± 0.96 years), who completed 75% of the meetings. To check the PAL and the SB was applied the questionnaire proposed by Militão et al. (2013) and analyzed physical activity level at sports, in leisure time during the week, level in leisure time during weekend, moving to and at school, sedentary behavior during the week and weekend. RESULTS: At FO 25% of children remained more active (> 1500 and <3000METs per week) in comparison to before CAMP; In contrast the amount of sedentary children (<600METs/week) decreased by 15% and the insufficiently active (600 at 1500METs per week) increased by 15%. No child was classified as very active (> 3000METs per week) in any time. The PAL leisure time during the week and during the weekend significant...
increase, 26.06% and 14.1%, respectively, when comparing to pre-CAMP and 12 weeks of follow-up. SB during the week and the weekend showed a significant mean reduction of 177.14 and 177.14 min/week, respectively.

**CONCLUSIONS:** The Health Educational Program for Children contributed to the increase in physical activity level and reduced sedentary behaviour in overweight and obese children.

---

**3139  Board #44**

**June 2 3:30 PM - 5:00 PM**

**Feasibility and Acceptability of Implementing Physical Activity Programs at a Residential Center for High-Risk Youth**

Kari J. Hyslop (Hilgendorf),1 Judy Knuth,2 Western Washington University, Bellingham, WA. 1Washington State University, Spokane, WA. (No relationships reported)

With increased health concerns among youth, establishing a healthy lifestyle at young ages is prudent. Even more, youth exposed to adverse experiences face compounded risks for health concerns; it is essential to equip caregivers and youth with tools to reduce risks. Well-established physical activity (PA) programs may be such a tool.

**PURPOSE:** To determine feasibility and acceptability of implementing a group PA program at a care facility for high-risk youth, and success of achieving ACSM’s moderate-vigorous physical activity (MVPA) guidelines.

**METHODS:** Group exercise programs were implemented at a high-risk care facility for two summers. Activities of appropriate METs from Addendum of PA for Children were employed 3 days/week, 60 min/day, and aimed to keep all youth engaged throughout program duration. MVPA-momentary time sampling, 20-min dash tests for VO2max estimation, and staff interviews were conducted. **RESULTS:** MVPA assessments indicated program success in engaging 34 of 37 children in ACSM’s recommended PA guidelines throughout the duration of the program. Estimated maximal exercise capacity increased from pre- to post-program (9.7 ± 0.5 vs 11.0 ± 0.5 MET; p = 0.047). Qualitative interviews with staff indicated 100% acceptance rate and desirability of program return, and 80% of staff stated non-elicted, agreed-upon program outcomes for participants: reduced bickering, aggravation of peers, and sedentary time; and increased positive behaviors, state of calm, sleep patterns, desirability of participation in activities, and appetites. Identifiable program outcomes were group- and individual-based mindsets, full participation of staff, and structure and consistency. **CONCLUSION:** Findings endorse feasibility and acceptability of establishing structured group MVPA programs in care facilities for youth, in addition to enhancing well-being outcomes for participants. Rigorous involvement in determining benefit of PA programs among this population is needed to justify work in providing refined, structured exercise programs to residential settings; doing so may provide an impactful tool for the care and well-being of these individuals.

Note: informed assent and consent forms were obtained for each participant.

Supported by Washington State University.

---

**3140  Board #45**

**June 2 3:30 PM - 5:00 PM**

**Examining The Relationship Between High School Physical Education With Current Fitness Outcomes In College Students**

Melissa Bopp, FACSIM, Zack Papalia, Christopher M. Bopp, Allison Burner, Alison Weimer, Pennsylvania State University, University Park, PA. Email: mjb73@psu.edu (No relationships reported)

Physical education during K-12 can positively impact fitness outcomes, though it is unclear if youth maintain physical activity levels. Prospective studies examining current fitness outcomes in college students are needed. PURPOSE: To determine the relationship between high school physical education (PA) with current fitness outcomes in college students. METHODS: Students (N=754, 56.2% black, 30.1% multi-racial/other, 13.7% white; 44.0% females; mean age 19.6±1.0 y) were recruited into a study at the beginning of their first year. A majority (81.3%) of participants indicated they were enrolled in PE classes at least 1 day/week, 60 min/day, and aimed to keep all youth engaged throughout program duration. As a result of being physically active.

**RESULTS:** There were no significant differences in fitness or behavioral outcomes by PE outcomes.

**CONCLUSIONS:** The Health Educational Program for Children contributed to the increase in physical activity level and reduced sedentary behaviour in overweight and obese children.

---

**3141  Board #46**

**June 2 3:30 PM - 5:00 PM**

**Sport And Physical Activity Lesson Participation And Health-related Variables In Low-income Youth**

Jeanette Ricci,1 Karin A. Pfeiffer, FACSIM, Kimberly A. Cleverden,1 James M. Pivarnik, FACSM,2 Sara Sekula,2 Michigan State University, East Lansing, MI. (No relationships reported)

**PURPOSE:** To explore the relationship between S/PA participation and physical activity, diet, and health-related quality of life (QoL) in low-income youth.

**METHODS:** A sample of students (N=754, 51.4% males; 53.6% multi-racial/other, 13.4% white; mean age 10.4±1.0 y) completed a survey including the Physical Activity Questionnaire for Children (PAQ-C); 9 items, max, 100; KidsScreen-27 (psychological, peer-, and parent-related dimensions, max 100); and School Physical Activity and Nutrition Survey (SPAN; 25 items, max 3 per item). Single items described fruit and vegetable intake, and a junk food index was calculated (6 items, max 18). Participants self-reported S/PA participation (sports teams and/or dance/martial arts class) during the last year. Height and weight were measured to determine body mass index. One-way ANOVA was used to determine if physical activity, diet, or health-related QoL differed among S/PA participants and non-participants.

**RESULTS:** Approximately 59% of youth participated in at least one S/PA. Physical activity (F(2,751)=5.011, p=0.05), fruit intake (F(2,746)=4.933, p=0.05), parent-related QoL (F(2,749)=10.443, p<0.05), and peer-related QoL (F(2,747)=6.170, p<0.05) were higher in S/PA participants compared to non-participants. However, junk food intake was higher in S/PA participants compared to non-participants (F(2,746)=6.490, p<0.05).

**CONCLUSIONS:** In this sample, S/PA participation was associated with higher physical activity, fruit intake, and peer- and parent-related QoL. Our findings support previous research in a similar population of youth sport participants who had healthier dietary behaviors than non-participants. Our finding that junk food intake was higher in S/PA participants could be explained by time constraints and/or the belief that junk food consumption is acceptable as a result of being physically active.

Funded by: Crim Fitness Foundation.

---

**3142  Board #47**

**June 2 3:30 PM - 5:00 PM**

**The Effects of Different Types of Exercise on Chinese College Students’ Energy Expenditure**

Nan Zeng,1 Xianxiang Li,1 Huimin Yang,1 Wenfeng Liu,2 Hui Xiong3, Yanting Chen,2 Jiao Li,2 Wei He1,2, Zan Gao, FACSIM.

1University of Minnesota, Minneapolis, MN. 2Hunan Normal University, Changsha, China. (No relationships reported)

**Purpose:** To examine the effect of light physical activity (LPA), moderate PA (MPA), vigorous PA (VPA), and active video games (AVGs) on college students’ energy expenditure (EE). Gender differences in EE were also investigated.

**METHODS:** Twenty-four college students (12 males; M = 23.5, SD ± 1.06) completed four separate 10-minute exercise sessions on LPA (treadmill walking at 3.0 kph), MPA (treadmill walking at 5.0 kph), VPA (treadmill running at 7.0 kph, and AVGs (Xbox 360 Kinect Just Dance play) in a highly controlled laboratory. EE (total calories) was objectively measured by ActiGraph accelerometers.

**Results:** Repeated-measures ANOVA revealed significant differences in EE across different exercise sessions (F(1,21) = 160.51, p < .01, n² = 0.638). In detail, VPA (M = 75.25, SD = 35.12) yielded significantly higher EE than LPA and AVGs (p < .01). Similarly, MPA (M = 70.74, SD = 28.77) triggered significantly greater EE than LPA and AVGs (p < .01). LPA (M = 30.04, SD = 13.38) generated significantly higher EE than AVGs (M = 21.16, SD = 18.59, p < .01). Notably, significant EE difference emerged between VPA and MPA (p < .05). In addition, independent t-tests indicated that males burned more calories than females in LPA (M = 34.42, SD = 5.22, p < .001), MPA (M = 84.49 vs. 57.00, p < .01), and VPA (M = 100.74 vs. 49.76, p < .001). No significant gender difference in EE during AVGs play (M = 23.58 vs. 18.74, p > .05).

**Conclusion:** Findings suggest that a 10-minute exercise session in treadmill running at 7.0 kph has the highest EE, followed by treadmill walking at 5.0 kph, 3.0 kph, and...
Physical Activity Self-efficacy As A Predictor Of Achieving MVPA Guidelines In University Students

Jamie Faro1, Jessica Whiteley1, Laura L. Hayman3, Samuel J. Simmens2, Melissa Napolitano1
1University of Massachusetts Boston, Boston, MA. 2The George Washington University, Washington, DC.
Email: Email: Jamie.faro001@umb.edu

Few studies have examined characteristics associated with physical activity levels in university students seeking weight loss treatment, though it has been shown that physical activity is associated with weight loss in interventions with general adult populations. Understanding the characteristics predicting university students’ achievement of moderate-to-vigorous physical activity (MVPA) could better inform interventions designed to increase physical activity. PURPOSE: To identify predictors of meeting MVPA guidelines among university students enrolled in an intervention aimed at attaining or maintaining a healthy body weight. METHODS: AT 2 campuses, 128 university students (66% female; mean age=21.6, SD=3.1; mean BMI=31.6 kg/m²; SD=3.7) completed demographic questions, the International Physical Activity Questionnaire (IPAQ), and physical activity self-efficacy at baseline. MVPA was calculated for each participant based on the days and minutes of self-reported activity, with meeting guidelines defined as 150 minutes/week of combined MVPA. RESULTS: A higher percentage of males met the MVPA guidelines (73%) compared to females (58%) and published national averages (49%). Logistic regressions revealed that PA-SE (p<0.05) was a significant predictor of meeting MVPA guidelines, while BMI, gender and race/ethnicity were not significant. No significant male/female differences in PA-SE were found. However, physical activity self-efficacy was a moderately strong predictor of achieving MVPA for both females (OR=2.22, p<0.05) and males (OR=3.99, p<0.15), although not statistically significant for males. CONCLUSION: Higher levels of physical activity self-efficacy appear to be substantially associated with the likelihood of whether or not female university students achieved MVPA guidelines, while no other demographic variables usually associated with MVPA levels were significant. Further examination is needed to determine if the effects of physical activity self-efficacy on meeting MVPA guidelines that were found here are causal and could therefore suggest different behavioral treatment strategies for the promotion of MVPA in male and female university students.

Supported by: NIH Grant R01DK100916

No relationships reported.
Studies show that energy imbalances cause the generation of obesity, metabolic markers play a fundamental role in the promotion and inhibition of weight loss as a consequence gain or loss weight, furthermore physical activity (PA) has been associated with endocrine regulation and with positive dietary changes.

**PURPOSE:** To assess the effect of a School-based Exercising and Nutrition Counseling Intervention On metabolic Markers (ghrelin, Leptin, Insulin) In School-aged Obese Adolescents from Monterrey México

**METHODS:** Experimental study with a sample of 51 adolescents (13±2 yrs) randomly distributed in two groups: Control (CG) and experimental (EG). CG had 4 weekly sessions of 60 minutes of study with a sample of 51 adolescents (13±2 yrs) randomly distributed in two groups: Control (CG) and experimental (EG). CG had 4 weekly sessions of 60 minutes of PA and one weekly session of nutritional counseling. EG engaged in regular school activities.

**CONCLUSIONS:** The change in the levels of leptin and ghrelin suggests a possible change in the metabolic behavior, showing that the practice of physical activity combined with nutritional counseling are factors of change in the interventions studies, it is recommended to increase the duration of the program, and to suggest changes on diet.

**RESULTS:**

- After pre-test test, results showed in EG at post-test that ghrelin significantly decreased (p=0.005) the increase of leptin (p=0.008) and insulin (p=0.05).

- No differences were observed after the comparison in CG.

- CONCLUSIONS: The change in the levels of leptin and ghrelin suggests a possible change in the metabolic behavior, showing that the practice of physical activity combined with nutritional counseling are factors of change in the interventions studies, it is recommended to increase the duration of the program, and to suggest changes on diet.

Obesity has positioned itself as a public health problem worldwide with multifactorial characteristics. Different studies define sleep time as obesogenic factor while others found a correlation with the levels of moderate to vigorous physical activity. (MVPA)

**PURPOSE:** To assess the effect of a School-based Exercising and Nutrition Counseling Intervention On sleep parameters (sleep time, sleep latency and number of awakenings) and time in MVPA In School-aged Obese Adolescents from Monterrey México.

**METHODS:** An experimental study with a sample of 51 adolescents (13±2 yrs) randomly distributed in two groups: Control (CG) and experimental (EG). CG had 4 weekly sessions of 60 minutes of PA and one weekly session of nutritional counseling. EG engaged in regular school activities. Sleep variables and levels of MVPA were monitored by triaxial accelerometer (ActiGraph wGT3X-BT) for at least 7 consecutive days.

**RESULTS:**

- Pre-post test comparison showed into de EG significative changes on sleep latency when MPVA increased (P<0.006), other differences were observed on the decrease in awakening on sleep (P=0.001).

- No changes were observed on MPVA. CG increased only sleep latency (P<0.001), on the other parameters no changes were found.

**CONCLUSIONS:** The practice of physical shows a significant relationship with sleep parameters which seems to be a favorable factor in the treatment of obesity in adolescents. We suggest further studies to modify the duration of the intervention and use other indirect instruments for analyzing the quality of sleep.

**RESULTS:**

- Boys accumulated 36.6 SED bouts daily, with median bout duration of 2.0 min. The daily number of bouts lasting 1-4, 5-10, 10-15 and 15+ min was 28.9, 3.3, 18,0, and 1.4, respectively. SED time accrued in each category was 57.2, 22.2, 12.1, and 41.0 min, respectively.

- Girls accumulated 41.6 SED bouts daily, with median bout duration of 1.8 min. The daily number of bouts lasting 1-4, 5-9, 10-14 and 15+ min was 67.1, 22.9, 11.1, and 34.6, respectively. SED time accrued in each category was 57.2, 22.2, 12.1, and 41.0 min, respectively.

**CONCLUSIONS:** SED during child care attendance is accumulated in mostly short bouts. Few children exhibited prolonged SED bouts ≥ 20 mins. Child care practices related to: sitting time, screen time, and active play may reduce the frequency of SED bouts.
Increased amount of daily sitting time has been linked to increased risk of disease, independent of the amount of daily physical activity. A number of devices have been developed to address prolonged sitting in work and educational settings (e.g., sit-stand desks, treadmill-desks, cycle-desks, stepping desks). However, very little research has investigated the effect of a sit-stand desk on cognitive mood and performance in the college classroom. PURPOSE: To determine the effect of using adjustable-height (sit-stand) desks in a college classroom on attention (AT), stress (ST), musculoskeletal discomfort (MD), anxiety (AN), and academic performance (EXAM). METHODS: A total of 18 subjects (12 intervention, mean age 22.1, mean credits 13.9) conducted the 13 week intervention (week 3-15 of the semester). Adjustable-height sit-stand desks were placed in the back and one side of the classroom for students to use as they desired. Participants completed a weekly visual analogue scale (VAS) for AT, ST, MD, and AN, and were given space to provide optional comments on why they answered the way they did. Class sessions were video recorded to allow for direct observation of attention (OAT) in weeks 9, 12, and 13. Exams were taken at week 4, 6, 8, 10, 12, 14, and 15. RESULTS: The main findings indicated a significant interaction effect for AT (F(1,166) = 2.79, p = 0.002) and ST (F(2,166) = 2.15, p = 0.017), and significantly (p<0.002) lower overall MD for the intervention (12.81±3.45) vs. control (35.12±8.40) group. Exam scores were not different between groups. There was no difference in direct observation of attention (OAT) between groups (total n=15, control=6) at week 9, 12, or 13. Age was correlated with overall observation of attention scores (r=0.54, p<0.001) and ST with AN scores all weeks except week 9 (r range 0.61-0.95, p<0.05). CONCLUSION: A strength of this study is the week to week data collection on various measures of cognitive mood and performance, and overall discomfort levels. Use of a sit-stand desk was associated with lower MD scores and more variability in AT and ST scores. Future studies should utilize increased sample sizes to determine the dose of standing that would result in changes in AT, ST, MD, AN, OAT, and EXAM in a university setting. This research was supported by a SCUS Faculty Research Grant.
An individual’s environment has a major impact on their activities, travel mode, and health. Thus, to improve physical activity (PA), active transportation, and health, it is important to understand a society’s awareness of their environment. PURPOSE: To evaluate discordance between perceived and actual presence of factors associated with the built environment. METHODS: A survey of 170 college students’ (19±8.9 years) familiarity with their environment and PA and PA participation was conducted in Spring 2015. Objectively measured environmental audits of the environment were conducted simultaneously using an environment audit (WASABE). Variables included for the present study include: presence of trails, presence of parks, sidewalk maintenance, and perceived activity of those in the neighborhood. A continuous discordance score (2-4) was created by summing the frequency by which an individual differed from the audit on each variable. A score of 2 represents always perceiving the presence of a variable when there was not one (negative discordance). A score of 4 represents always perceiving the absence of a variable when there was one (positive discordance). Paired-samples t-tests assessed discrepancies between the perceived and actual environment. Pearson correlations examined the relationship between fitness and discordance. A linear regression identified which factors within the individual (i.e., demographics, PA and environmental) most predicted discordance. Results: T-tests indicated significant differences between perceived and actual results for: the presence of bike trails (t=10.69), the presence of parks (t=5.81), and the presence of people being physically active (t=2.49). Positive discordance was correlated with a lack of moderate PA (r=−0.23), but negative relationship (r=−0.27) was not significant. The Pearson correlation was seen between variables: at least one chronic diseases risk factor (p value ranges = .045-.022) and negative relationship (p value ranges = .01-.045) was observed. The most compelling changes relative to the number of variables were observed in 2015 including an increase of HG by 9% (p value =.006), PASE by 25% (p =.000), and CR by 14.5% (p =.006). BMI and BMI percentiles did not change significantly over all years; however observed mean ranges for BMI between 17.3 and 21.00 and BMI percentiles ranges between 55 and 63 were within normal limits. VJ did not increase significantly.

CONCLUSION: Compelling and consistent improvements in CR among children in addition to increases in PASE and and HG support continuing a collaborative effort and commitment to the health of children.
Children with lower %BF had higher MVPA levels (β = -1.17, p < 0.05), however, significant differences disappeared after controlling for %BF (β = 1.91, p > 0.05). The Sobel test showed that the positive association between MVPA and intangible parental support and children's MVPA was fully mediated by %BF (z = 2.09, p < 0.05).

Conclusions: Intangible parental support and children's MVPA is fully mediated by %BF. Children with higher levels of intangible support showed higher levels of MVPA (β = 3.21, p < 0.05), however, significant differences disappeared after controlling for %BF (β = -1.91, p > 0.05). The Sobel test showed that the positive association between intangible parental support and children's MVPA was fully mediated by %BF (β = -2.09, p < 0.05), with a percentage of indirect effect of 40.5%.

3160 Board #65 June 2 3:30 PM - 5:00 PM
Association Between Active Commuting To School And Sleep Duration In Ecuadorian Youth
Emilio Villa-González1, Palma Chillón2, Francisco Javier Huertas-Delgado2, Manuel Herrador-Colmenero1, Carlos Rodríguez-Lorente3, Yaira Barranco-Ruiz1.
1National University of Chimborazo, Riobamba, Ecuador. 2University of Granada, Granada, Spain. 3University of Cartagena, Cartagena, Colombia.

Abstracts were prepared by the authors and printed as submitted.

PURPOSE: Active commuting has been associated to longer sleep duration in adolescents, however, the literature is still limited. Thus, the aim of this study was to investigate the association between the mode of commuting to and from school and sleep duration in Ecuadorian youth. METHODS: A total of 732 students (13.6±2.1 years, 65.3% boys) belonging to 3 schools from Riobamba (Ecuador) were recruited via convenience sampling in class. Participants completed a self-reported paper-based questionnaire about personal data, usual mode of commuting to and from school and regular sleep-wake schedule at night on normal school days. Via sleep-wake schedule, sleep duration was calculated for each individual. They were classified as active (walk or bike), and passive (motorbike, bus, car or another motorized transport). Participants were also classified into two groups: sleeping at night for at least 8 hours/day or less than 8 hours/day. Binary logistic regression analyses were applied to investigate the association between the mode of commuting (active vs. passive) to and from school and the sleep duration (<8 hours/day and >8 hours/day) after correction for confounding factors (age, gender). RESULTS: The main mode of commuting used by Ecuadorian students was passive (86.4%), whereas active modes were less used (12.6%). The main passive mode chosen was the car (40%), followed by public bus (21%) and school bus (17%). Active commuters were more likely to sleep at least 8 hours/day than passive commuters showing a trend towards an increase in the sleep duration (OR, 95% CI 1.50, 0.945 to 2.409, p = 0.085). CONCLUSIONS: Active commuting to school could be associated with sleep duration in youth. The links between lifestyle factors, as sleep duration and active commuting to school need to be investigated in greater depth in order to promote public health strategies in youth.

3161 Board #66 June 2 3:30 PM - 5:00 PM
School Day Physical Activity and Classroom Behavior in Disadvantaged Children
Timothy A. Brussseau, Ryan D. Burns. University of Utah, Salt Lake City, UT.
Email: Tim.brussseau@utah.edu

Abstracts were prepared by the authors and printed as submitted.

Increased physical activity has been shown to improve classroom behavior in children. No study has examined the relationship between classroom level behavior and school day physical activity in disadvantaged children from low-income schools. PURPOSE: The purpose of this study was to examine the cross-sectional relationship between classroom level on-task behavior and average school day physical activity throughout one school week. METHODS: A total of 106 classrooms were recruited from five low-income schools from a school district located in the Mountain West Region of the U.S. Classrooms were recruited from the 1st through 6th grades and class sizes ranged from 16 to 28 students. On-task classroom behavior was assessed at the beginning of the 2015-2016 academic school year using momentary time sampling methods for an observation duration time of 15-minutes. Classrooms were stratified into those that achieved 80% on-task behavior and those that did not. Physical activity was assessed at the student level using Yamax pedometers and Actigraph accelerometers that were worn for the entire school day for one school week. Step counts and time in MVPA were averaged at the classroom level to account for clustering of observations within classrooms. A multivariate analysis of variance (MANOVA) test was used to examine the relationship between a categorical classroom behavior variable and classroom-level physical activity. RESULTS: Classrooms that achieved at least 80% classroom behavior displayed higher school day step counts (Δ = -449 steps, p < 0.001, Cohen’s d = 0.26) and time in MVPA (Δ = 3.6 minutes, p < 0.01, Cohen’s d = 0.28) compared to classrooms that displayed lower classroom behavior. CONCLUSION: Classrooms that display higher levels of on-task behavior tend to record higher levels of average school day physical activity. The results provide further evidence of the relationships between favorable classroom behavior and physical activity. Future research needs to examine this relationship for potential causation and bi-directionality so that effective interventions can be employed.
Abstract:
Purpose: The present study aims to compare the effect of recreational programs in the overall value of resilience and each of its dimensions, according to measurement, group and sex of the population.

Methods: The intervention was carried out by performing 14 sessions of two types of recreational programs based on physical recreation and another on artistic recreation. Each treatment lasted 32 hours in total, with one session per week. The research design was quasi-experimental. Eighty-six (86) sixth grade students, ages 11 to 14, from a primary school in social vulnerability participated in the study. The sampling was non-probabilistic. School Resilience Scale (E.R.E) for children between 9 and 14 years old was used. A three-way analysis of variance 2x3x2 (ANOVA) for repeated measures in a factor (measurements * group * sex) was performed.

Results: There was significant interaction (p < .01) between measurements * group in the overall value of resilience. Bonferroni Post hoc analysis showed that physical recreation and artistic recreation treatment significantly improved (p < .05) the value of the overall resilience. In addition, the effect on resilience did not differ significantly by type of program, in the post-test measurement.

Conclusions: The findings support the use of recreational programs as a useful and effective way to build resilience in pre-adolescent students in areas of social vulnerability context.

S670 Vol. 49 No. 5 Supplement
3163 Board #68 June 2 3:30 PM - 5:00 PM Building Resilience In Pre-adolescents, Through Physical & Artistic Recreation
Email: cecilia.romero@ucr.ac.cr

No relationships reported

Funding was provided by the Childhood Obesity Foundation and the Provincial Health Services Authority.

3164 Board #69 June 2 3:30 PM - 5:00 PM Are Parental Barriers Related To Youths' Gender And Mode Of Commuting To School?
Email: fj.huertas@ugr.es

Purpose: Understanding parental barriers is crucial to promote active commuting to school (ACS) among Spanish youths (aged 9-16) and their association with gender and usual mode of commuting of their children.

Methods: Parents of children (n=628) and parents of adolescents (n=151) from Granada (Spain) completed a paper-based questionnaire about perceived parental barriers for ACS and their children’s mode of commuting to school. Data were analyzed using the Chi-square test.

Results: The most common barriers reported by parents of children were traffic volume (48.7%) and dangerous intersections (39.6%). Compared to parents of children, barriers reported by parents of adolescents were distance to school (50.3%) and dangerous intersections (39.6%). In children, parents of non-active commuters to school more frequently reported absence of a policeman on crosswalks (passive 20.8%; active 16.0%; p=0.041) and distance to school (passive 50.3%) and dangerous intersections (39.6%). Compared to parents of children were traffic volume (48.7%) and dangerous intersection (45.0%), whereas the most frequent barriers reported by parents of adolescents were distance to school (50.3%) and dangerous intersections (39.6%). Compared to parents of children, a greater proportion of parents of adolescents reported distance to school (children 37.1%; adolescents 50.3%; p=0.003) and crime (children 28.6%; adolescents 36.9%; p=0.047) and smaller proportion reported traffic volume (children 48.7%; adolescents 32.9%; p=0.000) as barriers to ACS. Among parents of children, crime was more reported as a barrier by parents of girls than parents of boys (girls 33.2%; boys 24.2%; p=0.013). In children, parents of non-active commuters to school more frequently reported absence of a policeman on crosswalks (passive 20.8%; active 14.9%; p=0.044), absence of adults to walk with (passive 28.9%; active 19.9%; p=0.44), no sidewalks or bike lines (passive 44.8%; active 36.6%; p=0.041), distance to school (passive 44.8%; active 36.6% p=0.000), time required to ACS (passive 17.5%; active 9.1%; p=0.002) and weather conditions (passive 36.4%; active 27.7%; p=0.023) as barriers for ACS compared to parents of active commuters. In adolescents, parents of active commuters reported less importance to absence of a policeman on crosswalks (passive 30.1%; active 16.0%; p=0.041) and distance to school (passive 64.4%; active 37.3%; p=0.001) than their counterparts. Conclusion: The main parental barriers for ACS in children were traffic volume and intersection safety whereas for adolescents were distance and intersection safety. Among Spanish parents, parental barriers for ACS were influenced by children’s age, gender and usual mode of commuting to school.

3165 Board #70 June 2 3:30 PM - 5:00 PM Eating Behaviour Correlates in Children Referred to a Telehealth Program for Overweight and Obesity Treatment
Anne M. Lasinsky1, Tanis V. Mihalyuk2, Darren ER Warburton1, Danika B. Dickson1, Donna Forsyth-Lukas2, Kiran Kalkat1, Genevieve Larrivee2, Barbara Leslie1, Shannon SD Bredin1. 1University of British Columbia, Vancouver, BC, Canada. 2HealthLink BC, Burnaby, BC, Canada. 3The Physical Activity Line, Richmond, BC, Canada.
Email: anne.lasinsky@ubc.ca

Purpose: To describe the relationships between emotional eating behaviours and demographic, anthropometric, and behavioural characteristics of children referred to a comprehensive telehealth program for the treatment of overweight and obesity.

Methods: Correlational analyses were conducted using baseline scores from self-reports on the Dutch Eating Behavior Questionnaire for Children (DEBQ-C), the Dutch Eating Behavior Questionnaire (DEBQ), the Godin Leisure-Time Exercise Questionnaire (GLTEQ), and physician-reported anthropometric/demographic measures obtained from referrals to the program.

Results: Data from girls (n = 20), age 8-17 yr, revealed a significant positive correlation between the Emotional Eating subscale of the DEBQ-C and DEBQ and age (r = 0.76, p = 0.0006), a non-significant negative correlation with standardized BMI score (r = -0.19, p = 0.4), and a significant negative correlation with total physical activity (r = -0.54, p = 0.04), as reported through the GLTEQ. Data from boys (n = 21), age 8-18 yr, revealed a significant positive correlation between the Emotional Eating subscale of the DEBQ-C and DEBQ and age (r = 0.62, p = 0.003), a non-significant negative correlation with standardized BMI score (r = -0.08, p = 0.7), and a significant negative correlation with total physical activity (r = -0.60, p = 0.004) as reported through the GLTEQ.

Conclusion: In both boys and girls, emotional eating behaviors were reported to increase with age, decrease with higher levels of physical activity, and show no significant correlation with standardized BMI scores. This provides further evidence for the protective effect of physical activity in children. This research has important implications for the future treatment of children with overweight and obesity.

Funding was provided by the Childhood Obesity Foundation and the Provincial Health Services Authority.

F-53 Free Communication/Poster - Cancer
June 2, 2017, 1:00 PM - 6:00 PM
Room: Hall F

3166 Board #71 June 2 2:00 PM - 3:30 PM Dual Energy X-ray Absorptiometry Is Comparable To Computed Tomography For Visceral Adiposity Measurement In Cancer Patients And Survivors
Adriana M. Coletta, Ann H. Klopp, David Fogelman, Yisheng Li, Naveen Garg, Karen Basen-Engquist MD Anderson Cancer Center, Houston, TX.

Purpose: New software to measure visceral adipose tissue area with dual energy x-ray absorptiometry (DXA) was developed and proposed as an alternative method to abdominal computer tomography (CT) scan. The DXA software has previously been validated in apparently healthy populations; however it is yet to be determined if visceral adiposity measurement by DXA is comparable to CT in a cancer patient population. Use of DXA instead of CT may provide various benefits to cancer patients, notably less radiation exposure. Therefore the purpose of this study was to determine the level of agreement between DXA and CT when measuring visceral adipose tissue area in cancer patients and survivors.

Methods: Patients seen in the gastrointestinal and diagnostic imaging clinics were screened for the total sample and by sex. Interested patients underwent a CT scan at L4-L5, as part of their medical care, and a non-invasive whole-body DXA scan within 48 hours of their CT scan. Bland-Altman analysis was conducted for the total sample and by sex. Results: A total of 99 patients (62:12 years, 28.5±7.4 kg/m²), 53 female (61:13 years, 28.3±8.5 kg/m² and 46:11 years, 28.6±5.9 kg/m²), participated in the study. The majority of patients were non-Hispanic (90%), Caucasian (89%), diagnosed with adenocarcinoma (76%) at the site of the pancreas (46%) or colon (20%), and had stage 4 cancer (46%). Compared to CT, DXA underestimated visceral adipose area.
Mobile technology has become an increasingly essential instrument for those who are responsible for healthcare and facilitating the interactions between health professionals and patients. PURPOSE: The purpose of this study is to design a smartphone application to self-monitoring resistance and exercise prescription, health knowledge, daily physical activity and compare this application to traditional intervention on psychological wellbeing (PW) and physical functioning (PF) in breast cancer survivor.

METHODS: Thirty patients with breast cancer (age ~46.7 ± 15 years) were randomly assigned into control (CON) or intervention (INT) groups with 15 patients in each group. INT was provided a smartphone equipped with a mobile health application for self-monitoring of biometrics and performed a resistance and aerobic exercise prescription 5 times/week and 30 minutes/time. PW and PF measures were taken at baseline and 12th week. Fourteen patients in each group completed the study. Data were analyzed by means of independent t-test. RESULTS: Result indicated that the INT had significant improvements than the CON on PW outcomes: anxiety (t = 2.93, P < 0.05) and depression (t = 3.34, P < 0.05) and on PF measures: 6 min walking (t = 3.57, P < 0.001), arm curl (t = 2.45, P = 0.05) and YMCA (t = 2.75, P < 0.05). The body composition (t = 0.89, P = 0.45), weight (t = 1.08, P = 0.14), BMI (t = 0.99, P = 0.74), body fat percentage (t = 0.87) were not significantly different between groups, but the pain (t = 3.64, P < 0.05), fatigue (t = 3.98, P < 0.001) and sleep disturbance (t = 4.57, P < 0.001) decreased significantly between CON and INT during twelve weeks excises.

CONCLUSIONS: This study suggested that the smartphone application significantly improve PB and may be the effective way to decrease depression and anxiety and enhance PF in breast cancer survivors. Future study should determine whether home-base smartphone system can promote them to maintain long-term exercise effect. The work presented in this article was supported by grant from the Ministry of Science and Technology of China (2015Y111600).
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

3:30 PM

54,24±3,41; p<0.001). While it appears evident a significant reduction of Extra Cellular (T0: 51,61±4,43 vs T6: 52,93±4,11; p<0.01) and at T12 (T0: 51,61±4,43 vs T12: 51,61±4,43; p<0.01) of body water. There was a significant improvement of Intra Cellular Water % at T6 and T12 (T0: 51,61±4,43 vs T6: 54,24±3,41; p<0.001) and Intra Cellular Water % at T12 (T0: 51,61±4,43 vs T12: 54,24±3,41; p<0.001) despite the absence of a significant variation of the Total Body Water%. % of a significant (p<0.005) improvement of Fatty Free Mass (FFM) was also observed. CONCLUSIONS: Like a goldpil, a mixed moderate intensity exercise contributes to a correct water distribution in the active intracellular compartments in cancer patients. Those results appear to be already relevant after 6 months and they become even more evident after 12 months.

3173 Board #78 June 2 2:00 PM - 3:30 PM Strength Training Following Hematopoietic Stem Cell Transplantation: Designing Interventions for Eventual Translation into Clinical Practice

Eileen D. Hacker, Tara Peters, Ruby Erdmann, Eileen Collins. University of Illinois at Chicago, Chicago, IL. (No relationships reported)

PURPOSE: Intensive cancer therapy followed by hematopoietic stem cell transplantation (HCT) results in highly distressing symptoms, impaired functional ability and diminished quality of life. These problems are amenable to exercise interventions but dependent upon participant uptake for eventual translation into clinical practice. This study reports subject attrition, compliance, adherence, and progression from the strength training arm (n = 37) of our intervention study, Strength Training to Enhance Early Recovery (STEEER) after HCT.

METHODS: This single-blinded study randomized subjects to STEER versus usual care plus attention control with health education. STEER consisted of a progressive resistance program using elastic resistance bands tailored to the individual’s capabilities and integrated seamlessly into existing clinical practice. Subjects received instruction and began active range of motion two times per week while hospitalized for HCT followed by a six-week moderate intensity program (three sessions per week/18 sessions total) post hospital discharge. STEER employed a combined supervised/unsupervised approach.

RESULTS: Four subjects died during the course of the study, unrelated to the STEER intervention (attrition rate 10%). Post-hospitalization, subject compliance with STEER was high (83%, SD = 22) as well as adherence to the exercise prescription (89%, SD = 25). Most subjects (90%) were able to progressively increase their prescription by adding repetitions, sets, number of exercises or band resistance.

CONCLUSIONS: STEER was tested in a challenging group of patients during a period of complex, frequently changing needs. Our study took advantage of common clinical situations following HCT, such as frequent clinic visits during the first six weeks following hospital discharge and downtime in clinic when subjects wait to see their healthcare provider. Using downtime in clinic to exercise is an efficient use of subjects’ time. The intervention was specifically designed to minimize subject burden and maximize benefits. Subjects had high compliance and adherence to the STEER intervention which (1) reflects a patient-centered approach; (2) demonstrates effective tailoring to HCT subject’s capability; and, (3) facilitates eventual translation into practice.

3174 Board #79 June 2 2:00 PM - 3:30 PM Self-reported Ltpa Versus Expected Ltpa In Rural Cancer Survivors: Missing The Mark

Stephen LoRusso, Stephen Baker, Ivan Mulligan. Saint Francis University, Loretto, PA. Email: slorusso@francis.edu (No relationships reported)

The evidence of the benefits of exercise for those diagnosed with Cancer has grown significantly indicating that leisure time physical activity is associated with lower risks of many types of cancer. As part of an ongoing study of rural cancer survivors in West Central Pennsylvania we sampled subjects regarding their levels of leisure time physical activity and compared those levels to ACSM recommendations. Purpose: To describe the levels of self-reported total lifetime leisure time physical activity hours vs ACSM recommended expected hours. Methods: A sample of 39 rural cancer survivors completed questionnaires which included a modified Historical Leisure Activity Questionnaire. Grouped by age (13-17, 18-22, 23-34, 35-50, 51-65, and 66-80), Total MET Hours were calculated and compared to ACSM recommendations of 2.5 MET hours of moderate intensity activity per week. The comparator of a 5 MET activity was used in the calculation of the benchmark Total MET Hours value. This study was approved by the Saint Francis University IRB. Results: Thirty-three (33) questionnaires were returned and 27 were analyzed. Participants were predominantly white, non-Hispanic, with a mean age of 60 years (27 to 77 years). The mean age of Cancer diagnosis was 51 years, (9 to 70 years). Breast Cancer (n=11) and Prostate (n=4) were primary Cancers reported. Significant differences (p<0.05) from actual to expected Total MET hours were found for each age group, except for the 13-17 group. The following groups demonstrated significantly lower Total MET Hours than expected: 18-22 (p<0.017), 23-34 (p<0.016), 35-50 (p<.000), 51-65 (p<.001), and 66-80 (p<.043). Average percent difference ages 13-50 is 636% actual to expected MET Hours. Conclusion: This pilot data supports the evidence that reduced physical activity is associated with a cancer diagnosis, and suggests that lifetime physical activity levels may play a role in the incidence of Cancer in a rural population. Support was provided in part, by the Department of Physical Therapy.
Motivations for Breast Cancer Survivors (BCS) to exercise after cancer treatment are not well understood and many BCS do not exercise at recommended levels. Goal-oriented team exercise training, such as triathlon training and dragon boating, may improve exercise activity. PURPOSE: The overall objective of this study was to determine the motivations to participate in goal-oriented team triathlon training among a group of BCS dragon boat racers. METHODS: Female breast cancer survivors (age=63.5 (SD 4.1) yr, BMI =25.8 (SD 4.4)) who were members of a BCS dragon boat team (membership length=6 (SD 4.1) seasons) were recruited to participate in a focus group after completing a 14 wk individualized triathlon training program. Training comprised two supervised group sessions and three home-based sessions per week. The training program culminated with participation in a sprint triathlon (Athlete Iron Girl, 0.5 mi swim, 12 mi bike, 3.1 mi run). Dragon boat training occurred twice weekly during triathlon training. Common themes related to dragon boat and triathlon training participation were analyzed. RESULTS: Four women participated in the focus group from which the following themes emerged: (1) Champion for Exercise from personal contacts, (2) Team motivation to join another team, (3) Sharing Life Experiences while not focusing on cancer helped in supporting each other, (4) Having Fun and not focusing on cancer was important, and (5) Integrating New and Renewed types of exercise into daily lives. Overall, survivors recognized their improved activity levels during triathlon training. They also expressed a desire for future volunteer participation to encourage others in the program. CONCLUSIONS: Goal-oriented team triathlon training for BCS dragon boat racers can improve exercise activity. Structured exercise as a part of a team with a common goal may have facilitated successful participation. Furthermore, goal-oriented team training could lead to better health for BCS.

FUNDING
Acknowledgement: Aurora Research Institute/Aurora Health Care

EX
M (SD)
SG
M (SD)
*p value
Total Fat Mass (kg)  
-2.43 (1.77)  
0.26 (0.78)  
0.03
Trunk Fat Mass (kg)  
-1.26 (1.06)  
0.66 (0.69)  
0.01
Body Fat (%)  
-2.23 (1.63)  
0.65 (1.53)  
0.01
Lean Mass (kg)  
0.63 (1.02)  
-0.51 (1.96)  
0.12
Spine BMD (g/cm²)  
-0.03 (0.06)  
-0.02 (0.03)  
0.94
Total Hip BMD (g/cm²)  
-0.002 (0.04)  
0.007 (0.01)  
0.22

Conclusion: This study demonstrated the potential efficacy of combined training to decrease total and trunk fat mass, an indicator of central adiposity, in breast cancer survivors on aromatase inhibitor therapy, in which fat mass is considered risk factor for recurrence of cancer, metastasis and other chronic disease. A combined modality program did not slow bone loss in this population, thus modifications to the program to include specific osteogenic training may need to be considered to target this health outcome.

Exercise may mitigate a cluster of related symptoms in Breast Cancer Survivors (BCS). This cluster includes fatigue, sleep disturbances, pain, depression, and cognitive changes. In addition, Cortisol Awakening Response (CAR), a function of stress, Heart Rate Variability (HRV), an indication of cardiac autonomic balance, and quality of life (QOL) may relate to this symptom cluster.

PURPOSE: To examine the effect of triathlon training on a BCS symptom cluster and to determine the relationships between the symptom cluster and CAR, HRV and QOL.

METHODS: Female BCS (N = 26; age = 49 (8) yr) participated in a 14 wk sprint triathlon training program. Training consisted of 2 supervised and 3 unsupervised sessions per week. Pre- and Post-training measures included CAR, HRV, and QOL (FACT-B), along with fatigue (FACT-F), and PROMIS questionnaires for cognition (Applied Cognition-General Concerns-Short Form), depression (Emotional Distress Depression), pain (Pain Interference-SF), and sleep (Sleep Disturbance-SF). Except for QOL and FACT-F, higher questionnaire scores represent worse function.

RESULTS: Data are mean (SD). After training, CAR decreased, (pre= 12.8 (6.8), post= 8.5 (7.3) mmol/L, p= 0.03) and HRV increased, (pre= 44.8 (28.2), post= 68.6 (55.4) ms, p= 0.04). Further, QOL (pre= 117.4 (14), post= 125.1 (11), p= 0.01), fatigue, (pre= 41.0 (9.1), post= 47.2 (4.1), p= 0.01), cognition (pre= 16.4 (8.4), post= 13.1 (5.8), p= 0.02), depression, (pre= 10.7 (4.6), post= 9.2 (2.5), p= 0.04), and pain improved (pre= 10.6 (3.9), post= 8.9 (2.2), p= 0.03). Sleep did not change. No training variables were associated with CAR or HRV. Before training, QOL correlated with depression (rs= - 0.70), cognition (rs= - 0.64) and fatigue (rs= 0.80). Further, sleep correlated with pain (rs= 0.37) and depression correlated with cognition (rs= 0.54). Similar correlations were observed after training.

CONCLUSIONS: Triathlon training for BCS improved all symptoms in a cluster except sleep. QOL was related to cognition, depression and fatigue. CAR and HRV were not related to any of the symptoms studied. However, the decreased CAR and increased HRV from exercise in BCS could have positive health implications.

Funding was provided by Vince Lombardi Cancer Research Foundation/Aurora Health Care

Table 1. Mean score changes in EX and SG groups from baseline to 9 months.

Purpose: This study aimed to assess physical activity levels in childhood cancer survivors (CCS), compare these to recommended guidelines, and investigated the feasibility of distance-delivered physical activity interventions amongst CCS.

Background: Treatment for breast cancer is multi-modal and often includes estrogen blockade that can alter body composition. Aerobic training can reduce body fat, while resistance training improves lean mass and, bone mineral density (BMD); however, it is unclear whether exercise retains its efficacy during aromatase inhibition. Our study determined the influence of combined aerobic + resistance training on body composition of breast cancer survivors (BCS) that use aromatase inhibitors. Methods: Women cancer survivors are randomized to 9 months of exercise [Resistance + aerobic training] (EX): n= 18 or stretching group (SG): n=18. Body composition was measured by DXA (total body and trunk fat mass % body fat (BF); lean body mass (LBM); spine and total hip BMD at baseline, 3, 6 and 9 months. The exercise group performed by 40 minutes with 7 resistance exercises on machines followed by 30 minutes of treadmill (aerobic) training 3x/wk. Separate 2 x 3 repeated measure ANOVAs were used to compare groups. Results: Retention in the study was 94% in EX and 72% in SG. Adherence to training was 78.2%. Significant group x time interactions were found for total and trunk fat mass, and % body fat, (p<0.001), where women in EX lost fat compared to slight gains among women in SG. There were no significant group x time interactions for LBM, total hip or spine BMD. Table 1. Mean score changes in EX and SG groups from baseline to 9 months.
Methods: CCS (aged=16) and parents (survivors aged=16) from 11 hospitals in Australia and New Zealand participated in this study. Participants self-reported their moderate-vigorous physical activity (MVPA). This was compared to American Cancer Society’s physical activity guidelines (150 min/week for adults, 300 min/week for children). A systematic review and meta-analysis were conducted to determine the feasibility (adherence, retention and recruitment) and effect of distance-delivered interventions on physical activity levels, physical and psychological function after intensive treatment. Results: 329 CCS (age=27.7±7.2 years, 20.3±8.3 years since diagnosis) and 254 parents of CCS (age=14.0±2.8 years, 10.9±2.9 years since diagnosis) participated. Adult CCS reported mean MVPA of 115.9±129.8 min/week and children had MVPA of 231.3±227.8 min/week, which was in both cases lower than recommended guidelines (both p<0.001). Only 31.3% of adults and 29.1% of children achieved recommended MVPA guidelines. Our systematic review included 13 studies (n=270 participants), while 4 (n=110 participants) were included in the meta-analysis. Distance-delivered physical activity interventions were feasible in CCS (mean recruitment rate =64%, retention rate=85%, adherence rate=88%), but did not increase physical activity levels from baseline to post intervention (p=0.09). Participation in physical activity interventions displayed a positive effect on physical function (p=0.002) and psychological outcomes (p=0.001).

Conclusion: Over two-thirds of child and adult CCS are not achieving recommended physical activity levels. Strategies including education and early monitoring are needed to increase MVPA levels to lower the risk of cardiovascular and metabolic co-morbidity. CCS may experience barriers including fatigue, access to facilities or lack of guidance, but our investigation into distance-delivered interventions to increase physical activity levels suggests that such interventions could represent a viable option to tackle this important issue.

**METHODS**

The TrueNTH Lifestyle Management program is an international program aimed to improve the survivorship and wellness of men with prostate cancer. As part of the national network, an initial 12-week exercise program, 3 days per week, was carried out at a university-based location in Edmonton Canada. PURPOSE: To better understand the motivation, facilitators and barriers to exercise following participation in the TrueNTH exercise program. METHODS: An optional post-program satisfaction questionnaire was administered and a focus group session conducted with 16 of the 22 program participants (mean age = 65.5 years). Quantitative data from the participant satisfaction questionnaire were analyzed descriptively and qualitative data from the focus group were used to clarify and further describe quantitative results. RESULTS: Main findings included high satisfaction with the program (100%) and improvements in 8 repetition maximum strength of 8.5 lbs for bench press and 31.6 lbs for the leg press. Results from the Behavioral Regulation in Exercise Questionnaire (Version 3) showed high scores for intrinsic (3.28) and identified integration (3.25), and low scores for amotivation (0.08) and external regulation (3.25), and low scores for amotivation (0.08) and external regulation (3.25), and low scores for amotivation (0.08) and external regulation (3.25). Only 31.3% of adults and 29.1% of children achieved recommended MVPA guidelines. Our systematic review included 13 studies (n=270 participants), while 4 (n=110 participants) were included in the meta-analysis. Distance-delivered physical activity interventions were feasible in CCS (mean recruitment rate =64%, retention rate=85%, adherence rate=88%), but did not increase physical activity levels from baseline to post intervention (p=0.09). Participation in physical activity interventions displayed a positive effect on physical function (p=0.002) and psychological outcomes (p=0.001).

Conclusion: Over two-thirds of child and adult CCS are not achieving recommended physical activity levels. Strategies including education and early monitoring are needed to increase MVPA levels to lower the risk of cardiovascular and metabolic co-morbidity. CCS may experience barriers including fatigue, access to facilities or lack of guidance, but our investigation into distance-delivered interventions to increase physical activity levels suggests that such interventions could represent a viable option to tackle this important issue.

**Sclerostin in Breast Cancer Survivors**

Tae Ho Kim, Jae Seung Chang, In Deok Kong. Yonsei Institute of Sports Science & Exercise Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea, Republic of.

Email: thg@125@naver.com

(No relationships reported)

Wingless and integrase site growth factor (Wnt) signaling is a tumorigenesis-related signaling pathway. Sclerostin is one of endogenous negative regulators of Wnt/b-catenin signaling. Accumulating evidences indicate that higher serum level of sclerostin is associated with osteoporosis and bone metastasis in breast cancer patients. PURPOSE: To investigate whether exercise training elicits changes in the serum level of sclerostin in breast cancer survivors. METHODS: Thirty-nine breast cancer survivors after anti-cancer treatment and forty healthy women volunteers participated in this study. Breast cancer survivors were randomized to either an exercise group or a control group for 12 weeks. All participants completed health-related fitness tests and measurements of anthropometric and serological biomarker variables. Independent t-test and Wilcoxon signed-rank test were performed to analyze the changes of variables in-between and within-groups, respectively. RESULTS: Breast cancer survivors showed higher levels of serum sclerostin compared to age-matched healthy women at baseline (115.6 ± 58.8 vs. 86.5 ± 53.2 pg/mL, p=0.016). Exercise training for 12 weeks remarkably improved muscle strength, endurance and flexibility, and reduced body fat percentage, waist circumference and visceral fat area in breast cancer survivors. The exercise training reduced the serum levels of insulin, leptin and interlukin-8 as well (all p<0.05). Moreover, circulating sclerostin levels were significantly decreased by the exercise training (124.4 ± 17.0 vs. 106.3 ± 42.6 pg/mL, p=0.021), but there were no differences observed in control group during this clinical trial period (116.3 ± 42.6 vs. 114.2 ± 66.9 pg/mL, p=0.79). CONCLUSION: These findings suggest that sclerostin may be a notable serological parameter reflecting the beneficial effects of exercise training in breast cancer survivors.

**Assessment of Heart Rate Variability After Maximal Exercise in Trained Postmenopausal Women**


Email: jorri@usfca.edu

(No relationships reported)

The increased parasympathetic tone achieved with endurance training may provide important cardioprotection after menopause. Inability to restore autonomic balance postexercise is a risk factor for sudden cardiac death as sympathetic stimulation has an arrhythmic effect. Until recently, most of the studies on recovery heart rate variability (HRV) have focused on young men. PURPOSE: The purpose of this study was to compare the HRV response from rest through maximal exercise and recovery in postmenopausal women (PNW) who trained at moderate (MOD) or vigorous (VIG) intensities. METHODS: Thirty-six PNW women who self-reported exercising at either MOD (3-5 METS; n = 18; 58.9±4.4 yr, 59.2±6.8 kg,160.9±10.0 cm, 32.4±5.7 ml/kg/min), or VIG intensities (>6 METS; n = 18; 59.7±5.2 yr, 68.3±10.2 kg,167.0±7.4 cm, 34.5±5.1 ml/kg/min) participated. HRV and cardioprotective fitness (Bruce protocol) were measured in the laboratory. The HRV was measured with a heart rate monitor at rest for 5 minutes in the supine position with the participant breathing normally. HRV was also measured in the last minute of the VO2 max test and after 2 minutes of active recovery. Comparison of HRV in MOD and VIG was performed using a factorial ANOVA with repeated measures on time. HRV values were log transformed due to skewness. An alpha of .05 was considered statistically significant. Data are presented mean ± SD. RESULTS: The two groups (MOD, VIG) responded similarly over the three time periods for selected HRV indices of root mean square of sequential deviations (rMSSD), and low (LF) and high frequency (HF) power values (p>0.05). There were significant main effects for rMSSD, HF and LF. Specifically, maximal exercise significantly lowered rMSSD (3.3 ± 0.08 vs. 1.2 ± 0.06) and lnLF (4.1 ± 0.05 vs. 3.3 ± 0.13) and increased lnHF (3.3 ± 0.14 vs. 4.0 ± 0.16; p<.01) from resting. However, two minutes of active recovery significantly restored lnHF (3.3 ± 0.11) and lnLF (4.1 ± 0.08) from maximal values (p<.01). CONCLUSION: Our findings suggest that both moderate and vigorous exercise
training enhance HRV recovery in the immediate postexercise period following one bout of maximal exercise in older women. These data further document the benefits of regular aerobic exercise in the improvement of cardiac electrical stability.

Strenuous exercise has been shown to dramatically alter levels of anti- and proinflammatory cytokines; proteins involved in regulation of systemic inflammation.

**RESULTS:** There were no differences in exercise intensity (%VO2max) using the Borg Scale (6-20).

**CONCLUSION:** Despite the added hemodynamic stress and perception that exercise in a hot environment is more difficult than in a thermo-neutral room, we observed parallel responses in oxygen consumption during hot vs. thermo-neutral yoga resulting in relatively modest but equal objective measures of exercise intensity and energy expenditure.

Prior studies have demonstrated that sitting on a stability ball during arm ergometry elevates oxygen consumption about 10%; however, the influence that the characteristics of the stability ball has on this response has not been examined.

**CONCLUSION:** It is concluded that a more elastic material making up a stability ball can elevate the metabolic response to arm exercise but might be attenuated by a smaller ball. In addition, the type of stability ball might not affect exercise training rates.

**RESULTS**

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Stage 1 VO2 (L/min)</th>
<th>Stage 2 VO2 (L/min)</th>
<th>Stage 1 HR (min)</th>
<th>Stage 2 HR (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB Mean</td>
<td>0.613 ± 0.306</td>
<td>0.829 ± 0.406</td>
<td>118 ± 12</td>
<td>143 ± 12</td>
</tr>
<tr>
<td>SE Mean</td>
<td>0.622 ± 0.286</td>
<td>0.851 ± 0.413</td>
<td>117 ± 18</td>
<td>141 ± 16</td>
</tr>
</tbody>
</table>

**CONCLUSION:** It is concluded that a more elastic material making up a stability ball can elevate the metabolic response to arm exercise but might be attenuated by a smaller ball. In addition, the type of stability ball might not affect exercise training rates.
The Relationship Between Changes In lnRMSSD And Rectus Femoris Cross-sectional Area Following Exercise

Thomas J. Kopec,1 Bailey A. Welborn,2 James E. Lepere,3 Elizabeth E. Hibberd,2 Phillip A. Bishop,1 Mark T. Richardson,2 Michael R. Esco, FACSM3,4
1Samford University, Birmingham, AL. 2University of Alabama, Tuscaloosa, AL. 3Liberty University, Lynchburg, VA. (Sponsor: Michael R. Esco, FACSM)
Email: kopec001@gmail.com

PURPOSE: The natural log transformation of the root mean square of successive R-R differences (lnRMSSD) is a parasympathetic measure of heart rate variability. The extent to the relationship between lnRMSSD and localized muscle damage following exercise is unknown. The purpose of this study was to examine the relationship between lnRMSSD and Rectus femoris CSA (CSA-RF) following an exhaustive bout of exercise over 72 hours. METHODS: Twelve participants were measured for pre-exercise lnRMSSD for five minutes in a seated position, followed by a CSA-RF measurement with musculoskeletal ultrasound 15 cm above the superior pole of the participant’s right patella. Next participants completed an exhaustive exercise protocol. Finally, participants repeated the lnRMSSD and CSA-RF measures immediately following exercise termination with follow-up testing at 24-hours, 48-hours, and 72-hours. RESULTS: Repeated measures ANOVA revealed significant differences in lnRMSSD between pre-exercise and post-exercise measures (p < .001, Table 1), but no other significant differences. Likewise, there were significant differences in CSA-RF from pre-exercise to post-exercise (p < .001, Table 1), but no other differences were noted. There was a large near-significant correlation between the changes in lnRMSSD and CSA-RF from pre-exercise to post-exercise (r = -.57, p = .055), and large statistically significant correlation between the changes in lnRMSSD and CSA-RF from pre-exercise to post-exercise (r = -.46, p = .025). CONCLUSIONS: In this study lnRMSSD declined as CSA-RF increased immediately following exercise up to 24 hours. This inverse relationship is likely the result of vagal tone suppression and increased sympathetic outflow in cardiac control during and immediately following exercise. Tracking lnRMSSD following exercise may give practitioners further insight to the mechanisms of recovery.

Repeated Measures ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ex</th>
<th>Post-Ex</th>
<th>24H-Post-Ex</th>
<th>48H-Post-Ex</th>
<th>72H-Post-Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>InRMSSD</td>
<td>3.99</td>
<td>2.60*</td>
<td>3.91</td>
<td>3.92</td>
<td>3.89</td>
</tr>
<tr>
<td>CSA-RF</td>
<td>7.12</td>
<td>7.73*</td>
<td>7.17</td>
<td>7.06</td>
<td>7.38</td>
</tr>
</tbody>
</table>

Heart Rate Variability Following a Short and Long Bout of High-Intensity Functional Training

Emily Bechke, Allyson Box, Wade Hoffstetter, Paul Serafini, Cassidy Williamson, Yuri Feito, FACSM, Brian Kliszczechewicz, Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSM)

Depression of Heart Rate Variability (HRV) occurs following exercise and is influenced by the intensity and duration of the activity. High-Intensity Functional Training (HIFT) is a style of training performed using various modalities and durations. PURPOSE: To examine the effect of a short (< 5-min) and a long (15-min) bout of HIFT on HRV recovery. METHODS: Ten apparently healthy males (28 ± 5 yrs) participated in this study. Two HIFT sessions were performed in a crossover fashion. Each visit consisted of three HRV recordings: at rest (PRE; 10-min), post exercise (P; 45-min), and two hours post (P2HR; 10-min). The short bout (SHORT) consisted of 30 power clean-and-jerks (61 kg) for time, while the long bout (LONG) was a 15-min circuit of 250m row, 20 kettlebell swings (24 kg), and 15 dumbbell squats (16 kg). The HRV marker used was the Root Mean Square of Successive Differences (RMSSD) and was analyzed in 5-min segments: the last 5-minutes of PRE, eight segments during P (P1-P8) starting at the 5th minute, and the last 5-mins of P2HR. RESULTS: Normality was violated and data underwent a natural log transformation (lnRMSSD). Repeated Measures ANOVA did not reveal any significant differences in lnRMSSD between the SHORT and LONG trials (p = 0.822). A significant time effect (p = 0.023) was observed in both trials, with lnRMSSD depression occurring from P1-P8 (p < 0.05) and recovering by P2HR (p = 0.141). Conclusion: This study indicates that SHORT and LONG bouts of HIFT result in similar HRV depression and recovery. Future research is needed to better understand various bouts of HIFT and its relationship with HRV.
PURPOSE: To investigate the influence of group III/IV muscle afferent feedback on skeletal muscle force production and bioenergetics during all-out exercise.

METHODS: Phosphoryl magnetic resonance spectroscopy was performed during a 5-min all-out intermittent isometric single-leg knee-extensor exercise, consisting of 60 maximal voluntary contractions (MVC), with intrarticular fentanyl (FENT), to attenuate group II muscle afferent feedback, and control (CTRL) conditions in 8 healthy women (age: 28 ± 5 yrs, stature: 178 ± 4 cm, and body mass: 77 ± 8 kg). Peak, integrated, and mean forces were determined per MVC and critical force (CF) was determined as the mean force of the final 6 MVCs. The intramuscular metabolic perturbation and adenosine triphosphate (ATP) synthesis rates were determined from intramuscular concentrations of phosphocreatine (PCr), inorganic phosphate (Pi), diprotonated phosphate (H₂P₂O₄⁻), and pH. RESULTS: Peak force (FENT: 595 ± 113 vs. CTRL: 568 ± 126 N) and end-test force (FENT: 224 ± 50 vs. CTRL: 209 ± 52) were not significantly different between conditions. The cumulative integrated force was significantly greater in FENT than CTRL over the 1st min (175755 ± 2581 vs. 16154 ± 2825 N), but not thereafter (Figure 1). End-exercise [Pi] was not significantly different between conditions, while [Pi] and [H₂P₂O₄⁻] were significantly greater for FENT. The estimated total ATP synthesis rate was significantly greater for FENT than CTRL over the 1st min (66 ± 16 vs. 57 ± 13 mM), but not thereafter (Figure 1). The estimated total ATP synthesis rate at CF arose from a significantly greater oxidative ATP synthesis (FENT: 77 ± 15 vs. CTRL: 83 ± 13 %) than anaerobic ATP synthesis (FENT: 23 ± 15 vs. CTRL 17 ± 13 %). CONCLUSION: Attenuation of group III/IV muscle afferent feedback augmented force production during the 1st min of all-out exercise, for which the increased energy demand was met, en masse, by the creatine kinase reaction, glycolysis, and oxidative metabolism.

Isometric (IHG) handgrip training can reduce arterial blood pressure (ABP), especially in hypertensives, but the mechanisms remain unclear (1). We recently showed that IHG for 4-weeks in healthy young White European (WE) and South Asian (SA) men augmented peak exercise hyperaemia and reactive hyperaemia in the contralateral arm by ~30% in WE, but only ~15% in SAs (2,3). This suggested that IHG training of one arm improves endothelial dilator function systemically even in young men, but the effects are greater in WE. PURPOSE: To determine the changes induced in forearm blood flow (FBF) in the contralateral arm (CA) during a single bout of IHG training, which might serve as a stimulus for improving endothelial function, and to test whether endothelium-dependent cyclooxygenase (COX) products contribute.

METHODS: In 10 WE and 10 SAs (19-23 yrs), FBF was recorded by venous occlusion photoplethysmography in the CA during IHG contractions of the dominant arm at 30% maximum voluntary contraction (5 x 3min at 5 min intervals) on 2 different days in the absence or presence of the COX inhibitor aspirin (600mg p.o.).

RESULTS: Mean arterial pressure (MABP), recorded by finger photoplethysmography, increased similarly in WEs and SAs from 79.3±2.1 to 84.0±2.6 and 82.0±2.7 to 87.5±3.0 mmHg respectively in IHG 2 and by 30% in WEs, but only ~15% in SAs (to 26.8 ± 2.9§ and 39.4 ± 3.5§ ml/min/100g in IHGs 2 and 5, §; p<.01). Aortic COX products contributed to the increased FBF in WEs, whereas vasoconstrictor COX products limit the increased FBF in SAs, thereby limiting the effectiveness of IHG training on endothelial function. Supported by Alexander S. Onassis Public Foundation

INTRODUCTION: Adults often see a period of post-exercise hypotension (PEH) following moderate intensity exercise. It is not established if children experience PEH after aerobic exercise. PURPOSE: To investigate the changes in blood pressure (BP) occurring after a bout of exercise in prepubescent boys ages 8-10.

METHODS: Ten boys visited the lab on four separate occasions. The first visit was to assess anthropometric measurements (height, weight and body composition via skinfolds) as well as perform a graded exercise test to exhaustion on an electronically braked cycle ergometer in order to establish aerobic capacity and peak power output (PPO). The subsequent visits (two exercise and one control) were randomized and counterbalanced and separated by at least 48hrs. The exercise visits were identical in protocol and required participants to arrive at the lab after an overnight fast. Resting BP measurements were obtained during 30 minutes of semi-recumbent seating. After the resting period, the child then performed 20 minutes of continuous cycling at 50% of their PPO. Upon cessation of the exercise test the child resumed the semi-recumbent position and BP measurements were obtained for minutes 5, 10, 15, 20, 30, 40, 50 and 60 post-exercise. Participants remained in the semi-recumbent position for the control visit; IP measurements were taken the same as the exercise visits.

RESULTS: Data from exercise tests were averaged. When cycling at 50% of PPO the boys averaged 62% of their VO₂peak. Resting systolic BP (110.7±14.2mmHg) did not significantly (p>0.05) differ when compared to post-exercise measurements at minutes 5 (123.2±23.6mmHg), 10 (130.3±16.1mmHg), 15 (111.0±15.7mmHg), 20 (108.7±14.3mmHg), 30 (108.9±16.1mmHg), 40 (106.4:16.1mmHg), 50 (107.3±15.2mmHg), 60 (104.8:16.1mmHg) or any measurements from the control visit. Furthermore, resting diastolic BP (61.0±3.9mmHg) did not significantly (p>0.05) differ when compared to post-exercise measurements at minutes 5 (58.1±5.1mmHg), 10 (61.7±1.8), 15 (61.1±4.3), 20 (59.2±3.9), 30 (60.2±5.7), 40 (59.0±5.0), 50 (58.3±2.7), 60 (61.2±5.4) or any measurements from the control visit. PEH was not observed in 8-10 year old boys following a 20-minute exercise at 62% of VO₂peak. It is unknown if a greater exercise intensity would elicit a PEH response.
Purpose: The objective of this study was to investigate the effect of acute exercise on coagulation factors and fibrin fiber properties in both younger healthy subjects and older subjects with cardiovascular disease (CVD). In addition, it was of interest to examine relationships between coagulation factors and fibrin fiber properties during acute exercise. METHODS: 5 male subjects were recruited to the younger, healthy (YH) group and 5 male subjects were recruited to the older group with CVD (OD). Each participant performed a single session of an acute exercise protocol, having blood drawn pre-exercise and post-exercise. Results: post-exercise liver levels were seen in groups pre- to post-exercise (p= .002) but the OD did not differ. Between group differences (YH vs. OD) were seen during exercise when measuring alpha-2-antiplasmin (p= .018, p^2= .552), antithrombin (p= .026, p^2= .481), and fibrin fiber extensibility (p= .003, p^2= .691). A significant increase in platelet levels was seen within groups from pre- to post-exercise (p= .048, p^2= .507). Pearson’s correlations revealed significant inverse correlations between VIII and fibrin fiber extensibility post-exercise (r= -.804), and between platelets and fibrin fiber extensibility post-exercise (r= -.711). Significant inverse relationships were also seen between pre-exercise alpha-2-antiplasmin and post-exercise fibrin fiber extensibility (r= -.646). Conclusion: Coagulation factors including VIII, alpha-2-antiplasmin, and antithrombin all appear to be affected by acute exercise. Furthermore, acute exercise appears to cause an increase in fibrin fiber extensibility in the OD group but not in the YH group. The four significant inverse correlations provide evidence fibrin fiber extensibility may decrease in response to exercise, by altering levels of pre-exercise VIII and platelets, and post-exercise alpha-2-antiplasmin and antithrombin.

Purpose: Determine if decrements in peripheral factors, such as skeletal muscle oxygen delivery, oxygen diffusion and mitochondrial oxygen consumption, contribute to the well-established, age-related decline in aerobic capacity (i.e. VO_2max).

Methods: Eight young (25±1 yrs) and eight old (74±3 yrs) males matched for physical activity, and body mass index, performed a graded cycling exercise test to determine maximal aerobic power (VO_2max), indirect calorimetry (i.e. Direct Fix). Maximal skeletal muscle mitochondrial respiratory capacity V_ACEO (Δ VO_2max) was assessed with mitochondrial respiration of biopsied fibers from the vastus lateralis. Results: Consistent with previous reports, during cycling exercise older individuals exhibited a 25-30% reduction in maximum power (Young: 244±9 W, Old: 182±16 W, P<0.05) and Δ VO_2max (Young: 37±2 ml/kg/min, Old: 26±2 ml/kg/min, P<0.05). Interestingly, during KE, which is free from central constraints, older individuals exhibited similar capacities in terms of KE power, Δ VO_2max, VO_2max, and Δ D O_2, to the young (See Figure). Additionally, rather than being attenuated, Δ VO_2max was actually slightly greater in the old (P<0.05). Conclusion: Despite exhibiting a lower VO_2max during whole-body exercise, the capacity for peripheral oxygen transport and utilization appears preserved in physical-activity matched elderly adults. Thus, when physical activity is maintained the age-associated decline in aerobic capacity during whole-body exercise is likely dependent upon limited central factors, such as cardiac output, and not peripheral oxygen transport and utilization.

Purpose: The age-related decline in aerobic capacity during whole-body exercise appears to be preserved in physical-activity matched, older adults. Thus, when physical activity is maintained the age-associated decline in aerobic capacity during whole-body exercise is likely dependent upon limited central factors, such as cardiac output, and not peripheral oxygen transport and utilization.

Purpose: High-intensity interval exercise leads to greater improvements in the vascular endothelial function than continuous exercise at moderate intensity. However, few studies have been performed on the effects of repetition exercise consisting of high-intensity exercise and followed by short intervals of recovery. Therefore, the purpose of this study was to investigate the effects of repetition exercise on the vascular endothelial function determined by flow-mediated vasodilation (FMD). Methods: Seven healthy male subjects completed two exercise sessions on a cycle ergometer in a counterbalanced order. The exercise sessions were (i) 20 min cycling at 50%VO_2max (CE) and (ii) 20 × 20-sec intervals at 100%VO_2max interspersed with 40-sec intervals at complete rest of the arterial function. The primary outcome measures were nFMD, adjusted peak shear rate, and endothelial function of the right brachial artery was also assessed by flow-mediated vasodilation (FMD), and then the normalized FMD (nFMD) was calculated from the adjusted peak shear rate. Results: In the CE trial, the nFMD (µM) increased after exercise and returned to the baseline level after 60 min of recovery (0.9 ± 0.1 at baseline, 1.4 ± 0.2 at 30 min after the trial, 1.2 ± 0.2 at 60 min after the trial). In the RE trial, the change in the nFMD (µM) was not significant. After the protocol, the brachial systolic and diastolic blood pressure were measured in the supine position. The vascular endothelial function of the right brachial artery was also assessed by flow-mediated vasodilation (%FMD), and then the normalized FMD (nFMD) was calculated from the adjusted peak shear rate. Results: In the CE trial, the nFMD (µM) increased after exercise and returned to the baseline level after 60 min of recovery (0.9 ± 0.1 at baseline, 1.4 ± 0.2 at 30 min after the trial, 1.2 ± 0.2 at 60 min after the trial). The exercise-by-time interaction effect was not significant; in addition, the main effect of exercise was not significant. However, there was a significant main effect of time present (P < 0.05), indicating that the nFMD changed over time. Conclusion: Acute repetition exercise increases the systemic vascular endothelial function just as continuous exercises do. These results suggest that repetition training might be useful for the prevention of cardiovascular disease.
**PURPOSE:** Burn trauma causes a hypermetabolic-cardiac stress response that impairs resting cardiac function. It is currently unknown how burn trauma affects cardiovascular responses to submaximal exercise in children. We tested the hypothesis that burned children have reduced cardiac output and stroke volume during submaximal exercise at 6-12 months post-burn.

**METHODS:** Values are expressed as means ± SD with significance set at *P* < 0.05. Five children with 49±4% total body surface area (BSA) burned (2 female, 11.7±1y, 40.4±18kg, 141±19cm) and nine similar (±0.05) controls (6 female, 12.5±2y, 59.0±16kg, 150±112cm) with comparable exercise capacity (VO2peak: 31.8±11 vs 37.7±8 mlO2·kg·min, *P* = 0.27) participated. Burned children had a reduced growth BMI-for-age percentile compared to non-burned (54±6.3 vs 93.2±6.3±tile, *P* < 0.008) at 9.4±3 mo post-burn injury. Oxygen consumption (VO2), heart rate (HR), cardiac output (Q), via non-rebreathing, stroke volume (SV, Q/HR), and arteriovenous difference (Qa-VO2) were measured during a submaximal exercise protocol that entailed a pre-exercise (preEX) rest period followed by 3-minute exercise stages at 50% and 75% of their peak VO2.

**RESULTS:** Utilizing a 2-way factorial ANOVA (group (G) x exercise (EX), G at 50% and 75% VO2peak were reduced ~27% in burned (5.6±1, 6.9±1.6 L·min) compared to non-burned (9.2±2, 9.1±1.3 L·min) (G x EX interaction, *P* = 0.012). SV did not differ from preEX to 50-75%VO2peak in burn children (preEX: 41.7±15 to 50-75%: 43.8±11.8 ml·beat), but increased ~21% in non-burned group (preEX: 47.7±16 to 50-75%: 60.7±16 ml·beat; main effect for EX, *P* = 0.046). (a-v) O2a and VO2 at preEX, 50-75%VO2peak was not different (<0.05) between groups but HR response to exercise was reduced (G x EX interaction, *P* = 0.02). When normalized to BSA, SV/index was similar between groups; however, Q/index response to exercise remained attenuated in the burned (G x EX interaction, *P* = 0.007).

**CONCLUSIONS:** These preliminary data indicate that burn children have an attenuated cardiovascular response to submaximal exercise compared to non-burned children due to impaired cardiac function. Further examination of hemodynamic function during exercise will offer insight for cardiovascular rehabilitation medicine in burned children.

---

**Abstracts were prepared by the authors and printed as submitted.**
significantly change in response to HIIT (4.93±0.55 vs. 6.31±0.57%, P=0.14) and MICT (5.32±0.62 vs. 5.60±0.68%, P=0.99). In response to LICT, FMD did not change in postmenopausal women or older men (5.21±0.64 vs. 6.02±0.73%, P=0.7 and 5.70±0.80 vs. 5.55±0.67%, P=0.99). CONCLUSIONS: Sex and exercise intensity significantly impact the FMD response to acute aerobic exercise in older adults. In older men, FMD is attenuated following acute HIIT and MICT but not LICT, whereas in postmenopausal women FMD is unaffected.

3202  Board #107  June 2 2:00 PM - 3:30 PM
The Acute Cardiorespiratory Responses to High versus Low Volume Interval Cycling Exercise in Healthy Adults
Andrew Scott, Danielle Kidd, Jodie Lawson. University of Portsmouth, Portsmouth, United Kingdom.
Email: andrew.scott@port.ac.uk

No relationships reported.

PURPOSE: High intensity interval training (IT) is an increasingly popular exercise mode with possible health risks and benefits. Therefore the purpose was to compare acute responses to two volumes of IT in healthy untrained males.

METHODS: Ten males (aged 19.5 ± 1.3 years) completed two IT trials on a cycle ergometer in a counter-balanced repeated measures study, at least 48 hours apart. Low volume (LVIT) consisted of three 20 s sprints (3x20) at self-selected maximal cadence with 7% of body mass as resistance and 60 s active rest. High volume (HVIT) consisted of ten 60 s sprints (10x60) at self-selected maximal cadence with 3.5% of body mass as resistance and 60 s active rest. Oxygen uptake (VO2), heart rate (HR) and power (W) were recorded continuously. In addition to these measures blood lactate ([La-]) and systolic blood pressure (SBP) were recorded pre, post and every ten minutes post-exercise for 30 minutes. Oxygen pulse (O2pulse), % predicted peak heart rate (%HRpeak), elevated post-exercise oxygen consumption (EPOC), energy expenditure (EE), fatigue index and rate pressure product (RPP) were calculated. Rate pressure product, systolic blood pressure trends and effect sizes were analyzed.

RESULTS: 10x60 caused a significantly greater VO2 (1548 ± 708 mL·kg⁻¹·min⁻¹ vs 1155 ± 476 mL·kg⁻¹·min⁻¹, p=0.001), O2pulse (9.6 ± 5.5 mL·beat⁻¹ vs 7.5 ± 3.3 mL·beat⁻¹, p=0.001), %HRpeak (95 ± 4.5% vs 91 ± 5.5%, p=0.010), EPOC magnitude (353.5 ± 8.1 W·hr vs 283.7 ± 7.1 L, p=0.018) and EE (500 ± 53 kcal vs 235 ± 29 kcal; p=0.001) than 3x20. EPOC duration was not significantly different (10x60: 16.5 ± 13.2 minutes vs 3x20: 10.8 ± 6.19 minutes; p=0.140). There were no significant differences in mean SBP (10x60: 136.3 ± 2.6 mmHg vs 3x20: 134.6 ± 2.4 mmHg; p=0.050) or RPP 10x60: 1617 ± 462 vs 3x20: 15957 ± 481; p=0.668) between trials, however there was a clinically significant increase in SBP 30 minutes following 3x20 (122 ± 15 mmHg) compared to pre-exercise (135 ± 8 mmHg) (p=0.053, d=1.10), but not following 10x60 (pre 131 ± 12 mmHg; post 126 ± 9 mmHg; p=0.303). 3x20 caused significantly greater fatigue index (36.5 ± 11.3% vs 23.0 ± 10.1%; p=0.009) and [La-] (11.56 ± 2.13 mmol·L⁻¹ vs 7.79 ± 2.47 mmol·L⁻¹; p=0.010; d=2.63) 10 minutes post-exercise.

CONCLUSIONS: 10x60 elicited significantly greater cardiorespiratory responses, whereas 3x20 produced a greater [La-] and fatigue index. 3203  Board #108  June 2 2:00 PM - 3:30 PM
Acute Effects of Heated Water Based Exercise on Ambulatory Blood Pressure and Heart Rate Variability in Long Term Treated Elderly Hypertensive Patients
Awassi Yuhwila Ngomane, Julia Lara Balbo, Emmanuel Gomes Ciolac. São Paulo State University – UNESP, Bauru, Brazil.
Email: awassiy@gmail.com

No relationships reported.

PURPOSE: Although heated water-based exercise (HEx) training has shown to largely reduce blood pressure (BP) in patients with resistant hypertension, the effect of a single exercise bout on ambulatory BP (ABP) in elderly subjects is unknown. Our purpose was to evaluate the acute effect of HEx versus land-based exercise (LEx) on ABP and heart rate variability (HRV) in long-term treated elderly hypertensive patients.

METHODS: Twelve sedentary elderly hypertensive patients (6 women) aged 60 ± 10 years, under drug therapy for 15 ± 3 years, underwent a 30 min of HEx (walking inside the pool), LEx (walking on a treadmill) and nonexercise control session (CON) in random order (2-5 days between interventions). HEx and LEx intensity was set at 11-13 on the 6-20 RPE scale. HRV was analyzed before and after each intervention, and twenty-four hour (24-h) ABP monitoring was performed after each intervention.

RESULTS: There was a tendency toward (P = 0.06) increase in low-frequency (pre = 43.7 ± 7.3 n.u.; post = 57.91 ± 6.5 n.u.) and decrease in high-frequency (pre = 56.7 ± 7.3 n.u.; post = 42.5 ± 5.5 n.u.) HRV after LEx, but no changes were observed after HEx and CON. However, 24-h (6 mmHg), daytime (6 mmHg) and nighttime (6 mmHg) systolic ABP were significantly lower (P < 0.05) after HEx than after LEx and CON. Although daytime (3 mmHg) and nighttime (4 mmHg) diastolic ABP was lower after HEx than after LEx and CON, this reduction was not statistically significant.

CONCLUSIONS: Although there was an improvement in HRV after LEx, 24-h daytime and nighttime systolic ABP reduced only after HEx. This result suggest that HEx may be superior than LEx to manage BP hypertension in long-term treated elderly hypertensive patients.

3204  Board #109  June 2 2:00 PM - 3:30 PM
Effect of Acute Antioxidant Therapy on Cardiac Baroreflex Sensitivity in Young Healthy Men

No relationships reported.

There is an emerging body of evidence in animals indicating that elevated oxidative stress impairs baroreflex sensitivity (BRS) function, however studies in healthy humans have yielded equivocal results. One potential reason for this discrepancy is that previous studies have used individual antioxidant treatments (e.g., Vitamin C only) to investigate the effect of oxidative stress on BRS. Recent studies in healthy humans have demonstrated significant reductions in reactive oxygen species using an antioxidant cocktail (AOC; Vitamin C, Vitamin E, and Co-enzyme Q10) suggesting the effectiveness of this treatment. Whether this AOC induced reduction in oxidative species affects BRS in young, healthy adults remains unknown.

PURPOSE: We tested the hypothesis that AOC will improve cardiac BRS in young healthy adults.

METHODS: Nine young healthy males (18 ± 3 yrs) performed two interventions: placebo (sugar pills) and AOC (200 mg Vitamin C, 150 IU Vitamin E and 100 mg Co-enzyme Q10) performed in random order. Resting heart rate (ECG) and arterial blood pressure (automated sphygmomanometer and finger plethysmography) were measured 90 minutes after AOC or placebo (a time period this AOC has been shown to have peak effects on oxidative stress). Spontaneous cardiac BRS was determined for all sequences combined (overall BRS), and also separately for up (increase systolic blood pressure: increase R-R interval) and down (decrease systolic blood pressure: decrease R-R interval) sequences.

RESULTS: Systolic blood pressure on AOC day tended to be lower relative to the placebo day (127 ± 4 vs. 131 ± 5; p=0.098). However, no differences in overall cardiac BRS were found between placebo and AOC (18.0 ± 2.7 vs 17.3 ± 2.6 ms/mmHg; p=0.98). Likewise, up sequences (17.02 ± 2.9 vs 14.04 ± 4.0 ms/mmHg; p=0.51) and down sequences (18.0 ± 2.7 vs placebo 18.0 ± 2.6 ms/mmHg AOC: p=0.98) were not different between conditions. Equal number of sequences were found between the placebo and AOC days.

CONCLUSION: These preliminary data suggest that antioxidant treatment does not affect resting cardiac BRS in young, healthy men. Supported by UTA College of Nursing and Health Innovation.
At least 44 percent of adult Americans will be obese by 2030. When young adults go off to college and leave the structured environment of a household, they often adopt unhealthy behaviors, such as unhealthy eating and getting less exercise, leading to the risk of weight gain, popularly referred to as the “Freshman Fifteen.” Unless interrupted, this pattern of weight gain in early adulthood can lead to obesity in later adulthood. Whole-body vibration training (WBVT) is a novel alternative approach to structured exercise for improving body composition for physically limited, time constrained, and/or unmotivated persons, but has not been studied yet in college students. PURPOSE: To determine if WBVT is a feasible and effective method of preventing weight gain in physically inactive college students enrolled in undergraduate nursing or other 4-year programs. METHODS: Male (n=5) and female (n=28) undergraduate students were randomized to control (n=14), age 28±1.71, BMI=28.1±5.3) or WBVT groups (n=19, age 28.5±9.0, BMI=27.5±3.8). The WBVT group completed three training sessions per week, progressing from low to high frequencies (30-50 Hz) and amplitudes (2-4mm), for six months. Control subjects were asked to maintain their usual diet and exercise habits. A 2 x 3 RM-ANOVA was used to detect
**RESULTS**: To date, 8 patients have been enrolled and randomized to AEX+RT or control. Differences in outcomes are presented as mean ± SE or median (range). Results are significant for time between groups at 6-months (p < 0.02, mean difference = 4.48 ± 1.79 SE, p = 1.79), but not so for WC (p = 0.13, mean difference = 2.71 ± 0.175 SE). **CONCLUSION**: Our preliminary findings suggest that WBVT may be both a feasible and effective method for preventing weight gain in inactive undergraduate students. Future studies should assess the effectiveness of self-monitored WBVT in the college recreation center setting.

**PURPOSE**: The present study aimed at determining the effect of two different types of exercise (elite athletes (EA) playing football and ultramarathon runners (UR)) on iron metabolism, and especially the role of hepcidin in iron homeostasis. **METHODS**: In our study, two different groups of athletes were investigated. The first group consisted of 19 male elite football athletes and the second group of 41 ultramarathon runners. In both cases, blood samples were taken pre-race (t1), immediately post-race (t2), and 24 hours post-race for EA athletes and 36–48 hours post-race for UR athletes (t3). **RESULTS**: The iron levels in time t3 were found to have statistically significant decreases compared with the iron levels in pre-race and post-race period. Moreover, in both cases, ferritin levels were increased significantly in time t2 and t3. Hepcidin levels increased in time t2 after the race, in football players (from 27.95 ± 12.98 to 37.42 ± 13.74 ng/mL) and in time t3 decreased again. However, in ultramarathon runners, hepcidin levels significantly increased in time t2 (from 29.16 ± 10.92 to 58.81 ± 16.97 ng/mL) and remained increased in time t3 as well (37.69 ± 16.38 ng/mL), despite a trend for its decrease. In football players, sTIR levels did not change, contrary to ultramarathon runners where sTIR levels were found decreased after the race and in time t3. **CONCLUSIONS**: Iron metabolism in athletes can be impacted by the type of exercise. Ferritin is not a reliable marker for iron balance, because in the present study, it is more likely an acute phase protein. The main regulator of iron homeostasis, hepcidin increases, showing the body’s response to inflammation, by trapping iron in the macrophages and by altering iron absorption. Finally, a strenuous and prolonged exercise can lead to sports anaemia.

**HIV+ adults have 40% lower VO2 (\textsuperscript{max}) (VO2) than age-matched healthy adults. High intensity aerobic exercise (AEX) increases VO2 in older adults. A growing body of evidence demonstrates that HIIT can serve as an effective alternative to AEX. However, data in older HIV+ adults for both modalities is very limited even though a quarter of HIV+ Americans are over 50 years old. PURPOSE: To examine the effects of progressive AEX+RT and HIIT+RT on VO2 and strength in HIV+ older adults vs. sedentary controls.**

**METHODS**: Sedentary HIV+ men 50+ years of age were randomized to AEX+RT or delayed entry control groups. AEX+RT group received 16-weeks (48 sessions) of supervised center-based training with progression to a target of 45 minutes of continuous exercise at 70–80% HR\textsuperscript{max}. The RT protocol consisted of 6 exercises progressed to 80% of baseline 1-RM. Control participants remained sedentary. Both groups were tested at baseline and 16-weeks. The control group participants started 16 weeks of HIIT in a cross over design. The HIIT group received the same duration of supervised training and identical RT protocol with repeated testing at 32 weeks. The HIIT protocol was performed using 4 intervals of 4 minutes of work (90–95% HR\textsuperscript{max}) separated by 3 minutes of active rest (50–60% HR\textsuperscript{max}) for a total time of 28 minutes. Paired t-test or Wilcoxon signed rank sum were used to test pre/post differences. Results are presented as mean ± SE or median (range).

**RESULTS**: To date, 8 patients have been enrolled and randomized to AEX+RT or control with 16 week testing complete in all 8 and post-HIIT testing completed in 3. AEX+RT increased VO2 by 0.29 ± 0.03 L/min (p < 0.03) and lower body strength (+37% 1-RM, p = 0.05). Post-hoc comparison showed that HIIT+RT training had comparable increases in VO2 by 0.32 ± 0.09 L/min (p = 0.07) and lower body strength (+31% 1-RM, p = 0.05). There was a trend for increased lean mass (LM) measured by DXA after AEX+RT (1.2 kg (-1.8 to 6.1) and HIIT+RT (1.5 kg (-1.2 to 6.1) and decreased LM after the sedentary control period (-1.7kg (-4.1 to 1.6). Changes in LM were significant for time t3 between AEX+RT and HIIT+RT (p = 0.02). **CONCLUSIONS**: Progressive high-intensity AEX+RT was well tolerated and effective in older HIV+ men. HIIT may be a more time efficient option that can equally improve VO2 and strength in the growing population of older adults with HIV.
**Purpose:** To determine the effect of prolonged exercise (14 to 30 hours) on intraocular pressure and corneal thickness.

**Methods:** Entrants of the 2013 161-km Western States Endurance Run were invited to participate in our study via pre-race email. During the 2 days prior to the race, informed consent was obtained and pre-race testing was performed. Pre- and immediate post-race, binocular and monocular visual acuity was measured using an illuminated Snellen eye chart and intraocular pressure was measured in both eyes with Tonopen XL (Reichert Technologies, Depew, NY). Pre- and immediate post-race corneal thickness was measured three times in rapid succession using an ultrasonic pachymeter (Corneo-Gage Plus, Sonogage, Cleveland, OH) after corneal anesthetization with 0.5% proparacaine hydrochloride.

**Results:** Eight entrants completed the study among which, six reported a prior history of ultramarathon-associated visual impairment. Three had a history of bilateral refractive surgery. One participant reported a period of "tunnel vision" during the race. Beyond this, there were no reports of visual impairment during this race which had a temperature range of 5.0 to 39.0°C. Pre- and post-race visual acuity measurements were essentially unchanged. Pre- and post-race corneal thickness did not change with a mean (±SD) of 661 (±82) mm pre-race and 667 (±84) mm post-race. Post-race intraocular pressure decreased from pre-race values in 10 of 16 eyes, was unchanged in 2 and higher in 4, with mean (±SD) pressure being 12.3 (±3.6) and 11.4 (±3.5) pre- and post-race, respectively (p<0.5).

**Conclusions:** Within this small sample, visual acuity, corneal thickness and intraocular pressure were not significantly altered by completion of a 161-km foot race. These findings offer some assurance to athletes who might have concern about elevating intraocular pressure from ultramarathon running.

---

**Purpose:** To evaluate hamstring and quadriceps strength after ACL (Anterior Cruciate Ligament) reconstruction.

**Methods:** To determine the effect of prolonged exercise (14 to 30 hours) on intraocular pressure and corneal thickness.

**Results:** A total of 40 subjects met inclusion criteria’s, of which 31 had hamstring graft and 9 had patellar tendon graft. 35% of subjects with hamstring graft had weakness in both extensors and flexors (greater in extensors). 9 subjects had a patellar tendon graft. 35% of subjects with hamstring graft had weakness in the extensor mechanism of the knee, 13 had weakness in flexors and extendors (29% greater in extendors and 13% greater in flexors), 13% presented weakness in flexors and 10% had weakness in the extensors of the non-surgical knee. 9 subjects had a patellar tendon graft, of which 56% had weakness in extensors and 44% demonstrated weakness in both extensors and flexors (greater in extensors).

**Conclusions:** Overall, our subject’s demonstrated increased weakness in the extensor mechanism of the knee in both patellar tendon and hamstring graft groups.
Sedentary bouts were defined as greater than or equal to 20, 30, and 60 min. Body composition, waist circumference, blood pressure, glucose, insulin, triglycerides (TG), high-density lipoprotein, and low density lipoprotein (LDL) cholesterol were measured. Multiple regression analyses were used to assess associations among variables, while controlling for age, sex, race/ethnicity, accelerometer wear time and MVPA. RESULTS: Total time spent in sedentary behaviors averaged 8.7 ± 1.5 h/day. Sedentary bouts greater than or equal to 20, 30 and 60 min accounted for 36%, 23%, and 6% of total sedentary time, respectively. The average length for bouts of greater than or equal to 20, 30, and 60 min was 33.7 ± 4.1 min, 45.6 ± 6.6 min and 63.7 ± 4.0 min, respectively. Sedentary bouts of 20 min or more had the strongest relationships with CMD risk factors, compared to bouts of 30 and 60 min or more. Time spent in sedentary bouts of 20 min or more was independently associated with BMI (R² = 0.13, β = 0.24, p < 0.01), waist circumference (R² = 0.15, β = 0.25, p < 0.01), LDL (R² = 0.20, β = 0.27, p < 0.01), TG (R² = 0.11, β = 0.25, p < 0.02), insulin (R² = 0.15, β = 0.25, p < 0.01), and fat mass (R² = 0.23, β = 0.27, p < 0.01), after adjusting for all covariates. CONCLUSIONS: Our novel findings suggest that sedentary behavior, in bouts of 20 min or more, is significantly and independently associated with markers of CMD in young adults. These findings have important implications for CVD prevention programs in young adults and suggest that public health guidelines with regards to minimizing prolonged sedentary behaviors are warranted. Funded by NIH 1U54GM104944

3219 Board #124 June 2 3:30 PM - 5:00 PM Energy Expenditure in Yoga versus Other Forms of Physical Activity
Sally A. Sherman, Ph.D.1, Renee J. Rogers, Ph.D.1, Kelliann K. Davis, Ph.D.1, Ryan L. Minster, Ph.D., M.S.I.S.1, Seth A. Creasy, Ph.D.1, Nicole C. Mullarkey, M.S.1, Matthew O’Dell, M.S.2, Patrick Donahue, B.S.3, John M. Jakicic, Ph.D., FACSM1. 1University of Pittsburgh, Pittsburgh, PA. 2University of Colorado, Denver, CO. (Sponsor: John M. Jakicic, Ph.D., FACSM)
Email: sally.sherman@pitt.edu

It is currently not clear whether yoga is an activity that meets the requirements for moderate-to-vigorous physical activity and how yoga compares in intensity to other forms of physical activity.

PURPOSE: This study compared energy expenditure during acute bouts of Vinyasa yoga (YOGA) and two treadmill walking protocols. METHODS: Data from were available on 28 participants (15 males, 13 females) who performed three 60-minute activity bouts on separate days that included: 1) YOGA, 2) treadmill walking at a self-selected brisk pace (SELF), 3) treadmill walking at a pace that matched their HR to that of their yoga session (HR-MATCH). Energy expenditure (kcal and metabolic equivalent of task [MET]) was measured with indirect calorimetry. RESULTS: When examining the entire 60 minute period of activity, energy expenditure was significantly lower in YOGA (285.1±71.6 kcal, 3.7±0.6 MET/min) compared to both HR-MATCH (367.3±93.7 kcal, p<0.001; 4.9±0.8 MET/min, p<0.001) and SELF (329.2±82.1 kcal, p<0.001; 4.4±0.7 MET/min, p<0.002), and in HR-MATCH compared to SELF (p-value for kcal = 0.012; p-value for MET/min = 0.016). Because the final 15 minutes of the YOGA session was restorative in nature, data analysis was repeated using only the initial 45 minutes of each activity session. For these analyses, energy expenditure was significantly lower in YOGA (234.0±57.8 kcal, 4.1±0.6 MET/min) compared to HR-MATCH (306.0±77.6 kcal, p<0.001; 5.4±0.9 MET/min, p<0.001) but not SELF (242.8±60.7 kcal, p=0.393; 4.3±0.7 MET/min, p=0.650), and in HR-MATCH compared to SELF (p-value for kcal <0.001; p-value for MET/min <0.001). Gender did not significantly influence the pattern of the results observed. CONCLUSIONS: Across a 60-90 min walking bout, energy expenditure in YOGA is significantly lower than both SELF and HR-Match. When the restorative component of YOGA was removed from the analysis, energy expenditure in YOGA was comparable to SELF. Moreover, YOGA met the energy expenditure requirement (>3 METs) for moderate-intensity physical activity, and therefore is likely to elicit health benefits similar to walking performed at a self-selected brisk walking pace. Interventions to directly compare YOGA to other forms of physical activity are warranted.
non-significant correlations were found between measures of physical functioning and other PA variables. CONCLUSION: Persons with DS have low levels of PA and high levels of sedentarity. Most persons with DS do not meet the PA Guidelines for Americans. They also have low levels of physical functioning. Lower levels of physical functioning are associated with greater participation in light PA among persons with DS.

F-56  Free Communication/Poster - Descriptive Epidemiology and Surveillance
Friday, June 2, 2017; 1:00 PM - 6:00 PM
Room: Hall F

3221  Board #126  June 2 2:00 PM - 3:30 PM
Screen Time, Physical Activity, And BMI Among Hispanic Children In Puerto Rico
David Colon, Lucia Del R. Martinez-Colón, Farah A. Ramírez-Marrero, FACSM. Universidad de Puerto Rico Rio Piedras Campus, San Juan, PR.
Email: mcolon.edfi@gmail.com
(No relationships reported)

Screen time (ScT) represents a behavior usually, but not always, associated with reduced physical activity, and increased sedentary time and BMI among children. Childhood obesity is a major health problem, particularly among Hispanic children in Puerto Rico. Aims: To evaluate the use of passive vs. active video games (PVG and AVG), and BMI and sedentary among ≤ 8-year-old Hispanic children in PR. Methods: A convenience sample of 100 children (54 boys and 46 girls) were enrolled in the study. Each child wore an accelerometer attached to an elastic band over the right hip area for 7-days, and their parents completed a physical activity questionnaire including information regarding their children’s screen time. T-tests were conducted to detect sex differences, and correlation analyses to detect associations between variables. Results: Total screen time (2.1±1.5 hrs/day), PVG (0.4±0.6 hrs/day) and AVG (0.1±0.4 hrs/day), and MVPA (4.4±2.9 hrs/day) were not significantly different between boys and girls. An inverse correlation was observed between MPVA and AVG (r = -0.20, P = 0.04). No other significant correlations were detected between ST, MPVA, and BMI. Conclusion: ScT in the group of Hispanic children evaluated was in the recommended limit, and appear not to affect their level of MPVA, which exceeded current recommendations. They appear to spend more time using PVG than AVG, and those that spent more time in AVG also spent less time in MPVA. These results support other studies suggesting that ScT does not influence MPVA or BMI in young children.

3222  Board #127  June 2 2:00 PM - 3:30 PM
Comparison Of Step Count During A Bout Of Pokémon Go Vs Traditional Aerobic Exercise
Katie M. Smith, Sadie Timms, Casey Reisen, Calvin A. Busby, Nicole L. Whalen. Simpson College, Indianola, IA.
Email: katie.smith@simpson.edu
(No relationships reported)

Traditional video game use employs sedentary behavior but exergames allow for such games to involve physical activity (PA). Pokémon Go is a live, real-time version of a popular video game involving the use of a mobile device’s GPS capability to locate, capture, battle, and evolve virtual characters. Users transport to physical locations to advance in the game, meanwhile potentially using a mode of PA during play. Purpose: To compare the number of steps taken when playing Pokémon Go to a traditional bout of aerobic exercise, walking at a self-selected pace. Methods: Seventeen regular Pokémon Go users ages 18-65 years old wore a pedometer while playing the exergame as an individual or in a group depending upon the participant’s normal type of play, distance traveled, and regular PA patterns. ST and AVG PA Guidelines were included in the analysis. The amount of green space, regardless of buffer level, has no variable while accounting for socio-demographic variables in regression analysis. Residential green space was used as the primary independent variable while accounting for socio-demographic variables in regression analysis. RESULTS: The adjusted mean ST value (min/day) in men and women was 561.8 and 469.3, respectively (P<0.001), and number of SB bouts (times/day) was 57.0 in men and 61.3 in women (P<0.001). The number of SB bouts of less than 10 min was 42.9 in men and 49.4 in women (P<0.01). On the other hand, the number of SB bouts of lasting 20-29 min was 2.9 and 2.3 in women, that of 30-59 min was 3.5 in men and 2.5 in women, and that of at least 60 min was 1.6 in men and 1.1 in women (all P<0.001). Time accumulated by short-bout (1-9 min) SB in women was significantly longer than men (men:114.7, women:128.3), whereas time accumulated by long-bout SB in women was significantly shorter than men (20-29 min SB:men:70.4, women:55.6, 30-59 min SB:men:143.4, women:103.1, and ≥60 min SB:men:148.4, women:100.2). CONCLUSIONS: Older women were less likely to be prolonged sedentary with more frequent interruption compared to older men. Effect of patterns of SB on health outcomes may differ by gender.

3223  Board #128  June 2 2:00 PM - 3:30 PM
Patterns of Objectively-assessed Sedentary Behavior in Community-dwelling Japanese Older Adults
Shiho Amagasa, Noritoshi Fukushima, Hiroyuki Kikuchi, Tomoko Takarniya, Shigeru Inoue. Tokyo Medical University, Tokyo, Japan.
(No relationships reported)

Accumulated evidence suggests greater time spent in sitting is associated with adverse health outcomes. However, limited data on how sedentary behavior (SB) is patterned in older adults. PURPOSE: To examine patterns of objectively-assessed SB classified by duration of bout in community-dwelling Japanese older men and women. METHODS: This cross-sectional study included 450 Japanese older adults (255 men, 70-79 years) who were randomly selected from resident registries and provided valid data (wearing at least four days of ≥10 hours/day) of accelerometer (HJA-350IT, Omron Healthcare, Japan). Descriptive analyses of the duration (min/day) and number of bouts (times/day) of SB (<1.5 METs) were conducted, stratified by gender. Total SB time was further divided into five types according to the duration of SB: 1-9 min, 10-19 min, 20-29 min, 30-59 min, and ≥60 min. Gender differences in patterns of SB were assessed using analysis of covariance (ANCOVA) after adjusting for age and wear time.

RESULTS: The adjusted mean SB time (min/day) in men and women was 561.8 and 469.3, respectively (P<0.001), and number of SB bouts (times/day) was 57.0 in men and 61.3 in women (P<0.001). The number of SB bouts of less than 10 min was 42.9 in men and 49.4 in women (P<0.01). On the other hand, the number of SB bouts of lasting 20-29 min was 2.9 and 2.3 in women, that of 30-59 min was 3.5 in men and 2.5 in women, and that of at least 60 min was 1.6 in men and 1.1 in women (all P<0.001). Time accumulated by short-bout (1-9 min) SB in women was significantly longer than men (men:114.7, women:128.3), whereas time accumulated by long-bout SB in women was significantly shorter than men (20-29 min SB:men:70.4, women:55.6, 30-59 min SB:men:143.4, women:103.1, and ≥60 min SB:men:148.4, women:100.2). CONCLUSIONS: Older women were less likely to be prolonged sedentary with more frequent interruption compared to older men. Effect of patterns of SB on health outcomes may differ by gender.

3224  Board #129  June 2 2:00 PM - 3:30 PM
Exploring Associations Between Greenspace, Physical Activity, And Health Outcomes: Results From The 2011-2015 Illinois BRFSS
Jong Chedl Shin, Diana S. Grigsby-Tousson, 61820. University of Illinois at Urbana-Champaign, Champaign, IL.
Email: jshin57@illinois.edu
(No relationships reported)

PURPOSE: 1) To examine spatial effects of green space on health outcomes at various levels of geography; 2) To examine the potential mediating effect of physical activity on the relationship between green space and health outcomes. METHODS: Socio-demographic (e.g., sex, race, poverty, age) and health outcome variables (e.g., obesity, diabetes, heart disease, and mental health) were derived from the 2010-2015 Illinois Behavioral Risk Factor Surveillance System (BRFSS). Measures of green-space were created using tree canopy data from the 2011 National Land Cover Dataset (NLCD). Residential area was defined using measures of urban density by counting dwellings per 10 hectares. Green space was calculated for three levels of buffers, specifically 300m, 500m, 1km for each residential unit and the entire county where the residential unit was located. ArcGIS 10.3 (ESRI, CA), was used to geoprocessing all data. Residential green space was used as the primary independent variable while accounting for socio-demographic variables in regression analysis. RESULTS: Due to missing data, only 78 of 102 Illinois counties (76.47 %) were included in the analysis. The amount of green space, regardless of buffer level, has no association with health outcomes. Physical activity explained a significant proportion of variance only for diabetes all measures of green space: 300m, 500m, and 1000m for residential units (β = -0.12, p<0.03; R² = 0.30, p<0.001); county level (β = -0.14, p<0.02; R² = 0.31, p<0.001). CONCLUSIONS: Although county level green space was negatively associated with physical activity, residential green space showed no association. This difference supports the importance of appropriately defining geographical units used for large-scale population-based. Further studies clarifying geographic units of analysis are required.
The Impact of Public Transportation on Daily Walking Level

Kenta Okuyama. Colorado Department of Public Health and Environment, Denver, CO.

(No relationships reported)

Background: Only 21% of the U.S. adults meet the recommended level of physical activity: 150 minutes of moderate intensity of physical activity per week, or 75 minutes of vigorous intensity of physical activity per week. Transportation is recognized as one of the most influential domains determining people’s daily physical activity level. There are a few studies looked at the walking level of public transit users as well as socio-demographic traits. This study examined walking time difference between public transit users and non-public transit users to articulate how much walking time is derived from transit related walking more clearly, and how demographic characteristics differ among the two groups. Purpose: To investigate and articulate the impact of public transit on the walking activity level within the U.S. population in order to advocate the ongoing public transit improvement projects and policy changes toward walkable communities. Methods: The National Household Travel Survey conducted from March 2008 to May 2009 by the U.S. Department of Transportation was used to examine the association between public transit use and walking trip time for an assigned travel day. Multivariate linear regression model was applied to estimate the difference of walking time in minutes per day between public transit users (n=2,835) and non-public transit users (n=165,969). Results: People who used any forms of public transit walked 35.2 minutes more than people who did not use public transit during one travel day (p<0.01). 27.0 minutes of the 35.2 minutes difference was gained exclusively from transit related walking which includes access from or to public transit. In addition, people in low income group, minority population groups such as African American and Hispanic people, people residing in bigger cities, and people perceiving the lack of access or availability of public transit as a big issue had longer daily walking time compared to the other groups (p<0.01). Conclusion: There is a significant association between public transit use and daily walking time. The results of this study will add on an evidence to the positive impact of public transit on physical activity and, support ongoing project of public transit improvement, such as railway extension, as well as policy enactments with respect to public transit system.

3226 Board #131 June 2 2:00 PM - 3:30 PM
Social Network Engagement and Adherence with Physical Activity Recommendations; The American Time Use Survey

Carlene A. Mayfield1, Melinda Forthofer2.1 University of South Carolina, Columbia, SC. 2University of North Carolina Charlotte, Charlotte, NC.

Email: carlene@email.sc.edu

(No relationships reported)

Physical activity has numerous benefits in both primary and secondary prevention of chronic diseases. Current estimates suggest that most adults are not meeting the minimum recommended levels (PA-R) of leisure time physical activity (LT-PA) and these levels of adherence can vary by sociodemographic factors. Individuals’ social networks may impact their health behavior choices through interpersonal support mechanisms. Many LT-PA intervention studies have utilized “buddy systems” or social network engagement (SNE), as a method of promoting adherence. Thus far, there have been no large-scale, population based examinations of the relationship between SNE and adherence to PA-R. PURPOSE: The current study used nationally representative data from the American Time Use Survey dataset to test the relationship between Social Network Engagement (SNE) and participants’ adherence to minimum recommendations (PA-R) during leisure-time physical activity (LT-PA), and the impact of socio-demographic factors.

METHODS: Data were collected from each cross sectional year (2003-2014) of the American Time Use Survey dataset. Leisure Time-Social Network Engagement (SNE) was conceptualized as the participation of LT-PA with a member of an individual’s social network. Adherence to PA Recommendations (PA-R) was dichotomized as meeting or not meeting the PA-R adherence estimation. RESULTS: The data were stratified by gender for the analysis. Age group, the only significant covariate, was controlled for in the models presented here. Men (OR = 1.53; 95% CI: 1.11 to 2.11) and women (OR = 2.52; 95% CI: 1.90 to 3.34) engaging their social network during reported LT-PA were more likely to meet PA-R compared to participating alone. Men engaging a friend (OR = 2.80; 95% CI: 1.84 to 4.25) and women engaging a family member (OR = 4.39; 95% CI: 2.37 to 8.12) or a friend (OR = 3.08; 95% CI: 2.10 to 4.51) during LT-PA were more likely to meet PA-R compared to participating alone, and when controlling for age and other forms of SNE. CONCLUSIONS: Social Network Engagement is associated with meeting PA-R. This relationship varies by gender and the type of SNE, but not other common sociodemographic factors.

3227 Board #132 June 2 2:00 PM - 3:30 PM
Reported Walkable Destinations Across Age Groups Among US Adults — 2015

Geoffrey Whitfield1, Susan A. Carlson2, Emily N. Ussery3, Kathleen Watson4, David Berri2, Janet E. Fulton, FACSM3.1 Centers for Disease Control and Prevention, Atlanta, GA. 2National Institutes of Health, Bethesda, MD. (Sponsor: Janet Fulton, FACSM)

(No relationships reported)

The Guide to Community Preventive Services recommends community-scale design strategies as a way to increase physical activity. One example of this strategy is locating residences within walking distance of other destinations. Physical activity participation declines with increasing age. It is unclear if the prevalence of near-home walkable destinations also declines with age. PURPOSE: To describe the prevalence of four types of walkable destinations across age groups in a representative sample of US adults aged ≥18 years. METHODS: Respondents to the 2015 National Health Interview Survey reported the presence of four walkable destination types near their home: shops, stores, or markets; bus or transit stops; movies, libraries, or churches; and places that help one relax, clear one’s mind, and reduce stress. The proportion reporting each was calculated and stratified by age group. Differences between age groups were assessed with Wald tests corrected for multiple comparisons; trends were tested with orthogonal contrasts. RESULTS: Overall, 71.8% reported walkable relaxing destinations, followed by shops (58.0%), transit (53.2%); and movies, libraries, or churches (47.5%). For shops; transit; and movies, libraries, or churches, adults aged 18–34 years reported similar values, beyond which the prevalence was progressively lower with increasing age (all p<0.05 for trend, Table). For relaxing destinations, the prevalence was similar among adults aged 18–44 years, and lower among those aged 45–64 and ≥65 years. CONCLUSIONS: In general, the prevalence of walkable destinations among adults was lower with increasing age, and most consistently among adults aged ≥45 years. Community-scale design, including locating residences and other destinations within walking distance, can help promote physical activity across all ages. Addressing differences in the prevalence of walkable destinations between older and younger adults may be a community design priority.

% Reporting Walkable Destinations

<table>
<thead>
<tr>
<th>Shops, stores, markets</th>
<th>Bus or transit stops</th>
<th>Movies, libraries, churches</th>
<th>Places to relax, reduce stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>%</td>
<td>95% CI</td>
<td>%</td>
</tr>
<tr>
<td>18-24</td>
<td>71.5a</td>
<td>68.8-74.1</td>
<td>62.7a</td>
</tr>
<tr>
<td>25-34</td>
<td>67.8a</td>
<td>65.6-69.9</td>
<td>62.1a</td>
</tr>
<tr>
<td>34-44</td>
<td>60.5</td>
<td>58.3-62.6</td>
<td>56.0</td>
</tr>
<tr>
<td>45-64</td>
<td>54.3</td>
<td>52.5-56.0</td>
<td>49.6</td>
</tr>
<tr>
<td>≥65</td>
<td>44.7</td>
<td>42.8-46.6</td>
<td>42.8</td>
</tr>
</tbody>
</table>

Within columns, values with the same letter are not significantly different (p>0.05).
**RESULTS:** Objectively assessed physical activity, i.e. daily average step counts per day, declined during the month of Ramadan compared to non-Ramadan months in this population. The average daily steps per day during Ramadan month was 7,267 (95% CI 7,180 to 7354) steps. When compared to one month prior Ramadan there was an average reduction of 619 steps (95% CI 483 to 755) per day p<0.001. The decline in physical activity during Ramadan was higher men (729±74) steps compared to women (490±81). However, one month post Ramadan the physical activity levels declined by daily average step counts increased by average 548 steps (95% CI 407 to 688) compared to Ramadan (P<0.001) and were similar to pre-Ramadan month (P=0.692).

**CONCLUSIONS:** This study confirmed that in this population, due to the shift in time of activity as well as caloric intake from daylight to evening hours during Ramadan there was substantial decline in objectively assessed daily physical activity among Muslim adults. Interventions are needed to promote physical activity during this period.

**3229 Board #134**

**June 2 2:00 PM - 3:30 PM**

**Changes In Body Height And Weight Of Children And Adolescents In China During 1943-2014**

Yihong Zhang, Yu Pei. Chengdu Sport Institute, Chengdu City, China. (Sponsor: Zhengheng Wang, FACSM)

Email: 1688821@qq.com

(No relationships reported)

**PURPOSE:** To compare body height and weight of 5-19 years old children and adolescents between 1943 and 2014 in China, and to determine the change in morphological development in Chinese children and adolescents over 71 years. METHODS: Based on the Student Physical Standard (made by the Physical Education Committee of the Ministry of Education of China, with unknown sample size) in 1943 and the National Physical Fitness Surveillance Report (from the General Administration of Sport of China, with sample size of 358725.) in 2014, the data in body height and weight of 5-19yr boys and 5-17yr girls were compared. The difference of height and weight average of children and adolescents in each age, and the growth of each age were calculated. And contrast chart were generated. Due to the sample size data could not be obtained when the Student Physique Standard is established, in this study we couldn’t test the mean difference. Therefore this study used simple statistical description to reflect the growth trend of children and adolescents. RESULTS: The average height in each age for boys between 5-19yr and girls between 5-19yr in 2014 was significantly higher than that in 1943, the differences were 4.6(19yr)-20.4(13yr) cm for boys and 3.4(17yr)-14.7(11yr) cm for girls. The average weight in each age for boys between 5-19yr and girls between 5-19yr in 2014 was significantly higher than in 1943, and the differences were 2.4(5yr)-14.8(3yr)kg for boys and 1.2(5yr)-11.6(11yr) kg for girls. In 1943,boys between 5-14yr were at a lower physical development level than girls, but boys after 14 yr were at a higher physical development level than girls. However, in 2014,boys between 10-11yr were at a similar physical development level compared to girls, in each of the other ages boys were at a higher level than girls. In 1943, the height growth spurt periods were from 12-13yr in girls and from 15yr in boys, and the weight growth spurt periods were from 12-15yr in girls, and from 14-15yr in boys. In 2014, the growth spurt periods for both height and weight were 11yr in girls and 13yr in boys. CONCLUSION: Compared to the data collected in 1943, Chinese children in 2014 were larger and heavier. In the year, a 1-2 cm girls gap was also observed in terms of the growth spurt age. Supported by the Sports Medicine key laboratory of General Administration of Sport of China(A2015C06).

**3230 Board #135**

**June 2 2:00 PM - 3:30 PM**

**Physical Literacy of 8-12 Year Old Children in Prince Edward Island, Canada**

Travis Saunders, Rachel Kays, Dany MacDonald. University of Prince Edward Island, Charlottetown, PE, Canada.

(No relationships reported)

**PURPOSE:** Physical literacy is defined as the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engaging in physical activities for life. The purpose of the present study was to assess the physical literacy of children and youth living in Prince Edward Island, Canada, using preliminary results from the RBC Canadian Assessment of Physical Literacy (CAPL).

**METHODS:** The CAPL includes tests in 4 domains: Motivation and Confidence (CSAPPA Questionnaire), Knowledge and Understanding (CAPL Physical Activity Questionnaire), Physical Competence (BMI, waist circumference, grip strength, PACER test, plank, sit and reach, and obstacle course), and Daily Behaviour (objectively measured steps/day and self-reported physical activity and sedentary behaviour). The scoring categories for each domain were: Beginning, Progressing, Achieving, or Excelling, with Achieving considered the minimum recommended score.

**RESULTS:** Data were collected on 205 boys and 202 girls aged 8-12 years (mean: 10.7±1.1 years). The proportion of participants identified as Achieving or Excelling in each domain was as follows: Motivation and Confidence: 40%; Knowledge and Understanding: 66%; Daily Behaviour: 64%; Physical Competence: 39%; Overall Physical Literacy: 63%.

**CONCLUSIONS:** Although two-thirds of participants were considered to have met the minimum recommended level of Knowledge, Daily Behaviour, and overall Physical Literacy, only a minority of children met the minimum recommended levels of Physical Competence and Motivation and Confidence.

**FUNDING:** Research funding was provided by the Children’s Hospital of Eastern Ontario Research Institute through the RBC Learn to Play project, delivered in partnership with Participation ACTION and the Public Health Agency of Canada.

**3231 Board #136**

**June 2 2:00 PM - 3:30 PM**

**Geographical Distribution, Socioeconomic Status And Health-related Physical Fitness In Adolescents From A Large Population-based Sample From Bogotá, Colombia: The Ser Study**

Diogo Rodrigues-Bezerra1, Robinson Ramirez-Vélez2, Jorge E. Correa-Bautista2, Jose De Jesus Moreno-Montoya2, Gustavo Tovar3, Antonio García-Hermoso4. 1Centro de Estudios para la Medición de la Actividad Física «CEMA», Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá, Bogotá D.C, Colombia. 2Centro de Estudios para la Medición de la Actividad Física «CEMA», Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá, Bogotá, Colombia. 3Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá D.C, Colombia. 4Laboratorio de Ciencias de la Actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile.

Email: robin640@hotmail.com

(No relationships reported)

**PURPOSE:** The negative gradient between socio-economic status and prevalence of non-communicable disease in adulthood has prompted investigation of potential foundations that may have been based in childhood. The objective of the present study is to examine the influence of socio-geographical variations and socioeconomic status on health-related physical fitness in adolescents from a large population-based sample of Colombian ninth graders.

**METHODS:** During the 2014-2015 school year, we examined a cross-sectional component of the SER Study is a cross-sectional Body mass, height, muscular fitness (standing broad jump and handgrip tests) and cardiorespiratory fitness (20 m shuttle-run) were measured in n=52,204 14-16-year-olds. Area-level socioeconomic status was categorized from 1 to 6. A model was built by means of a step-by-step process and gradient maps were created to show physical fitness in the quartiles and the trend of physical fitness across disaggregated in Zonal Planning Units (in Spanish UPZ) in Bogotá, for each of the five health-related physical fitness variables.

**RESULTS:** Socioeconomic status was used as the only group-level variable and this had a significant effect on the models for all health-related physical fitness parameters except for handgrip. Cardiorespiratory fitness, standing broad jump, and body mass index increased 6.31, 2.69, and 1.45 times, respectively, on average with the maximum increase in socioeconomic status categories, when we compared two random individuals in each stratum.

**CONCLUSIONS:** Our results suggest a significant association between health-related physical fitness variables and socio-geographical location in ninth grade adolescents from Bogotá, using a multilevel methodological approach.
to estimate the age-adjusted prevalence of self-reported walking among adults ≥ 18 years. Walking was defined as engaging in at least one 10-minute bout of transportation or leisure walking in the past seven days. Estimates are reported for the total sample and stratified by sex. Linear and quadratic trends in walking prevalence from 2005 to 2015 were tested using logistic regression.

RESULTS: The overall prevalence of self-reported walking increased significantly from 2005 to 2015, although a leveling off was observed between 2010 and 2015 (2005: 55.7%, 2010: 62.1%, 2015: 63.9%; p-value for linear and quadratic trends &lt; 0.05). A similar trend was observed among men, with no significant difference in prevalence between 2010 and 2015 (2005: 54.3%, 2010: 61.8%, 2015: 62.8%; p-value for linear and quadratic trends &lt; 0.05). Among women, the prevalence of walking demonstrated a significant linear increase from 2005 to 2015 with no significant quadratic trend; the increase in prevalence between 2010 and 2015 was significant (2005: 55.4%, 2010: 62.5%, 2015: 65.1%; p-value for linear trend only &lt; 0.05).

CONCLUSION: Overall, the proportion of U.S. adults who reported walking significantly increased from 2005 to 2015; however, the results suggest that this increase has slowed in recent years, especially among men. This finding highlights the importance of implementing effective programs and policies that promote walking and improve the walkability of communities, as described in Step It Up! The Surgeon General’s Call to Action to Promote Walking and Walkable Communities.

### Board #138
**Findings from the 2016 Active Healthy Kids Scotland Report Card**

ADRIENNE R. HUGHES1, Avril Johnstone1, Geraldine McNeill2, John J. Reilly1. 
1University of Strathclyde, Glasgow, United Kingdom; 2University of Aberdeen, Aberdeen, United Kingdom. (Sponsor: David Rowe, FACSM)

Email: adrienne.hughes@strath.ac.uk

No relationships reported

The Active Healthy Kids Scotland Report Card provides a comprehensive assessment on the physical activity and health of Scottish children and adolescents. **PURPOSE:** To summarize the report card grades; to identify changes in report card grades since the previous report card published in 2013; to critique Scottish surveillance of physical activity and health in children and young people.

**METHODS:** Report card grades were assigned to 10 indicators related to physical activity and health (7 behavioral indicators and 3 policy and environment indicators). Grades were based on Scottish data which were: recent (published after the 2013 card), derived from nationally representative samples and affected by minimal bias, and determined by the percentage of Scottish children and adolescents meeting an evidence-based benchmark: A is 81% to 100%; B is 61% to 80%; C is 41% to 60%; D is 21% to 40%; F is 0% to 20%; INC is Incomplete data combined with lack of an evidence-based recommendation. Grades were assigned a ‘+’ if trends had improved since the last report card and a ‘−’ if there was a marked socio-economic inequality in the indicator. **RESULTS:** Overall Physical Activity, Sedentary Behavior and Obesity received F or F+ grades. Active Outdoor Play and Organised Sport Participation were graded as INC. Active Transportation to School/Nursery was graded C, and Diet D-. Family and Peer Influence was graded as D-. Community and the Built Environment, and National Policy were both graded B. Issues with measurement and reporting of several physical activity indicators were identified: no surveillance of moderate to vigorous physical activity in children, no surveillance of active outdoor play and sports participation in children or adolescents, and summary surveillance data not reported in line with evidence-based recommendations.

**CONCLUSIONS:** Grades were similar to those in 2013. Scotland has a favorable environment for physical activity, but children and adolescents have low physical activity and high screen-based sedentary behavior. Better surveillance of physical activity and health in Scottish children and adolescents is required and would encourage more evidence-informed physical activity and health policy in Scotland in future.

### Board #139
**Running Profiles And Their Associated Behaviors: A Proposal For Chilean Runners**

Manuela Besomi1, Jaime Leppe1, Manuel Vicente Mauri-Stecca1, Phillip S. Sizer2. 1Universidad del Desarrollo, Santiago, Chile. 2Texas Tech University Health Sciences Center, Lubbock, TX.

Email: mbesomin@ttd.cl

No relationships reported

**Purpose:** Identifying different runner profiles may improve running-related injuries (RRIs) prevention, education, and management. The aim of this study was to determine Chilean runner’s profiles according to socio-demographic characteristics, motivations, training factors and behaviors associated with running during 2015-2016. **Methods:** An email and web-based online cross-sectional survey were conducted. Runners from six different competitions and other running circuits were recruited. The survey collected information on 6 dimensions: (1) socio-demographics; (2) health; (3) motivations; (4) training factors; (5) behaviors associated with running; and (6) beliefs and perceptions. Profiles’ construction was performed through a two-step cluster analysis using Bayesian Information Criterion and linear discriminant analysis to correctly assess subject classification. All statistical analyses were performed using SPSS22 with a significance level set at 5%. **Results:** A total of 821 runners (46% females), aged 36.6 (±10.0) years were analyzed. Cluster analysis allowed the generation of 4 groups (n=752) according to years-of-running-experience, volume (km/week) and hours of training (hrs/week). Main variable for runners’ classification was years-of-running-experience: “Beginner” (n=163); “Basic” (n=164); “Intermediate” (n=160); and “Advanced” (n=265). Statistically significant (p<0.05) and clinically relevant variables among the 4 groups were: sex, age, years-of-running-experience, training factors, previous injury (PI) and technological implements used for running practice. Beginners were mainly females (63.2%), aged 28.5 (±8.4) years, having less than 1 year-of-running-experience. 32.5% reported PI, and accumulated a training volume of 18.3 (±12.7) km/week. Advanced runners were mainly males (65.3%), aged 37.4 (±10.9) years, 63.4% with more than 7 years-of-running-experience, 44.2% reported to have PI and accumulated a training volume of 38.2 (±20.8) km/week. **Conclusion:** Advanced runners accumulate greater training load per week, were older, and with higher PI proportions when compared with Beginners. Future work should include a differentiated classification of runners, in order to identify specifically specific risk factors related to running injuries.
The 2008 Physical Activity Guidelines recommends that all adults avoid inactivity and engage in activities based on their abilities. Mobility disability is the most prevalent disability type among US working-age adults and is related to poor health outcomes. Understanding physical activity (PA) patterns among this group can aid development of inclusive interventions to increase PA participation in ways that meet their needs and abilities. PURPOSE: To assess prevalence of PA levels among adults aged 18-64 years with mobility disability and determine the most common PA types by activity level. METHODS: Using the 2015 Behavioral Risk Factor Surveillance System (n=269,486), we classified respondents reporting serious difficulty walking or climbing stairs as having mobility disability (n=35,140). We calculated moderate-intensity-equivalent minutes/week (2*vigorous min/wk + moderate min/wk) from self-reported type, frequency, and duration of PA in the past month. Three PA levels were: active (≥150 min/wk), insufficiently active (10 - 149 min/wk), and inactive (no PA for ≥10 min/wk). Weighted prevalence estimates and 95% confidence intervals (CI) were calculated for PA levels and for activity types. RESULTS: Overall, 10.5% of 18-64 year olds adults reported mobility disability. Among these adults, a significantly higher percentage were inactive [51.0% (95% CI: 50.5, 51.6)] than insufficiently active [19.1% (95% CI: 18.3, 20.0)] or active [29.9% (95% CI: 29.0, 30.9)]. Among those who were insufficiently active, walking was the most commonly reported activity (78.1%), followed by gardening/yard work (3.8%), and bicycling (3.3%). Among active adults, walking was the most commonly reported activity (61.3%) followed by gardening/yard work (9.4%) and bicycling (6.2%). CONCLUSION: Nearly 5 in 10 working-age adults with mobility disability avoid inactivity, primarily through walking. However, the other half of this group are inactive and missing the opportunity to protect or improve their health by regularly engaging in PA. These results highlight the need for PA promotion strategies in which all adults have opportunities to participate according to their abilities and the need to evaluate how specific activities, such as walking or wheelchair rolling, may increase PA among adults with mobility disabilities.

### Table: Prevalence of built environment features among audited street length, US Virgin Islands, 2016

<table>
<thead>
<tr>
<th>Features</th>
<th>Overall (N=1456 Km)</th>
<th>Residential land use</th>
<th>Commercial land use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of destinations</td>
<td>0</td>
<td>78.0 (70.9-83.7)</td>
<td>87.3 (82.6-90.8)</td>
</tr>
<tr>
<td>Traffic calming features</td>
<td>None</td>
<td>72.1 (60.4-81.4)</td>
<td>72.4 (58.8-82.8)</td>
</tr>
<tr>
<td>Street lighting</td>
<td>None</td>
<td>47.0 (39.0-55.1)</td>
<td>50.4 (42.3-58.5)</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>Not present or continuous</td>
<td>88.8 (81.7-93.4)</td>
<td>93.9 (87.0-97.2)</td>
</tr>
<tr>
<td>Present</td>
<td>11.2 (6.6-18.3)</td>
<td>6.1 (2.3-13.0)</td>
<td>39.7 (27.3-53.5)</td>
</tr>
</tbody>
</table>

Note: Percentages may not add to 100% due to rounding.

### Purpose

The purpose of the study was to analyze the fitness and BMI levels of children from Barcelona related to their socio-economical level. METHODS: A two-stage sampling method was used to select representative street segments (1) Estates (census subdivisions in the USVI) were selected using stratified random sampling (n=46 selected of 336) and (2) street segments were then randomly selected from within Estates (n=1550). The Microscale Audit of Pedestrian Streetscape Abbreviated Tool was locally adapted and used by trained auditors to conduct objective assessments of several key elements of street-scale design, including destinations, traffic calming features, street lighting, and sidewalks. Descriptive statistics were weighted to be representative of the total street length within the sampling frame. Audits were conducted on 1114 street segments (unweighted: 94.6 km of street length; weighted: 1456 km).

RESULTS: Overall, 22.1% of street length had at least one destination, 27.9% had at least one traffic calming feature, 53.0% had at least some street lighting, and 11.2% had sidewalks (TABLE). Significant differences were found by type of land use for the presence of several features, including number of destinations, the degree of street lighting, and sidewalks (Pearson’s chi-square test, p<0.001).

CONCLUSION: Across the USVI, street-scale features that support walking were uncommon and were less prevalent on residential streets than on commercial streets. Implementing policies and projects relating to street-scale design in the USVI could improve walkability, particularly those that focus on residential areas.
Bikability At Westfield State University

Objective and Subjective Measures Of Walkability And Bikability At Westfield State University

Characteristics and Fitness test values compared between socio-economical levels

<table>
<thead>
<tr>
<th>Variables</th>
<th>Socio-economic level</th>
<th>Descriptive</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>HighMean (SD)</td>
<td>MediumMean (SD)</td>
<td>LowMean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>17.4 (2.6)</td>
<td>17.6 (2.9)</td>
<td>18.0 (3.2)</td>
<td>.276</td>
<td>.181</td>
</tr>
<tr>
<td>Fitness test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ball throwing (cm)</td>
<td>415.7 (102.7)</td>
<td>407.7 (109.7)</td>
<td>390.4 (104.1)</td>
<td>.242</td>
<td>.042</td>
</tr>
<tr>
<td>Long jump (cm)</td>
<td>129.4 (23.6)</td>
<td>126.2 (25.4)</td>
<td>122.7 (23.1)</td>
<td>.008</td>
<td>.098</td>
</tr>
<tr>
<td>Zig-zag running (sec)</td>
<td>12.0 (5.3)</td>
<td>12.7 (5.3)</td>
<td>12.8 (4.2)</td>
<td>.008</td>
<td>.010</td>
</tr>
<tr>
<td>Vertical jump (cm)</td>
<td>22.3 (7.1)</td>
<td>22.17 (7.1)</td>
<td>21.9 (6.5)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>20 m running velocity (sec)</td>
<td>4.6 (0.6)</td>
<td>4.7 (0.7)</td>
<td>4.8 (0.8)</td>
<td>.024</td>
<td>.010</td>
</tr>
<tr>
<td>20m shuttle run</td>
<td>12.3 (3.7)</td>
<td>11.8 (3.9)</td>
<td>11.3 (3.9)</td>
<td>.052</td>
<td>.077</td>
</tr>
</tbody>
</table>

Abbreviations: P1: group differences between High and Medium level; P2: group differences between Medium and Low level; P3: group differences between High and Low level.

PURPOSE: Walking and bicycling are popular forms of active transportation that help an individual engage in physical activity. College campuses present unique opportunities for all of its members to engage in physical activity as they are moving on and around campus and these forms of active transport should be encouraged for all campus members. This study aims to compare objective walkability measurements of Westfield State University’s (WSU) pathways and roadways and how they support walking and biking versus student and faculty/staff perceptions of infrastructure support for walking and biking.

METHODS: The national representative data (N = 53,669,505; 51.12% male; 3-15 yr.) from the 2012 NHANES National Youth Fitness Survey were employed for the analysis. Descriptive analysis was applied to examine the popularity of different type of PA and t-tests were used to determine the sex difference and ANOVAs were applied to examine the age difference on total PA participation.

RESULTS: Among the 30 types of PA listed, including running, football, basketball, soccer, swimming, dance, and walking, etc., the most popular PA for children and youth in all age groups is running (33.30%), followed by bike riding (27.86%), and backyard games (21.71%). The most popular PA for boys are running (35.18%), basketball (30.31%), and bike riding (29.90%), and for girls are running (31.33%), bike riding (25.57%), and walking (21.55%). About 16.9% of children/youth participated in no activity, but about 18.7% took part in at least one activity and about 64.4% took part in more than one activities; on average, children/youth took part in 2.59 ± 2.18 (M ± SD) activities and boys (2.81 ± 2.31) participated in more activities than girls (2.36 ± 2.02; t = 758.54; p = 0.00; effect size = 10). From 3 to 11 yr., as the children got older, they participated in more PA, but the PA participation decreased after 12 yr.

CONCLUSIONS: Running is the most popular PA for the US children and youth, and some gender and age impact on PA participation was found.

Regular participation in physical activity (PA) has overwhelming positive implications on long-term health and on disease prevention. Despite established government guidelines to improve health through PA, over half of New Zealand women reportedly fail to meet these criteria. Barriers to achieving minimum physical activity levels may include demographic characteristics (i.e., age, ethnicity), but the contribution of each factor is unclear.

PURPOSE: To understand how age and ethnicity affect a New Zealand woman’s ability to meet PA guidelines. METHODS: Healthy New Zealand women (n ~ 350) of three ethnicities (Māori, Pacific, European) aged 16-45y (stratified as 16-25y, 26-35y, 36-45y) wore triaxial accelerometers for 7 days. Levels of moderate-vigorous PA (MVPA; ≥2020 counts.min⁻¹) were assessed. Participants were categorised as achieving or not achieving PA guidelines. PA guidelines are commonly reported as either ≥150 min.wk⁻¹ MVPA (Basic) or ≥30 min.wk⁻¹ MVPA in bouts of 10 min+ (Basic10+), therefore both of these classifications were considered. RESULTS: Basic10+ guidelines were met by only 32% of New Zealand women; a further 34% of women (66% in total) met Basic guidelines. There were no significant differences between the three age groups when ethnicity was not also considered. Achievement of Basic guidelines was lower in Pacific women (37%) than Maori (65%; p = 0.001) or European (75%; p = 0.001) women. Specifically, fewer Pacific women in the 16-25y and 36-45y age groups achieved Basic PA guidelines than women of the same age but different ethnicity. More European women (38%) met Basic10+ guidelines than Maori (22%; p = 0.011) or Pacific (22%; p = 0.012) women. These differences between ethnicity were not specific to any age group. CONCLUSION: Although only two-thirds of New Zealand women achieved Basic PA guidelines, the prevalence was substantially higher than overall national statistics (48%). Given the extremely low rates of PA for periods of 10 or more minutes, a strategy is needed to increase the length of time women spend in bouts of MVPA. The findings further suggest that ethnicity, more so than age, is a contributing factor to achieving PA guidelines.
The dominance of the U.S based LPGA/PGA tour by Korean-born golfers over the past decade has been well recognized. The sheer volume of quality golfers being produced by this relatively small golfing nation has certainly caught the attention of the field of golf. However, the level of physical activity in Korean professional golfers has never been systematically examined. PURPOSE: The present study was to describe the baseline characteristics of the participant and to compare the physical activity level between weekdays and weekends in Korean professional golfers using objective physical assessment tools (i.e., Accelerometer). METHODS: Fourteen (male=7; female=8) young Korean professional golfers (23 ± 2.4 yrs; height = 171±7.5 cm; weight = 73.7±7.5 kg, experience = 6.6 yrs) consented to participate in the study. Participants were asked to wear the accelerometer (i.e., Actigraph) on their right wrist for 24 hours/day, 7 consecutive days to provide data on time in moderate and vigorous physical activity (MVPA). ActiLife software (version 6.11.2) was used to download all data. Raw data were processed with the R package GGR and associated Hildemark milling (mg) cut points. Descriptive for all variables was calculated and Pearson product moment correlations were used to test for relationships between weekdays and weekends. A paired sample t-test was used to evaluate differences between weekday and weekend physical activity level. RESULTS: The accelerometer wear compliance was excellent 6.8 days, 98% of the time. Time in MVPA was 99.5 ± 35.79 mins/week. T-test, and a repeated measures ANOVA were used to determine significant differences. kcals, kcals from the metabolic cart (MET kcals), pace, and score. Unpaired, paired t-test, and a repeated measures ANOVA were used to determine significant differences. Correlation and step-wise multiple regression were used to determine which variables had the largest influence on determining kcals expended. RESULTS: During the in-lab testing, the device overestimated kcals expended compared to the actual MET kcals (+22.4%; p<0.01) for the 6-min SS tests. Step-wise regression showed that HR had the largest impact on kcals during the SS tests. During golf tournament, males had lower mean HRs (males: 111.00 ± 4.31 bpm; females: 121.99 ± 15.26 bpm). The device showed females burned more tournament kcals (1,642.33 ± 442.98 kcals), but less kcals per hour (348.59 ± 78.09 cal/hour) than males (1,583.13 ± 145.80 kcals; 357.13 ± 30.21 cal/hour). Comparing MET kcals and device kcals, the device underestimated females by 6.22% (not significant, NS) and overestimated males by 5.3% (NS). Looking at the device kcals for all golfers across all rounds, step-wise regression showed that calories/hour and playing duration time (p ≤ 0.01; r=0.99) were the primary independent device kcals determinants. CONCLUSION: The in-lab tests showed the device overestimated kcals expended.
During the golf tournament, the device overestimated males and underestimated the female calcs expended. S692

| Board #151 | June 2 3:30 PM - 5:00 PM | Muscle Oxygen Extraction is a Key Performance Adaptation in Sprint Canoe-Kayak |

Myriam Paquet, François Billault. Université Laval, Québec, QC, Canada. (Sponsor: David Bishop, FACSM) Email: myriam.paquette.2@ulaval.ca  

3248

**BACKGROUND** The aerobic contribution to sprint canoe-kayak performance ranges from ~37% to ~85% of total energy expenditure from shortest (200m) to longest (1000m) events. While systemic VO2 max is a strong predictor of performance in 500m and 1000m races, the respective role of central and peripheral adaptations is poorly understood.  

**PURPOSE** The purpose of this study was therefore to characterize the changes in oxygenation derived from portable near-infrared spectroscopy (NIRS) in various muscles during a VO2 max test and two on-water time trials (TT: 200m and 500m or 1000m), and to examine the link between muscle oxygenation, cardiac output and performance.  

**METHODS** Twenty one well-trained sprint canoe-kayak athletes (12 men: 8 kayakers (MK) and 4 canoeists (MC); 9 women: 4 kayakers (WK) and 5 canoeists (WC)) participated in three test sessions: 1) an incremental VO2 max test on a canoe or kayak ergometer; 2) a 200m TT; and 3) a 500m-WK or 1000m-MK and MC TT. NIRS monitors were placed on the latissimus dorsi (LD), biceps brachii (BB), and vastus lateralis (VL) during the 3 testing sessions to assess changes in muscle O2 saturation (SmO2, % from baseline). Cardiac output was measured by impedance during the VO2 max test in a subset of athletes.  

**RESULTS** Performance in the 200m time trial correlated with both LD final SmO2 (R=0.700, p<0.01) and VL final SmO2 (R=0.568, p=0.02). Performance during the 500-1000m time trials correlated with BB final SmO2 obtained during the VO2 max test (R=0.519, p<0.033) and with VO2 max test (L/min: R=-0.560, p=0.03). Maximal cardiac output was low (men: 26.2 ± 4.7 L/min, women: 24.0 ± 2.6 L/min) and did not correlate with 200m (R=-0.253) or 500-1000m (R=0.028) performance.  

**CONCLUSION** These results confirm that systemic VO2 max is related to performance in the longer canoe-kayak events, and suggest that peripheral adaptations (i.e., the muscle ability to extract oxygen during the effort) rather than central factors better contribute to success in this sport. The ability to extract oxygen during the effort appears to be a predictor of performance for both short and long events. These results indicate that training for sprint canoe-kayak athletes should emphasize the development of the peripheral component of oxygen consumption.

| Board #152 | June 2 3:30 PM - 5:00 PM | Gender Differences In Resting Energy Expenditure In Athletic Populations |

Andrew Jagim1, Carl Foster, FACSM1, Joel Luedke1, Jamie Ochenewald1, Jacob Kissiokel1, Margaret Jones, FACSM1; Jonathan Oliver2. University of Wisconsin - La Crosse, La Crosse, WI; George Mason University, Fairfax, VA; Texas Christian University, Fort Worth, TX. (Sponsor: Carl Foster, FACSM) Email: ajagim@uwlax.edu  

3247

Gender differences in energy expenditure and fuel utilization have been observed during exercise. However, less is known about whether or not these differences are also evident at rest, particularly in athletic populations, and it is currently unknown whether these differences remain when adjusted for body mass (BM) and fat-free mass (FFM).  

**PURPOSE** The purpose of this study was to determine the differences in resting metabolism between men and women athletes when adjusted for body mass and fat-free mass.  

**METHODS** Twenty-one men (20 ± 1.70 yrs training experience) from the Chinese national youth team participated in one round of semi-contact karate, with the duration of 2 min and 3 min, respectively. A portable spirometric system (MetaMax 3B, Cortex, Germany) was utilized to measure the inspired oxygen uptake. Capillary blood was taken from the earlobe prior to and post the karate, and analyzed with blood lactate analyzer (Biosen C-line, EKF, Germany). Athletes were encouraged to fight as in real matches, but without touching the protective gear. The energy contributions were calculated based on the accumulated oxygen uptake and blood lactate during karate, as well as the last component of oxygen debt during the recovery.  

**RESULTS** The peak blood lactate values after karate were 3.36 ± 1.15 and 5.14 ± 1.70 mM for females and males. The average oxygen uptakes during karate were 30.6 ± 1.70 and 33.5 ± 5.00 ml/min.kg for females and males, respectively. The oxygen uptake was calculated from anaerobic alactic, anaerobic lactic, and aerobic pathways were 27.3 ± 11.8 (27.7 ± 8.1 %), 7.5 ± 4.4 (7.4 ± 3.3 %), and 61.6 ± 10.7 (64.9 ± 9.3%) kJ for females, and 31.1 ± 10.8 (17.7 ± 5.3 %), 13.0 ± 5.9 (7.1 ± 2.7 %), and 132.7 ± 22.5 (72.5 ± 5.3%) kJ for males.

3249

**PURPOSE** It is known that plasma adenosine triphosphate (ATP) concentration increases during exercise and depends on its intensity. There are no reports about the effect of specific long-term training adaptation on plasma ATP levels during exercise. The aim of our study was to compare the exercise-induced plasma ATP release in athletes specialized in speed-power vs endurance disciplines.  

**METHODS** Nine sprinters, 9 triathletes at national/international level, and 9 amateur runners (controls), aged 23.8 ± 2.8 y, 21.4 ± 3.5 y, and 25.2 ± 2.7 y, respectively, were studied. They underwent an incremental exercise test until exhaustion on a motorized treadmill. Venous blood samples were drawn at rest, at exhaustion (maximum intensity), and after 10 and 30 min of recovery. Blood samples were immediately centrifugated for 30 s at 14,000 rpm and 4°C, frozen in liquid nitrogen, stored at -86°C, and then analyzed using high-performance liquid chromatography. Comparisons between groups and exercise phases were made using two-way ANOVA with repeated measures and Scheffe post-hoc test.  

**RESULTS** In all three groups, a significant increase in plasma ATP was observed between rest and exhaustion, as well as after 30 min of recovery (p<0.05). A significantly greater plasma ATP concentration was observed in sprinters than in triathletes and controls at exhaustion and after 10 min of recovery. No significant between-group differences were observed at rest and 30 min after exercise.  

**CONCLUSION** Plasma ATP response to incremental exercise until exhaustion is different depending on specific training adaptation. Training based on speed-power exercise brings about much greater plasma ATP release than endurance training. Underlying mechanisms, connected with exercise-induced vasodilation and its mediators, erythrocyte function, skeletal muscle activity, and other factors, need further research. Supported by National Science Center Poland Grant 2013/09/B/BN2/02556.
CONCLUSIONS: Karate is an aerobic-dominant sport event, while the anaerobic energy system may play an important role in high-intensity fighting. These findings are consistent with existing studies on non-contact karate.

3250 Board #155 June 2 3:30 PM - 5:00 PM A Comparison of Energy Expenditure Between Motorized and Non-Motorized Treadmills Andrew G. Hatchett, Brian B. Parr, Lianna R. Epstein, Harli R. Eggenberger, Rachel L. Herring. University of South Carolina Aiken, Aiken, SC. (Sponsor: Micheal J Turner, FACSM)

Email: andrewhat@usca.edu

(No relationships reported)

Non-motorized, arced treadmills are becoming more popular in fitness settings and are thought to require greater effort than walking or running on a traditional motorized treadmill. However, little research has been conducted to evaluate this type of exercise equipment.

PURPOSE: The purpose of this study was to compare the energy expenditure (EE) required to complete one mile on a non-motorized, arced treadmill (AT) and a motorized treadmill (TM).

METHODS: Nine recreationally trained healthy participants (4 male, 5 female) ages 26.1±9.6 years walked or ran 1-mile at a self-selected speed on a motorized treadmill (TM) and a non-motorized arced treadmill (AT) while VO2, EE, and heart rate (HR) were measured. The EE in kcal·min-1 and kcal·mile-1 was calculated from VO2 measured after subjects achieved steady-state. The tests were counterbalanced so half of the subjects completed the TM trial first and half completed the AT trial first.

RESULTS: Nine participants completed the 1-mile effort at an average speed was 125.1±32.6 m·min-1 (range: 88.4–160.8 m·min-1). The mean VO2, EE, and HR were significantly higher during the FF trial compared to the TM trial.

<table>
<thead>
<tr>
<th>VO2 (L·min⁻¹)</th>
<th>EE (kcal·min⁻¹)</th>
<th>HR (beats·min⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.61±0.9</td>
<td>7.9±4.6</td>
<td>152.0±29.3</td>
</tr>
<tr>
<td>2.2±1.1</td>
<td>10.9±5.4</td>
<td>164.9±23.3</td>
</tr>
<tr>
<td>p = 0.0006</td>
<td>p = 0.0005</td>
<td>p = 0.005</td>
</tr>
</tbody>
</table>

Values expressed as mean±SD

CONCLUSION: Use of a non-motorized arced treadmill resulted in a significantly higher VO2, EE, and HR compared to a traditional treadmill at the same speed. This could be due to the unique design of the arced treadmill that requires a different movement pattern and additional effort to propel the non-motorized belt. This may have implications for fitness applications in which EE is of interest.

3251 Board #156 June 2 3:30 PM - 5:00 PM Energy Expenditure Characteristics of Overweight Women at the Same Speed of Jogging and Walking Peizhen Zhang, Xiangrong Shi, FACSM. Beijing Sport University, Beijing, China. 'UNT Health Science Center, Fort Worth, TX.

(No relationships reported)

PURPOSE: Jogging and walking are two common exercises in overweight people. However, the relationship between energy expenditure of jogging and walking in overweight people is still not clear. This paper probes into characteristics of energy expenditure and physiology of overweight adult women at the same speed of jogging and walking.

METHODS: Twenty-six overweight and twenty-five normal weight adult women (age: 22.0±1.6 years) participated in the study. The resting energy expenditure and the energy expenditure of overground walking and jogging were measured by Cortex portable gas metabolism system. The overground walking speed from low to high were 4.0km/h, 4.5km/h, 5.0km/h, 5.5km/h, 6.0km/h, 6.5km/h and 7.0km/h. The overground jogging speed were 6.0km/h, 7.0km/h and 8.0km/h. The duration of each speed was 6 minutes. Net energy expenditure of each speed was calculated as energy expenditure minus resting energy expenditure.

RESULTS: When the jogging speed over 7.0km/h (including 7.0km/h) and the SS condition resulted in greater change in one hour PEWL (0.52±0.14 kg vs. 0.36±0.13 kg). These findings suggest that participating in a recreational activity, such as racquetball, will yield similar total energy expenditure benefits compared to simple aerobic running exercise among apparently healthy college-aged males and females.

3252 Board #157 June 2 3:30 PM - 5:00 PM Comparisons Of Caloric Expenditure During- And Post-Treadmill Activity Vs. Racquetball In Apparently Healthy College-Aged Adults Stephen Hodgson Jr, Anna Kurilla, Katrina Von Arx, Brittany Luteyn, Jayden Dobbs, Saori Braun, Jeffrey Janot. University of Wisconsin - Eau Claire, Eau Claire, WI. Email: Hodgsonstephenjr@gmail.com

(No relationships reported)

PURPOSE: The purpose of this study was to examine the possibility that alternative modes of exercise, specifically racquetball, may provide similar caloric benefits as traditional aerobic physical activity guidelines defined by the American College of Sports Medicine. Alternative modes of physical activity can be used to counteract many common physical activity barriers. This study examined the caloric expenditure (Kcal) differences during and post treadmill activity in comparison to racquetball.

METHODS: Twenty-six university students, aged 18-22 years, participated in this study. All participants completed a 30-minute racquetball session and a 30-minute treadmill running session (at 40-60% heart rate reserve), each session followed by a 30-minute post-exercise monitoring of oxygen consumption (VO2) using a metabolic cart. Minute-by-minute VO2 and respiratory exchange ratio were utilized to calculate the total Kcal over the 30-minute recovery period, during which participants were laying supine. To obtain Kcal during exercise, accelerometer connected to heart rate monitor was utilized. RESULTS: Out of 26 participants, 4 were excluded from the analyses due to equipment malfunctioning during testing, resulting in N = 22 (Male n = 11, Female n = 11). A two-way (sex × modality) repeated measures ANOVA, using an alpha level of .05, indicated that there was a significant main effect (treadmill vs. racquetball) effect on Kcal post activity, F(1,20) = 5.61, p = .028, meaning that Kcal was significantly higher post treadmill activity vs. post racquetball session. A two-way repeated measures ANOVA indicated that there was a significant interaction (treadmill vs. running) effect on Kcal during activity, F(1,20) = 5.08, p = .036. More specifically, Kcal expended during racquetball activity was significantly higher than Kcal expended during treadmill activity. Ultimately, a two-way repeated measures ANOVA indicated that modality was not a significant predictor of total (during- and post-exercise) Kcal expenditure, F(1,20) = 1.33, p = .262. CONCLUSION: These findings suggest that participating in a recreational activity, such as racquetball, will yield similar total energy expenditure benefits compared to simple aerobic running exercise among apparently healthy college-aged males and females.
Impact of Alternative Footwear on Human Energy Expenditure

Teresa Wiczynski1, Cody E. Morris2, Harish Chander3, Samuel J. Wilson4, Mark Loftin, FACSM5, Chip Wade6, John C. Garner7, Western Kentucky University, Bowling Green, KY. 1Mississippi State University, Mississippi State, MS. 2University of Mississippi, University, MS. 3Auburn University, Auburn, AL. 4Troy University, Troy, AL. (Sponsor: Mark Loftin, FACSM)

Email: teresa.wiczynski406@topper.wku.edu

(No relationships reported)

PURPOSE: Use of alternative footwear options such as flip-flop style sandals and minimalist athletic shoes are becoming increasingly popular footwear choices. The purpose of the investigation was to analyze the energy expenditure and oxygen consumption consumption requirements of walking at preferred pace while wearing flip-flops, slip-on style shoes, and minimalist athletic shoes.

METHODS: Eighteen healthy male adults participated in this study. In addition to an initial familiarization session, participants were tested in three different footwear conditions [thong-style flip-flops (FF), slip on shoes (CROC), and minimalist shoes (MIN)]. Then after a brief warm-up, participants walked a one-mile distance at their preferred pace. Immediately following completion of the one-mile walk, participants stood quietly on the treadmill for an additional period to assess excess post-exercise oxygen consumption (EPOC).

RESULTS: A repeated-measures ANOVA showed that the following variables did not show evidence of a significant differently value between conditions: preferred pace (p = 0.392), average oxygen consumption (p = 0.804), energy expenditure per mile (p = 0.306), or EPOC (p = 0.088). There was shown to be a significantly higher RER during exercise in CROC compared to MIN (p = 0.031) with no significant differences observed when comparing CROC to FF (p = 0.106) or FF to MIN (p = 0.827).

CONCLUSIONS: Based on the results of the current study, it appears that the alternative footwear selected for evaluation do not lead to a substantial alteration of walking pace or overall EE. However, the significant difference in RER suggesting a slightly elevated exercise intensity while wearing the CROC could perhaps be related to the softer sole, influencing overall mechanical efficiency.

Energy Expenditure of College Students

Danielle Ludlam, Sarah M. Henry, Ashby M. Williamson, G. William Lyerly, FACSM. Coastal Carolina University, Conway, SC.

Email: dnludlam@g.coastal.edu

(No relationships reported)

A great deal of research has made it evident that an increase in physical activity (PA) leads to a decrease in risk for developing health issues such as cardiovascular disease (CVD). While persons of all ages and skill levels can increase their PA, young adults often have the ability to focus on decreasing their risk of CVD early in life through avoiding sedentary lifestyles and meeting PA guidelines (PAG). The 2008 PAG suggest that a 70 kg person expend approximately 1198.75 kcals/week, which equates to 0.12 kcals/min, at 50% HRR, intensity to elicit health benefits. PURPOSE: To determine the PA level of college students as compared to PAG through monitoring their level of energy expenditure (EE) as kilocalories per minute (kcals/min) burned. METHODS: Eighteen healthy male adults participated in this study. In addition to an initial familiarization session, participants were tested in three different footwear conditions (FF, CROC, MIN). Each participant wore each of the three footwear types for a 3-minute period, which was repeated 5 times in total. The metabolic analyzer recorded EE data for the entire period, which was then averaged over the 5 repetitions. RESULTS: The EE data indicate that college students met and exceeded the PAG of 0.12 kcals/min (1198.75 kcals/week) by 0.0441 kcals/min. This exceeds the PAG of 0.12 kcals/min (1198.75 kcals/week). CONCLUSION: Our data indicate that college students met and exceeded the PAG of 0.12 kcals/min (1198.75 kcals/week).
PURPOSE: Overexposure to reactive oxygen species has been implicated in the pathogenesis of a wide range of chronic conditions, including cardiovascular disease, cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”). While some early studies have shown the benefits of “direct” antioxidants (e.g. vitamins A, C, E) in cancer, and the aging process (e.g. “free radical theory of aging”).
intensity running. Future studies should address whether there is an effect of long-duration intake of Matcha green tea on metabolic and physiological responses and exercise performance. Matcha capsules were provided by OMGTEA Ltd, United Kingdom.

3262 Board #167 June 2 2:00 PM - 3:30 PM Beyond Ginseng And Echinacea: A Meta-analysis Of Herbal Supplement Use By Athletes David S. Senchina. Drake University, Des Moines, IA. Email: david.senchina@drake.edu

Herbal supplements are noteworthy components of athletes’ nutritional supplement regimens. Recent reviews have characterized use of herbal supplements vaguely, or ginseng and echinacea specifically, but neglected less common supplements such as ginkgo, spirulina, St. John’s Wort, and others. PURPOSE: To determine the frequency of athletes’ use of specific herbal supplements beyond ginseng and echinacea through a meta-analysis of previously published surveys. METHODS: Thirty-two studies (published between 1985 and 2016) that reported specific herbal supplement data were identified through a combination of systematic database searching and citations from previous works. Usage rates for specific herbs were tabulated and overall prevalence calculated. When available, demographic information including age, sex, sport, and athlete country-of-origin were also tabulated. RESULTS: 11,855 athletes were in the final data set. All-supplement usage averaged 58.7%. Average individual herbal supplement usage were: ginseng (9.6%), echinacea (9.6%), ginkgo (3.8%), garlic (2.8%), St. John’s Wort (0.6%), and spirulina or blue-green algae (0.4%); others (≤0.3%) included chamomile, ciwujia, yohimbe, flaxseed, green tea, arnica, evening primrose, guava, kava kava, tribulus, goldenseal, kola nut, and peppermint. Several additional studies reported that athletes consumed various lesser-known herbal supplements including these and others (such as tea tree oil), but did not provide usage statistics. Multi- or poly-herbal supplements (2.0%) and “other” unspecified herbal supplements (4.9%) usage averages were also reported. Surveyed athletes were predominantly male (61.6%), from North America (40.3%), and college-aged (38.9%); most surveys sampled athletes from multiple sports. CONCLUSION: While ginseng and echinacea are (unsurprisingly) the herbal supplements most frequently consumed by athletes, over a dozen other herbal supplements are also consumed and warrant better attention in both athlete nutrition surveys and research. Certain athlete populations are underrepresented in the current literature, including females, those hailing from the southern hemisphere, non-college-aged athletes, and athletes with impairments.

3263 Board #168 June 2 2:00 PM - 3:30 PM Seaweed Supplement Harmed The Exercise Effect In Ovariectomy Rats Ji-Hong Lu, Chun Tai Chen, Jian Liu, Yu You Wu, Chi Yang, Ching Hung Lin, Chien Wen Hou. University of Taipei, Taipei, Taiwan. (Sponsor: Chia Hua, Kuo, FACSM) Email: campbell-fans@hotmail.com.tw

Purpose
This study aimed to find out the effect on blood glucose regulation after 10 weeks resistance exercise of ovariectomized rats with seaweed supplementation.

Method
12-month-old Sprague Dawley female rats were subjected to bilateral ovariectomy and then were randomly divided into 3 groups: Control (C), Exercise (E), Exercise-Seaweed (ES). Resistance exercise started 2 weeks after the surgery and operated 5 days/week in E and ES group. In ES group, 50 mg/kg of seaweed gavage was given immediately after exercise. In C and E group, rats also receive the same volume of water gavage after exercise. Oral glucose tolerance test (OGTT) and serum insulin level was evaluated after 10 weeks of resistance training.

Result
After 10 weeks of resistance training, ES had higher fasting and 60 min blood glucose compared to E. (Fasting glucose: E 96.9 ± 3.12 < ES 105.0 ± 3.32 mg/dl;60 min glucose: E 141.4 ± 6.39 < ES 161.7 ± 9.51 mg/dl, p<0.05). E had lower fasting insulin level than C and ES. (E 0.4 ± 0.1 < C 0.8 ± 0.2 < ES 0.9 ± 0.2 ug/dl p<0.05).

Conclusion
10 weeks of resistance exercise significantly improve the ability of blood sugar regulation on ovariectomized rats. However, if combined with seaweed supplementation, the benefits of exercise were eliminated.

3264 Board #169 June 2 2:00 PM - 3:30 PM Capsaicin Induces Metabolic Gene Expression in C2C12 Myotubes Michele A. Johnson1, Jamie K. Schnuck1, Lacey M. Gould1, Nicholas P. Gannon2, Roger A. Vaughan1,2. High Point University, High Point, NC; 3Medical College of Wisconsin, Milwaukee, WI. (No relationships reported)

PURPOSE: Capsaicinoids may possess thermic effects resulting in increased energy expenditure, leading some to consume concentrated capsaicin supplements for weight loss. Capsaicin has been shown to activate select molecular targets contributing to increased metabolism, however the effects of capsaicin on many molecular targets have yet to be determined. This study investigated the effects of capsaicin on metabolic gene expression in cultured skeletal muscle. METHODS: C2C12 myotubes were treated with either DMSO control or capsaicin at 0.25µM, 0.5µM, 1.0µM, or 2.5µM for 24 hours. Gene expression of several regulators of mitochondrial biogenesis and oxidative metabolism including peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1α), nuclear respiratory factor 1 (NRF1), and mitochondrial transcription factor A (TFAM) were measured via qRT-PCR. Mitochondrial content was quantified via fluorescence microscopy. Cellular lipid content was determined by oil red o colorimetric staining. RESULTS: Gene expression experiments identified capsaicin at 0.5µM to be the most optimal concentration for inducing myotube mitochondrial biogenesis. Specifically, capsaicin at 0.5µM significantly elevated PGC-1α (18.6 fold ±14.5), NRF1 (4.6 fold ±1.7), and TFAM (5.0 fold ±2.3) gene expression following 24-hour treatment. Cells treated with capsaicin at 0.5µM also exhibited significantly greater mitochondrial staining (7.5% ±4.5%). Moreover, capsaicin induced the expression of several related metabolic genes such as Forkhead Box O1 (FoxO1) and Sirtuin 3 (Sirt3). Lastly, despite unaltered peroxisome proliferator-activated receptor gamma (PPARγ) expression, capsaicin-treated cells exhibited significantly reduced lipid content suggesting lipid oxidation may be enhanced following capsaicin treatment. CONCLUSION: Capsaicin appears to stimulate several genes which govern mitochondrial biogenesis and cellular energetics. These findings suggest capsaicin may provide metabolic benefits, however, these data require verification at the protein and functional level.

3265 Board #170 June 2 2:00 PM - 3:30 PM The Effect Of Chlorella Supplementation On Exercise Performance And Inflammation-related Blood Cells After Dehydration. Chia-Pei Lin1, Chung-Fu Chi2, Ming-Fen Xu1, Szu-Haien Yu3. 1University of Taipei, Taipei, Taiwan, 2Taipei Medical University, Taipei, Taiwan, 3National Ilan University, Taipei, Taiwan. Email: trosceic@gmail.com (No relationships reported)

PURPOSE: The purpose of this present study was to investigate the effect of chlorella supplementation on aerobic performance and complete blood count (CBC) after dehydration.

METHODS: Twelve male college students with exercise habit were recruited in this double-blind, crossover designed study. All subjects were divided into control and Chlorella groups. All subjects performed an acute treadmill exercise at 40% VO2max in 35°C and 70% relative humidity environment until reaching dehydration to 3% body weight. Subjects of Control and Chlorella were given 130 ml of placebo or chlorella drink respectively immediately after dehydration, and then all subjects were rehydrated with sports drink (6% sucrose and 0.04% NaCl), 1.5 times amount of weight loss within 2 hours after dehydration. Blood samples were obtained before, 1h to 4h, 24h, and 48h after dehydration. The maximal aerobic exercise capacity was determined before, 4h, 24h and 48h after dehydration. White blood cells, neutrophils, lymphocytes and blood glucose levels were measured from blood samples.

RESULTS: The results showed that dehydration caused a significant reduction in exercise time and a significant increase in white blood cells and neutrophils numbers. The exercise time of Chlorella group was significantly higher than that of control group 4 hours after dehydration. White blood cells and neutrophils numbers in Chlorella group were significantly lower than that of the control group within 2 to 4 hours after dehydration. However, blood glucose level and the lymphocytes number showed no significant differences between control and Chlorella groups.

CONCLUSIONS: Our results concluded that Chlorella supplementation can improve aerobic exercise capacity and reduce Inflammation after dehydration.
Chronic chlorella intake enhances aerobic exercise capacities, i.e. exercise tolerance. High intensity intermittent exercise (HIIE) training enhances aerobic and anaerobic exercise capacities via elevations of muscle glycolytic and oxidative metabolism. However, the additive effects of combination of HIIE training and chlorella intake on exercise performance and muscle glycolytic and oxidative metabolism remain unclear.

**PURPOSE:** The purpose of this study was to investigate the effect of chronic chlorella intake alone or in combination with HIIE training on exercise performance and muscle glycolytic and oxidative metabolism in rats. **METHODS:** Male 12-week-old Sprague-Dawley rats were randomly assigned to the four groups; sedentary control, chlorella intake (0.5% chlorella powder in normal feed), HIIE training, and combination of HIIE training and chlorella intake for 6 weeks (n = 10 each group). HIIE training comprised 14 repeats of a 20-s swimming session with a 10-s pause between sessions, while bearing a weight equivalent to 16% of body weight, 4 days/week. Exercise performance was tested after the interventions by measuring the maximal number of HIIE sessions that could be completed. **RESULTS:** Chlorella intake and HIIE training significantly increased the maximal number of HIIE, and enhanced the expression of monocyte chemoattractant protein (MCP1), MCP4, and peroxisome proliferator activated receptor (PPAR-γ coactivator-1α) concomitantly with the activities of lactate dehydrogenase (LDH), phosphofructokinase (PFK), and cytochrome oxidase (COX) in the red region of the gastrocnemius muscle (p < 0.05). Furthermore, the combination further augmented the increased exercise performance and the enhanced expressions and activities (p < 0.05). By contrast, in the white region of the gastrocnemius muscle, MCT1 expression and LDH, CS, and COX activities did not change. **CONCLUSIONS:** 1.8 mmol·L⁻¹, p = 0.018) and BL decreased significantly in the both ED (PRE: 5.5±8.2 cm, POST: 55.5±8.2 cm, p = 0.012) and anaerobic work (BASE: 12.3±1.3 KJ, POST: 11.4±1.5 KJ, p < 0.05) decreased significantly in PO.

**CONCLUSIONS:** The results indicate that energy drink may replenish a deficiency of fuel source and promote improvement of muscular and anaerobic power during recovery period.

**PURPOSE:** The purpose of this study was to determine the effects of one week of mushroom blend supplementation (PeakO2, Compound Solutions, USA) on maximal oxygen uptake, peak power output, time to fatigue, and submaximal aerobic capacity in apparently healthy young adults.

**METHODS:** Forty recreationally active men and women volunteered to participate, were randomized into one of two groups, and completed the testing protocol. At baseline each participant completed a maximal oxygen consumption (VO2max) test, which included a 5 minute economy state from minutes 3-8 along with a Wingate cycle ergometer test (peak power) at least 24 hrs later. The treatment group (T, n=23, mean ± standard deviation, Age = 23.5 ± 5.2 yrs, Height = 172.9 ± 8.8 cm, Body Mass = 72.4 ± 12.1 kg) consumed 12.0 g /day of mushroom blend (PeakO2) along with 12.0 g of Gatorade powder for one week. The control group (C, n=17, Age = 22.5 ± 4.6 yrs, Height = 172.4 ± 8.4 cm, Body Mass = 72.3 ± 11.8 kg) consumed placebo (white wheat flour and Gatorade powder in identical fashion).

**RESULTS:** There were no differences between groups in any variables at baseline. Analysis was conducted stratifying each group by VO2max at baseline, in which the top 50% of each group was compared to the bottom 50% (Treatment top, TT, Treatment bottom, TB, Control top, CT, Control bottom, CB). TB increased VO2max significantly (1.95 ± 2.76 ml·kg⁻¹·min⁻¹, p = 0.02) while TT, CT, and CB did not change significantly. PPO did not change significantly in any group, however; a trend (p = 0.059) for increased PPO in TB by was observed. Submaximal HR was lower (3.5±18.5 bpm, p = 0.167) in TT, but these changes were not different from changes in TT, CT, CB. TFT increased significantly (p < 0.05) in both TT and CT but changes between groups were not significant.

**CONCLUSIONS:** Seven days of supplementation with 12.0 g /day of PeakO2 may improve aerobic and anaerobic power output in less aerobically fit, healthy individuals. Those higher fit, apparently healthy individuals may see an improvement (e.g lower HR) in economy during submaximal aerobic exercise.
The Effect Of Blackcurrant Polyphenols On Recovery And Performance In Elite Endurance Athletes Upon Intensified Training

Nathan A. Lewis1, Richard Burden1, Georgie Bruinvels2, James Cheeseman1, Stuart Pickering3, Chris Price1, Kevin Currell1, Jan Bartu3, Glyn Howatson, FACSM4, Charles R. Pedlar1. 1English Institute of Sport, Bath, United Kingdom. 2Queen Mary University, London, United Kingdom. 3British Modern Pentathlon, Bath, United Kingdom. 4Northumbria University, Newcastle, United Kingdom. 5Massachusetts General Hospital, Boston, MA.

Email: nathan.lewis@es2zwin.co.uk

(No relationships reported)

Strategies that enable athletes to tolerate a higher training load may be advantageous for athletic health and performance.

PURPOSE: To examine the effects of New Zealand blackcurrants polyphenols (NZBK) on recovery and physical performance in elite athletes during a period of intensified training.

METHODS: Nine male modern pentathletes were tested at baseline (T1), after 7 days of receiving a placebo (P; T2) and after 7 days of receiving a blackcurrant supplement (NZBK; T3). Training volume was 30% higher during the second week. The test battery included a counter movement jump (CMJ) a running test (4 x 800 m), a mood questionnaire (Recovery-Cue), and an extensive panel of blood tests including haematology and biochemistry. CMJ, lactate, a biomarker of oxidative damage (FORT) and anti-oxidant defense (FORD) were measured at rest and immediately before and after the 4 x 800 m run. A general linear model, with Tukey’s post-hoc test for pairwise comparisons was used to determine differences between conditions, with Cohen’s effect sizes (d) to calculate the magnitude of the standardised difference in means where significant; reported as 0.2 (small), 0.5 (moderate), 0.8 (large), and 1.3 (very large). Data are presented as mean ± SD.

RESULTS: No effects were seen for P or NZBK on hormonal, haematological biochemistry markers, mood state, or running performance (p>0.05). NZBK reduced inflammation in comparison to P (HS-CRP = 0.8±0.3 mg•L−1 at T3 vs. 1.3±0.4 mg•L−1 at T2, p=0.024), despite the increased training volume. There was a trend and effect for NZBK on reducing FORT (1.70±0.31 mmol•L−1 at T1 vs. 1.50±0.25 mmol•L−1 at T3, p=0.033) and FORD (1.53±0.1 mmol•L−1 at T1 vs. 1.54±0.16 mmol•L−1 at T2 vs. 1.34±0.18 mmol•L−1 at T3; p=0.015, d=1.17). Of interest, oxidative damage (FORT) correlated with testosterone, cortisol, CMJ and mood state (p<0.05).

CONCLUSIONS: NZBK reduces inflammation and oxidative stress in the presence of an increased training volume, with no effects on performance. Furthermore, the monitoring of oxidative damage in endurance athletes may be effective for tracking fatigue and well-being given the relationship with measures of recovery (e.g., hormones, CMJ and mood state).

The Effects Of Cissus Quadrangularis On Body Composition And Blood Lipids

Eric E. Noreen, Cara E. Pietrolongo, David S. Gilmore. Gettysburg College, Gettysburg, PA.

Email: enoreen@gettysburg.edu

(No relationships reported)

PURPOSE: The purpose of this study was to determine the effects of 6 wks of supplementation with Cissus Quadrangularis (CQ) on body composition and blood lipids in healthy college aged adults. METHODS: A total of 27 healthy college aged adults (13 males, 14 females, 21.0±0.6 y; mean±SD) completed this study. All testing was done first thing in the morning following an overnight fast. Baseline body composition was assessed by whole body densitometry using air displacement plethysmography, and blood lipids and glucose were assessed using whole blood obtained via finger puncture. Following baseline testing, subjects were randomly assigned in a double blind manner into one of two groups: 3.2 g/d of CQ or 3.2 g/d of a neutral placebo (PL). Subjects consumed half of the daily dose in the morning and half in the evening on an empty stomach. All testing was repeated following 6 wks of treatment. Pre to post differences were analyzed using a treatment by time repeated measures ANOVA.

RESULTS: Compared to the PL group, there was a significant increase in fat free mass following treatment with CQ (CQ= 0.3±1.2 kg, PL= 0.0±0.9 kg, p<0.003), a significant increase in fat mass (CQ= 0.7±1.2 kg, PL= 0.8±1.4 kg, p<0.005), a significant decrease in body fat percentage (CQ= -0.7±1.4 % body fat, PL= 1.1±1.8 % body fat, p=0.006), and a significant increase in HDL (CQ= 0.01±0.18 mmol•L−1, PL= -0.20±0.2 mmol•L−1, p<0.009). No significant differences were observed for body mass (CQ= -0.4±1.2 kg, PL= 0.0±1.5 kg, p=0.41), total cholesterol (CQ= -0.11±0.42 mmol•L−1, PL= -0.23±0.29 mmol•L−1, p=0.39), LDL (CQ= -0.12±0.39 mmol•L−1, PL= -0.08±0.35 mmol•L−1, p=0.93), glucose (CQ= -0.06±0.46 mmol•L−1, PL= -0.14±0.45 mmol•L−1, p=0.28) or triglycerides (CQ= -0.09±0.61 mmol•L−1, PL= 0.22±0.30 mmol•L−1, p=0.10). CONCLUSION: 6wk of supplementation with CQ prevented the drop in HDL that was seen in the PL group, with no other changes observed for blood lipids or glucose. CQ significantly increased lean mass and decreased fat mass, resulting in a significant decrease in body fat percentage.

Effects Of Tart Cherry Concentrate Upon Muscle Oxidation During Cycling Exercise

Gregory R. Davis, Amber Victor, David Bellar. University of Louisiana at Lafayette, Lafayette, LA.

Email: grd4800@louisiana.edu

(No relationships reported)

Previous studies examining the effects of short-term tart cherry (TC) ingestion are primarily limited to inflammatory markers and markers of oxidative stress. Short-term ingestion of nitrate-rich supplements have shown improvements in exercise performance. PURPOSE: The primary aim of the study was to determine if short-term TC concentrate ingestion would enhance exercise performance via increased serum nitrate levels, and subsequent increased muscle oxygenation (SmO2). METHODS: Healthy college-age males were randomly assigned to a TC supplement treatment n= 18 or a placebo treatment (PL) n= 12. Peak VO2 and baseline measures were obtained. 48 hours later, participants returned to the lab following an overnight fast. The TC or PL supplement was provided and blood was drawn from the cubital vein 30 minutes, 1 hour, and 2 hours after supplement consumption. Subsequently, participants were given additional supplements to consume over the next 6 days. Following supplementation, participants cycled at a power output achieved at 60% of VO2 peak for a maximum of 60 minutes or until exhaustion. Near-Infrared Spectroscopy sensors were placed on the vastus lateralis of each leg. Serum was analyzed for total nitrate levels via colorimetric assay. All samples were analyzed in duplicate. Results are presented as mean ± SEM.

RESULTS: A repeated measures ANOVA revealed increased nitrate (µM/L) levels at 30 minutes (TC = 11.0±0.80, PL = 10.8±0.63) 1 hour (TC = 11.7±0.66, PL = 11.00±0.64) and 2 hours (TC = 9.25±1.79, PL = 10.07±0.77) were not significant for treatment, (F = 0.14, p = 0.71) time, (F = 1.89, p = 0.18) or treatment by time interaction (F = 0.75, p = 0.49). One way ANOVA revealed SmO2 in the left leg (TC = 0.69±0.05, PL = 0.82±0.06; F = 2.68, p = 0.12) and right leg (TC = 0.65±0.04, PL = 0.78±0.11; F = 1.94, p = 0.18) were not significantly different between groups. An independent t-test revealed no significant differences for time (min) to exhaustion between groups (TC = 39.11±5.66, PL = 42.94±6.06; t = 0.46, p = 0.65). CONCLUSIONS: TC concentrate ingestion does not acutely increase blood nitrate levels. Furthermore, short-term TC ingestion does not increase muscle oxygenation during cycling exercise nor does it improve exercise performance, likely due to an absence of change in blood nitrate levels.

Effects Of Aquarobic Exercise And Burdock Extract On Blood Lipids And Vascular Compliance In Elderly Women

Min-Seong Ha1, Do-Yeon Kim1, Jong-Won Kim1, Ji-Hyoon Kim1, Ji-Hoon Kim1, Su-Jin Hyun1, Jung-Sook Kim1, Su-Han Koh1. 1Pusan National University, Busan, Korea, Republic of. 2Pusan National University of Education, Busan, Korea, Republic of.

(No relationships reported)

The elderly’s health issues are often complex and tend to lead to chronic diseases; such issues can be due to a fitness decline resulting from a lack of physical activities. PURPOSE: The present study aims to determine the effects of aquarobic exercise and burdock intake on blood lipid profiles and vascular compliance in elderly women, by implementing the 16-week program. METHODS: Thirty eight healthy elderly female volunteer subjects aged 75.27±4.32 years comprised the control group (n=8), aquarobic exercise group (n=10), aquarobic exercise and burdock intake combination group (n=10), and burdock intake group (n=10). This intervention trial was designed to compare pre-and post-exercise intervention variables. Changes from baseline to the end of the intervention were determined by a paired t-test and one-way analysis of variance (ANOVA). The variables of body composition, serum blood lipids, and vascular elasticity were measured in all participants before and after the 16-week study. RESULTS: TC=176.45±20.61 vs. 181.18±24.28 mg/dl, TG=112.45±38.73 vs. 127.27±48.19 mg/dl, LDL-C=145.83±30.03 vs. 152.32±30.04 mg/dl, glucose=94.0±16.25 vs. 93.18±12.18 mg/dl, and insulin=7.77±3.77 vs. 7.73±5.09 uU/mL decreased significantly in the aquatic exercise group and aquarobic exercise and burdock intake combination group(p<0.05). However, no statistically significant changes were found within or between groups in high-density lipoprotein cholesterol and HOMA-IR. No statistically significant changes were found within or between groups in pulse wave velocity before and after participation in the 16-week aquarobic exercise program and/or burdock intake program. CONCLUSIONS: The findings of the present study discussed so far suggest that aquarobic exercise and burdock extract...
Nitrile oxide (NO) plays a critical role in regulating blood flow to skeletal muscle. NO production in humans is 1) oxygen-dependent via NO-synthases that convert L-arginine to NO and 2) oxygen-independent via the nitrate-nitrite-N0 pathway. The latter pathway is largely dependent on the intake of nitrate-rich foods, such as beetroot and beetroot juice supplements (BR). Consumption of BR has been shown to lower resting blood pressure and the volume of oxygen (VO2) required to perform submaximal aerobic exercise. **Purpose**: The purpose of the present study was to investigate the acute effect of a low dose of BR compared to placebo (PL) during moderate and vigorous intensity aerobic exercise. **Methods**: Ten female division-3 collegiate club-level volleyball players (mean ± SD: age = 19.3 ± 1.3 yr, VO2peak = 37.4 ± 3.3 ml·kg⁻¹·min⁻¹) completed three exercise trials consisting of an initial graded test to exhaustion and two performance trials on a motorized treadmill. For the performance trials, participants consumed either 60 mL of BR or PL, three hours prior to five minutes of walking/jogging at 45%, 65%, and 85% of volume of oxygen uptake reserve (VO2R). **Results**: Separate two-way repeated measures ANOVAs were run to determine the effect of treatment (BR or PL) and exercise intensity (45%, 65%, and 85% VO2R) on VO2R, heart rate (HR), and rating of perceived exertion (RPE). Paired samples t-tests were run to compare differences between resting systolic (SBP) and diastolic blood pressure (DBP) between treatments. All data are reported mean ± standard deviation with statistical significance accepted at p < 0.05. There were no statistically significant interactions between treatment and exercise intensity for VO2R, HR, or RPE. The main effect of treatment was not statistically significantly different for VO2R (BR: 19.9 ± 6.6 vs. PL: 20.4 ± 6.5 ml·kg⁻¹·min⁻¹; p = 0.360), HR (BR: 131.3 ± 25.8 vs. PL: 135.4 ± 25.3 beats·min⁻¹; p = 0.172), or RPE (BR: 9.8 ± 2.2 vs. PL: 9.9 ± 2.4; p = 0.504). There were no statistically significant differences in resting SBP (BR: 110.6 ± 6.8 vs. PL: 112.7 ± 8.0; p = 0.166) or DBP (BR: 70.8 ± 5.5 vs. PL: 73.3 ± 6.6; p = 0.275) between treatments. **Conclusions**: These results suggest that a low dose of BR taken three hours prior to moderate and vigorous intensity aerobic exercise has no effect on VO2R, HR, RPE, or resting SBP and DBP.

**PURPOSE**: Transient Receptor Potential (TRP) channel activation in the mouth, esophagus and stomach after ingestion of spicy food extracts can have direct effects on central nervous system (CNS) function that have been linked to increased maximal oxygen uptake and altered energy expenditure. TRP channels are ion channels that are activated by noxious stimuli and are expressed in many areas of the peripheral and central nervous system. We aimed to determine the effects of a spice-TRPV1 and TRPA1 agonist (BRC) with the potential for energy and fatigue modulation during moderate intensity exercise. **Methods**: Twenty-seven participants (12 female, 15 male, mean BMI = 23) completed baseline assessment of aerobic fitness (mean VO2 peak = 40 ml·kg⁻¹·min⁻¹) before being randomized to a placebo or spice supplement condition for four weeks. All participants were involved in regular physical activity three or more days per week. Assessment of energy, fatigue, and perceived exertion responses during and after moderately intense cycle ergometry exercise was conducted before and after the 4-week ingestion period during which participants were instructed to maintain existing exercise activities. **Results**: Data were analyzed by way of repeated measures ANOVA and dependent t-tests to determine the presence of significant differences across time and between the supplement and placebo conditions. Participants receiving the supplement reported greater levels of energy and lower levels of fatigue during the initial moments after completing the exercise trial (p < 0.05), greater levels of energy at the midpoint of the exercise trial (p < 0.05) but not at the end of the exercise session (p > 0.05), and lower perceived exertion at four of the six measurement points during exercise (p < 0.05). No differences were observed from pre to post intervention within the placebo condition (p > 0.05). **Conclusions**: Findings indicate that a commercially available supplement marketed to boost energy and reduce fatigue can deliver the purported benefits at least in part. Related findings that supplementation for a 4-week period can allow for equal work at a lower rating of perceived exertion provides further, though limited support that this product may have efficacy.
Korean Wild Ginseng (KWG) has been known to have efficacy not only in physical stamina but also in anti-inflammatory properties. However, its effect on performance recovery from acute strenuous exercise is not well known.

**PURPOSE:** To investigate the effects of KWG Drink on performance recovery from acute strenuous exercise (ASE).

**METHODS:** This study was conducted in double-blind, counterbalanced, placebo-controlled design with 14 days washout periods. Ten healthy male volunteers (27 ± 4.33 years old) were randomly assigned to one of two parallel trials. KWG (2g of KWG; 16.8 mg of ginsenosides/package) or placebo supplementation were consumed right after ASE and following 4 days (2 packs/day). The ASE program consisted of downhill running and jumping exercise. Subjects performed downhill running (-10 %) for 20 minutes at 60 % of VO2 max. After downhill running, subjects performed jumping exercise that consisted of five sets of 20 maximal drop jumps from height of 60 cm with a 10 seconds interval between jumps and 2 minutes rest between each set. Peak and mean power, isotonic muscle strength, electromyography activity, cognitive function, cortisol, interleukin-6 (IL-6), myoglobin, total antioxidant capacity (TAC), and muscle soreness were assessed at each time points: baseline, 2, 48, and 96 hours after ASE. A series of 2 x 4 repeated measures ANOVA, and MANOVA were used to determine differences according to the supplementation. **RESULTS:** There were no statistical differences in performance (F=0.368, p=.970), cognitive function (F=0.366, p=.983), blood variables (cortisol: F=0.509, p=.584; IL-6: F=1.166, p=.206; myoglobin: F=0.574, p=.544; TAC: F=1.508, p=.241), and muscle soreness (F=0.760, p=.462) according to the supplementation.

**CONCLUSION:** Supplementation of KWG extract has no efficacy for performance recovery from acute strenuous exercise in healthy male subjects. Dosage and short duration of KWG application may produce non-significance results. Further studies are needed to investigate the different dosage and duration of KWG supplementation on performance recovery.
A transient augmentation in the energy efficiency of working skeletal muscle is the purported basis for dietary nitrate (NO₃⁻) supplementation amongst competitive and recreational athletes alike. Previous studies support the ergogenic benefits of NO₃⁻ as results indicated improved microvascular blood flow, skeletal muscle oxygenation, and exercise performance with relatively short-term supplementation. As with most ergogenic aids, the optimum duration of supplementation prior to performance or competition, i.e., loading phase, is a critical determinant for efficacy. Purpose: Therefore, the purpose of this study was to investigate the effects of long-term vs. single dose NO₃⁻ supplementation on skeletal muscle oxygenation and cycling performance. Methods: In a randomized, placebo controlled, double blind, parallel design study, healthy, recreationally active male (n=15) and female (n=14) subjects (age 18-28 yrs.) completed a 5-mi simulated cycling time trial before and after a 14-day supplementation period with either a NO₃⁻ supplement (pre-nitrate loading; PRE) (n=14) or placebo (single nitrate dosing; SGL) (n=15). Both groups consumed a single dose of the NO₃⁻ supplement 2 hours prior to the post-treatment time trial. In addition, skeletal muscle oxygenation was measured via near-infrared spectroscopy during each time trial. Results: Fourteen days of NO₃⁻ supplementation (i.e. PRE) significantly decreased time to completion (Tlim) (p<0.01) and increased average power (PWRavg) (p=0.04) and speed (SPEEDavg) (p=0.02) from pre- to post-treatment while a single dosing (i.e. SGL) produced no significant changes to these measures. There were no significant differences over time and across treatments for any other measures including muscle oxygenation variables. Conclusion: Overall, long-term NO₃⁻ supplementation appears to have slight benefits over a single pre-exercise dosing in terms of cycling performance. However, this ergogenic response cannot be explained by changes to skeletal muscle oxygenation, thus contradicting previously purported mechanisms of action.

Table 1. Values of near-infrared spectroscopy (NIRS) during exercise and recovery period of exercise.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PLA</th>
<th>BET</th>
</tr>
</thead>
<tbody>
<tr>
<td>SmO2½DT(s)</td>
<td>24.2 ± 10.8</td>
<td>19.5 ± 9.5*</td>
</tr>
<tr>
<td>SmO2max(%)</td>
<td>71.4 ± 3.8</td>
<td>71.3 ± 3.2</td>
</tr>
<tr>
<td>ΔtHb (A.U)</td>
<td>24.1 ± 15.8</td>
<td>31.4 ± 16.6*</td>
</tr>
<tr>
<td>ΔHb (A.U)</td>
<td>7.5 ± 4.9</td>
<td>11.2 ± 7.3*</td>
</tr>
</tbody>
</table>

The values are mean ± SD. * (P<0.05) vs. PLA

ABSTRACT: Muscle oxidative capacity and recovery time of muscle oxygenation following maximal exercise decline with the aging. Although dietary nitrate supplementation has been shown to improve muscle oxygenation in health subjects, these effects in elderly have not been addressed. Purpose: To evaluate the effect of a beetroot-based nutritional gel (BG) on forearm muscle oxygenation, blood volume and handgrip strength in elderly with cardiovascular risk factors. Methods: 12 elderly participated in a randomized, double-blind and crossover study. Maximal voluntary contraction (MVC) was collected for baseline, immediately and 20 min after exercise in both BG (100 g of beetroot-based gel containing approx. 12 mmol nitrate) or PLA (100 g of nitrate-depleted gel nitrate-depleted) were provided. After 150 min of ingestion of each intervention, elderly performed a rhythmic handgrip exercise which consisted of one 1-min set at 30 % of the MVC of each subject following 1 min of quiet recovery after exercise. Muscle deoxygenation (SmO2min), muscle reoxygenation (SmO2max), muscle deoxygenation time (SmO2½DT), muscle reoxygenation time (SmO2½RT) and blood volume (tHb) were continuously monitored using an NIRS device. Results: significant reduction in SmO2min and SmO2max was observed during exercise and SmO2max during recovery, as it was in the AMVC (BG: -18.56±13.8 vs. PLA: -26.18±14.6 N; P<0.05) only 20 min after handgrip exercise. Significant increase in Hb during and after exercise was observed in BG. There was no significant difference in SmO2max between interventions. conclusion: Single dose of BG improve microvascular hemodynamics which may accelerate the muscle recovery after short exercise in elderly with cardiovascular risk factors.

Purpose: The present study examined whether consuming an antioxidant-rich beetroot juice (BTJ) would attenuate markers of inflammation and muscle damage following a marathon. Methods: Using a double blind, independent groups design, 34 marathon runners (~16 previous marathons completed) consumed either BTJ (~3mmol/L Trolox equivalent antioxidant capacity; polyphenol content: ~405 mg of Gallic Acid Equivalents) or an isocaloric placebo (PLA) for 3 days following a marathon race (3 x 250 ml per day). Maximal isometric voluntary contractions (MVIC), countermovement jumps (CMJ), muscle soreness, serum cytokines, leucocytes, creatine kinase (CK), high sensitivity C-reactive protein (hs-CRP) and aspartate aminotransferase (AST) were measured pre-post exercise in both groups (BG: 100 g of beetroot-based gel containing approx. 12 mmol nitrate) and blood volume (tHb) were continuously monitored using an NIRS device. Results: significant reduction in SmO2min and SmO2max was observed during exercise and SmO2max during recovery, as it was in the AMVC (BG: -18.56±13.8 vs. PLA: -26.18±14.6 N; P<0.05) only 20 min after handgrip exercise. Significant increase in Hb during and after exercise was observed in BG. There was no significant difference in SmO2max between interventions. Conclusion: Single dose of BG improve microvascular hemodynamics which may accelerate the muscle recovery after short exercise in elderly with cardiovascular risk factors. Supported by FAPERJ (E-26/010.002692/2014) and CNPq (442977/2014-0). Grant.
The influence of dietary nitrate (NO₃⁻) supplementation on indices of maximal sprint and intermittent exercise performance is unclear. Purpose: To investigate the effects of NO₃⁻ supplementation on sprint running performance, and cognitive function and exercise performance during the sport-specific Yo-Yo Intermittent Recovery level 1 test (IR1). Methods: In a double-blind, randomised, crossover study, 36 male team-sport players received NO₃⁻-rich (BR; 70 mL·day⁻¹); 6.4 mmol of NO₃⁻), and NO₃⁻-depleted (PL; 70 mL·day⁻¹; 0.4 mmol NO₃⁻) beetroot juice for 7 days. On days 5 and 7 of supplementation, subjects completed two bouts of moderate-intensity exercise and one bout of severe-intensity exercise that was continued until exhaustion on an arm-crank ergometer. Resting venous blood samples were obtained, for later determination of plasma nitrite concentration ([NO₂⁻]) and breath-by-breath VO₂ were measured during all exercise tests.

RESULTS: Plasma [NO₂⁻] was higher following BR, compared to PL (BR: 0.91 ± 0.24 L·min⁻¹ vs. PL: 0.59 ± 0.23 L·min⁻¹; P = 0.05). Exercise economy and time-to-exhaustion (PL: 459 ± 102 vs. BR: 474 ± 135 s; P < 0.05) were not impacted by BR supplementation during severe-intensity exercise. However, the effect of dietary NO₃⁻ supplementation on economy and performance during continuous-submaximal exercise was less clear. PURPOSE: To test the hypothesis that dietary NO₃⁻ supplementation would improve economy and performance during arm cranking exercise. METHODS: Eight recreationally-active males were assigned in a randomized, double-blind, crossover design to receive NO₃⁻-rich beetroot juice (BR; 12.2 mmol NO₃⁻·day⁻¹) or NO₃⁻-depleted beetroot juice (PL; 0.01 mmol NO₃⁻·day⁻¹) for 7 days. On days 5 and 7 of supplementation, subjects completed two bouts of moderate-intensity exercise and one bout of severe-intensity exercise that was continued until exhaustion on an arm-crank ergometer. Resting venous blood samples were obtained, for later determination of plasma nitrite concentration ([NO₂⁻]) and breath-by-breath VO₂ were measured during all exercise tests.

RESULTS: Plasma [NO₂⁻] was higher following BR, compared to PL (BR: 86 ± 51 nM vs. PL: 54 ± 31 nM; P < 0.05). BR supplementation lowered steady-state VO₂ during moderate-intensity exercise by 3% (PL: 0.93 ± 0.24 L·min⁻¹ vs. BR: 0.90 ± 0.23 L·min⁻¹; P = 0.05). Exercise economy and time-to-exhaustion (PL: 459 ± 102 vs. BR: 474 ± 135 s; P = 0.05) were not impacted by BR supplementation during severe-intensity arm cranking.

CONCLUSIONS: Short-term dietary NO₃⁻ supplementation improved moderate-intensity exercise economy, but not severe-intensity exercise economy or tolerance, during arm-cranking exercise in recreationally-active subjects.

There is evidence to suggest that the ingestion of >5 mmol inorganic nitrate (NO₃⁻) can enhance exercise economy [lower pulmonary oxygen uptake [VO₂]] and performance during cycling and running exercise. However, the effect of dietary NO₃⁻ supplementation on economy and performance during isolated upper-body exercise is less clear. PURPOSE: To test the hypothesis that dietary NO₃⁻ supplementation would improve economy and performance during arm cranking exercise. METHODS: Eight recreationally-active males were assigned in a randomized, double-blind, crossover design to receive NO₃⁻-rich beetroot juice (BR; 12.2 mmol NO₃⁻·day⁻¹) or NO₃⁻-depleted beetroot juice (PL; 0.01 mmol NO₃⁻·day⁻¹) for 7 days. On days 5 and 7 of supplementation, subjects completed two bouts of moderate-intensity exercise and one bout of severe-intensity exercise that was continued until exhaustion on an arm-crank ergometer. Resting venous blood samples were obtained, for later determination of plasma nitrite concentration ([NO₂⁻]) and breath-by-breath VO₂ were measured during all exercise tests.

RESULTS: Plasma [NO₂⁻] was higher following BR, compared to PL (BR: 86 ± 51 nM vs. PL: 54 ± 31 nM; P < 0.05). BR supplementation lowered steady-state VO₂ during moderate-intensity exercise by 3% (PL: 0.93 ± 0.24 L·min⁻¹ vs. BR: 0.90 ± 0.23 L·min⁻¹; P = 0.05). Exercise economy and time-to-exhaustion (PL: 459 ± 102 vs. BR: 474 ± 135 s; P = 0.05) were not impacted by BR supplementation during severe-intensity arm cranking.

CONCLUSIONS: Short-term dietary NO₃⁻ supplementation improved moderate-intensity exercise economy, but not severe-intensity exercise economy or tolerance, during arm-cranking exercise in recreationally-active subjects.
PAPER

**Title:** Far-infrared Emitting Fabric Improves Aerobic Metabolism, Oxidative Stress and Exercise Tolerance, Independent of Nitric Oxide

**Authors:** Arthur Gáspari1, Antônio Carlos de Moraes1, Celene Bernardes2, João Barbieri1, Patricia Guimarães1, Amanda Sardeli1, Alex Castro1, André Sposito1, Glenn McColl1, David Briskey2, Marcia Patricia Chacon-Mikahil1, Romulo Bertuzzi1, João Barbieri1, Patricia Guimarães1, Amanda Sardeli1, Alex Castro1, André Sposito1, Glenn McColl1, David Briskey2, Marcia Patricia Chacon-Mikahil1, Romulo Bertuzzi1. 1University of Campinas, Campinas, Brazil. 2Metrocamp/DeVray, Campinas, Brazil. 3Victoria University, Melbourne, Australia. 4University of Queensland, Brisbane, Australia. 5University of São Paulo, São Paulo, Brazil. Email: arthur.fg@hotmail.com

**PAPER ABSTRACT:**

Studies have shown that FIR emitted by materials can, without change temperature, enhance cell metabolism and function, increase cellular availability of nitric oxide (NO) and Ca2⁺, improve blood circulation and an enhance cell metabolism and function, increase cellular availability of nitric oxide similar to that performed in soccer. The purpose of this project was to examine the effects of acute beets juice supplementation on performance during a simulated soccer match.

**METHODS:** 8 female college soccer players (VO2max: 52.3 ± 8.5 ml/kg/min; mean ± SD) each completed two trials in a randomized, double-blind design. Participants ingested one nitrate rich beet juice shot (BR: ~6.5 mmol of nitrate per 70 ml) or one nitrate depleted beet juice shot (PL: ~0.04 mmol nitrate per 70 ml) 3 h before performing a modified Loughborough Intermittent Shuttle Test (LIST), separated by 7 days. Participants performed a Yo-Yo intermittent shuttle test to estimate maximal aerobic speed used in the modified LIST. The LIST consists of six 15 min periods of walking, running, sprinting and shooting. Each 15 min period was separated by a 3 min break. Ox. consumption and heart rate were measured continuously using a portable metabolic system. Values were averaged over the last 5 min of each 15 min period. Lactate and RPE were collected every 15 min.

**RESULTS:** There was no significant difference at any time point in any of the measured variables between PL and BR trials. The average VO2 between the PL and BR trial was 33.8 ± 4.4 vs 34.2 ± 4.1 ml/kg/min. In both trials the VO2 was significantly higher in the first 15 min compared to all other time points (p<0.05). The average lactate value between the PL and the BR trial was 3.8 ± 2.0 vs 3.2 ± 1.5 mmol. RPE values between the PL and the BR were 15.4 ± 1.2 vs 15.8 ± 1.6. In both trials the RPE was significantly lower in the first 15 min compared to all other time points (p<0.05).

**CONCLUSIONS:** Acute ingestion of nitrate rich beet juice did not improve simulated soccer performance.
Skeletal muscle typically experiences a repeated bout effect (RBE) following a single bout of heavy unaccustomed exercise, characterized by rapid adaptations aimed at protecting against a subsequent insult. Previous research indicates that non-steroidal anti-inflammatory drugs such as ibuprofen (IBU) may interfere with key mechanisms governing early skeletal muscle adaptive responses. **PURPOSE:** To determine the effects of naproxen on performance and gastro-intestinal (GI) distress during repetitive exercise. Naproxen and heat (NH) were completed. Eleven volunteers (6 male, 5 female; age 32.9 ± 5.7 ml/kg) cycled 80 min at a heart rate (HR) corresponding to 70% \( V_{\text{O2max}} \). Mean distance covered was greatest during \( N \) (176.2 ± 15.5 km) and lowest in \( NH \) (179.0 ± 18.0 km) (No relationships reported).

RESULTS: Changes in post-exercise muscle soreness 24 h following RE2 were 1: 43 ± 15 mm to RE2: 27 ± 14 mm) compared to IBU (RE1: 64 ± 14 mm to RE2: 58 ± 1 mm) and \( NH \) (RE1: 36 ± 14 mm to RE2: 36 ± 14 mm). The impact of IBU on RBE, compared to PLA, was greater during \( B \) (177.8 ± 18.2 bpm) than \( H \) (175.7 ± 14.2 bpm) and \( NH \) (179.0 ± 18.0 bpm) than \( N \) (177.8 ± 18.2 bpm). Mean distance covered was greatest during \( N \) (176.2 ± 15.5 km) and lowest in \( NH \) (179.0 ± 18.0 km). During exercise, GI symptoms were measured 24 and 72 h following each RE session (Initial RE = RE1). Muscle recovery variables [skeletal soreness, peak isokinetic torque, total isokinetic work during 30 reps and plasma creatine kinase (CK)] were measured 24 and 72 h following each RE session (Initial RE = RE1; RE 10 days later = RE2). Magnitude-based inferences were used to evaluate treatment effects on muscle recovery variables.

RESULTS: Changes in post-exercise muscle soreness 24 h following RE were 'likely' reduced with PLA (RE: 43 ± 15 mm to RE: 27 ± 14 mm) compared to IBU (RE: 39 ± 23 mm to RE: 39 ± 15 mm). In addition, reductions in total work output 72 h following RE were 'likely' attenuated with PLA (RE: -598 ± 614 J to RE: 13 ± 445 J), but not IBU (RE: -335 ± 481 J to RE: 343 ± 284 J). The impact of IBU on measures of peak muscle torque and CK were 'unclear'.

**CONCLUSION:** In general, ibuprofen consumption appeared to interfere with the RBE, compared to PLA. These data suggest that prescription-strength dosing of IBU following skeletal muscle trauma may be detrimental to the initial adaptive responses following heavy exercise.

Non-steroidal anti-inflammatory drugs are often perceived as performance enhancing due to their anti-inflammatory and analgesic effects. However, these drugs are known to cause gastrointestinal (GI) damage and alter cardiovascular function, which could be detrimental to performance. **PURPOSE:** To determine the effects of naproxen on GI distress and performance in hydrated humans cycling in the heat. **METHODS:** A double-blind, randomized and counterbalanced, cross-over design was utilized. Four trials: 1) placebo and ambient (Control); 2) ambien and ambient; 3) naproxen and ambient; and 4) naproxen and heat (NH) were completed. Eleven volunteers (6 male, 5 female; age 27 ± 8.6 yrs, weight 79.1 ± 17.9 kg, height 177 ± 9.5 cm, and VO2 max 41.4 ± 5.7 ml/kg s/g) cycled 80 min at a heart rate (HR) corresponding to 70% VO2 max before completing a 10 min time trial for maximum distance. Heart rate, rate of perceived exertion (RPE) and GI symptoms were measured throughout cycling. Gastronomic symptoms were assessed pre-, post-, 3 hrs post-, and 24 hrs post-cycling. Fecal occult blood was measured 24 hrs pre- and 24 hrs post-cycling. **RESULTS:** No statistically significant differences were found between conditions. Max HR was higher during \( N \) (176.2 ± 15.5 km) than \( C \) (175.7 ± 14.2 bpm) and \( NH \) (179.0 ± 18.0 bpm) than \( H \) (177.8 ± 18.2 bpm). Mean distance covered was greatest during \( N \) (176.2 ± 15.5 km) and lowest in \( NH \) (179.0 ± 18.0 km). During exercise, GI symptoms occurred in 64% of all trials (C = 82%, N = 73%, H = 45%, and NH = 55%). At 3 hrs post-exercise, C experienced more frequent and serious upper, lower, and systemic GI symptoms than any other condition. Compared to other trials, \( H \) experienced higher upper (18%) and systemic (5%) GI scores 24 hrs post-exercise. NH resulted in more serious lower GI symptoms (12%) 24 hrs post-exercise. **CONCLUSION:** Although naproxen did not significantly affect performance or GI distress during 90 min of exercise in the heat, a possible negative interaction between naproxen and heat stress may exist, as indicated by higher max HR and lower distance during \( NH \), which warrants further research. Supported by the ACSM Foundation Carl V. Gisolfi Memorial Fund

Roughly 12% of college students report non-medical use of prescription opioid painkillers (OPK). The risk of overdose and addiction are great and information needs to be gathered for creation of effective prevention programs. **PURPOSE:** To determine what factors contribute to college students’ perceptions related to their own use of OPKs and how perceptions are influenced by a brief education intervention. **METHODS:** 234 college students (213.3y, 70% female) completed three separate questionnaires. After responding to demographic questions, participants replied to Likert-style statements regarding responsible use of prescription opioids after being asked to imagine themselves in a situation where they had become injured and prescribed OPKs. The questionnaire was completed a second time after hearing an educational intervention regarding the costs, overdose rates, and OPK alternatives. **RESULTS:** Initially, females disagreed more strongly than males regarding the sharing of OPKs (t = 3.315, p = .002). Compared to never-prescribed, students that had previously been prescribed OPKs disagreed more strongly that they would finish their prescription regardless of pain (t = 4.44, p < .001). Those that knew at least one person who was addicted to OPKs, compared to those who did not know an OPK addicted person, were more in favor of prescription monitoring programs (t = -3.19, p < .002). The intervention positively influenced responses to statements regarding taking OPKs without first visiting a doctor, sharing unused OPKs, favorability of OPK monitoring programs, and agreement with doctors describing the risks of OPKs upon prescription (all p < 0.002). Participants were more concerned about the risks of OPKs and agreed more strongly that over-prescription of OPKs is a problem following the intervention (both p < .001). **CONCLUSIONS:** Gender and past OPK exposure influence initial feelings regarding OPKs. A brief low-cost and low-intensive educational intervention appears to have potential for positively influencing college students’ ratings related to responsible OPK usage.
PURPOSE: Astaxanthin (AX) is a naturally occurring carotenoid, synthesized primarily by marine microalgae, with powerful antioxidant and anti-inflammatory properties. Rodent studies suggest that AX supplementation improves fat utilization and exercise endurance (Ikenuchi 2003). In athletes, AX supplementation (4mg/day for 4 weeks) resulted in significant improvements in power output and cycling performance (Earnest 2011), however, a higher dose of AX (20mg/day for 4 weeks) in well-trained cyclists and triathletes, yielded no significant changes in total antioxidant capacity, oxidative damage, rate of fat oxidation, or time trial performance (Res 2013). The purpose of this study was to assess the effects of 8 weeks of AX supplementation on cardiorespiratory function during higher and lower intensity exercise in recreational runners. METHODS: Using a double-blind parallel design, 28 recreational runners (male = 14, female = 14, age = 42) were supplemented for 8 weeks with 12mg/day of AX (Haematococcus pluvialis algal extract) or a placebo. Before and after the supplementation period, subjects performed a maximal voluntary oxygen consumption test (VO2max on treadmill) and a maximal cycling test (watts on cycle ergometer). RESULTS: There was no improvement in maximal oxygen uptake (running VO2max) or maximal power output (cycling watts) with AX supplementation. Interestingly, subjects in the AX group showed a significant −10% lower average heart rate at submaximal running intensities (aerobic threshold, AT; AX 130 ± 17 vs. PL 145 ± 14; and anaerobic threshold, AT; AX 139 ± 20 vs. PL 154 ± 11, p=0.05) compared to placebo. CONCLUSIONS: Supplementation with 12mg/day of AX for 8 weeks reduced running heart rate at submaximal endurance intensities (AT & AT), but not at higher “peak” intensities. These results suggest that AX may be a beneficial ergogenic aid for long/ultra-distance endurance athletes, but not necessarily for athletes competing in shorter higher intensity efforts. In addition, these data are also suggestive of a general “cardiotonic” effect of AX, that should be investigated in non-athletic populations including elderly subjects and those with cardiac complications including post-myocardial infarction, heart failure, statin usage, mitochondrial dysfunction, chronic fatigue, and related conditions.

3300 Board #205 June 2 3:30 PM - 5:00 PM Effect Of Low Dose Cobalt Administration On Erythropoiesis

Walter FJ Schmidt1, Torben Hoffmeister1, Nadine Wachsmuth1, Dirk Schwenke2, William C. Byrnes3, FACSM1. 1University of Bayreuth, Bayreuth, Germany. 2University of Dresden, Dresden, Germany. 3University of Colorado, Boulder, CO. (Sponsor: William C. Byrnes, FACSM) Email: walter.schmidt@uni-bayreuth.de

Reported Relationships: W.F. Schmidt: Ownership Interest (Stocks, Bonds); W.F.J. Schmidt is a managing partner of Blood tec GmbH.

Before recombinant EPO became available cobalt chloride has been used as a therapeutic drug to treat anemic patients. Nowadays, cobalt (Co) is offered as nutritional supplement for endurance athletes as it is supposed to stimulate erythropoiesis also in smaller dosages. As a consequence, WADA has put cobalt on the list of prohibited substances although no information is available on the efficacy of low dose Co application on red cell production. Purpose: To evaluate the effect of low dose oral Co administration on erythropoietic activity. Methods: Three studies were performed: 1. application of a single dose of either 5mg Co (n=6) or 10mg Co (n=7); 2. application of 5mg (n=9) or 10 mg (n=7) per day for 5 days, and 3. application of 5mg Co/day for 3 weeks followed by a 3-week wash-out period (n=16). In all studies a control group was included. Venous EPO concentration was determined in all studies, reticulocytes (ret) and immature reticulocyte fraction (IRF) in study 2 and 3 and fthbmass in study 3 by the optimized carbon monoxide re-breathing method. Results: 10 mg Co significantly increased plasma EPO until 7h after the single dose (from 8.7 ±2.6 to 11.2 ±4.2 mU/ml) and remained elevated after the 5-day treatment (5.6 ±2.8 to 13.1 ±4.2 mU/ml, p<0.05). 5 mg Co had only a slight effect 5h after a single application (from 8.8 ±4.3 to 10.6 ±5.5 mU/ml, p=0.05). During the 3-week administration 5mg Co transiently increased EPO by 30% (from 9.5 ±3.0 to 12.4 ±5.2 mU/ml after 2 weeks, p<0.01). IRF increased after 5 days of 10mg Co administration (from 0.60 ±0.22 to 0.87 ±0.27, p<0.001), but not after short or long-term dosage of 5 mg. Ret% significantly increased in study 3 after 2 weeks (from 1.6 ±10.42 to 1.25 ±4.41%, p<0.05). In study 3, Hbmass slightly increased until week 2 (from 17.2 ±2.2 g/dl to 19.0 ±0.1 g/dl) and remained at higher level thereafter. Conclusions: Low dose cobalt administration which can be achieved with nutritional supplements slightly increases erythropoietic activity and total hemoglobin mass. Supported by WADA Grant 13D21DS.

Exercise-induced muscle damage (EIMD) would impair the muscle strength, elevate the activity of creatine kinase (CK), and make individual perceive fatigue. Reactive oxygen species play an important role in EIMD, and supplement with antioxidants might attenuate the undesirable physiological effects. Polyphenols are chemical compounds with antioxidant property extracted from fruit and vegetables. Moreover, studies showed that some kinds of them can be absorbed via skin.

PURPOSE: To determine the effect of using dermal absorbable polyphenol-based soap (PBS) upon EIMD after a single bout eccentric endurance exercise. METHODS: Thirteen healthy adults (40±5y) were recruited for a double-blind, cross-over, counter-balanced study. Graded exercise test (GXT) was performed to determine the maximal oxygen consumption (L/min) of subjects one week before eccentric exercise. Thereafter, subjects took a single bout of -5% grade downhill running (DHR) for 60 min at a speed eliciting 75% on a level grade. After the DHR, subjects took showers twice a day (12 h intervals) with PBS or a commercial neutral soap (CNP) for three days. Before, immediately after, 2, 4h, 7h and 2h after DHR, capillary finger blood was collected and profiles of mood states (POMS) questionnaire were recorded for analyzing the activities of serum CK and the scores of fatigue. Fifteen minutes after blood sampling, isokinetic strength test with maximum voluntary contractions at 170°/s (123±24 N/kg BW vs. 124±32 N/kg BW, p=0.08) when compared to immediately after DHR. On the contrary, there were no significant differences in fatigue scores between treatments. CONCLUSION: Using polyphenol-based soap might attenuate the activities of serum CK after a single bout DHR, and help muscle strength recovery. However, fatigue score of POMS questionnaire didn’t reflect this efficacy.

Supported by Hong Kong Small Biomolecules Laboratory.

Previous research relating to Alpha-GPC supplementation and physical performance has been limited to researching Alpha-GPC as a single ingredient supplement. Further research is needed to investigate the effect of Alpha-GPC in combination with other ergogenic ingredients on physical performance. Purpose: The purpose of this study was to investigate the acute effect of a supplement on physical performance in Division 2 football players. Methods: 14 male Division 2 football players (20.4 ± 1.0 years) participated in a randomized, double blind crossover experiment separated by at least 7 days. Subjects were given either supplement or placebo 60 minutes prior to any physical testing measures. Testing consisted of, maximum vertical jumps, maximum voluntary isometric contractions (MVIC), maximum voluntary concentric contractions (MVCC), and fatigue induced contractions. Subjects performed 3 maximum vertical jumps with 1-minute rest between jumps. Four MVICs were performed with the knee extensors muscles while seated on a dynamometer at 90° of hip flexion and knee flexion, with 2-minute rest between trials. Seven sets of 2 MVCCs at various loads (1 Nm; 10%, 20%, 30%, 40%, 50% and 60% MVIC) were completed with 30-seconds of rest between each set. During the fatigue tasks, 12 MVCCs (4 sets × 3 trials) were performed with each load equivalent to % of the range of motion. Recovery measures consisting of one MVIC and 7 MVCCs were taken 10 minutes post completion of fatigue task. Results: MVIC torque was similar between supplemental and control sessions (243 ± 41.1 vs. 240.2 ± 29.7 Nm, respectively, P=0.34). Rate of torque development (highest slope of torque during the first 400 ms of MVIC) was greater for the supplement than the control session (1801 ± 336 vs. 1801 ± 336 vs. 3301 Board #206 June 2 3:30 PM - 5:00 PM Using Polyphenol-Based Soap Ameliorates Eccentric Exercise-Induced Muscle Damage

Bo-Huei Huang, Hsin-Yi Lin, Kuei-Hui Chan, Chi-Huang Huang. National Taiwan Sport University, Taoyuan City, Taiwan. Email: 1040699@ntsu.edu.tw

Reported Relationships: B. Huang: Honoraria; Hong Kong Small Biomolecules Laboratory.

Email: mgage@mtu.edu

Michigan Technological University, Houghton, MI. (No relationships reported)

S705 Official Journal of the American College of Sports Medicine

Vol. 49 No. 5 Supplement
**PURPOSE:** Recent studies showed several nutrients taken individually, i.e. resveratrol, quercetin, α-3 fatty acids, vitamins and others, partially prevent metabolic alterations induced by physical inactivity. We hypothesized additive effects will be obtained when these nutrients are taken as a cocktail. In a pilot study, we tested the efficacy of such a cocktail, composed of polyphenols (530mg/d), α-3 (2.1g/d), selenium (80ug/d) and vitamin E (169mg/d) during 20 days of enforced physical inactivity coupled during the last 10 days with fructose supplementation (3.5g/kg/d) to trigger metabolic deterioration. **METHODS:** Twenty healthy active (14000 steps/d measured by accelerometer) young men, randomized in a control group (n=10) and a cocktail supplemented group (n=10), were asked to step exercise and reduce their daily physical activities (2800 steps/d). Body composition, glucose tolerance, substrate oxidation, blood anti-oxidant capacities and lateral muscle biopsies were assessed before and after intervention. Analyses used linear mixed models taking into account repeated measures. **RESULTS:** Twenty days of deconditioning reduced by 20% total and type 2-myosin heavy chain cross sectional areas in the control group that was prevented in the supplemented group (p<0.01 for both). While insulin sensitivity was only modestly affected in the two groups, plasma adiponectin was higher in the supplemented than in the control group at the end of the intervention (p<0.05). The supplementation counteracted the increase in fasting plasma triglycerides (p<0.02) and LDL (p<0.001) induced by reduced activity, was associated with greater fat oxidation (p<0.02) and higher muscle FATP1 protein content. The supplemented group had higher blood anti-oxidant capacities (p<0.01). **CONCLUSION:** These results are very promising as they can have a number of scientific and clinical implications for both the general sedentary populations and hospitalized bed rested patients.

**Purpose:** Reduced muscle strength and endurance is strongly associated with functional decline in older adults. We conducted a randomized, double-blind, placebo-controlled trial of the impact of daily oral astaxanthin treatment with high intensity interval training (HIIT) in the elderly. Astaxanthin is a natural product that combined with vitamin E has both anti-inflammatory and anti-oxidant properties that may improve muscle adaptation to exercise training in the elderly. **Methods:** Healthy males and females (n=44), age 65-82 yrs, undertook 3 months (3x/week for 30 min) of HIIT with vitamin E has both anti-inflammatory and anti-oxidant properties that may improve muscle adaptation to exercise training in the elderly. **Results:** Tibialis anterior muscle (TA) strength and endurance were measured in an exercise tolerance test to fatigue using dorsiflexion exercise. Treadmill and 6-minute walking tests were also performed. Results: TA muscle maximal force (MVC) increased by 11% only in the astaxanthin group (∆8.7±4.0 N; mean±SEM; P=0.029). Improvement in TA exercise endurance were found only in the supplemented group as measured by an increase in total contractions of 46% (Δ192±79 contractions; P=0.015) and in total force generated by 28% in the exercise test (Δ77±26 N; P=0.004). Significant improvements in treadmill exercise time, exercise efficiency, VO2 peak (Balke method), and reduced respiratory exchange ratio in addition to greater 6 minute walking distance were observed in both groups (P<0.025 for all). **Conclusion:** In healthy elderly, astaxanthin improved TA muscle strength and endurance with HIIT significantly more than placebo. These results suggest that the anti-inflammatory and anti-oxidant properties of astaxanthin form a cocktail enhance training adaptations in elderly subjects. An important impact of these findings is the potential to improve exercise tolerance with less frequent or intense training in elderly subjects. Supported by AstaMed NIH/NIA T32 AG000057.
Aging is associated with increases in oxidative stress. Redox imbalance occurs when production of reactive oxygen species (ROS) exceeds the capacity of antioxidant enzymes to eliminate ROS. Increased levels of intracellular ROS can compromise proteostasis by causing irreversible damage to proteins. The transcription factor nuclear factor erythroid-derived 2-like 2 (Nrf2) mediates the cellular endogenous antioxidant defense system by regulating antioxidant enzymes that are cytoprotective against ROS. Nrf2 can be activated phychochemically through the supplement Protandim. Previous work from our lab has demonstrated that a phychochemical based on musculoskeletal in vivo. Recently, we have begun to characterize a second generation Nrf2 activator (PB125) that has increased anti-inflammatory action in addition to anti-oxidant properties. Since inflammation can blunt protein synthetic responses, we speculated that PB125 might provide additional benefits on proteostatic processes. PURPOSE: The purpose of the present study was to examine in vivo the effects of three different doses (10, 100, and 300 ppm) of PB125 supplementation on Nrf2 activation and proteostasis. METHODS: 60 male CB6F1 mice aged 10-11 months were assigned to diets containing low, medium, or high doses of product PB125 in a 5 week feeding study. Mice were isocellaneously labeled with 8% deuterium oxide (D2O) to simultaneously measure protein and DNA fractional synthesis rates (FSR) in liver, heart, and skeletal muscle. Nrf2 activation was assessed through analysis of gene expression profiles via Affymetrix GeneChip microarray. RESULTS: Proteostatic processes were increased in the liver mitochondrial fraction in the 10 ppm treatment group (18.9 vs. 16.3 FSR%/day, p<0.05). However, there were no differences in proteostatic mechanisms in heart or skeletal muscle. At 100 ppm, there was up-regulation of Nrf-2 dependent cytoprotective genes (Akrl, Dnp3, Gclm, FhIL-7b, 3.82, 1.84, 1.42, 1.64-fold increase). CONCLUSION: From our data we are able to conclude that all three doses were safe, and that 100 ppm was effective at activating Nrf2. In addition, there was an indication of increased proteostatic processes in the liver, but not heart or skeletal muscle, perhaps due to the healthy status of the mice.

Vitamin D (Vit D) plays an important role in the musculoskeletal system and additionally can be deficient in some segments of the population. PURPOSE: The present study examined the effects of 4 weeks of Vit D supplementation versus placebo on musculoskeletal and psychomotor performance. METHODS: The participants were 32 college age males (Age: 22±4 y, Height: 177.7±8.3 cm, Weight: 81.5±14.6 kg, BF%: 19.6±7.9, Vit D: 20.0±7.2ng/ml). Participants were randomly assigned to group (Vit D vs placebo) and remained blind to the treatment throughout the study. The treatments consisted of 4000 IU of Vitamin D3 or similarly sized placebo (dextrose) administered daily for 4 weeks. The participants underwent baseline testing for isometric strength, explosive ability and psychomotor performance, which was repeated at week 2 and week 4. Isometric tests consisted of an isometric mid thigh pull (IMTP) on a force plate and an upper body isometric test (UBIST) using a load cell. Peak force during a countermovement jump (CMJ) was also determined via force plate. Psychomotor vigilance test (PVT) was used to measure sustained reaction time. RESULTS: For UBIST there was a significant effect of group (F=4.52, p<0.04) but not a significant group*time interaction (F=0.18, p=0.84; Vit D pre: 553.7±168.3N, post: 585.5±150.2N, Placebo pre: 677.7±182.3N, post: 649.8±236.9N). For IMTP no significant effect of group (F=0.92, p=0.34) or group*time interaction (F=0.17, p=0.63; Vit D pre: 2596.4±342.3N, post: 2606.9±378.3N; Placebo pre: 2684.0±432.9N, post: 2762.6±440.4N) was found. CMJ analysis did not reveal a significant main effect for group (F=0.75, p=0.39) or interaction effects for group*time (F=1.63, p=0.21; Vit D pre: 4429.7±1619.0N, post: 4938.5±2374.8N; Placebo pre: 5537.3±3027.0N, post: 6266.9±4577.3N). For PVT (mean reaction time) there was no significant main effect for treatment (F=1.29, p=0.29) or interaction effects for group*time (F=1.08, p=0.35; Vit D pre: 0.30±0.014sec; Placebo pre: 0.295±0.044sec; post: 0.284±0.029sec). CONCLUSION: Four weeks of Vitamin D supplementation was not effective in increasing musculoskeletal or psychomotor performance in college aged males. Further research is needed to clarify the effect of vitamin D on recreationally active persons.

Abstract: Low back pain (LBP) is a common clinical disease, and most patients require long-term treatment. PURPOSE: To observe the change in core stability before and after a 6-week Pilates program in young individuals with low back pain. METHODS: Twenty subjects with LBP (age: 22±2 years, 11 males and 9 females) completed a 6-week Pilates exercises intervention. Before and after the intervention, the Y-balance test (YBT) and abdomen bridge test (ABT) were used to assess the core stability of the subjects. During the YBT, which measures the dynamic balance and coordination of core and lower extremity, values on three directions (anterior - A, posteromedial - PM, and posterolateral - PL) of both sides and the difference value (D-value) between the two sides were determined. During the ABT, which measures the core control ability and includes eight levels, the attained level and endurance time of every level were measured. Paired t-tests were performed to compare results before and after the intervention. RESULTS: After the 6-week intervention, compared with the baseline values, there were significant improvements in all three directions of the YBT (see table). Specifically, the overall performance score increased significantly on both sides (both p<0.05). Compared with the baseline values, there was an improvement of more than one level and endurance time increased from 95.06±53.50 sec to 117.50±54.99 sec on the ABT (p<0.05). CONCLUSION: A 6-week Pilates exercise program improved core stability, as evaluated by YBT and ABT, in young individuals with LBP. Future randomized, controlled studies are needed to confirm these findings.

YBT Result Before and After Intervention

<table>
<thead>
<tr>
<th>Variables (n=20)</th>
<th>Before (cm)</th>
<th>After (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA</td>
<td>61.69±7.69</td>
<td>65.86±11.16*</td>
</tr>
<tr>
<td>RA</td>
<td>62.19±9.10</td>
<td>65.03±10.24</td>
</tr>
<tr>
<td>D-Value</td>
<td>4.11±2.77</td>
<td>2.11±2.47**</td>
</tr>
<tr>
<td>LPM</td>
<td>101.17±10.95</td>
<td>105.25±9.28*</td>
</tr>
<tr>
<td>RPM</td>
<td>103.31±10.54</td>
<td>105.06±9.08</td>
</tr>
<tr>
<td>D-Value</td>
<td>4.69±2.80</td>
<td>3.36±1.53*</td>
</tr>
<tr>
<td>LPL</td>
<td>100.19±10.02</td>
<td>102.42±8.55</td>
</tr>
<tr>
<td>RPL</td>
<td>99.56±12.30</td>
<td>102.36±10.00*</td>
</tr>
<tr>
<td>D-Value</td>
<td>4.31±3.78</td>
<td>3.26±2.87*</td>
</tr>
</tbody>
</table>

*p<0.05, ** p<0.01 compared to before intervention

Support by the Sports Medicine key laboratory of General Administration of Sport of China/ Sports Medicine key laboratory of Sichuan province Foundation.

Tryptic muscle injury can lead to microvascular perfusion failure; however, the effect of muscle contusion on microvascular circulation is not fully understood due to methodological limitations. We studied microvascular circulation in injured skeletal muscles after a contusion injury by histochemistry using lectin.

METHODS: Eighteen ICR male mice (39.0 ± 2.9 g) aged 8 and 9 weeks old were used. Microvascular circulation in leg muscles was examined immediately (n=5), 15 cm on the top of the impactor (impact area, radius 6 mm) that directly contacted

Abstracts were prepared by the authors and printed as submitted.
the skin over the posterior leg muscles. After the contusion, mice were allowed to recover. One mouse was without contusion and was used as a control. Fluorescein isothiocyanate (FITC)-labeled Lycopersicon esculentum lectin was injected into the caudal vein and allowed to circulate for 3 min before sacrifice. Endothelial cells of open and functioning blood vessels were labeled by this lectin for 3 min. Leg muscles were removed, frozen and 3 serial cross-sections (10 µm) were obtained from each specimen using a cryostat. Open and functioning capillaries were detected by immunostaining for PECA-1 (CD31) using an adjacent section. The third section was stained with hematoxylin and eosin for histological assessment. Photographs of these sections were carefully compared.

**RESULTS:** Muscle swelling was observed immediately after contusion. Myofibers were disorganized due to the expansion of interfiber spaces. At 24 h after muscle contusion, disrupted myofibers with infiltrated cells were observed. Some non-flowing capillaries were found within the injured area by immunostaining for lectin from immediately after contusion to 24 h.

**CONCLUSIONS:** The present study clearly demonstrated non-flowing capillaries within the injured muscle area after contusion injury for the first time by histochemistry. This method is useful for examining microvascular circulation after muscle contusion.

**3311 Board #216**
June 2 3:30 PM - 5:00 PM  
High Concentration CO2-water Immersion Promotes A Recovery From The Muscle Hardness Induced By Resistance Exercise  
Noriyuki Yamamoto, 090-0011, 1Tadashi Wada, 2Fumiko Takenoya, 3Masaaki Hashimoto. 4Japanese Red Cross Hokkaido College of Nursing, Kitami, Japan. 5Kokushikan Univ, Tokyo, Japan. 6Hoshi Univ., Tokyo, Japan. 7Teikyo Univ. Sci., Tokyo, Japan. 8Nagoya Univer. Japan.  

Clinical observations of CO₂ hot spring (CO₂ ≥1000 ppm) immersion revealed the effects, such as an immersed part reddening, skin blood flow improvements, blood catecholamine decrease, etc. In response to the CO₂-water bath, the reduction of sympathetic nerve activity may imply the facilitation of muscle fatigue recovery.

**PURPOSE:** We investigated whether the immersion of extremities including agonist muscles into artificially made high concentration CO₂-water (CO₂ ≥1000 ppm) influences recovery of muscle hardness in fatigue after resistance exercise.

**METHODS:** The healthy male college students (n=11, age: 18-19 yrs, height: 168.6±4.5 cm, weight: 66.2±9.3 kg) participated in this study. The subjects were randomly divided into the CO₂-water foot bath group (n=6) and the tap-water foot bath group (n=5). A laser blood flow in the immersed skin (BF) and electrocardiogram (ECG) were recorded continuously throughout the experiment. The subjects performed 100 times calf raise resistance exercise and immersed lower legs into tap-water or artificial CO₂-water at 35 °C for 10 minute after exercise. MG dominant muscle hardness was evaluated using ultrasound real-time tissue elastography and visual analog scale in muscle (VAS) at pre-exercise, immediately after exercise, after 10 min recovery. The strain ratio (SR) between the MG and a reference material was calculated. **RESULTS:** BF in the CO₂-water foot bath was significantly higher than in the tap-water foot bath (CO₂-water vs. tap-water, 5.7±2.4 vs. 1.5±0.6 mmHg /100 g, p<0.05). After 10 min recovery, in the CO₂-water foot bath compared with the tap-water, SR significantly decreased quicker (1.37±0.83 vs. 0.62±0.07, p<0.05). In addition, VAS after 10 min recovery became smaller in the CO₂-water than the tap-water (22.2±13.5 vs. 38.8±13.5 mm, p<0.05). **CONCLUSIONS:** The present study suggested that high concentration artificial CO₂-water foot bath may contribute to rapid recovery from the high intensity exercise-induced muscle hardness.

**3312 Board #217**
June 2 3:30 PM - 5:00 PM  
Using DT-MRI and 31P-MRS to Assess Muscle Damage Following Unaccustomed Eccentric Exercise  
Wenqian Deng¹, Lu Wang², Ping Li³, Rui Xia², Lei Wang². ¹Chengdu Sport Institute, Chengdu, China. ²Sichuan University, Chengdu, China. (Sponsor: Tongjian You, FACSM)  
Email: deng_wen_qian@163.com  

**PURPOSE:** To detect the musculoskeletal structure and metabolism changes in vivo by diffusion tensor magnetic resonance imaging (DT-MRI) and 31P-Magnetic resonance spectroscopy (31P-MRS) after a single bout of eccentric exercise.

**METHODS:** Thirty two male Sprague Dawley rats (body weight 238±15g) were randomly divided into either a sham group (n=8) or a downhill running group (n=24). Rats in the downhill running group ran 120 min on treadmill at a speed of 20 m/min at -10 degrees grade. DT-MRI and 31P-MRS were performed in right lower limb at pre-exercise (sham), immediately, 24 hr and 48 hr post-exercise at 7T MR. The MR sequence included RARE T2, RARE T1 and EPI-DTI. MRS observational indices included the peak areas of inorganic phosphate concentration (Pi), phosphocreatine concentration (PCr) and the ratio of Pi/PCr. The morphological changes were confirmed by histological and immunohistochemical methods. One-way ANOVAs and Tukey’s test were used to assess the differences among different time points.

**RESULTS:** On diffusion tensor tractography images, a single bout of downhill running significantly disrupted muscle fiber structure. The peak areas of Pi were significantly higher after extra exercise (pre: 4.1±0.8 mM; 0 hr post-exercise: 4.7±1.4 mM; 24 hr post-exercise: 6.6±1.9 mM; 48 hr post-exercise: 6.1±1.7 mM, all P<0.01). Muscle PCr did not differ before and post-exercise; consequently, Pi/PCr values were significantly higher following EIMD (pre: 0.14±0.05; 0 hr post: 0.18±0.05; 24 hr post:0.22±0.08; 48 hr post: 0.21±0.08; all P<0.05). According to the histological detection, Z-band streaming was higher post-exercise compared with baseline (all P<0.05). The histopathological indices of damage coincided with changes in DT-MRI parameters of fractional anisotropy and apparent diffusion coefficient.

**CONCLUSIONS:** The data suggest that exercise-induced muscle damage was accompanied by structural and metabolic alterations in skeletal muscle following a single bout of downhill running. The ability of DT-MRI and 31P-MRS to accurately detect these changes vivo makes them promising approaches to evaluate skeletal muscle damage after unaccustomed exercise. (This research is supported by the National Natural Science Foundation of China, Grant#: 81301195)

**3313 Board #218**
June 2 3:30 PM - 5:00 PM  
Relationship Between Knee Extensor Strength And Dynamic Balance Stability In Partial ACL Injury  
Geon Park, Dong Kyung Kim, Won Hah Park, Professor. Samsung Medical Center, Seoul, Korea, Republic of.  
Email: pk90007@naver.com  
(No relationships reported)

**PURPOSE:** Anterior cruciate ligament (ACL) injury are known to develop muscle weakness in the quadriceps. The quadriceps injuries contribute to loss of knee extensor function. The purpose of this study was to assess the correlations between dynamic balance stability and isokinetic extensor strength measurements in subjects with partial anterior cruciate ligament injury.

**METHODS:** We examined 38 men (mean age, 26.3 ± 7.0 years) with partial ACL tear. The isokinetic strength of extensor and flexor muscles were evaluated by using the CSMI isokinetic testing device. The peak torque was determined at speeds of 60°/s and 180°/s. The value of the highest peak torque for each velocity was compared with the uninjured side, and described as a percent of strength deficit. The balance stability was measured with single-leg by using the Biodex Stability System. Correlations between the ability of single-leg balance and knee extensor muscle strength were determined.

**RESULTS:** The knee extensor strength deficit of 22.5±18.9% was found in the injured leg that compared to the uninjured leg at 60°/s and extensor strength deficit was 18.8±17.2% at 180°/s. Single-leg balance stability at 22±15.8%was required the level of improvement of balance stability. Significant correlations were found between deficient of each extensor muscles in injured knees at 60 and 180°/s and dynamic balance stability (r = 0.61, P = 0.025; and r = 0.38, P = 0.035, respectively).

**CONCLUSION:** The ability of single-leg balance with injured knees appeared to be influenced by knee extensor muscle strength. The results contribute to the evidence indicating the importance of knee strength for dynamic balance stability for partial ACL injury.

**3314 Board #219**
June 2 3:30 PM - 5:00 PM  
Knee Extensor Strength Is Associated with Femoral Cartilage Thickness in Individuals with ACL Reconstruction  
Mike N. Vakula, Melissa M. Montgomery, Tyler J. Moffit, Kevin Choe, Derek N. Pumukoff. California State University, Fullerton, Fullerton, CA. (Sponsor: Dr. Lee Brown, FACSM)  
(No relationships reported)

**PURPOSE:** To (1) determine the relationship between quadriceps function and femoral cartilage morphology in individuals with anterior cruciate ligament reconstruction (ACLR), and (2) compare quadriceps function and femoral cartilage morphology between injured and uninjured limbs.

**METHODS:** Quadriceps function and femoral cartilage was assessed with unilateral ACLR in 20 subjects (women=15, age= 22.3±3.3 years, time since ACLR=44.9±32.8 months). Quadriceps function was assessed using peak isometric knee extension torque (PT) and rate of torque development (RTD) at 45 degrees of knee flexion, and peak isokinetic knee extensor torque at 60, 180 and 240°/sec. Femoral cartilage morphology (area and thickness) were obtained via ultrasound imaging at 140° of knee flexion. Partial correlations were used to evaluate the associations between indices of quadriceps function, and cartilage area and thickness accounting for time since reconstruction. Paired samples t-tests were used to evaluate interlimb differences.

**RESULTS:** The ACLR limb produced smaller isometric peak torque (2.56±0.42 vs. 2.75±0.30 Nm/kg, p<0.04), slower isometric rate of torque development (38.12±13.27 vs. 47.81±17.99 Nm/sec/kg, p=0.03), and isokinetic peak knee extensor torque at 60°/sec (2.38±0.54 vs. 2.80±0.63 Nm/kg, p<0.01) compared to the uninjured limb.
No differences were found in isokinetic peak torque at 180 or 240°/sec (p=0.06 and 0.60, respectively). After accounting for time since ACLR, a positive association was found between isometric peak torque and medial femoral cartilage thickness (r=0.41, p=0.04).

CONCLUSIONS: The ACLR limb demonstrated deficits in quadriceps function. We found a moderate association between isometric peak torque and medial femoral cartilage thickness. Our results suggest that restoring quadriceps strength may delay femoral cartilage thinning following ACLR.

3315 Board #220 June 2 3:30 PM - 5:00 PM MuscleSkeletal Pain as Predictors of Health Behavior: Implications for an Ergonomic Intervention
Pouran Faghi, FACSM, Carnish M. Gilder, CPHEW Team. University of Connecticut, Storrs, CT.
Email: carnish.gilder@uconn.edu
(No relationships reported)

Background: Work-related musculoskeletal disorders (WMSDs) are significant problems in the workplace that are extremely costly to employers, employees, and society. One of the most common symptoms of WMSDs is musculoskeletal pain which has been associated with detrimental effects to health behaviors including a decrease in physical activity levels. Lower levels of physical activity have been associated with elevated levels of obesity which increases the risk for the negative health consequences associated with a higher BMI.

Purpose: To compare the prevalence of obesity, musculoskeletal pain, and the difficulty to engage in physical activity of Correctional Officers (COs) to the U.S. adult general population at two time points. Furthermore, to explore the associations between musculoskeletal pain and health behaviors amongst COs.

Design: Seventy-seven Correctional Officers from two maximum security correctional facilities in the Northeastern United States were enrolled in the study. The health profiles (musculoskeletal pain, difficulty to engage in physical activity, and BMI characteristics) of participants were collected at two time points (Time 1 (2011) and Time 2 (2013)) and compared to the U.S. adult general population. The health profiles of COs were also used to investigate associations between musculoskeletal pain and the difficulty to engage in physical activity at two time points. Also to explore if musculoskeletal pain at Time 1 predicts the difficulty to engage in physical activity at Time 2.

Results: Correctional employees exhibited a significantly higher prevalence of overweight and obesity, musculoskeletal pain, and difficulty to engage in physical activity than the U.S. adult general population at both time points (p<0.05).

Musculoskeletal pain was associated with a difficulty to engage in physical activity at both time points (p<0.05). Musculoskeletal pain was predictive of the future difficulty to engage in physical activity (p<0.05).

Conclusions: As a result of the musculoskeletal pain, COs report difficulties to engage in physical activity. The results of this study provide a rationale for the implementation of feasible ergonomic interventions in the environment of corrections to alleviate musculoskeletal pain and improve the health behaviors of COs.

3316 Board #221 June 2 3:30 PM - 5:00 PM Effects Of Methol Gel On Delayed-Onset Muscle Soreness (DOMS) In Sedentary Young Adults
Michael E. Rogers, FACSM1, Jolauo M. Jimoh1, Sri Valli Chekur1, Duane C. Button3. 1Wichita State University, Wichita, KS; 2Memorial University of Newfoundland, St. John's, NL, Canada; 3Wichita State University.
Email: michael.rogers@wichita.edu
(No relationships reported)

Delayed-onset muscle soreness (DOMS) is common 24 hr after engaging in resistance training. Topical analgesics containing menthol are often used to treat DOMS but little is known about their effectiveness. PURPOSE: To determine how long menthol gel may reduce pain associated with DOMS. METHODS: Sedentary young men (n=3) and women (n=6) (age = 23.9 yr; wt = 70.1 kg) participated in the study and were instructed to refrain from exercise and consuming or applying any type of anti-inflammatory medication 24 hr before, and throughout the duration of, the study. After determining 1-RM, participants performed 10 sets of 10 repetitions of barbell biceps at 60% of their 1RM to elicit DOMS. Squats were performed to a predetermined depth using stacked 5-kilogram plates so the femoral condyle was moved to the floor at the end of the eccentric phase. 24 hr later, a gel containing 4.0% menthol was applied (1ml of gel per 200 cm² of surface area) to one quadriceps and the same dose of a menthol-scented placebo gel was applied to the other quadriceps. Application was randomized to each leg and participants were blinded to the gel identity. Prior to application, participants rated pain in each leg using a visual anaalgic scale (0=no pain to 10 pain as bad as it could be). Following application, participants completed this rating scale every 30 min for 8 hr. RESULTS: Pain was reported to be exactly the same for both legs at 24 hr (6.67 - severe pain). After application of the menthol gel, pain declined (p=0.05) to a minimum at 60 min (pain rating = 5.28; 21% decline) that was classified as moderate pain. Although pain tended to increase after 1 hr, pain remained less (p=0.05) than placebo for 5 hr. CONCLUSION: A 4.0% menthol gel reduces DOMS-related pain by ~20% 60 min after application in sedentary young adults and then a lower plateau of pain perception is achieved for 5 hr following application. Our previous study using the same protocol with recreational athletes who had lower (p=0.05) levels of pain (4.65) 24 hr after exercise also reported maximum pain relief 1 hr after application. Although a 31% relative decline, their absolute pain scores declined similarly (1.4 points) compared to the current study. Further research is needed to determine whether declines in pain can be attained in less time and if a greater decline can be achieved. Supported by Performance Health.

3317 Board #222 June 2 3:30 PM - 5:00 PM Exercise Intervention Effects On Winged Scapula And Postural Pain: A Case Study
Emily Mulcahy, Cody Baglow, Melissa W. Roti, FACSM. Westfield State University, Westfield, MA.
(No relationships reported)

Researchers have shown that more than 80% of the American workforce has a sedentary lifestyle that can leave people sitting for upwards of 10 hours a day (OECD, 2014). In turn this has a negative influence on posture and back pain. “Molly”, a 52 year-old, sedentary individual that has experienced right subscapular pain due to her posture, had developed protracted shoulders and winged scapula. Molly volunteered to take part in an 8-week Community Fitness Partner program as part of Westfield State University’s Exercise in Medicine on Campus intervention. A student trainer developed an 8-week total body exercise prescription. PURPOSE: The purpose of the study was to determine if resistance training postural exercises (RTPE), stretches, and self-myofascial release (SMR) could be used to counteract the protracted shoulder posture resulting in her upper back pain. RTPEs have been shown to help healthy populations neutralize the shoulder girdle and improve the overall health of the upper extremity. Methods: Initial meetings included goal setting and fitness screening. Subject characteristics include: Height=1.74m, Body Mass=65kg, BMI=22.4, Resting HR=68bpm, Resting BP=115/70mmHg and FMS shoulder mobility of left arm grade III and right arm grade II. The program included RTPE, stretching, SMR, and a customized training. After each workout specific exercises, stretches and/or SMR modalities were performed to target her upper back and pectoral area to help with shoulder girdle imbalances. Pre and posttest measures included assisted push-ups, curl ups, and self-awareness of back pain. Results: Molly’s upper body strength increased from 19 assisted pushups to 35, Curls-ups improved from 23 to 42. Improved alignment of her shoulders were observed in an axillary line with her ear and superior iliac crest. Additionally, she reported changes that included: an increase in overall mood, more energy, reduced upper back pain, improvement in body image and fewer aches throughout the day. Conclusion: An 8-week training program consisting of resistance training and specific postural exercises can effectively improve posture and decrease upper back pain. Through a multimodal approach, including strengthening and lengthening of muscles and tendons, posture can be improved which may lead to a decrease in pain.
p = .213, p = .609). The statistical comparison of
injured knees between the pre- and post-mat intervention.

Pre- and post-treatment blood samples were obtained
from all participants. Blood samples were collected from
a central venous catheter. Platelet-rich plasma (PRP)
was harvested from citrate anticoagulated blood
using LeukoLyzer kit (Stemcell Technologies). The
PRP was centrifuged at 3,000 rpm for 10 min.

RESULTS:
The platelet-rich plasma (PRP) platelet
concentration was significantly increased from
30.6 ± 11.8% to 70.8 ± 13.1% (p < 0.05). The
platelet release rate was significantly increased from
30.6 ± 11.8% to 58.9 ± 15.1% (p < 0.05). The
platelet-derived growth factor (PDGF) and transforming
growth factor beta (TGF-beta) levels were significantly
increased from 3.0 ± 0.5 ng/ml to 5.0 ± 0.5 ng/ml
(p < 0.05) and from 0.03 ± 0.01 ng/ml to 0.24 ± 0.1 ng/ml
(p < 0.05), respectively.

CONCLUSION:
The platelet concentration and release rate were increased
significantly after the PRP intervention. This suggests
that PRP may have potential therapeutic effects on
the repair and regeneration of injured tissues.

3302 Board #227 June 2 3:30 PM - 5:00 PM
The Effect Of Cold Water Immersion Treatment On Inflammation Factor And MMP-1 Releasing In Post-exercise Patellar Tendon
Bo Wang, Sheng Chao Bai, Wen Bo Li, Jiu Xiang Gao, Lin Wang. Beijing Sports university, Beijing, China. Email: wangbode002@163.com

No indication of muscle damage is evident after 30 or 60 low-intensity (10% of
maximal voluntary isometric contraction strength: MVC) eccentric contractions
(LEC) of the elbow flexors (EF, Chen et al., 2012) or the knee flexors and extensors
(Chen et al., 2013, 2015). Nosaka & Newton (2002) reported that a large number of
LEC of the EF (lowering a dumbbell of 9% MVC 1800 times) resulted in significant
changes in MVC torque, range of motion (ROM), upper arm circumference, muscle
soreness (SOM) and plasma creatine kinase (CK) activity lasting for 4 days post-
exercise. It appears that LIEC induce muscle damage when the number of contractions
exceeds a certain level, but the level has not been determined.

PURPOSE: To determine the effect of CWI on
inflammation factors and MMP-1 releasing in
post-exercise patellar tendon.

METHODOLOGY: Sixty New Zealand rabbits (18 month,
2.8±0.2 kg) were divided into three groups.

In high intensity jumping (HIJ) group, 30 rabbits jumped 150 times by low current
electrical stimulation, the jumping force were limited between 80-110N. In cold
water immersion (CWI) group, 30 rabbits received 15 minutes 4°C CWI treatment on
posterior limbs after 150 times jumping. Rest of 6 animals were control (CON)
group which was identified as baseline. The patellar tendons were harvested at 0 hour, 6 hour, 24 hour, 48 hours after exercise in HIJ group or after treatment in CWI group. TNF-α,
IL-6, COX-2 and MMP-1 mRNA expression assessed by RT-PCR. The all data was analysis by two-way ANOVA with multiple-comparison test. Result: IL-1β mRNA expression reached peak value at the 0 hour (CWI:22.89±5.98, HIJ:20.47±6.24 vs. CON:9.99±0.40, P<0.01), and no significate different between exercise groups. The activity of COX-2 and MMP-1 mRNA expression reached peak value at the 0 hour (CWI:73.25±2.7 vs. CON:73.90±8.17 vs. HIJ:0.63±0.03, P<0.01), and significantly higher in HIJ group at 0 hour (CWI vs. HIJ, P<0.05). IL-6 mRNA expression reached peak value at the 0 hour (CWI:23.49±5.83, HIJ:35.40±6.55 vs. CON:0.73±0.22, P<0.01), and

The patellar tendinopathy is a chronic overuse injury. After high intensity exercise, patellar tendon tissue releases mass of TNF-α, IL-1β, IL-6 that induce COX-2 and
MMP-1 releasing, which correlate to inflammation and tissue degeneration. Cold
water immersion (CWI) therapy has been considered an effective way to reduce the
inflammation and injury in muscle tissue. Purpose: To determine the effect of CWI on
TNF-α, IL-1β, IL-6, MMP-1, COX-2 releasing and in post-exercise patellar tendon.

Hypothesis: 1) High intensity jumping (HIJ) group, 30 rabbits jumped 150 times
by low current electrical stimulation, the jumping force were limited between 80-110N. In cold
water immersion (CWI) group, 30 rabbits received 15 minutes 4°C CWI treatment on
posterior limbs after 150 times jumping. Rest of 6 animals were control (CON)
group which was identified as baseline. The patellar tendons were harvested at 0 hour, 6 hour, 24 hour, 48 hours after exercise in HIJ group or after treatment in CWI group. TNF-α,
IL-6, COX-2 and MMP-1 mRNA expression assessed by RT-PCR. The all data was analysis by two-way ANOVA with multiple-comparison test. Result: IL-1β mRNA expression reached peak value at the 0 hour (CWI:22.89±5.98, HIJ:20.47±6.24 vs. CON:9.99±0.40, P<0.01), and no significate different between exercise groups. The activity of COX-2 and MMP-1 mRNA expression reached peak value at the 0 hour (CWI:73.25±2.7 vs. CON:73.90±8.17 vs. HIJ:0.63±0.03, P<0.01), and significantly higher in HIJ group at 0 hour (CWI vs. HIJ, P<0.05). IL-6 mRNA expression reached peak value at the 0 hour (CWI:23.49±5.83, HIJ:35.40±6.55 vs. CON:0.73±0.22, P<0.01), and

The perceived musculoskeletal discomfort and fatigue of the lower back and
foot were reduced. Future research should repeat this feasibility study with a larger sample size and longer intervention duration to investigate the effects of
ergonomic mats on musculoskeletal health and health behaviors.

Conclusion: Ergonomic mats are practical to implement in correctional facilities.
Following implementation, the reported musculoskeletal discomfort and fatigue of
the lower back and foot were reduced. Future research should repeat this feasibility study
with a larger sample size and longer intervention duration to investigate the effects of
ergonomic mats on musculoskeletal health and health behaviors.

Background: Prolonged standing on hard concrete surfaces has been associated
with musculoskeletal pain and discomfort of the lower extremities. Musculoskeletal
pain negatively effects health behaviors including sleep quality and levels of
physical activity. Ergonomics mats have been reported as an effective intervention
for reducing the musculoskeletal pain and discomfort of the lower extremities in
occupational settings. Understanding the alleviating effects of ergonomic mats on the
musculoskeletal symptoms of the lower extremities may aide in the improvement of
the musculoskeletal health and health behaviors amongst prolonged standers.

Purpose: To investigate the feasibility of implementing ergonomic mats in a
correctional facility to decrease the perceived musculoskeletal symptoms (pain,
discomfort, and fatigue) of the lower extremities amongst Correctional Officers (COs).
Furthermore, to evaluate the potential improvement of reported health behaviors (sleep
quality, sleep quantity, and physical activity) during the course of an ergonomic mat
intervention.

Design: Seven overweight and obese (BMI=25) Correctional Officers from a
correctional facility in the Northeastern United States participated in the 21-day
ergonomic intervention. Musculoskeletal symptoms (pain, discomfort, and sleep quality) were compared with a 2-phase panel evaluation (with and without the
ergonomic mat) and a pre-post evaluation.

Results: The perceived musculoskeletal discomfort and fatigue of the lower back and
foot significantly decreased (p<.05) at the follow-up. There were no significant changes in health behaviors.

Conclusion: Ergonomic mats are practical to implement in correctional facilities.
Following implementation, the reported musculoskeletal discomfort and fatigue of
the lower back and foot were reduced. Future research should repeat this feasibility study
with a larger sample size and longer intervention duration to investigate the effects of
ergonomic mats on musculoskeletal health and health behaviors.
significantly higher in HIJ group at 0 hour (CW1 vs. HIJ, P=0.05). MMP-1 mRNA expression reached peak value at the 6 hour (CW1:12.10±3.71, HIJ:13.31±5.78 vs. CON:0.99±0.99, P=0.01), and significantly higher in HIJ group at 0 hour in joint (CW1:4.0±0.70 vs. HIJ:7.82±1.18, P=0.05). COX-2 mRNA expression reached peak value at the 0 hour (CW1:7.57±2.01, HIJ: 18.02±4.17 vs. CON:0.78±0.29, P=0.01), and significantly higher in HIJ group at 0 hour and 6 hour (CW1 vs. HIJ, P=0.01).

**Conclusion:** The CW1 treatment transiently reduces the inflammation factors, MMP-1 and COX-2 releasing in patellar tendon after exercise.

### Session 3323: Board #228 June 2 3:30 PM - 5:00 PM

**Altered Joint Loading Affects Cartilage Degeneration and Limb Function in Rats following Knee Meniscal Transsection**

Liang-Ching Tsai1, Elana S. Cooper2, Kevin M. Hetzendorfer2, David S. Reece1, Young-Hui Chang3, Caroline R. Waters3, Robert E. Gulberg1, Gordon L. Warren, FACSM1, Nick J. Willett.1. Georgia State University, Atlanta, GA. 2. Emory University, Atlanta, GA. 3. Georgia Institute of Technology, Atlanta, GA. (Sponsor: Gordon Warren, FACSM)

**Email:** ltsai@gsu.edu

(No relationships reported)

**PURPOSE:** Either reduced or elevated joint loading has been associated with post-traumatic osteoarthritis (OA); however, which altered loading condition may be more detrimental to cartilage health post-injury remains unknown. This study examined the effects of reduced and elevated joint loading on cartilage degeneration, knee locomotion kinematics, and degree of voluntary activity in rats following medial meniscal transsection (MMT).

**METHODS:** A total of 22 male Lewis rats (weight: 304 ± 57 gm) underwent MMT in their left hind-limbs and were assigned to one of the three conditions: 1) regular loading (N = 7), 2) reduced loading via hind-limb immobilization (N = 8), or 3) elevated loading via daily treadmill running (N = 7). A sham surgery was performed in 7 separate rats. Rats were evaluated pre-MMT and 8 weeks post-MMT for the amount of voluntary daily run time/distance on a running wheel and hind-limb joint kinematics during treadmill locomotion (speed: 30 m/min) using a 3D X-ray motion analysis.

Rats were euthanized after 8 weeks and the 3D microstructure and composition of the tibial plateaus cartilage and subchondral bone was quantified using contrast-enhanced microcomputed tomography.

**RESULTS:** When compared to the elevated-loading group at the 8th week post-MMT, the reduced-loading group demonstrated a greater reduction in voluntary run time (47.7 ± 46.8% vs. 18.0 ± 69.9%, P = 0.043) and distance (57.2 ± 38.3% vs. 19.7 ± 81.2%, P = 0.029). Cartilage data from 4 rats per group indicated that the elevated-loading group had the greatest lesion/exposed bone area and subchondral bone volume (0.50 ± 0.35 mm3 and 1.16 ± 0.24 mm3, respectively), followed by the regular-loading rats (0.43 ± 0.19 mm3 and 1.06 ± 0.22 mm3) and reduced-loading rats (0.14 ± 0.17 mm3 and 0.97 ± 0.03 mm3). All three MMT groups demonstrated a more extended knee position (by about 8-18°) at mid-stance during locomotion when compared to the sham rats.

**CONCLUSIONS:** Our current findings suggest that while elevating joint loading (via treadmill running) exacerbated post-traumatic OA, reducing joint loading (via joint immobilization) may delay OA progression in MMT rats. However, the difference in cartilage degeneration among different loading conditions may not correlate with the behavior changes in voluntary activity and knee locomotion kinematics.

### Session 3324: Board #229 June 2 3:30 PM - 5:00 PM

**Prevalence of Joint Pain Before and After Bariatric Surgery and Impact on Physical Activity**

Alexandra Sirois, Ryan E.R. Reid, Kathleen M. Andersen, Nicolas V. Christou, Ross E. Andersen, FACSM, Susan J. Bartlett. McGill University, Montreal, QC, Canada.

(No relationships reported)

Consistent physical activity (PA) is one of the strongest predictors of successful long-term weight loss maintenance. However, joint pain is common among severely obese patients and is a significant barrier to regular PA.

**PURPOSE:** Our goal was to compare the prevalence of hip, knee, and back/other pain before and after bariatric surgery and explore interrelationships among joint pain, BMI, and PA.

**METHODS:** Data were drawn from a convenience sample of adults undergoing bariatric surgery at an urban academic center. In a phone survey, participants reported whether they had experienced knee, hip, and/or back/other pain prior to surgery, and changes in joint pain post-surgery. We compared BMI and PA by pain status (improved vs. worse) using t-tests and chi-square.

**RESULTS:** The 285 participants had undergone surgery a mean (SD) of 10 (3) years earlier. At follow up [FU], participants had an average age of 51 (10), BMI of 34.4 (8.4), and change in BMI of -19.0 (9.4); 191 (68%) had a BMI>30. Prior to surgery, 21-45% reported joint pain; at FU, 123 (43%) reported no pain; 80 (28%); 66 (23%); and 16 (6%) reported pain in 1, 2, or 3 joint regions, and 62 (22%) were on NSAIDs or analgesics. Participants who reported having less joint pain had greater reductions in BMI, and a significantly larger proportion reported being more active than prior to surgery (Table 1). Those with improved knee and back pain were also more likely to meet recommended PA guidelines. **CONCLUSION:** Joint pain was common among bariatric surgery patients and had improved in 34-40% even 10 years later. Improvements in pain were associated with greater reductions in BMI, greater likelihood of being more active, and of meeting PA guidelines. For the >60% with similar/worse joint pain, effective pain management strategies may be needed to facilitate reaching PA goals.

### Session 3325: Board #230 June 2 3:30 PM - 5:00 PM

**Cartilage And Subchondral Bone Histomorphometry In Osteoarthritic Knee.**

Masensen Cherief, 450001, Annabelle Cesaro1, Thomas M. Best, FACSM2, Mazen Ali3, Eric Lespessailles4, Hechmi Toumi4, 1 Service de Rhumatologie, Centre hospitalier régional d’Orléans. Orleans University, Orleans, France. 2. Department of Orthopedics, Division of Sports Medicine, Miami, FL. 3. Service orthopédique, CHR Orleans, Orleans, France. (Sponsor: Thomas Best, FACSM)

Email: hechmi.toumi@univ-orleans.fr

(No relationships reported)

Importance of subchondral bone in the pathogenesis and management of osteoarthritis remain recently the interest of both clinicians and researchers community. In fact, the integrity of articular cartilage relies on subchondral bone to provide mechanical support and nutrition supply. Herein, we investigated the relation between bone and cartilage structures and the vascular supply in human knee OA.

**METHODS:** 37 osteoarthritic tibial plateaus were collected after a total knee replacement surgery. Samples from macroscopically different ICRS grades were prepared from tibial plateaus. Samples were scanned using the micro-computed tomography at 10µm resolution (Skyscan 1072, Bruker), projections were reconstructed using the elongated slicing via micro computed tomography. Samples were sectioned into 4µm slices, coloured with HES and scored into 6 groups, based on histological OARSI score. Subchondral bone surface and thickness and articular cartilage surface were calculated. The number of vessels in the subchondral bone area were visually counted by two different operators and a VEGF immunofluorescent staining was performed. Results: bone volume fraction, trabecular thickness, spacing, and number were positively correlated OARSI grades. Also, blood vessels significantly increased from grade 1 to 5 (p<0.05). Yet, they were significantly less vessels in grade 6 compared to grade 5. **Conclusion:** Taken together, our data indicate an interplay and dynamic load-bearing structures between subchondral bone and cartilage. Understanding the signaling pathways, the cartilage-bone biochemical unit in joints and the intercellular communication between cartilage and subchondral bone may lead to development of more effective strategies for treating OA patients.

### Session 3326: Board #231 June 2 3:30 PM - 5:00 PM

**Early Unloading and Loading Exercises for Preventing Posttraumatic Osteoarthritis after Anterior Cruciate Ligament Injury**

Yanjmaa Erdenekhuuyag. Sports medicine, Ulaanbaatar, Mongolia. Email: Yanjmaa_oksana@yahoo.com

(No relationships reported)

How to prevent posttraumatic osteoarthritis remains controversial. However, a suitable unloading and/or loading exercise offers stimulus to reduce articular joint inflammation.

Abstracts were prepared by the authors and printed as submitted.
and facilitate cartilage regeneration. Continuous passive motion (CPM) and active treadmill exercise (TRE) have been shown to increase cartilage repair in knee stability condition. PURPOSE: To understand the protective effects of early unloading CPM, and loading TRE after ACL rupture. METHODS: Sixteen adult New Zealand White male rabbits were studied and randomly assigned to two groups: (I) CPM group, rabbits performed the CPM exercise for continuously 7 days post ACLT. (II) TRE group, rabbits performed active treadmill exercise at the third week for two weeks after ACLT. All animals received the ACL transection of right knee. Left knee was for the sham group. All animals sacrificed at 4 weeks after surgery. All knees were taken out for whole knee evaluations including gross appearance, histology, and OA quantitative scores as well as inflammatory reactions. RESULTS: Regarding gross appearance, the TRE group had more obvious cartilage abrasion than the CPM group. The CPM group demonstrated the better cartilage smooth than the TRE group. The total OA scores in the TRE group (13.14) were significantly higher than the CPM group (7.88) (p< .01). Regarding histological aspect, the TRE group showed the more severe cartilage degeneration, while the CPM group showed no degeneration status. On the basis of H&E and Alcian blue stainings, the TRE group showed much cell disorganized, decreased of cartilage cells, and decreased of GAG. In contrast, CPM had smoother surface of cartilage, retained GAG, cell density and oriented arrangement of chondrocyte, indicating protecting articular cartilage. We also found that the CPM group had the least TNF-α and caspase-3, suggesting anti-inflammation and sound chondrocyte growth. However, the TRE group had the significantly increased TNF-α and caspase-3 (p< .01), particularly in superficial and middle layers of the cartilage. CONCLUSION: CPM in the early stage after ACL injury provides the protection of cartilage. In contrast, active treadmill exercise may lead to osteoarthrosis. CPM after acute ACL injury for short-term articular cartilage protection is beneficial, while TRE should be judiciously applied.

Context: Athletic tape (AT), leukotape P (LEU), and prophylactic ankle bracing (BR) are commonly used in sport activity where dynamic postural control is important in optimal performance. The relationship between balance and these different types of tape and bracing have not been extensively studied. PURPOSE: The purpose of this study was to examine the effect of no intervention (NO), AT, LEU, and BR on modified Star Excursion Balance Test (SEBT) reach distance. Participants: Twenty-four healthy volunteers (9 males, 15 females; age: 22.13 ± 2.37 years; height: 164.99 ± 8.71 cm; mass: 70.06 ± 12.42 kg) who were self-reported recreationally active and have not experienced a lower extremity injury in the past six months participated. METHODS: NO, AT, LEU, and BR were applied during four randomized trials. Reach distance during a modified SEBT were recorded for individual directions and as composite scores for each leg and standardized by leg length. RESULTS: One-way repeated measures ANOVA showed a significance F omnibus value between type of tape and reach distance for right composite score, F(3, 20) = 10.071, p< .000, right anterior reach F(3, 21) = 7.082, p<.002, and left anterior reach F(3, 21) = 6.231 p=.003. Post hoc comparisons revealed that AT condition had significantly less right composite score compared to LEU condition; t(22) = 3.85, p< .001 and BR condition; t(22) = 4.12, p<.000. Right anterior reach for AT condition was less than NO, t(23) = 4.179, p<.000 and BR condition, t(23) = 3.045, p<.006. Left anterior reach for AT was also less compared to NO, t(23) = 5.79, p< .000; and LEU; t(23) = 3.690, p<.001. Conclusion: AT is often used to address ankle instability, moreover it may limit dynamic postural control stability. Using other tape or braces may exhibit the same stabilizing effect without impeding dynamic postural control.

CONCLUSION: CWI significantly decreased muscle soreness compared to contrast water therapy at 48 hours post DOMS inducing exercise. METHODS: Thirty-nine healthy college student volunteers (20 males; 19 females) with ages ranging from 18 to 23 years (M = 20.36, SD = 1.35) agreed to perform 5 sets of 20 drop jumps from a 0.6m box to induce DOMS. Subjects identified perceived muscle soreness on a 11-point (0 = no pain; 10 = most intense pain imaginable) numeric pain rating scale (NPRS) measured at baseline, immediately post exercise, and at 24, 48, 72, and 96 hours post exercise. Subjects were randomly assigned to a CWI (10°C) or CWT (-1°C) or NO condition. RESULTS: There was a statistically significant difference in NPRS scores for the CWI (M = 2.90, SD = 1.92) and CWT (M = 4.32, SD = 2.48); t(37) = 2.04, p<.049, interventions at 48 hours. Further, Cohen’s effect size was d = −0.66. CONCLUSIONS: CWI significantly decreased muscle soreness compared to CWT 48 hours post DOMS inducing exercise. CWI can be considered superior to CWT to decrease muscle soreness associated with DOMS 48 hours post-exercise. Additionally, the effect size indicates the intervention had a moderate effect. These results add to previous literature indicating CWI is more effective than CWT to treat muscle soreness.
Can Weakness in End-Range Plantarflexion after Achilles Repair Be Prevented?
Email: karl@nismat.org
(No relationships reported)

Purpose
Disproportionate end-range plantarflexion weakness, decreased passive stiffness, and inability to perform a heel rise on a decline after Achilles tendon repair, are thought to reflect increased tendon compliance or anatomical tendon lengthening. Since this was first noted, we have performed stronger repairs and avoided stretching into dorsiflexion for the first 12 weeks after surgery. It was hypothesized that these treatment changes would eliminate end-range plantarflexion weakness and normalize passive stiffness.

Methods
Achilles repairs with epimembranous augmentation were performed on 18 patients. Plantarflexion torque, dorsiflexion ROM, passive joint stiffness, and standing single-leg heel rise on a decline were assessed 43±24 months after surgery (range, 9 months-8 years). Maximum isometric plantarflexion torque was measured at 20° and 10° of dorsiflexion, neutral, and 10° and 20° of plantarflexion. Passive dorsiflexion ROM was measured goniometrically. Passive joint stiffness was computed from torque in passive torque from 10° to 20° of dorsiflexion measured before isometric contractions. Tendon thickness was measured by digital calipers. Plantarfex ROM was recorded during strength and functional tests. ANOVA and Wilcoxon tests were used to assess weakness and function.

Results
Marked weakness was evident on the involved side at 20° plantar flexion (deficit 26±18%; P<0.001) with no weakness at 20° dorsiflexion (deficit 6±17%; P<0.03). Compared to the noninvolved side, dorsiflexion range of motion was decreased 6±8° and tendon thickness was 7±3 mm greater (P<0.001) on the involved side. Passive joint stiffness was similar between the involved and noninvolved sides. Only 3 of 18 patients could perform a decline heel rise on the involved side versus 18 of 18 on the noninvolved side (P<0.01). There was no difference in EMG amplitude between the involved and noninvolved sides during all tests.

Conclusion
Normalized passive joint stiffness and reduced dorsiflexion ROM were likely due to a stronger, protected repair. EMG data confirmed that end-range weakness was not due to neural inhibition. Weakness with the plantar flexors in a shortened position may be due to inefficient transmission of contractile forces through the thickened tendon when the muscles are in a shortened position.

A Comparison of Two Equipment Removal and Spinal Restriction Protocols on Cervical Spine and Head Motion during Football Player Stretcher Transfer
Tyler Melnicove, Jennifer Kalash, Steven Leigh. Montclair State University, Montclair, NJ. (No relationships reported)

Current research suggests full spinal immobilization is not effective and is potentially harmful during the treatment of spinal injuries. EMS agencies nationwide have adopted new spinal motion restriction protocols in response to these findings. However, these protocols do not account for the protective equipment worn by many athletes. Removing protective equipment from an athlete is necessary for treatment but causes potentially harmful motion of the head and spine. Optimal time on task for equipment removal is also unknown. PURPOSE: To compare the differences in time and head/neck kinematics when transferring a football player with a scoop stretcher between full and partial equipment removal.

METHODS: A stratified sample of twenty students representing a football team (2.8 ± 1.7 years; 1.71 ± 0.12 m; 84.0 ± 15.9 kg). Participants were fitted with football equipment and placed supine. EMS spinal restriction protocols were conducted with helmet and shoulder pad removal (remove) and face mask removal only (keep). Participants were transferred to an ambulance cot with a scoop stretcher. Time to completion, linear/angular head, trunk, cervical spine, and helmet motion were measured in 3-D with an electromagnetic motion tracking system.

RESULTS: Time on task was twice as fast during keep versus remove (42 s vs 78 s, p < 0.001). Cumulative cervical flexion was about 40% less (40° vs 75°, p = 0.038) and cumulative cervical rotation was about 50% less (246° vs 378°, p = 0.026) during keep versus remove. Cumulative linear head motion was about 1.5 times greater (0.15 vs 0.35 m, p = 0.018) during keep versus remove. Maximum angular and linear motions were similar between conditions.

CONCLUSIONS: There was considerable head and neck motion during both removal protocols. Motion was cumulatively greater during full equipment removal. Maximum linear and angular head and neck motion was similar between protocols and any deviation from neutral could put pressure on the spinal cord. Coupled with faster time of task, these findings suggest face mask removal only, before transferring patient to an ambulance cot, is preferred.

Vitamin D3 Supplementation and Stress Fracture Occurrence in High-Risk Collegiate Athletes
Kevin A. Williams, Christian Askew, Christopher Mazoue, Jeffery Guy, Toni M. Torres-McGeehe, J. Benjamin Jackson III. Palmetto Health Richland, Columbia, SC. Email: kwilimd@gmail.com
(No relationships reported)

Previous vitamin D research analyzes the regulation of calcium and phosphate levels, as well as bone mineralization and turnover. Very little is known about vitamin D’s role in the prevention of stress fractures in high level athletes. PURPOSE: We aim to investigate vitamin D’s role in the prevention of stress fractures in collegiate athletes

METHODS: Prospective: 118 NCAA Division I athletes were recruited from the high risk sports of track and field, cross county, soccer, and basketball. Blood samples were procured in August and February to determine fall and spring baseline 25(OH)D levels. Subjects with serum 25(OH)D <30 ng/ml were supplemented with 50,000 IU of vitamin D3/week for 8 weeks. Treated subjects were re-tested to ensure serum 25(OH)D levels rose to sufficient status. All enrolled subjects were monitored for the development of stress fractures.

RESULTS: A retrospective chart review of non-supplemented athletes from the same sports team was conducted to determine the incidence of any reported stress fractures. RESULTS: Prospective: 112 of the 118 enrolled subjects were tested in August. 61% were of sufficient status (40.2 ng/ml ±8.28) and 51% were either insufficient or deficient (22.7 ng/ml ±4.89). 104 of the 118 enrolled subjects were tested in February. 56% were of sufficient status (40.7 ng/ml ±9.47) and 48% were insufficient or deficient (21.6 ng/ml ±5.38). 2 stress fractures were diagnosed in 118 currently enrolled subjects (1.6%).

Conclusions: In our population, almost half of the tested athletes proved to be vitamin D insufficient or deficient by the current normative value standards. Despite vitamin D supplementation, hypovitaminosis D was prevalent throughout the winter months. With vitamin D supplementation in this particular year, the stress fracture rate in our particular cohort significantly decreased from 7.51% to 1.65% (p=0.009) following vitamin D supplementation.

Rasch Calibration of the Knee Injury Osteoarthritis Outcomes Score
James L. Farnsworth, II', Todd Evans', Helen Binkley', Minsoo Kang, FACSM', 'Buena Vista University, Storm Lake, IA. 'University of Northern Iowa, Cedar Falls, IA. 'Middle Tennessee State University, Murfreesboro, TN. (Sponsor: Minsoo Kang, FACSM)
Email: farnsworth@bvu.edu
(No relationships reported)

The knee is one of the most commonly injured body regions, accounting for nearly 15% of all sports-related injuries. Patient-reported outcomes such as the Knee Injury Osteoarthritis Outcomes Score (KOOS) has been used to evaluate changes in function following knee injury. Despite its clinical use, ceiling effects have been found across KOOS subscales in the general population. Ceiling effects diminish the clinical usefulness of the KOOS as function improves during recovery. In patients with a high functional ability, such as athletes, it is likely that this problem is even more pronounced. Evaluating the measurement properties of the KOOS in athletes is necessary to determine its clinical value. PURPOSE: To calibrate the 42-item KOOS using the Rasch Rating Scale Model. METHODS: One-hundred thirty adults (age 29.63 yrs ± 11.32) completed the KOOS. We used the Rasch Rating Scale Model to examine the KOOS. First, model-data fit was evaluated by examining mean square residuals for many items. The item difficulties ranged from -3.96 to 0.07 logits, where a higher value represents a more difficult item. Evaluating the measurement properties of the KOOS in athletes is necessary to determine its clinical value.
Platelet-rich plasma (PRP) is an autologous concentration of human platelets and has been used for treatment of tendon, ligament, and muscle injuries. However, it contains deleterious cytokines and growth factors that can cause fibrosis and inhibit muscle healing. PRP therapy has grown in popularity over the past few years but the effect of the PRP with physical rehabilitation is not clear. PURPOSE: To assess the effect of physical rehabilitation with PRP injection on treatment of hamstring strain injuries.

METHODS: Eight physically active males (age 22.7 ± 3.6 yrs) with acute hamstring strain injuries and nine matched controls (age 21.9 ± 2.8 yrs) were recruited as research participants. Approximately 60 mL of blood was drawn from an antecubital vein immediately before and after surgery. Pre- to post- surgery changes in cytokine concentrations were compared between groups.

RESULTS: The quadriceps indices were found similar at 60º/sec (p=0.308) and 300º/sec (p=0.716) angular speeds between the groups. There were no differences in IKDC (p=0.237) and fear of movement (p=0.059) scores between groups.

CONCLUSIONS: The use of tourniquets during total knee arthroplasties (TKA) has been debated given the possibility that prolonged application of a tourniquet may result in ischemia-reperfusion injury (IRI), potentially contributing to post-operative muscle atrophy. The goal of this study was to elucidate the influence that tourniquet use may have on the induction of IRI in muscle tissue following TKA surgeries. We hypothesized that tourniquet use during TKA causes larger global increases in pro-inflammatory cytokines, indicating the occurrence of IRI.

Patients undergoing primary ACL reconstruction with ATT allograft, HT or QT autografts had satisfactory and similar objective and subjective clinical results. Functional rehabilitation would be the key factor to improve the functional status for different type of graft use in ACL reconstruction patients.
to induction of IRI in TKA surgeries. However, additional studies comparing local plasma cytokine changes near the tourniquet site and utilizing larger sample sizes are necessary to determine if tourniquet should be used in TKA without inducing IRI.

3339 Board #244 June 2 2:00 PM - 3:30 PM
To What Extent is Weakness after ACL Reconstruction due to Central Inhibition versus Muscle Atrophy? A Magnetic Stimulation Study.
Email: tfukunaga@northwell.edu

No relationships reported

PURPOSE: Quadriceps weakness is common after ACL reconstruction. Studies using electrical stimulation suggested that limited central nervous activation may have a role in the weakness. The purpose of this study was to test for deficits in quadriceps strength and activation, using magnetic stimulation, in patients at 3 mo and 6 mo post ACL reconstruction.

METHODS: Ten patients (7M/3F; age 34.7±8.3 yrs; BMI 26.0±4.8 kg/m²) who had ACL reconstruction with BPTB autograft were recruited. Patients underwent standard physical therapy after surgery. At 3 and 6 mo post-op, patients’ knee extension maximum voluntary isometric contraction (MVIC) was measured. All tests were done bilaterally at 30° and 65° of knee flexion on a dynamometer. MVIC was augmented with a superimposed burst magnetic stimulation to the femoral nerve. The stimulator coil was placed over the femoral nerve and a 3-sec, 35-Hz pulse train was delivered at 100% intensity after 2 sec of MVIC. Peak torque before (Tpre) and after (Tpost) stimulation delivery was measured, and central activation ratio (CAR) was calculated using the formula: CAR = Tpost/Tpre. MVIC and CAR were analyzed using 3-way repeated measures ANOVA (time x side x angle).

RESULTS: Patients had marked deficits in MVIC (side effect P<0.001), with improvement from 3 mo to 6 mo (side x time P=0.015) that was more apparent at 65° vs 30° (side x time x angle P=0.022): at 3 mo, MVIC deficit was 34.6±14.1% at 30° and 34.7±8.6% at 65°; at 6 mo, MVIC deficit was 27.0±13.0% at 30° and 22.0±12.2% at 65°. CAR was lower on the involved side vs the noninvolved side (side effect P=0.022) and this effect was more prominent at 3 mo vs 6 mo (side x time P=0.026): combining the angles, mean CAR on the involved and noninvolved sides, respectively, was 91.4±7.6% and 97.5±5.3% at 3 mo, and 93.0±7.8% and 95.8±6.8% at 6 mo.

CONCLUSIONS: At 3 and 6 mo after ACL reconstruction, there were significant deficits in quadriceps strength and activation. The levels of activation were high (>90%) for both sides at both time points. The substantial strength deficits at these postoperative time points may be largely due to muscle atrophy with only a limited contribution from central inhibition. Rehabilitation interventions to normalize quadriceps strength should emphasize hypertrophic stimuli as opposed to neuromuscular activation strategies.

3340 Board #245 June 2 2:00 PM - 3:30 PM
Magnetic Resonance Imaging Detection of Meniscal Injuries in Pediatric and Adolescent Patients with ACL Tears
Alana M. Munger1, Nicholas R. Gonsalves2, Emily Clarke1, Curtis Vandenberg2, James L. Pace2. 1Keck School of Medicine of USC, Los Angeles, CA. 2Children’s Hospital Los Angeles, Los Angeles, CA.
Email: amunger@usc.edu

No relationships reported

PURPOSE: Prior research has shown decreased sensitivity and negative predictive value of meniscal injury detection using MRI in the setting of acute anterior cruciate ligament (ACL) tears in an adult population. This has yet to be investigated in a younger population. The objective of this study was to assess the diagnostic ability of MRI in detecting meniscal injuries for pediatric and adolescent patients undergoing arthrographic ACL reconstruction.

METHODS: From August 2012 - June 2016, 175 arthroscopic ACL reconstructions were performed at our institution. A total of 83 patients were included in our final analysis. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of meniscal tears on MRI were calculated. ANOVA and two-sample t-tests were used to compare event rates between medial meniscal (MM) and lateral meniscal (LM) tears.

RESULTS: The median age of our cohort was 15 (range: 7-18). Figure 1 shows the accuracy of MRI for patients with arthroscopically confirmed meniscal tears with a concurrent ACL tear. There were 25 (30.1%) cases in which a meniscal injury not detected on MRI was discovered arthroscopically (MM: 5 knees, LM: 19 knees, both: 1 knee). These false negative MRIs were more commonly a LM tear (p<0.001) and of the vertical tear type (13/25 tears, 52.0%). The posterior horn was the most common location for a missed LM tear (p=0.001).

CONCLUSIONS: For our younger patients with ACL injuries, there were 25 (30.1%) cases in which preoperative MRI failed to detect a meniscal tear. LM tears in the posterior horn were more commonly missed on MRI versus MM tears. Also, a vertical tear was the most commonly missed tear type. In comparison to an adult cohort, the MRIs of pediatric and adolescent patients with LM tears had a decreased NPV.

Figure 1: Sensitivity, Specificity, PPV, and NPV of 1.5T and 3.0T MRI

<table>
<thead>
<tr>
<th>MRI Finding</th>
<th>Arthscopic Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tear Present (+)</td>
<td>47</td>
</tr>
<tr>
<td>Tear Absent (-)</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
</tr>
</tbody>
</table>

Sensitivity 65.3%
Specificity 54.5%
PPV 90.4%
NPV 19.4%

3341 Board #246 June 2 2:00 PM - 3:30 PM
Body Mass Index is Associated with Cartilage Turnover in Individuals with ACL Reconstruction
Amy R. Lane, Matthew S. Harkey, Brittney A. Luc-Harkey, Hope C. Davis, J Troy Blackburn, Anthony C. Hackney, FACSM, Brian Pietrosimone. University of North Carolina at Chapel Hill, Chapel Hill, NC.
Email: lanea@email.unc.edu

No relationships reported

Obesity is a risk factor for idiopathic knee osteoarthritis, yet little is known regarding how body mass index (BMI) affects metabolic changes that increase the risk of post-traumatic osteoarthritis (PTOA) PURPOSE: Determine the association between BMI and the type II cartilage turnover ratio in individuals with a unilateral anterior cruciate ligament reconstruction (ACLR). METHODS: Forty-five individuals with unilateral ACLR (31 female; 21.8±2.9 yr; 25.6±4.2 kg/m²; 48.3±32.8 months post ACLR) that had been cleared for unrestricted physical activity participated in this study. Physical activity level prior to ACLR (Tegner score) as well as current level of disability (International Knee Documentation Committee Index [IKDC]) were assessed. BMI (kg/m²) was calculated from objectively measured height and mass. Following 20 min of rest, serum was obtained to measure Type II cartilage turnover ratio (C2C: CPII), which was quantified as the ratio of degradation (collagen type II cleavage product [C2C]) to synthesis (collagen type II C-propeptide [CPII]). Sera were put on ice to centrifugation, sample aliquots were stored at -80°C until analysis. Spearman rank order correlations were used to determine the bivariate association between BMI and C2C:CPII. Secondary, partial correlations were used to determine associations after controlling for covariates (IKDC and Tegner). All analyses were then repeated with males and females assessed separately. RESULTS: Overall greater BMI was associated with greater C2C:CPII (r=0.30, P=0.048). After controlling for covariates, we found a similar association between BMI and C2C:CPII (Partial r=0.42, P=0.009). In females, greater BMI was moderately associated with greater C2C:CPII before (r=0.51, P=0.004) and after controlling for covariates (Partial r=0.50, P=0.01). There was no association between BMI and C2C:CPII after (r=0.03, P=0.93) in males only. CONCLUSIONS: Greater BMI may influence greater collagen turnover in those with ACLR, potentially increasing the risk for developing deleterious cartilaginous alterations that are consistent with PTOA onset. By maintaining a lower BMI or reducing BMI, individuals, especially females, may be able to positively affect the cartilage turnover ratio following ACLR.

3342 Board #247 June 2 2:00 PM - 3:30 PM
Quadriceps Muscle Strength Recovers Faster Than Hamstring Strength After ACL Reconstruction With Hamstring Tendon Autograft
Gulcan Harput1, Hamza Ozer2, Gul Baltaci, FACSM. 1Hacettepe University, Ankara, Turkey. 2Gazi University, Ankara, Turkey.
Email: aktasgulcan@gmail.com

No relationships reported

Strength measurements are extensively performed following anterior cruciate ligament (ACL) reconstruction to better understand the strength recovery of the patients over time and to make the patients return to their sports safely.
PURPOSE: The aim of this study was to investigate the quadriceps and hamstring strength recovery after ACL reconstruction with hamstring tendon autograft (HTG).

METHODS: Fifty individuals (Age: 27±3.7 years; body mass index: 24.8±3.7 kg/ m²) who had undergone ACL reconstruction with HTG were included in the study. All participants attended a regular six-month rehabilitation program. Quadriceps and hamstring isometric strength was measured at first, third and sixth months after surgery. Limb symmetry index [(involved/uninvolved limb strength)x100] (LSI) was used to define strength recovery. Two-way (muscle X time) repeated measures of ANOVA was performed for statistical analysis.

RESULTS: Muscle by time interaction was found significant for LSI (F 6,478 = 4.43; p < 0.01). Quadriceps LSI was lower than hamstring LSI at first month (p = 0.02) but no difference was observed between quadriceps and hamstring LSI at third (p = 0.62) and sixth months (p = 0.64) post-surgery. Both quadriceps and hamstring LSI gradually increased after ACL reconstruction (p < 0.001) (Table 1).

Table 1. Quadriceps and hamstring strength recovery after ACL reconstruction

<table>
<thead>
<tr>
<th></th>
<th>First month</th>
<th>Third month</th>
<th>Sixth month</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadriceps (%)</td>
<td>49.3±17.17</td>
<td>79.2±14.97</td>
<td>84.0±12.55</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hamstring (%)</td>
<td>55.0±12.13</td>
<td>77.8±12.19</td>
<td>85.1±11.29</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>p value</td>
<td>0.02</td>
<td>0.62</td>
<td>0.64</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

CONCLUSION: Quadriceps strength decrement was greater than the hamstrings' at first month post-surgery when compared to contralateral limbs' strength. However, quadriceps and hamstring LSI's were found similar at third and sixth months post-surgery which showed quadriceps strength recovered faster than hamstring strength. Although the participants attended a regular ACL neuromuscular training program, their LSI for strength could not reach 90% at 6 months after surgery when patients usually return to sport.

3345 Board #250 June 2 2:00 PM - 3:30 PM
Competitive Bass Anglers: A New Concern in Sports Medicine
Connor R. Read, Shawna L. Watson, Jorge L. Perez, A Reed Estes. UAB Hospital, Birmingham, AL
Email: Connor.r.read@gmail.com
(No relationships reported)

Background: Angling is a popular pastime for many Americans. Competitive angling involves sport fishing against other anglers while targeting a specific species of fish. Due to the rapidly growing popularity of high school competitive bass angling in Alabama and the similarity of the casting motion to that of overhead athletes, we sought to examine the prevalence of sports-type injuries in this population.

Hypothesis: High school anglers who regularly compete will have a high prevalence of sports-type injury; likely due to the similarity of casting motion to the motions of many overhead athletes.

Study Design: Cross-sectional study

Methods: In spring 2016, an anonymous survey was distributed across two large scale competitive high school fishing tournaments, allowing for a broad sampling of anglers throughout the state of Alabama. Survey items included demographic information, relevant past medical history, and various pain associated with the shoulder, elbow and wrist. Results were recorded and analyzed electronically using Microsoft Excel and IBM SPSS statistical software.

Results: A total of 257 surveys were recorded. The mean age of participating anglers was 15 years old. The majority (42%) of anglers fished year round. On average, anglers casted nearly 1,000 more times while competing versus fishing recreationally. Approximately 15% of anglers experienced shoulder, elbow, and wrist pain. The most common factors associated with pain included higher tournament cast counts, number of competitive years, number of tournaments/year, number of tournaments, and use of light weight lures.

Conclusion: Roughly 15% of high school competitive anglers experience upper extremity pain. Knowledge of angling factors associated with pain allow for the creation of a modifiable routine to help reduce pain in affected anglers and prevent pain in healthy anglers.
of two groups showed that there was no significant difference between two groups (A: 49.2±3.9, poor; P: 58.6±10.9, poor, p=1.09±0.05). Over four-week-exercise period (24 assessment), A was better than P. There was a significant difference of JOA scores (A: 94.3±3.2, excellent; P: 79.3±6.9, good, p=0.00±0.01). However, the improvement rates of A and P had no significant difference(p=0.26±0.05). Improvement rate= (24 assessment – 1st assessment)/1st assessment. Conclusion Both active functional training and passive functional training are beneficial to postoperative patients with simple olecranon fractures, but active functional training method is the first choice.

High levels of sedentary behaviour are associated with functional decline, elevated blood pressure, weight gain, and increased risk for metabolic conditions in people with osteoarthritis independent of time spent in moderate-to-vigorous physical activity. While physical activity levels do not change substantially after total knee arthroplasty (TKA), the effects on sedentary behaviour have not been investigated. PURPOSE: To compare sedentary behaviour patterns in people with osteoarthritis awaiting TKA and individuals recovered from TKA. METHODS: Sedentary behaviour was measured with the 7-day Sedentary and Light Intensity Physical Activity Log (SLIPA), the Longitudinal Aging Study Amsterdam Sedentary Behaviour Questionnaire (LASA-SB), and 7 day accelerometer (ActiGraph GT3X+, < 100 activity counts/min) in 32 participants awaiting TKA and in 38 individuals one year after TKA (69.9 ± 5.3 SD and 67.9 ± 7.3 yrs of age respectively). T-tests and Mann-Whitney Rank Sum tests were used to detect differences between groups. A one-way RM ANOVA was used to detect differences between measures of sedentary time. RESULTS: There were no differences between pre- and post-operative groups for GT3X+ wear time (13.9 ± 1.1 hours/day vs 14.4 ± 1.1 respectively, p=0.09), total sedentary time (9.3 ± 1.4 hours/day vs 9.2 ± 1.4, p=0.62), and number of sedentary bouts/day < 30 min in duration (median 3.4 (IQR 3.1) vs 3.1 (IQR 2.0), p=0.37). In addition, SLIPA and LASA-SB scores did not differ between groups (p=0.17 and p=0.14 respectively). Measures of sedentary time (combined groups) were statistically different from one another: GT3X+ 9.2 ± 1.4 hours/day, SLIPA 6.7 ± 2.5 hours/day, LASA-SB 10.3 ± 3.7 hours/day (all comparisons p<0.05). CONCLUSIONS: Self-reported and objective measures of sedentary behaviour do not differ. We were unable to use the wait-list for TKA and one-year recovered from TKA. This suggests that after TKA there is still an increased risk for physical disability and cardiovascular health conditions related to high levels of sedentary behaviour. In addition to promoting increased physical activity after TKA, individuals will benefit from education regarding strategies to reduce sedentary behaviour.

Within the past few years, long distance triathlon has gained in popularity amongst the general population, which is by itself good news, since it leads to adopting an active lifestyle. Amateur athletes engaged in such a demanding challenge must prepare themselves wisely in order to achieve their goals with or without injury. Coaches establish training programs based upon their knowledge, personal experience and on approved training principles. Up to now, no training programs or methods have been evaluated scientifically in order to evaluate its effect on health and on success rate for age group athletes. PURPOSE: To evaluate a triathlon training program on the success rate of completing a half Ironman in neophyte amateur athletes. METHODS: A triathlon training program was conducted by the research team from February to June 2016 to follow age group athletes for their preparation to the Mont-Tremblant half Ironman. The training program adapted by a certified coach/registered kinesiologist included endurance and strength training in specific areas of running, cycling and swimming. Each participant did a full fitness assessment that included body composition, aerobic and musculoskeletal testing in January and two weeks prior to the event. Training volume was noted each week and injuries were reported to the team's physical therapist. RESULTS: Out of the 31 amateur triathletes (19 Males and 12 Females; mean age of 40 ± 9 years old; body weight of 74 ± 12 kg and a height of 172 ± 10 cm), only one did not complete the event. For a mean training volume of 410 ± 201 min per week, the mean finishing time was 6 hours 28 minutes and two participants obtained a qualification for the World Championships. Maximum oxygen consumption (46 ± 8 to 49 ± 7 ml/kg/min, p < 0.05) as well as maximal power output (293 ± 62 to 308 ± 57 W) were significantly increased by the training program. Ventilatory thresholds were also significantly increased (158 ± 40 to 175 ± 40 W, p < 0.05). No significant changes were observed in body weight (% of body fat and % lean mass), maximal grip strength and flexibility tests. Seven cases of minor injuries were reported during the six months of training. CONCLUSION: A 24 week training program adapted by a certified coach/registered kinesiologist is safe and provides a high success rate for amateur athletes that aim to finish a half-Ironman triathlon.

Verbal directions and encouragement are common in exercise testing; however, the verbiage used during each is rarely controlled despite the likelihood it may affect the participant’s performance. PURPOSE: To examine the effects of four variations in verbal encouragement verbiage on isokinetic performance during alternating concentric knee extensions and flexions. METHODS: Seventeen healthy participants (8M, 6F; height = 1.73 ± 0.09 m, mass = 70.0 ± 20.2 kg, age = 24.2 ± 3.9 y) completed 3347

Half Ironman Training For Age Group Triathletes
François Lalonde, J3L 1C6, Sarah-Maude Martin1, Marquita Thériault2, Jean-François Tremblay3, Christopher Bonneau Mercier4, Vincent Gosselin Boucher1, Mélanie Roch2, Mathilde Baudel1, Marc Gosselin5, Tournoux François6, Alain Steve Comtois7, Université du Québec à Montréal, Montréal, QC, Canada. 2Université de Sherbrooke, Sherbrooke, QC, Canada. 3Centre Hospitalier de l’Université de Montréal, Montréal, QC, Canada. 4Medical director for IronmanTM and Ironman 70.3TM Mont-Tremblant,Mont-Tremblant, QC, Canada. Email: triathlonfrank@gmail.com

F-62 Free Communication/Poster - Performance
Friday, June 2, 2017, 1:00 PM - 6:00 PM
Room: Hall F

3348 Board #253 June 2 3:30 PM - 5:00 PM Variations in Verbal Encouragement Modify Isokinetic Performance at High Speeds
Nicole K. Rendos1, Rebecca C. Regis2, Taislaine Alipio2, Kysha Harrilli2, Joseph F. Signorile3. 1Florida International University, Miami, FL. 2University of Miami, Coral Gables, FL. (Sponsor: Arlette Perry, FACSM)

Hitting a baseball or softball is one of the most difficult skills in sport. Use of a batting tee as a training technique is viewed as principle for establishing and improving basic fundamentals of hitting. PURPOSE: To determine lower extremity (knee flexion, pelvis rotation) and trunk (flexion, lateral flexion and rotation) kinematics hitting off a tee and hitting front toss. It was hypothesized that there would be no difference in lower extremity and trunk kinematics between the two conditions. METHODS: Nineteen National Collegiate Athletic Association (NCAA) Division I collegiate softball players (20.51±1.53 yrs; 69.99±7.68 kg; 1.66±.08 m) participated. Participants were instructed to execute five maximal effort swings hitting from a tee and five maximal effort swings hitting front toss from a pitcher at 9.14 m (30 ft). The hitting motion was divided into five events: stance (ST), load (LD), foot contact (FC), ball contact (BC), and follow-through (FT). RESULTS: Data failed the test of normality; therefore, a Wilcoxon signed-rank test was used to determine if there were median differences in hitting kinematics between two hitting conditions during each hitting event. Results revealed kinematic differences in trunk flexion at load (z = −2.55, p = 0.01). No other significant results were found between hitting events and examined variables during
Bilateral transfer is a common source of experimental study in motor learning. It is suggested that successful transfer from a non-dominant hand to dominant hand exists in the area of speed. However, there may be a difference between left- and right-handed individuals in the hemispheric transmission of visuo-motor information. Left-handed may have lower accuracy in trials. 

**PURPOSE:** The focus of this work was to quantify the amount of bilateral transfer of subjects and determine if there is preferred dominant hand for the greatest amount for transfer. 

**METHODS:** Participants first completed a handedness survey to establish laterality. They were then asked to trace a printed star pattern as quickly and accurately as possible while gazing at a mirror image of the pattern. The pattern for tracing was as follows: 1 time with non-dominant hand, 7 times for dominant hand, 1 time for non- dominant hand with 30 second breaks in between. Errors were measured by marks made outside of the star pattern. The distance outside the line was measured with a ruler. 

**RESULTS:** A total of 14 college age students were enrolled in this study, 50% (N=7) were female, and 35% (N=5) were left-handed. Significant differences were found in the pre to post test scores in both the number of errors (means ± standard deviation, significant pre = 15.4 ± 6.8, post = 6.93 ± 4.12, p=0.0001) and time to complete the tasks in minutes (means ± standard deviation, significance) pre = 1:48 ± 0.03, post = 1:00 ± 0.02, p=0.005. When stratified by dominant hand (left or right), only time to complete task was significantly different (p=0.04); whereas, the number of errors was not significantly different (p=0.09).

**CONCLUSIONS:** This study suggests that there may be significant skill transfer from the dominant to non-dominant hand. It does appear that perfection of a task (number of errors) is as easily transferred, regardless of which hand is dominant. The later may have implications for athletics whose participation in sports requiring perfection of movement is important.

---

**BOARD #257**

**June 2 2:30 PM - 5:00 PM**

**The Physiological Responses Of A Mandibular Repositioning MouthGuard And Their Effects On Athletic Performance**

Ricardo Martins, Patrick Girouard, Evan Elliott, Said Mekary. Acadia University, Wolfville, NS, Canada. Email: said.mekary@acadiau.ca.

**PURPOSE:** The purpose of this study is to understand the physiological responses of a mandibular repositioning mouthguard on athletic performance. We hypothesize that MG designs that produce anatomically desirable jaw adjustments for an increase in the upper airway may have the ability to elicit ergogenic effects thereby improving respiratory capacity and athletic performance.

**METHODS:** Twenty-four active participants volunteered for this study and were randomly counterbalanced submitted to six performance tests and 3D volumetric imaging with both conditions, without mouthguard (NMG) and with the mouthguard (MG).

**RESULTS:** The results demonstrated that the mandibular repositioning mouthguard has a significant effect on both aerobic (p < 0.01) and anaerobic performances (p < 0.05). The MG condition increased the pulmonary ventilation by 9% and maximal aerobic capacity by 5%. In addition, the MG condition increased anaerobic power production by 3% and decreased the 20- and 40-meter sprint time by 4% and 2% respectively. All results were statistically significant (p < 0.05). Imaging results demonstrated a 7% increase of the upper airway volume when comparing the MG to NMG conditions (p < 0.05).

**CONCLUSIONS:** Our results support our hypothesis that jaw-repositioning custom-made mouthguards can induce an increase in oropharynx width in the upper airways and these changes may be the cause for an increase in athletic performance.
Few studies have assessed factors that directly impact vertical jump performance in females. Prior studies investigating warm-up protocols as a means to enhance jump performance without seeking to manipulate the target (i.e. sport specific focal point, non-controllable, or governed focal point) that the female subjects focused on to complete the jumps. A previous focal point vertical jump study utilizing male subjects suggested that vertical jump performance increased when using a sport specific focal point. However, this has not been assessed using a female population to the best of the researchers’ knowledge. PURPOSE: To determine if a sport specific focal point contributes to an increase in jumping performance compared to non-controllable (i.e. no set focal point), and a governed (i.e. set focal point) in averagely fit females. METHODS: Thirty averagely fit female participants had descriptive data collected (i.e. age, HT, WT, BF). Participants completed an 8 min warmup, which avoided static movements, and then received a 4 min passive recovery. After completing four familiarization jumps in a counter movement manner participants completed four jumps per each jump trial with thirty seconds of rest between jumps and 2 min of passive rest between each trial. The jump series protocol consisted of three separate counterbalanced trials which included a sport specific (FPS), governed (FP), or non-controllable focal point (FPN). FPN, FP, FPS were compared using ANOVA with significance determined at an alpha level of 0.05. RESULTS: FPS (51.56 cm ± 8.69 cm) was significantly different (p = .0005) versus FP (49.00 cm ± 8.35 cm) and FPN (50.58 ± 8.83 cm). Also, there was no significant difference (p = .245) between FPS and FP. CONCLUSION: It appears that using a sport specific focal point may elicit a higher jump in averagely fit females as compared to the jumps when females utilized a non-controlled focal point or a governed focal point. Further research is necessary in order to evaluate the use of a sport specific focal point on vertical jump performance with females who participate in jumping sports (i.e. basketball, volleyball) at the high school, collegiate, and professional level.

PURPOSE: We reported in a previous study (ACSM's 60th Annual Meeting) that kinetic energy (kg•m²/s²) calculated from body weight (kg) and 30m sprint (m/s; maximum value), called breakthrough power (BT), was good as a performance assessment of running with body contact during rugby. The purpose of this study was to determine if the BT of individual players can explain team performance in rugby football.

METHODS: For four years the top level teams of university rugby football in Japan were investigated retrospectively (the number of players of 86 [regular 16, reserve 70]) in 2010-11 season, 60 [18, 42] in 2011-12, 96 [19, 77] in 2012-13, and 113 [19, 94] in 2013-14. Every season, number of players of regular and reserve (individual player’s performance level) were included in the high BT group (number of the regular players of the season) and in the low BT group. Odds ratio and Fischer’s exact test were calculated, and compared to team performance of the Japan university championship.

RESULTS: Odds ratio (p value as Fischer’s exact test) of each season was 28.6 (0.00) in 2010-11, 19.24 (0.00) in 2011-12, 8.40 (0.00) in 2012-13, and 2.88 (0.09) in 2013-14. The adjustment of odds ratio that standardized the player total number of each season when odds ratio was high, i.e. most players with high BT participated in a game as regular players, team result was high.

CONCLUSIONS: In the 2013-14 season, the contribution of breakthrough power, i.e. fitness level to assessment of player performance (regular or reserve) was low, thus team fitness was low. As result, the team performance was low. Thus the contribution of fitness factor to assessment performance level is important in rugby football. Breakthrough power is an effective assessment of team performance of university rugby football.
Muscular power declines 6-10% per decade throughout life. It is unknown, however, when the decrease is most apparent. Therefore, it’s important to examine the difference in power amongst different age cohorts. PURPOSE: The purpose of this study was to examine the difference in power output measures among adults over the age of 18 years, separated into age decade cohorts (18-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80-89 years). METHODS: A total of 160 men and women participated in the study (40.6 ± 21.0 years; 71.1 ± 14.0 kg), spanning in age from 18-86 years. Power was assessed using the Tendo power analyzer during a sit-to-stand (STS) task. Participants sat on a standard height (0.47 m) chair, arms crossed over their chest and performed five separate STS trials, rising from a seated to full standing position as quickly as possible; one-minute rest periods provided between each trial. The Tendo was positioned on the floor in alignment with the participant’s heel and the Kevlar string attached to the participant’s hip with a carabiner clip and belt. With each STS task, peak (PPOW) and average (APOW) power, as well as peak (PVEL) and average (avel) velocity were recorded in watts (W) and meters per second (m/s), respectively. PPOW, APOW, PVEL, and AVEL were recorded for each stand, with the average taken. RESULTS: One-way ANOVA analysis indicated a significant difference between groups for PPOW, APOW, PVEL, and AVEL measures (p < .05). Younger subjects produced significantly greater PVPOW and APOW than individuals in age cohorts over 40 years (p < .05). When assessing PVEL and AVEL, the younger age cohorts produced significantly greater values than the older age cohorts (p < .05). CONCLUSION: Findings indicate muscular power to be significantly greater among younger cohorts (≤ 40 years), as compared to older cohorts (> 40 years); however, among older cohorts, there was no significant decline in power. This gives an indication that decline in muscular power may occur around the age of 40, which is when the decline becomes less apparent. Based on findings, preservation of muscular power is necessary before 40 years of age. 

CONCLUSIONS: Moon phases did not affect evening explosive performances (mainly phosphagens’ pathway based efforts) among young trained athletes. Therefore, it seems that moon phase / illumination do not have an effect on short term physical performance in young trained adolescents. Future studies may evaluate whether High Intensity (predominance of the “glycolytic pathway” in addition to the “phosphagen’s pathway”) and Endurance (predominance of “oxidative phosphorylation”), performances would be affected by lunar cycle in athletes.
percent differences were calculated and used for analysis. Pearson’s r correlations were conducted to analyze the relationship between hamstring and quadriceps percent differences and lower body explosive performance variables.

RESULTS: There was no significant correlation between BQ% and total sprint time (r = -0.12; p = 0.85), vertical jump height (r = 0.06; p = 0.68), and peak power (r = -0.13; p = 0.36). There was no significant correlation between BTH% total sprint time (r = 0.22; p = 0.14), vertical jump height (r = -0.01; p = 0.99), and peak power (r = -0.26; p = 0.08).

CONCLUSIONS: No relationship was observed between bilateral asymmetry and any lower body explosive performance in this particular population. The lack of a relationship may be due to the type of participants involved in the investigation; since they were recreationally trained there may be varied training experience.

3365
Board #270
June 2 3:30 PM - 5:00 PM
The Effect Of Drop Jump Height On Post-activation Potentiation As Measured By Vertical Jump Performance
Monica Taylor1, Erica Thomas2, Amy Marszalek2, Hannah Dohm2, Laura Moorman1.1University of the Sciences, Philadelphia, PA. 2St. Ambrose University, Davenport, IA.

(Sponsor: Elizabeth Nagle, FACSM)

Email: m.taylor@usciences.edu

(No relationships reported)

Post-activation potentiation (PAP) is an enhanced contractile response within the muscles due to prior voluntary activation that has the potential to be used as a warm-up strategy prior to short, high intensity activities. PURPOSE: The purpose of this study was to compare the effects of two different drop jump heights on PAP as measured by subsequent vertical jump performance. METHODS: 76 male and female NAIA collegiate athletes (Age: 19.0±0.2 years) completed three different testing sessions during protocols. During the first session, the participants performed a pre-treatment vertical jump test and were familiarized with drop jumps. The second and final testing sessions included five drop jumps with rebound from an 18 and 30 inch box followed by a post-treatment vertical jump test. Three t-tests were performed in order to compare data from both treatments to the pre-treatment vertical jump data and the two treatments to each other.

RESULTS: The mean pre-treatment vertical jump was 22.2±0.6 inches while the 18 inch treatment mean was 21.3±0.6 inches and the 30 inch treatment mean was 21.8±0.5 inches. Two-tailed t-tests comparing the vertical jump after the varying jump height did not show any significant differences. Delta in vertical jump height between the two treatment groups were also examined, revealing no significant change in jump height.

Conclusion: Neither of the drop jump treatments were found to significantly influence vertical jump performance when compared to the pre-treatment vertical jump heights. Therefore, these results do not support the use of this volume of 18” or 30” drop jumps to induce PAP in collegiate level athletes.

3366
Board #271
June 2 3:30 PM - 5:00 PM
Effect of Crank Arm Length on Oxygen Consumption and Mechanical Efficiency During Forward Grinding
Jesper Franch, Christian G. Olesen, Olav T. Larsen, Simon N. Thomsen, Nikolai L. Toft, Mathias K. Poulsen. Aalborg University, Aalborg, Denmark.

Email: jfranch@hst.au.dk

(No relationships reported)

In America’s Cup yacht racing grinding is a major factor for boat handling. Recent changes in race regulations concerning number and anthropometry of crew members as well as the need for maintaining hydraulic pressure for boat maneuvering may emphasize the importance of optimizing grinding equipment for optimal aerobic efficiency during grinding. PURPOSE: To investigate the effect of crank arm length on oxygen consumption, mechanical efficiency and perceived exertion during forward grinding. METHODS: Eight trained male subjects participated (Age: 31.3 ± 11.5 yrs; Body mass: 85.7 ± 9.5 kg; Height: 185.4 ± 3.1 cm; Arm span: 187.9 ± 7.4 cm; Grinding VO2peak: 49.0 ± 14.4 ml kg⁻¹ min⁻¹). Whole body oxygen uptake, mechanical efficiency (net and gross), rate of perceived exertion (local and overall) and time to exhaustion (TTE) were compared during grinding with two different crank arm lengths (Standard: 228.6 mm vs. Long: 298.6 mm). Grinding was performed as an incremental discontinuous test, consisting of 3-minute bouts of forward grinding at 70 revolutions per minute separated by a 1-minute pause. Testing started at 90 W and was increased by 30 W until exhaustion. Oxygen uptake was measured using the Jaeger Oxycon Pro metabolic cart and grinding was performed at a Harker® prototype grinding ergometer (Olesen et al. Eur. J. Sport Science, 2015). Prior to the two test sessions resting metabolic rate was measured in supine position. Data were analyzed using a two-factor ANOVA repeated measures and paired t-test. RESULTS: The standard crank arm length elicited lower oxygen consumption (p<0.05) and was more efficient (p<0.05) than the long crank arm length at workloads < 180 W. Interestingly, rating of perceived exertion for local muscular fatigue (local RPE) was significantly higher (p<0.05) for the standard crank arm length at workloads > 90 W and TTE for the standard crank arm length was significantly shorter (1078 ± 44 sec vs 1144 ± 53 sec).
sec; \(p<0.05\). **CONCLUSION:** The long crank arm is less efficient than the standard crank arm at lower workloads. Conversely, lower lateral RPE at high exercise intensities and distance, superior TTE were found with the long crank arm. The authors wish to thank Harken® for building the prototype of the grinder ergometer. No other conflicts of interest, financial or otherwise.

3367  Board #272  June 2 3:30 PM - 5:00 PM  The Relationship Between Academic Stress and Skeletal Muscle Performance  
Voon Chi Chia, Angie Wei, Cynthia Villalobos, Nicole A. Laskosky, Courtney D. Jensen. University of the Pacific, Stockton, CA.  
Email: v_chia@u.pacific.edu  

**METHODS:** We enrolled 23 recreationally active students (10 men, 13 women) from a D1 university. Skeletal muscle function was assessed via quadriceps extension and hamstring flexion using a Cybex HUMAC NORM dynamometer. Psychological stress was measured with the Cohen Perceived Stress Scale. Subjects were evaluated at two time points: a high stress period (exams) and a low stress period (no exams). A history of injury excluded subjects from participation; nightly sleep, history of exercise, and recent exercise were controlled. Independent variables were stress, age, sex, weight, BMI, academic load, and participation in organized sports (club or intramural). Dependent variables were peak torque (ft/lb) and time to achieve peak torque (sec). Differences in muscle performance between high and low stress periods were assessed with t-tests. Linear regressions analyzed the effect of psychological stress on muscle performance.  

**RESULTS:** Subjects were 20.2 ± 1.1 years old, had peak flexor torque of 87.4 ± 19.7 ft/lb (achieved in 0.58 ± 0.12 sec), and peak extensor torque of 145.2 ± 37.5 ft/lb (achieved in 0.58 ± 0.15 sec). T-tests found no differences between low and high stress periods in peak torque or time to achieve peak torque (\(p>0.09\)). Linear regression found increases in psychological stress to correlate with decreases in time to achieve peak torque on the extensors (\(p<0.004\)). The effect was strongest with flexors: for each point that stress increased, time to achieve peak torque was 2.4% faster (\(p<0.002\)). **CONCLUSION:** Despite a small sample size, these findings suggest psychological stress may enhance force development. A possible mechanism could be sympathetically-mediated potentiation of calcium release. While academic stress presents many challenges for student-athletes, it does not appear to be detrimental to muscular performance.

3368  Board #273  June 2 3:30 PM - 5:00 PM  Effect of Cleat Position during Cycling on Running Performance in Elite Triathlete  
Ik Jin Kwon, Yong Bin Han, Chi Hoon Park, Min Gi Jung, Yun Bin Lee, Duc Tack Lee. Koekkin University, Seoul, Korea, Republic of.  
Email: joimmang@hotmail.com  

**METHODS:** To evaluate the effect of cycle shoes cleat position during cycling on subsequent running time in simulated duathlon in elite triathletes. **METHODS:** Nine male national team caliber triathletes (25.9 ± 2.4 yrs, 69.1 ± 4.4 kg, 176.1 ± 3.7 cm) participated in two occasions of simulated duathlon. In each occasion, they cycled 20 km on a fixed bicycle immediately followed by running 5 km on a treadmill. During cycling, they wore cycle shoes of either traditional cleat position (TCP) or middle cleat position (MCP, approximately 5 cm behind of TCP). During cycling and running, they changed and controlled the speed as well as the cycle gear combinations. The testing position (MCP, approximately 5 cm behind of TCP). During cycling and running, they changed and controlled the speed as well as the cycle gear combinations. The testing order was balanced. They were asked to perform their best. During the exercises, distance, time, speed, the transit time (HR) were recorded. The distance of running was divided into three phases; as 0-2, 2-4, and 4-5 km, and the time record changed and controlled the speed as well as the cycle gear combinations. The testing position (MCP, approximately 5 cm behind of TCP). During cycling and running, they changed and controlled the speed as well as the cycle gear combinations. The testing order was balanced. They were asked to perform their best. During the exercises, distance, time, speed, the transit time (HR) were recorded. The distance of running was divided into three phases; as 0-2, 2-4, and 4-5 km, and the time record was compared.  

**RESULTS:** The total time record of the exercises excluding the transit was 3126 ± 137 in TCP and 3096 ± 103 sec in MCP (\(p<0.05\)). The cycling time was 1956 ± 69 in TCP and 1967 ± 54 sec in MCP (\(p>0.05\)). The running time was 1170 ± 88 in TCP and 1129 ± 60 sec in MCP (\(p<0.05\)). The running time was faster in MCP than TCP by 5.4% at the phase of 0-2 km (4040 ± 24 sec vs. 4860 ± 40 sec, TCP vs. MCP, \(p<0.05\)), but not at 2-4 km (4472 ± 25 sec vs. 4627 ± 37 sec, TCP vs. MCP, \(p>0.05\)). The average HR was 166 ± 7.8 in MCP and 165 ± 5.7 bpm in TCP during cycling, and 175 ± 3.11 in MCP and 175 ± 4.31 in MCP during running. No differences were found in HR during the exercises.  

**CONCLUSION:** The cleat position did not change the total time record of simulated duathlon in elite triathlete. However, the time record of early stage of running following cycling was faster when they cycled with the shoes of middle cleat position. It appears that cleat position during cycling have some influence on muscle recruitment during running in trained elite triathletes.

3369  Board #274  June 2 3:30 PM - 5:00 PM  Electrolytes Drink Increases Performance During Repeated Exhaustive Exercise Tests  
rungchai C. chaunchaiyakul, mahidol university, Nakonpathom, Thailand.  
Email: gmrungchai@gmail.com  

**METHODS:** Electrolytes of carbohydrate drink were found to enhance endurance performance on the subsequent exercise. The presence of these electrolytes are found to enhance carbohydrate absorption in human gastrointestinal tract and may possibly act as co-enzymes in metabolic pathways. Supported by T.C. Pharmaceutical Industries Co.Ltd. Thailand.  
* corresponding author, contact email address: gmrungchai@gmail.com

**Purpose:** To investigated the effects of electrolyte drink on subsequent exhaustive exercises, 14 male-university students voluntarily participated. They were healthy and passed medical screening and physical exam prior to three exercise tests of at least 1 week apart. **Methods:** Two consecutive exhaustive exercise tests, with 2 hours recovery period in between, were done within a day. After the first exhaustive exercise, subject was randomly intervened by drank one of the followings fluids a: water (WT), b) placebo (PLA), c) sodium lactate 7% d) sports drink (SD, NaCl 0.13%, KCl 0.03%, sucrose 7%, dextrose 4%) and sports drink (SD, NaCl 0.13%, KCl 0.03%, sucrose 7%, dextrose 4%). During 2 hrs recovery period, the amount of energy drink was divided into 3 parts: first at 50% body weight (BW) at immediately after finished glycogen depletion, then at two sessions of 25% BW at 30 minutes and 60 minutes respectively Exhaustive exercise test was conducted on cycle ergometer. This study was approved by Mahidol University IRB. Statistical analysis was done using two-ways repeated ANOVA at \(p<0.05\). **Results:** Increasing in most of cardiorespiratory variables (heart rates, stroke volumes, cardiac outputs, end-diastolic volumes, total peripheral resistance, breathing frequencies, tidal volumes, minute ventilations, maximum oxygen consumptions and carbon dioxide productions) are not significantly different among the groups with an exception of ejection fraction where SD was higher than WT (\(p<0.05\)). Estimations of substrate utilizations revealed that fat oxidation was higher in WT (\(p<0.05\)) while carbohydrate oxidations in PL and SD were higher than WT (\(p<0.05\)). On the second exhaustive exercise SD had significantly higher time to exhaustion and went lower than WT and PL (\(p<0.05\)). **Conclusion:** In addition to carbohydrate alone, sports drink-containing electrolytes found to increase endurance performance on the subsequent exercise. The presence of these electrolytes are found to enhance carbohydrate absorption in human gastrointestinal tract and may possibly act as co-enzymes in metabolic pathways. Supported by T.C. Pharmaceutical Industries Co.Ltd. Thailand.

**Purpose:** Decaffeinated Green Tea Extract (GTE) supplementation can increase fat oxidation during leg exercise, but many people cannot perform leg exercise. The purpose of this study was to investigate the effect of GTE supplementation on fat utilization during 1h arm cycle exercise. We hypothesized that GTE supplementation will increase lipolysis and fat oxidation.  
**Methods:** This was a randomized, controlled, triple blind study with a crossover design. 8 healthy adults (4 females, 23-37yrs) performed an incremental arm cycle test to exhaustion followed by 4 time trials at fixed workloads. After an 8h fast subjects did 1h of arm cycling at 50% \(W_{\text{peak}}\). Subjects were randomly assigned to either decaffeinated GTE (650mg, 61mg EGCG) or placebo (PLA) for 4wks. Subjects then repeated the 1h arm cycle trial. A 4wk washout period was followed by the corresponding crossover trial. 5ml of blood were drawn pre and post exercise while respiratory gases were collected continuously. Plasma glycerol and free fatty acid (FFA) concentrations were assessed with commercially available analysis kits. The study was powered at 1-β > 95%, with \(\alpha = 0.05\) given a reported effect size of \(F = 3.39\) for the time by treatment interaction.  

**Results:** Mean VO2 during all 1h trials showed no significant differences (\(33.8 ± 19.25\) L/min, \(p = .460\)). Similarly, mean total energy expenditure (EE) showed no differences across all trials (264.58 ± 266.15 kcal, \(p = .420\)). The percentage of total EE from fat oxidation was higher after GTE supplementation compared to PLA, but this difference was not significant (22.83 ± 11.57 vs. 25.18 ± 11.33% vs. 23.39 ± 9.97 vs 20.69 ± 8.9%, \(p = .532\)). There were no significant changes in g/min of fat oxidized between treatments before and after supplementation (GTE = 11 ± 0.08 vs. 12 ± 0.06 vs. PLA = 11 ± 0.09 ± 0.04, \(p = .220\). Blood Glycerol concentration increased post exercise in all trials, with no significant differences between treatments (8.55 ± 3.44 mg/dl to 8.47 ± 2.6 vs. 10.05 ± 2.86 to 8.99 ± 3.51 mg/dl, \(p = .527\)). FFA concentration was also increased post exercise for both groups with no significant difference between treatments (8.30 ± 5.8 mg/dl to 8.69 ± 2.59 vs. 9.06 ± 4.49 to 7.16 ± 3.79, \(p = .234\)).  

**Conclusion:** These results suggest that there is no effect of GTE supplementation on fat utilization during 1h arm cycle exercise at 50% \(W_{\text{peak}}\).
High intensity interval training (HIIT) training has been shown to improve maximal oxygen uptake (VO\textsubscript{max}). CrossFit is an adapted high intensity, strength and conditioning program implementing multi joint movements. Recent studies have demonstrated how CrossFit can lead to improved aerobic fitness; however, these results are reported from studies lasting a maximum of 3 months.

**PURPOSE:** The aim of this study was to investigate the effect on VO\textsubscript{max} from the length of CrossFit participation.

**METHODS:** The participants were 22 male subjects, age 34.8 ± 8.0 months, with at least two months of CrossFit training prior to enrolling in this study. Two groups were formed based on continuous participation in the CrossFit program above 18 months. The participants underwent a VO\textsubscript{max} graded exercise maximal exertion test using a modified treadmill protocol. Subjects warmed up for 3 minutes at 8km/h and 0% grade, then started running at 9km/h with 0.5Km/h increase every 30 seconds until exhaustion. Exhaustion was defined as three of the four criteria: plateau of VO\textsubscript{max} for at least two consecutive readings, RPE higher than 18, RER > 1.1 and maximal heart rate (HR) within 10 beats of the age predicted maximum HR. The VO\textsubscript{max} data was collected using the ParvoMedics TrueOne 2400 Metabolic System.

**RESULTS:** The two groups were significantly different in their training participation; 31.6 ± 8.5 months compared to 9.1 ± 4.1 months, P < 0.001. The experienced individuals had a greater VO\textsubscript{max} (51.3 ± 5.5 ml/kg/min) compared to the novice individuals (45.3 ± 4.8 ml/kg/min) (P = 0.02). A forward regression analysis indicated that weight alone was a significant predictor for VO\textsubscript{max} (adjusted R\textsuperscript{2} = 0.47, P = 0.001). This group difference appears to be mediated primarily by body weight, as individuals exposed longer to CrossFit were leaner (88.0 ± 9.4 kg) compared to the novice individuals (97.5 ± 14.7 kg, P = 0.03).

**CONCLUSIONS:** These results suggest that CrossFit provides the appropriate stimulus to increase an individual’s VO\textsubscript{max} over time. This could be due to increased cellular oxidative metabolism caused by the high intensity nature of the exercise and the ability of more experienced CrossFit athletes to endure workouts at a greater intensity. Most of these adaptations seem to be mediated by the effects of the training program on body weight.

**Board #277**

**June 2 3:30 PM - 5:00 PM**

**Relationship Between Marathons Completed and Libido in Endurance-Trained Males**

David Furrow, Christopher Buschmann, Johnathon Childress, Michael Harris, Adrian Aron. Radford University, Radford, VA. (Sponsor: Trent A. Hargens, FACSFM)

(No relationships reported)

High levels of endurance training are known to depress testosterone production in males, (EAP 2003;89480), which plays an important role in libido maintenance. Research suggests that endurance exercise training (EET; intensity, duration in years) may impact libido status in endurance trained males (MSSES 2016;48:267).

**PURPOSE:** This study examined libido status among EET men with varying levels of marathon participation (at least 1 to > 5).

**METHODS:** A cross-sectional survey design was used to collect data. Respondents completed the survey via the Qualtrics™ online survey portal. Of the 1,366 respondents, 1,077 were valid (≥ 18 yr age, males, complete data sets). A total of 594 had completed marathons and were included in these analyses. Validity checks were conducted on the data. EET was assessed with components of the IPAQ and Baecke questionnaires. Questions from 3 validated sources (Androgen Deficiency in the Aging Male, Sexual Desire Inventory, Aging Male Symptoms Scale) were selected to make up the libido questionnaire, which was reviewed by a fertility specialist to ensure content validity. Total libido score (TLS) was calculated as the sum score of these questionnaire items. TLS was categorized into high, normal, and low libido categories. A between-groups ANOVA was performed to examine the number of completed marathons (1, 2, 3, 4, ≥ 5) and TLS.

**RESULTS:** Individuals who completed >5 marathons had a significantly lower TLS (p<0.05; Mean difference [CI]; -10.0% [-5.8, -14.2%]) than those who completed 1 marathon. In addition, a cross-tab analysis showed that 30 of the 41 individuals (73.2%) who were in the low TLS category had completed >5 marathons.

**CONCLUSION:** Findings suggest the EET necessary for performing multiple marathons may be a factor contributing to lower libido in endurance trained men.
PURPOSE: This study examined the alterations in circulating creatine kinase (CK) levels, leukocyte trafficking, delayed onset muscle soreness (DOMS), neuromuscular function and sprint performance in response to Gaelic football match-play.

METHODS: Participants (n=30, age 17.41 ± 0.78 yr, height 176.42 ± 7.13 cm, and mass 72.03 ± 6.49 kg) played single competitive 15-a-side Gaelic Football game of 60 min duration. Blood samples were taken before the game, immediately post game (Post), 24 h post game (+24 h), 48 h post game (+48h) and 72 h post game (+72 h).

Subjective muscle soreness, sprint performance and muscle power were measured Post, +24 h, +48h and +72 h. Heart rate and movement patterns were continuously measured throughout the game using telemetry and GPS tracking, respectively. Heavy to severe impacts were classified as acceleration G-forces ≥ 7 recorded via portable accelerometry.

RESULTS: Participants covered an average distance of 6.1 ± 1.1 km during match play. The majority (72%) of the distance involved walking and jogging. High speed and maximal running accounted for 10% of the total distance. There were a total of 155 impacts ≥ 7 G-forces. CK levels were significantly higher than baseline immediately post-game and 12h+ and returned to pregame values at +36 h. Compared to pre-match values circulating leukocytes and granulocytes were significantly higher than pre-game values post game and decreased significantly below pre-games values at +12h, +36 h and +60 h. Circulating leukocyte numbers were significantly decreased below pre-game values at +36h. Compared to pre-game values, there was a significant decrease in peak force at +12 h and +60 h and a significant decrease in 5 m and 20 m sprint times at +12 h, +36 h and +60 h. Compared to pre-games values there was no changes in any of the other measured neuromuscular performance indices (flight time, jump time and jump height performance) at any time point. DOMS scores were significantly higher than pre-games values at +12h and +46 h and lower (p<0.05) than pre-game values at +60 h. There was no significant relation between impact and CK levels.

CONCLUSIONS: Competitive Gaelic football match results in significant changes in CK levels, DOMS, leukocyte trafficking, peak force development and 5 m and 20 m sprint performance.

In baseball, one game or a season can depend greatly on the pitcher’s performance. A pitcher’s success can be greatly affected by velocity and their ability to maintain that velocity throughout the game. A better understanding of what physical attributes and training protocols affect a pitcher’s velocity would be helpful in designing training programs.

PURPOSE: To examine variables that may potentially impact baseball throwing velocity (BT).

METHODS: 12 Division I collegiate baseball pitchers (height=186.7±9.3 cm, weight=91.2±21.2 kg and age=20.5±2.3 years) underwent assessments for upper and lower body power and balance. Lower body power data was collected using the vertical jump test VERTEC (Jump USA, Sunnyvale, CA), and an incline 4.5 kg medicine ball chest press to measure upper body power. Balance was assessed using the BIODEX Balance System SD (Biodex, Inc, Shirley, NY) and measured in the one legged follow through position of the pitch. BT was collected while pitcher’s participated in actual games, off speed pitches were not used in this analysis and the number and type of pitches thrown varied depending upon the circumstance of the game. BT was recorded using a Stocksprint EII (Applied Concepts INC, Plano TX) radar gun.

RESULTS: Overall power output was highly correlated to BT (r=0.51, p<0.006) with the majority of that correlation coming from lower body power (r=0.47, p<0.01) and upper body (r=0.33, p<0.039). Body weight also correlated with BT (r=0.74, p<0.001), neither height (r=0.16, p=0.167) or balance (r=0.07, p=0.365), anterior (r=0.087, p=0.33), and medial/lateral (r=0.11, p=0.208) correlated with BT. Game BT was significantly decreased when comparing innings 1-3 to innings 4-6 respectfully (x=88.06 mph, x=86.57 mph, p<0.039).

CONCLUSIONS: There is a strong correlation between power and BT, more specifically lower body power. With no correlation between height and balance with BT, but a strong correlation with weight. In addition, fatigue appears to negatively impact BT. Based on these findings it appears that baseball pitchers may benefit from a conditioning program focused on lower body power to increase the velocity of their pitches. Future investigations could help establish if this type of training could also reduce the impact of fatigue on BT in the later innings of a game.
EFFECTS OF SPEED AND AGILITY TRAINING ON COMBINE PERFORMANCE IN YOUNG MALE ATHLETES

Amelia A. Miramonti1, Joel T. Cramer, FACSMD, Nathan D.M. Jenkins2, Zachary M. Gillen1, Brianna D. McKay1, Todd J. Leutzinger1. 1University of Nebraska - Lincoln, Lincoln, NE. 2Oklahoma State University, Stillwater, OK. (Sponsor: Joel T. Cramer, FACSMD)

Email: amelia.miramonti@unl.edu

(No relationships reported)

PURPOSE: To investigate the use of cMetS scoring in a sample of adolescents, and determine associations with physical activity (PA) and inflammation.

METHODS: As part of a larger study, a subset of 16 year olds (N=107, 57% female, 68% Caucasian) completed a blood draw, anthropometric BMI, and waist circumference (WC), and blood pressure measurements. Self-reported PA was assessed using the Godin Leisure-Time Exercise Questionnaire. Blood was analyzed for metabolic and immune markers: glucose, triglycerides (TG), c-reactive protein (CRP), and HDL were used in the present analyses. The cMetS score was calculated as the sum of the z scores based on sample means and standard deviations of each of the 5 factors that make

Recent reports suggest that metabolic syndrome (MetS) may emerge as early as childhood or adolescence, but no universal definition of MetS is available for these age groups. Continuous metabolic syndrome (cMetS) scores—standardized-normalized z scores based on the 5 components of MetS—take into account the severity of a single risk factor, and subclinical values. This composite score may more appropriately distinguish cardiovascular risk when compared to the traditional dichotomous risk factor, and less aggressive and impulsive behaviors were observed compared to the homecare group. The differences between homecare and daycare infants are a result of the influence of more physical activity in the daycare setting.

CONCLUSION: The cMetS score offers a more comprehensive and accurate measure of metabolic health in adolescents than the traditional MetS score. It allows for a more detailed understanding of the impact of lifestyle factors on cardiometabolic health, enabling targeted interventions to improve overall health outcomes.
up MetS (glucose, TG, HDL-inverse, WC and mean arterial pressure). Correlations were performed to assess associations between cMetS, individual MetS components, PA, BMI and CRP. RESULTS: The consistent with previous findings, MetS was low in our sample (6/107). Of the 45 participants with the highest cMetS scores, 44 did not achieve clinical MetS criteria. Neither total nor strenuous PA were associated with cMetS, however PA was correlated with WC (r = -0.49, p < 0.001). Higher levels of CRP (r = -0.38, p < 0.001) and increased concurrent BMI (r = -0.53, p < 0.001) were associated with higher cMetS scores. CONCLUSION: In populations where clinical MetS is low, cMetS may provide increased resolution and reflect a more global assessment of cardiovascular risk. This is supported in our findings, which show that cMetS scores were not necessarily indicative of the number of clinical MetS risk factors in adolescents. Since cMetS is unrelated to self-reported PA, future work should attempt to identify whether associations exist with other health behaviors or objective PA measures. Support provided by NIMH 58144, NICHD R01 HD078346-01A

3383 Board #288 June 2 2:00 PM - 3:30 PM Physical Activity, Body Mass Index And Cardiometabolic Risk In U.S. Adolescents
Bethany D. Williams1, Susan B. Sisson, FACSM2, Chris I. Ardem1, Kristina D. DuBose, FACSM2, Michael R. Richardson1, Tammie M. Johnson1, James R. Churilla, FACSM3.1University of North Florida, Jacksonville, FL. 2University of Oklahoma, Oklahoma City, OK. 3York University, Toronto, ON, Canada. 4East Carolina University, Greenville, NC. (Sponsor: James Churilla, FACSM)
Email: n00771498@ospreys.unf.edu

PURPOSE: Examine clustered metabolic risk (cMetS) score in adolescents classified as not overweight/active (NOA), not overweight/not active (NONA), overweight/active (OA), and overweight/not active (ONA). METHODS: Sample (n=875) included adolescent (12-17 years) participants in the 2007-2012 National Health and Nutrition Examination Survey. The cMetS score included triglycerides, high-density lipoprotein cholesterol, fasting blood glucose, and mean arterial pressure. Age- and sex- specific body mass index percentiles were utilized. Activity data included self-reported frequency of moderate-to-vigorous physical activity (PA). Adolescents reporting ≥60min/d of PA were considered “active”. A six-year fasting sample weight was applied to the analyses. Findings were adjusted for age, sex, and race/ethnicity.
RESULTS: The cMetS scores were significantly (p<0.05) higher in OA and ONA adolescents when compared to NOA (β=1.08 and β=1.57, respectively). In OA males, cMetS was significantly (p<0.01) higher when compared to NOA males. In OA and ONA females, cMetS scores were significantly higher (p<0.05 for both).
CONCLUSIONS: The cMetS scores were higher in OA and ONA adolescents when compared to NOA.

3384 Board #289 June 2 2:00 PM - 3:30 PM Muscular Strength And Endurance And Cardiometabolic Health In Low-income Hispanic Children
Ryan D. Burns, Timothy A. Brusseau. University of Utah, Salt Lake City, UT.

The predictive relationship between muscular strength and endurance and cardiometabolic health, independent of aerobic fitness, is not clear in disadvantaged Hispanic children. PURPOSE: The purpose of this study was to examine the predictive relationship between muscular strength and endurance and clustered cardiometabolic risk, controlling for aerobic fitness, in Hispanic children from low-income schools. METHODS: Participants were 320 Hispanic children (Mean age = 10.1 ± 1.1 years; 164 girls, 156 boys) recruited during the 2014-2015 and 2015-2016 academic years from five low-income schools from the state of Utah in the U.S. Muscular strength and endurance was assessed using the push-up and curl-up tests and estimated VO2 was calculated from the Progressive Aerobic Cardiovascular Endurance Run. A clustered metabolic syndrome composite score (MetS) was calculated from cardiometabolic health measurements consisting of HDL cholesterol, triglycerides, waist circumference, blood glucose, and mean arterial pressure (MAP). Multi-level general linear mixed effects models were used to examine the predictive relationship between muscular strength and endurance and MetS, controlling for the effects of aerobic fitness and the clustering of children within classrooms and schools. RESULTS: Children who were in the middle and upper tertiles for muscular strength and endurance associated with a lower (more favorable) MetS score (middle tertile: β = -2.29, 95% C.I. [-4.23, -0.39], p<0.05; upper tertile: β = -1.57, 95% C.I. [-3.30, -0.16], p<0.05). CONCLUSION: The results suggest that higher levels of muscular strength and endurance have a protective effect on cardio-metabolic risk, independent of aerobic fitness, in Hispanic children from low-income schools.

Adolescence is a critical period where major physical and psychologic changes occur. It is also a period where several lifelong health related behaviors are adopted and established. Behaviors such as unhealthy eating, tobacco use, alcohol use, and physical inactivity are related to major causes of morbidity and mortality among young and adults. Physical activity (PA) is an important behavior during adolescence not only because it is associated with general health, but also because it may be associated with other health-related risk behaviors.

PURPOSE: To examine the association of physical activity with health risk behaviors in adolescents from Curitiba, Brazil. METHODS: A cross-section study was carried out with a representative sample of 928 (mean age 14.06 ± 1.91 years old, 467 girls) adolescents enrolled in 14 randomly selected public schools from Curitiba, Brazil. The Brazilian version of the Youth Activity Profile survey evaluated PA levels and the YRBS survey evaluated fruit, vegetable, alcohol, and tobacco consumption in the past 30 days. The Adolescent Sedentary Questionnaire evaluated total screen time. Binary Logistic regression measured the association between PA levels and risk behaviors after controlling for gender, age, BMI status, income status, and parent educational level.
RESULTS: PA was inversely associated with low fruit consumption (OR = 50, 95% CI = 38 - 66, p < 0.001), low alcohol consumption (OR = 57, 95% CI = 42 - 73, p < 0.001), and high screen Time (≥3 hours/day) (OR = 79, 95% CI = 65 - 96, p < 0.01). Additionally, PA was positively associated with the consumption of at least one dose of alcohol in the past 30 days (OR = 1.47, 95% CI = 1.15 - 1.88, p < 0.01), and with the excessive consumption of alcohol (OR = 1.73, 95% CI = 1.29 - 2.33, p < 0.01). PA was not associated with Tobacco consumption (OR = 1.01, 95% CI = 0.67 - 1.52, p = 0.96).
CONCLUSION: The results indicated that adolescents with higher PA levels consumed more fruits and vegetables and spent less time in front of electronic screens. However, adolescents with higher levels of PA were also more likely to report alcohol consumption in the past 30 days. The social characteristics of alcohol consumption may explain its positive relationship to PA.
Supported by CNPq, Brazil.

3386 Board #291 June 2 2:00 PM - 3:30 PM Understanding the Relations between Physical Activity and Obesity among Chinese Children and Adolescents
Qiang Guo1, Xiaozan Wang2, Allen Jackson, FACSM2. 1Ning Bo University, Ning Bo, China. 2East China Normal University, Shanghai, China. 3University of North Texas, Denton, TX. (Sponsor: Allen Jackson, FACSM)
Email: matthewgs@gmail.com

Purpose: The purpose of this study was to examine the relations between self-reported physical activity and obesity among children and adolescents in China. Methods: The participants are 18424 students (51.9% boys, 49.1% girls) aged 8-18 years old in grades 3 to 12 from six provinces in China. They were divided into three groups by age: 8-12, 13-15, and 16-18. Physical activity level (PAL) was measured by Physical Activity Questionnaire for Children and Adolescents in Chinese (PAQ; Chen, 2008; Li, 2015; Jing, 2016). The summary scores of the PAQ were classified into three PAL categories “low” (PAQ≤2), medium (2<P AQ<3) and high (PAQ>3). In addition, physical fitness including high and weight were measured according to national standards of physical fitness during physical education classes. Weight status was classified into four categories “malnutrition, normal, overweight and obese” using BMI cut-points. Descriptive analysis, independent t-tests, ANOVA and Chi-square were used in the study. Results: The distribution of PAL decreased for girls with age and the PAL of boys was significantly higher than girls in all three groups (t=9.12, t=18.91, t=16.72, p< 0.01). The percentage of PAQ in the low category dramatically increased from 15 years (47%) to 18 years (66%). Significant differences in PAL were found across obesity classifications (for 8-12, f = 12.39, p = 6.86; for 13-15, f = 11.88; for 16-18, f =77;66, f =69, p = 0.001) except girls aged 13-15 years (t=1.42, p=0.05). Furthermore, the distribution of PAL in obesity classifications presents like a “U” that shows values of PAL were higher in the classifications of malnutrition and obesity than values in normal and overweight. Obesity status was significantly related to PAL (for 8-12, χ² = 34.86, p = 0.02; for 13-15, χ² = 27.80; for 16-18, χ² = 21.56, χ² =29.04, p = 0.01), but not girls aged 13-15 (t = 5.81, p = 0.05).
Conclusions: PAL was significantly related to weight status in Chinese children and adolescents. Boys demonstrated higher levels of PA across all age groups. Girls demonstrated a 19% decrease in PAL across 15 to 18 years of age.

3387 Board #292

June 2 2:00 PM - 3:30 PM

The Correlations Between Types of Families and Physical Activity Levels of Adolescents in Shanghai, China

Fan Xiang1, Zhu Zheng2, Zhehang Jie1, Liu Yang3, Tang Yan4, Chen Pei jie5, Cao Zhen bo.1, 2Shanghai Jiao Tong University, Shanghai, China. 3Shanghai University of Sport, Shanghai, China. (Sponsor: Mitsu Higuchi, FACSM)

Email: fanshevi@sjtu.edu.cn

(No relationships reported)

Previous studies have indicated that families can influence adolescents’ physical activity. The fifth census in China (2010) showed that 65.3% of the families in China are nuclear, but few studies have explored the association between the various types of families and the physical activity (PA) levels of adolescents in China using a large sample survey.

Purpose: To determine the correlations between types of families and the PA levels of adolescents 9-19 years while accounting for background demographic factors, such as age, gender, and socioeconomic status, in Shanghai, China.

Methods: In 2014, 9-11-year-old (N=13,237), 12-14-year-old (N=11,157), and 15-19-year-old (N=8,819) adolescents and their guardians were randomly sampled from 17 districts in Shanghai, China. The adolescents’ moderate-to-vigorous physical activity (MVPA) levels, attitudes toward the type of family, and the guardians’ sociodemographic factors were collected via a questionnaire completed by the adolescents and guardians.

Results: Analysis of covariance revealed that, after controlling for socioeconomic status and the age of the adolescents, 9-11-year-old boys from two-parent families spent more minutes per week in MVPA (297.4±120.4) than those who lived with their grandparents (286.9±120.1) and those from single-parent families (284.6±120.4, P<0.05). Regarding the girls aged 12-14 years, those who live with their grandparents spent more minutes per week in MVPA (274.1±105.7) than those from two-parent families (271.9±101.5) or single-parent families (257.3±107.0, P<0.05). Regarding the adolescents aged 15-19 years, we did not find significant differences between the boys and girls.

Logistic regression analysis showed that 9-11-year-old adolescents who live with their grandparents had 28% for boys (OR 0.72, 95% CI 0.60-0.84) and 16% for girls (OR 0.84, 95% CI 0.72-0.98) decreased odds of not reached the recommended level (≥60min/day MVPA), respectively, compared with those who from single-parent families. Conclusion: Being from a single-parent family and living with grandparents are two important factors that influence adolescents’ MVPA levels in Shanghai, China.

3388 Board #293

June 2 2:00 PM - 3:30 PM

Self-Reported Physical Activity of High School Students in Southern Maine

Karen Croteau, FACSM1, Rose Angel1, Laurie Milliken, FACSM2. 1Saint Joseph’s College, Standish, ME. 2University of Massachusetts Boston, Boston, MA.

Email: kcroteau@sjcme.edu

(No relationships reported)

Knowledge of high school students’ physical activity (PA) can assist in identifying areas of programmatic need within physical education (PE) and for out of school programs. Purpose: The purpose of this study was to assess the PA levels and patterns of high school students in southern Maine. Methods: Participants were 142 students (86 females, 56 males) from 4 high schools in southern Maine (one urban, one suburban, two rural). Mean age was 14.9 years with 87% of the sample in grade 9. The validated Physical Activity Questionnaire for Adolescents (PAQ-A) was used in this study to assess PA. The PAQ-A asks participants to recall their PA during the previous 7 days. Surveys were administered to students enrolled in PE and were part of a larger study examining attitudes toward PA and PE. Results: Mean overall score for the PAQ-A was 2.62±0.60 (low PA, 5 high PA), with a range of 1.18 to 4.29. Males were slightly more active than females overall (2.75±0.72 vs 2.53±0.66, p=0.068) and reported more PA during evenings (2.96±1.37 vs 2.50±1.29, p=0.044) and the weekend (2.70±1.08 vs 2.32±1.00, p=0.036). Students in urban (3.08±0.81) and suburban schools (4.30±0.76) reported significantly greater activity than rural students (3.54±0.86) (p<0.05) while students in rural schools (1.65±1.23) reported greater activity during lunch than urban (1.23±0.43) and suburban students (1.12±0.39) (p<0.05). Jogging, walking, basketball, and soccer were the most cited activities overall. Females preferred walking, jogging, dancing and skipping rope while males preferred jogging, basketball, walking and soccer. Overall, 10% reported daily activity while 14% reported no activity. In PE, 73% reported doing vigorous activity quite often. At lunch, 80% reported sitting. After school, 46% were very active while 28% reported no activity. During evenings, 29% reported being very active while 29% reported no activity. Over the weekend, 52% reported being very active 2 or more times, with 21% reporting no activity. Conclusions: These findings provide information on high school students’ PA from a sample of southern Maine schools. In addition to PA levels and patterns, knowledge of student preferences for PA would help in PA program development both in PE and for out of school programs.

3389 Board #294

June 2 2:00 PM - 3:30 PM

ICT USE Influence on Activity Pattern & Body Composition Of University Students In Kwara State

Fatulufimilolu L. Dominion, EDM1, Iliasi Y. Seidina1, Faithah A. Niyi-Adumosu, EDM2, Bamidele V. Owoyele, EDM1. 1University of Ilorin, Ilorin, Nigeria. 2National Centre for Sports and Exercise Medicine, Loughborough University, Loughborough, Leicestershire, United Kingdom.

Email: lolafunmilodam@gmail.com

(No relationships reported)

The use of ICT is a prominent aspect of students’ lifestyle in tertiary institutions. ICT creates efficiency in performing tasks but encourages sedentariness, alters body composition and may affect health. Purpose: To determine influence of ICT use on physical activity pattern and body composition of tertiary institution students. Methods: The study design was Ex-post facto. Multistage sampling was used to select 2,442 students with mean age 22.8 years from three tertiary institutions in Kwara state, Nigeria. Body composition was determined using height scale, body fat/ hydration monitor scale (brand number 7032497) and two birds non-elastic tape rule. Validated ICT Use and Physical Activity Questionnaire (IUPAQ) (Rho of .71) was used to assess level of ICT use and physical activity pattern. Approved Ethical Clearance from University of Ilorin and informed consent were duly obtained. Inclusion criteria were penultimate and final year students. Percentage, Mean, and Standard Deviation described the data. Hypotheses were tested at 0.05 alpha level using PPMC, ANOVA and Multiple Regression. Results: Many of the students did not perform the recommended physical activity (n = 1,065; 43.6%) and their physical activity pattern was sedentary-based (14 hours per day). Average ICT time per day was 9 hours (65%) of which mobile phone time was 4 hours (25%). Strong positive relationship existed between ICT use and sedentariness r = .84, p = .001; physical activity pattern and ICT use p = .001, r2 = .15%, and ICT use and body composition p = .001. Sedentariness was the highest predictor of excessive ICT use Beta = .20, p = .001 & BMI predictor of risk factor Beta = .156 . However, light to vigorous intensity physical activity levels indicated low predictable ability of ICT use p>.05.; Significant difference in the level of ICT use based on age range, p = .001 and type of institution of participants p = .001 existed. Conclusion: Prolonged ICT use causes sedentariness and alters body composition with BMI as the highest predictor of risk. This study advocates for institutional physical activity awareness for regulated ICT use campaign.

3390 Board #295

June 2 2:00 PM - 3:30 PM

Phsical Activity, Sedentary Time And Cardiorespiratory Fitness in Brazilian Children

Olufunmilola L. Dominic, EDM1, Iliasu Y. Seidina1, Faithah A. Niyi-Adumosu, EDM2, Bamidele V. Owoyele, EDM1. 1Saint Joseph’ s College, Standish, ME. 2University of Massachusetts Boston, Boston, MA.

Email: fanshevi@sjtu.edu.cn

(No relationships reported)

PROPOSE: to evaluate physical activity (PA), time expended in sedentary activities and cardiorespiratory fitness (CF) in boys and girls before and after 3 months of regular school.

Methods: children were evaluated at school after summer vacation and 3 months after regular classes. Weight (kg), height (m), maturational stage was evaluated. CF was evaluated by determining the maximum volume of oxygen during the Test Come and Go 20 meters by Léger. In addition, a questionnaire about PA and screen time during 3 days (3-DPAR instrument) was applied. Data are expressed as average and standard deviation. T Student and Wilcoxon tests were applied to estimate the difference between averages. Level of significance of 5 % was adopted. Results: 319 students were included, 146 boys (age 13.6 ± 1.2yrs) and 173 girls (age 13.6 ± 0.9yrs). For girls, first VO2max was 43.5ml/kg/min and second was 48.3ml/Kg/min (p<0.002). For boys, respective numbers were 45.8 ml/Kg/min and 49.8kg/ml/min (p=0.05). No significant difference was found between boys and girls. No difference was found for PA > 300 min/week during the two evaluations and among boys and girls. In time spend with sports, only girls increased significantly from the first to the second assessment (p<0.001). Boys spent more time in sedentary activities (TV, computer and video game) and increased this time between initial evaluation and re-evaluation (p <0.001). Conclusion: Girls became more active after school start, with increment of VO2max and less time in sedentary activities.
In sports, musculoskeletal pain (MSP) is often studied from the perspective of sport specific injuries, why little is known about the prevalence of daily or multisite MSP that does not affect participation in sports. It is also unclear if daily or multisite MSP is a risk factor for worse health-related quality of life (HRQoL) and worse sports performance in youth athletes.

**PURPOSE:** To study how HRQoL and sports performance is affected by daily MSP in youth athletes that are able to participate in sports.

**METHODS:** 136 Swedish youth athletes attending a sport school (13 to 14 years, boys n=83, girls n=53) completed the EQ-5D measuring HRQoL (range 0 to 1, worst to best), anthropometric measures to estimate biological age, and sports performance tests (grip strength, 20 meter sprint, and countermovement jump (CMJ)).

**RESULTS:** 109 to 117 of the 136 students answered the different pain questions. 53 of 113 (47%) reported current MSP, and 28 of 109 (26%) experienced MSP ‘more than once a week to almost daily’ from one or more body regions (frequent MSP group), while 28% (n=30) stated ‘never to rarely’ in MSP (no MSP group). Boys in the frequent MSP group reported worse HRQoL, higher pain intensity, performed worse in all sports performance tests, and had a younger biological age than boys in the no MSP Group. Girls in the frequent MSP group reported worse HRQoL and higher pain intensity than the girls in the no MSP group. No other differences were found (table).

**CONCLUSIONS:** Every other youth athlete attending a sport school reported current MSP and one out of four reported almost daily MSP. MSP affects HRQoL negatively in both boys and girls, and sports performance negatively in boys. The prevalence of MSP in youth athletes is concerning since pain in younger ages may predict pain in adult ages.

**3392 Board #298 June 2 2:00 PM - 3:30 PM Appropriate Physical Activity on Mental Health in Early Adolescents**

Saki Kawakatsu1, Shohei Kokudo2, Ryoji Kasanami1, Mayumi Nagan1, Kojirou Ishii1. 1Graduate School of Human Development and Environment, Kobe University, KOBE city, Japan. 2Kobe University, KOBE city, Japan. 3Nara University of Education, NARA city, Japan. 4Fukuoka Women’s University, Fukuoka city, Japan. 5Koh noh Music University, KYOTANABE city, Japan. Email: 137kd33d@stu.kobe-u.ac.jp

(No relationships reported)

The appropriate intensities, amount and details of physical activity (PA) for mental health (MH) have not yet been elucidated for adolescents.

**PURPOSE:** To investigate the PA factors (intensity, time, activity details [ADs]) that affect MH characteristics, such as depression tendency (DT), in early adolescence METHODS: The International Physical Activity Questionnaire, including ADs and physical activity (PA) (vigorous PA, moderate PA, sedentary behavior on the weekdays and on holidays) and foods in past 30 days were collected from 7,785,784 girls, aged 12-15 yr. old responded to the physical activity and diet behavior patterns of U.S. adolescent girls with different weight status.

**METHOD:** Data was derived from the 2012 National Youth Fitness Survey. A representative/weighted sample of 7,785,784 girls, aged 12-15 yr. old responded to both the physical activity and diet behavior and nutrition questionnaires. ANOVA analysis was applied to determine the difference in physical activity patterns and eating behaviors among girls with different weight status (underweight, normal weight, overweight, and obese, and defined by the CDC percentiles classifications).

**Results:** Significant differences were detected in the physical activity and diet behaviors patterns, and the results are displayed in the table below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Under-weight</th>
<th>Normal weight</th>
<th>Over-weight</th>
<th>Obese</th>
<th>Total</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vigorous-intensity work (min)</td>
<td>71.54±15.33</td>
<td>81.72±54.62</td>
<td>86.71±9.51</td>
<td>52.9±39.9</td>
<td>79.65±15.52</td>
<td>3168.29</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Moderate-intensity work (min)</td>
<td>32.78±15.95</td>
<td>58.6±45.41</td>
<td>60.73±36.81</td>
<td>51.29±9.92</td>
<td>57.06±47.28</td>
<td>22446.75</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sedentary activity (min)</td>
<td>550.97±132.19</td>
<td>556.04±154.50</td>
<td>552.75±125.89</td>
<td>489.72±156.12</td>
<td>508.88±150.59</td>
<td>8608.16</td>
<td>&lt;.001</td>
</tr>
<tr>
<td># of times/week get school lunch</td>
<td>3.1±2.24</td>
<td>3.17±2.24</td>
<td>3.16±1.56</td>
<td>4.17±1.40</td>
<td>3.29±2.18</td>
<td>45523.19</td>
<td>&lt;.001</td>
</tr>
<tr>
<td># of times/week get school lunch</td>
<td>1.09±2.06</td>
<td>1.28±2.08</td>
<td>1.64±2.07</td>
<td>6.5±1.23</td>
<td>1.28±1.50</td>
<td>1958.79</td>
<td>&lt;.001</td>
</tr>
<tr>
<td># of meals not at home prepared/week</td>
<td>2.29±2.62</td>
<td>1.87±1.85</td>
<td>1.58±2.04</td>
<td>99±1.08</td>
<td>1.88±1.12</td>
<td>31966.52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td># of ready-to-eat foods in past 30 days</td>
<td>27±.95</td>
<td>38±2.91</td>
<td>1.60±1.35</td>
<td>1.35±1.61</td>
<td>87±2.74</td>
<td>12704.63</td>
<td>&lt;.001</td>
</tr>
<tr>
<td># of frozen meals/pizza in past 30 days</td>
<td>3.23±3.85</td>
<td>2.61±4.06</td>
<td>1.86±3.00</td>
<td>2.42±2.67</td>
<td>2.57±3.91</td>
<td>14507.22</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Conclusion:** Overweight and obese girls tended to have less vigorous work and more ready-to-eat food.
Childhood obesity is a public health concern with the trajectory into adult obesity. Increasing moderate-to-vigorous physical activity (MVPA) and decreasing sedentary behavior (SB) are associated with lowered childhood obesity. Environmental factors, such as outdoor time and TV viewing time (TVVT), may contribute to MVPA and SB in preschool children. The child-care environment influences MVPA and SB, and is an area for improving activity patterns.

**Methods:** An observational study at child-care centers was conducted during 2011-2014. Outdoor time was defined as time children spent in an outdoor play space, and TVVT was defined as time children spent watching TV. Physical activity intensity and duration was measured for the entire school-day using waist-worn accelerometers. Data were recorded in 15 second epochs and analyzed with age-specific cut points to determine intensity. Dependent movement variables included minutes of SB, light physical activity (LPA), MVPA, and total steps. Hierarchical models were adjusted for weather, and used for the clustering of children within the classroom.

**Results:** Participants (n=202) of 34 classrooms were 3.7±0.7 years old, 51% male, and 60% Caucasian. Children took 4453±1655 steps, 310±83 minutes of SB, 36±13 minutes of LPA, and 19±10 minutes of MVPA. Outdoor time was observed in 87% of classrooms for 77±65 minutes, and TVVT was observed in 52% classrooms for 57±39 minutes. In hierarchical modelling, outdoor time was associated with SB (p=0.01), LPA (p=0.01), MVPA (p=0.01) and steps (p=0.01). At the classroom level there were mixed results on the impact of outdoor time, some classrooms with higher outdoor time exhibited higher LPA, MVPA and steps, while others engaged in more SB. TVVT was only associated with SB (b=2.20; p<.001) while an inverse relationship was observed with SB-AS (b=-2.62; p=.000) and SB-BS (b=-2.62; p=.000). The increased SB-AS was associated with increased sleep efficiency (b=0.16; p=.006) and SFI (b=0.24; p=.002), and screen time was associated with a decreased likelihood of having good sleep quality (OR=0.89; 95% CI =0.82, 0.97). Meanwhile, TST on previous night was associated with SB-BS (b=0.02; p=.001) on next day, and lower sleep quality was associated with decreased MVPA-BS (b=-0.24; p=.042), increased SB-AS (b=1.62; p=.022) and screen time (b=14.54; p=.049) on next day, respectively.

**Conclusions:** The current study suggests that, in general, a good perceived sleep quality on the previous night can potentially promote PA and reduce SB on next day. However, the temporal effects of PA and SB on sleep health are still inconclusive that warrants future study.
RESULTS: We confirmed the decline of recess over time; however, the majority of students in KG, 3rd and 5th grade had daily recess. In the unadjusted models, we found significantly higher math scores in 5th grade among students with more than average (β=−0.43), average (β=−0.4) and below average (β=−0.44) time for recess compared to students with no recess (all p<0.001). The effect of recess in 3rd grade was similar but less strong. Additionally, regular PA/exercise outside of school resulted in significantly higher math scores in 3rd grade students (β=−0.49) and 5th grade students (β=−0.33) compared to children without regular exercise (all p<0.001). However, once we adjust for race, parental education and gender, the majority of effects of recess on math scores did not remain significant. Only students with a low amount of recess compared to no recess in 5th grade had significantly higher math scores (β=−2.1, p=0.03). Also, regular exercise outside of school was positively associated with math scores in 3rd grade (β=−2.9, p=0.001).

CONCLUSIONS: Academic achievement is related to future health since school outcomes are highly correlated with future socio-economic status which itself is correlated with health status in adults. We conclude that - compared to race and SES - recess and regular PA seem to be beneficial but of lower importance for academic achievement. Nonetheless, both PA measures are modifiable factors and thus can potentially play a vital role in both health promotion and improved school outcomes.

3402 Board #307 June 2 2:00 PM - 3:30 PM Metabolic Syndrome And Activity Levels In College Students
Joshua M. Miller, Andrew Hudson, Natali Contreras, Daniel Serrano, Gaurang Cai, Kristen Morgan, Brian D. Street. California State University, Bakersfield, Bakersfield, CA. (Sponsor: Kathleen Knutzen, FACSM)
Email: jmiller68@csub.edu

No relationships reported

PURPOSE: It is estimated that greater than 30% of young adults attending college are overweight or obese. Many of the known risk factors that are often associated with obesity also place an individual at risk for developing metabolic syndrome (MetS). In particular, physical activity has been shown to insulate against future risk of such metabolic disorders. The purpose of this study was to examine the relationship of the risk factors associated with MetS and activity levels in college students.

METHODS: Twenty-one college students (age: 23.1±4.2 years; BMI: 28.1±6.2 kg/m²) participated in the study. The following information was obtained from each participant; body anthropometrics, fasting glucose and lipoproteins, and accelerometry measured activity levels. Participants wore, at the wrist, the wireless activity monitor (nGT3x; ActiGraph, Pensacola, FL) for seven consecutive days. MetS was determined if the participants met three of the five criteria utilizing the NCEP guidelines.

RESULTS: Metabolic syndrome was prevalent in 9.5% of the population. The average daily step count for the participants were 7982.6±2209.6 steps/day. The observed categorical activity levels (not including while asleep) for the participants included 84.3±0.05% spent in a sedentary state and 0.04±0.01% engaged in moderate to vigorous physical activity.

CONCLUSIONS: Metabolic syndrome is becoming more prevalent in all populations including college students. Current levels of activity in college students do not meet the CDC’s established guidelines for total steps/day, elevating their risk of acquiring
metabolic disorders. In order to reduce the increasing prevalence of MetS, increasing the total number of steps/day in conjunction with a focus on moderate-vigorous physical activity levels may reduce the risk factors associated with MetS later life. Ongoing participant collection will continue, looking to establish correlates between MetS criteria and physical activity.

3403  Board #308  June 2 2:00 PM - 3:30 PM
Discrepancies Among Children at the 99th Percentile
Karissa L. Peyer, Ashley Ewald. University of Tennessee at Chattanooga, Chattanooga, TN. (Sponsor: Gregory Heath, FACSM)

Purpose: Use of the body mass index percentile curves (BMI%) allows for consideration of growth and maturation throughout childhood but creates a ceiling effect for children with severe obesity who are classified at the 99th percentile. This study aimed to evaluate variances by age and gender of alternative measures of weight status in children and adolescents.

Methods: Child height and weight were measured in 1st grade (by school nurses) and 4th grade (by trained professionals). The purpose of this study is to examine the associations of physical activity and sedentary behavior with physical fitness in Chinese children and adolescents.

3404  Board #309  June 2 2:00 PM - 3:30 PM
Tracking BMI in Childhood Through Adolescence
Ashley Ewald1, Celina Partida1, Greg Welk, FACSM2, Kara Hamilton1, Karissa Peyer1. University of Tennessee at Chattanooga, Chattanooga, TN. 1: Iowa State University, Ames, IA.

Does a child’s BMI percentile change from 1st to 10th grade?

Purpose: Obesity, specifically in childhood, has become an important public health concern because of possible long-term correlations with heart disease and chronic illnesses in adulthood. However, there is limited evidence measuring the link between childhood to adolescent BMI by trained professionals. The purpose of this study is to examine the associations of physical activity and sedentary behavior with physical fitness in Chinese children and adolescents.

Methods: Child height and weight were measured in 1st grade (by school nurses) and 10th grade (by Physical Education teachers) and converted to Body Mass Index percentiles (BMI%) for sex and age using standard CDC SAS code. Subjects were grouped into BMI Categories (Cat) based on 1st grade BMI% with all children with BMI% less than 10% in Cat0, BMI% from 10-19% in Cat1 and so forth, up to Cat9 with 1st grade BMI% of 99% or higher. Average 10th grade BMI% and average change in BMI% from 1st to 10th grade were computed for each BMI Category.

Results: Complete data was available for 559 subjects. Average 10th grade BMI% ranged from 35.8% in Cat1 to 90.2% in Cat9. Average BMI change was 2.86% from 1st to 10th grade. Average BMI% in Cat0 increased by 31.4% while Cat9 showed an average decrease of 6.9%. Cats 7, 8, and 9 all showed overall decreases in BMI% while Cats 0-6 showed increases.

Conclusion: Categories 7, 8, and 9 show a decrease in BMI; however, that may be due to the maximum category limit. Childhood and adolescent obesity is an important public health concern as it shows an increased risk of becoming overweight and obese in adulthood, placing them at higher risk for chronic illness and heart disease. Obesity remains an issue and should continue to be monitored from childhood to adolescents.


3405  Board #310  June 2 2:00 PM - 3:30 PM
Associations between Physical Activity, Sedentary Time and Percent Body Fat in Chilean Adolescents
Maribel Parra-Saldias1, Farah A. Ramirez-Marrero, FACSM2. 1Universidad de Los Lagos, Santiago, Chile. 2University of Puerto Rico, San Juan, Puerto Rico.

Email: mparrasaldias@gmail.com

The prevalence of overweight and obesity among Chilean adolescents in 8th grade has increased from 41% in 2014 to 45% in 2016. However, physical activity (PA) and sedentary characteristics in this group of adolescents has not been evaluated.

Purpose: To evaluate PA and sedentary time (ST) and their association with percent body fat among 8th grade adolescents in Chile. Methods: A group of 156 adolescents (87 males, 69 females, mean age=13.4±0.7 years) were recruited from 4 public schools in the metropolitan region in Chile. Measures of height, weight, and percent body fat using bioelectrical impedance were obtained. Physical activity and sedentary behavior were measured with ActiGraph GT3X+ accelerometers that adolescents wore in the right hip area attached to an elastic waist band for 8 consecutive days. T-tests were conducted to detect gender differences, and Pearson correlations and linear regressions were used to evaluate associations between PA, ST, and percent body fat. Results: Males and females were not different in ST (9:0±2.6 vs. 8.9±2.8 day, P=0.97), but females had higher percent body fat compared with males (27.8±5.9 vs. 17.2±7.1; P=0.001), lower moderate to vigorous PA (MVPA) (170.7±128.8 vs. 285.3±161.1 min/week; P=0.001), and lower steps/day (5951±2139 vs. 7181±2268; respectively, P=0.002). MVPA was inversely associated with percent body fat (r=−0.30, P=0.0004) but ST was not associated with percent body fat. However, a strong inverse association was observed between percent of the day in ST and MVPA (r=−0.62, P=0.001). Conclusion: This group of Chilean adolescents had high ST and no complacency to PA recommendations, particularly for females; and those with less MVPA had higher percent body fat. To help control the obesity trend among adolescents in Chile, school programs that incorporate more PA and reduce ST is warranted.

3406  Board #311  June 2 2:00 PM - 3:30 PM
Associations with Physical Activity and Sedentary Behavior with Physical Fitness in Chinese Children and Adolescents
Zheng Zhu1, Peijie Chen1, Zhen-Bo Cao, Yan Tang, Jie Zhuang, Yang Liu. Shanghai University of Sport, Shanghai, China.

Associations with Physical Activity and Sedentary Behavior with Physical Fitness in Chinese Children and Adolescents
Zheng Zhu1, Peijie Chen1, Zhen-Bo Cao1, Yan Tang1, Jie Zhuang1, Yang Liu1. Shanghai University of Sport, Shanghai, China.

PURPOSE: The purpose of this study is to examine the associations of physical activity and sedentary behavior with physical fitness in Chinese children and adolescents. METHODS: A total of 33,414 participants (boys:48.9%, age:12.5±2.5 yr, weight:48.0±14.9 kg, height:154.6±13.9 cm, BMI:19.7±3.9 kg/m2) completed physical activity and sedentary behavior questionnaire and physical fitness test including Body Mass Index (BMI), lung capacity, sit and reach, jump rope/long jump, sit-ups/pull up and shuttle run /800meter/1000meter run. The participants were categorized into either “fit” or “unfit” by using National Students Physical Fitness Standard depending on whether they met the standard or not. Multiple logistic regressions were performed to examine the associations of physical activity and sedentary behavior with physical fitness after controlling for gender, age and BMI. Results: After adjusting gender, age and BMI, physical activity and sedentary behavior were significantly correlated with physical fitness, independently. The children and adolescents who did not meet the recommendation of 60 min/day of moderate and vigorous physical activity (MVPA) had 1.97 times the odds of being unfit compared to those meeting guideline (95% confidence interval [CI] of Odds Ratio: 1.69-2.30). The children and adolescents who did not meet the sedentary behavior guideline had 1.27 times the odds of being unfit (95% CI of Odds Ratio: 1.07-1.50). In joint association analysis, children who did not meet physical activity nor sedentary behavior guidelines had 2.26 times higher odds of being unfit than children who met both guidelines (95% CI of Odds Ratio: 1.61-3.17).

Conclusion: The results demonstrated that being physically active and reducing the sedentary behavior are independently and positively associated with physical fitness in children and adolescents.
3047 Board #312 June 2 2:00 PM - 3:30 PM

Anthropometric Measures Are Associated with Canadian Agility and Movement Skill Assessment Scores

Kevin Belanger1, Mark S. Tremblay, FACSM1, Patricia E. Longmuir1, Joel Barnes1, Dwayne Sheehan2, Jennifer L. Copeland3, Sarah J. Woodruff4, Brenda Bruner4, Barbi Law5, Lue J. Martin6, Angela M. Kolen7, Michelle Stone8, Kristal Anderson9, Kirstin N. Lane10, Nathan Hall10, Melanie Grege9, Travis J. Saunders11, Dany MacDonald12, François Trudeau12, Claude Dugas12,1 Children’s Hospital of Eastern Ontario Research Institute, Ottawa, ON, Canada. 2Mount Royal University, Calgary, AB, Canada. 3University of Lethbridge, Lethbridge, AB, Canada. 4University of Windsor, Windsor, ON, Canada. 5Mississauga University, North Bay, ON, Canada. 6Queen's University, Kingston, ON, Canada. 7St. Francis Xavier University, Antigonish, NS, Canada. 8Dalhousie University, Halifax, NS, Canada. 9Camosun College, Victoria, BC, Canada. 10University of Winnipeg, Winnipeg, MB, Canada. 11University of Prince Edward Island, Charlottetown, PE, Canada. 12Université du Québec à Trois-Rivières, Trois-Rivières, QC, Canada. (No relationships reported)

PURPOSE: Recent literature suggests that anthropometric measures are correlates of gross motor competence in children. The purpose of this study was to determine if body mass index (BMI) or waist circumference (WC) is associated with children’s scores on the Canadian Agility and Movement Skill Assessment (CAMSA). METHODS: Children aged 8-12 years (n = 7,773), with parental consent, from 7 Canadian provinces had their physical literacy level measured using the Canadian Assessment of Physical Literacy (CAPL). CAPL testing was completed between 2012-2016 and administered by trained research staff. As part of the CAPL tests, movement competence was measured using the CAMSA which evaluates fundamental, combined, and complex movement and motor skills. Children were scored on time to complete the CAMSA (range 1-14 points) and ability to demonstrate the movement skill criteria (range 0-14 points) for a combined score out of 28, with the best of two trials used for analyses. BMI was calculated from measured height and weight and converted to BMI z-score using the World Health Organization’s (WHO) BMI-for-age charts and formulae based on the LMS method. WC was measured in duplicate using an elastic tape measure at the level of the iliac crest and recorded in centimeters, with the average of the two measures used for analyses. Children were grouped for analysis based on those meeting (≥ 2.0 to ≤ 1.0) and not meeting (< 2.0 or > 1.0) the WHO’s recommended level of BMI z-score. Separate multiple linear regression models were used to predict CAMSA score for BMI z-score and WC, with both models adjusting for age and sex.

RESULTS: The difference in CAMSA scores between BMI z-score groups was significant (p < 0.001, Cohen’s d = 0.3). In the BMI z-score model, results of the regression (F [3,7455] = 353, p < 0.0001, R² = 0.12) indicated that CAMSA scores were lower by 0.5 units for every 1 unit increase in BMI z-score. In the WC model, results of the regression (F [3,7455] = 402.2, p < 0.0001, R² = 0.14) found lower CAMSA scores of 0.1 units for each 1 centimeter increase in WC. Age and sex were strongly associated with CAMSA score in both models, as expected.

CONCLUSIONS: These results align with previously reported findings suggesting that anthropometric measures have a moderate relationship with children’s performance on movement competence assessments.

3048 Board #313 June 2 2:00 PM - 3:30 PM

The Relationship Between Fundamental Motor Skills and Physical Activity in College Age Students in Puerto Rico

L. Romero Maysonet1, M. Amaral-Figueiroa2. 1Universidade de Puerto Rico, Recinto de Mayagüez, Mayagüez, Puerto Rico. 2Universidad de Puerto Rico, Rio Piedras Campus, San Juan, Puerto Rico. Email: lillianaromeroupr.edu (No relationships reported)

Physical activity (PA) is associated with disease prevention and maintaining a healthy lifestyle. It is expected that individuals with higher levels of Fundamental Motors Skills (FMS) would be more physically active. The lack of PA is currently a global problem for it has caused 1.9 million deaths. Furthermore, only 33.8% of the population in Puerto Rico meets the current PA guidelines, thus placing in the top of gross motor competence in children. The purpose of this study was to determine if PA and FMS have a moderate relationship with children’s performance on movement competence assessments.

3049 Board #314 June 2 2:00 PM - 3:30 PM

Physical Activity Levels In Preschool Children During Winter & Summer

Karín Helene Danielsen1, Gunnar E. Mathisen1, Jarle Stålesen2. 1UIThe arctic University of Norway, Tromsø, Norway. 2University of Agder, Kristiansand, Norway. Email: karin.danielsen@uit.no (No relationships reported)

Background: The Norwegian Directorate of Health recommends that children between 3 to 5 years accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. However, knowledge about physical activity levels in preschoolers is limited.

PURPOSE: To compare physical activity levels in kindergarten preschool during summer and winter in children aged 3-5 years.

METHODS: From Monday to Wednesday, physical activity levels were monitored using the Actigraphy GT3X between 6:30 am and 4:30 pm (n = 31, 3.9 yrs). Physical activity levels were measured twice, in February (n = 41, 4.42±0.86 years), (n = 71; 4.75±0.89 years) and in June. June (n = 71; 4.75±0.89 years) was the primary physical activity outcome was time spent at different activity intensities. We defined moderate-to-vigorous physical activity (MVPA) as all activity above 2000 counts/min. As universally (Ickland et al., 2004).

RESULTS: During the winter period, 64% of the children reached MVPA the recommendations of 60 minutes physical activity daily, whereas 29% was in MVPA betweenphysicallyactive 30-59 minutes per day, and 6% were in MVPAactive <29 minutes. During the summer period less children reached MVPA, physical activity level were, as 50% reached MVPAactive >30 minutes per day, whereas 39% were activereached MVPA between 30-59 minutes per day, and 11% was in MVPAless thanwere active <29 minutes. In total for both periods the boys spent significantly more time in MVPA, (84.11 minutes ± 37.97) compared to girls (63.46 minutes ± 31.39) (p<0.001). In the winter, 65.8% of the boys met the recommendations, and the percentage was reduced to 58% in the summer. For girls, the respective numbers were 34% and 41%. Boys were significantly () more active than girls () in both periods.

CONCLUSION: More than 2/3 of preschoolers do not reach the recommendations of 60 minutes moderate-to-vigorous physical activity. More children in preschool reached the recommendations of MVPA above 60 minutes in the winter, compared with the summer period.
t-tests. ΔSB and its associations between ΔMVPA and ΔBMI were assessed using a multivariate linear regression model, adjusted for gender and baseline values of age, SB, MVPA and BMI. RESULTS: The SB and BMI baseline increased significantly compared with follow-up (562.51 ± 46.81 and 577.29 ± 49.81 min/day; p = 0.033; 17.55 ± 2.44 kg/m²; 19.61 ± 3.21 kg/m²; p = 0.001, respectively) and MVPA was not significantly different (67.23 ± 15.38 and 65.24 ± 20.73; p = 0.380). Multiple linear regression analyses showed that ΔSB was negatively related to ΔMVPA (β: -0.609; 95%CI: -2.30, -1.39; p = 0.0001), however it was not associated significantly with ΔBMI (β: -0.088; 95%CI: -6.79, 1.58; p = 0.218). CONCLUSIONS: The increase of SB with age could displace the time spent in MVPA, although the influence of the BMI values remained unclear for the children sample presented here. This reinforces public health measures and suggests the need of interventions focusing in decline SB and increase MVPA during childhood. Supported by the CIAFEL under grant number UID/DTP/00617/2015; FCT under grant number SFRH/BDE/86538/2012; CNPq under grant number 206862/2014-8 and CAPES under grant number 6099/13-0.

### Table 1: Instrument Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Table utilizing combination of BMI and waist circumference to obtain disease risk</td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>Three Minute Step Test (Powers &amp; Dodd, 2009)</td>
</tr>
<tr>
<td>fitness</td>
<td></td>
</tr>
<tr>
<td>Body fat percentage</td>
<td>Bioelectrical Impedance (Tanita 350 Body Composition Analyzer)</td>
</tr>
<tr>
<td>Self-motivation</td>
<td>Self-Motivation Inventory (Dishman &amp; Ickes 1981; Merkle, 1997)</td>
</tr>
<tr>
<td>Exercise self-</td>
<td>Exercise Self-Efficacy Scale (Bandura, 1997)</td>
</tr>
<tr>
<td>efficacy</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Analysis Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pretest Mean (SD)</th>
<th>Posttest Mean (SD)</th>
<th>Mean Difference (post-pre)</th>
<th>t</th>
<th>P</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>SW</th>
<th>F (Wilcoxon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body-fat percentage (N=43)</td>
<td>23.42 (11.30)</td>
<td>23.53 (10.96)</td>
<td>0.11</td>
<td>0.26</td>
<td>0.7385</td>
<td>0.20</td>
<td>0.11</td>
<td>0.0317</td>
<td>0.0212</td>
</tr>
<tr>
<td>Cardiorespiratory fitness</td>
<td>160.74 (33.48)</td>
<td>152.70 (30.92)</td>
<td>-8.04</td>
<td>-3.04</td>
<td>0.0057*</td>
<td>1.48</td>
<td>5.17</td>
<td>0.0003</td>
<td>0.0001*</td>
</tr>
<tr>
<td>level (N=64)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-motivation score (N=41)</td>
<td>129.51 (18.45)</td>
<td>131.71 (19.11)</td>
<td>2.20</td>
<td>1.41</td>
<td>0.1675</td>
<td>0.07</td>
<td>2.65</td>
<td>0.0042</td>
<td>0.1758</td>
</tr>
<tr>
<td>(N=41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA stage (N=30)</td>
<td>67.05 (14.22)</td>
<td>65.62 (16.71)</td>
<td>-1.42</td>
<td>-0.75</td>
<td>0.4560</td>
<td>0.51</td>
<td>1.77</td>
<td>0.1543</td>
<td>0.2510</td>
</tr>
<tr>
<td>(N=30)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PURPOSE: To evaluate the effect of a program of physical activity with moderate to vigorous under the model of CATCH on body fat percentage and aerobic capacity in overweight or obesity children.

METHODS: Twenty-six children (15) male and (11) female (age 9±0.3 years), diagnosed with overweight or obesity participated in a program of physical activity with moderate to vigorous under the model of CATCH, 2 times a week over a period of 10 months, consisting of exercise intensity of 56% evaluated by the system for observing fitness instruction time (SOFIT), before and after the program body fat percentage was evaluated determined by the equation Slaughter with the anthropometrics measurements of triceps and media calf skinfolds. Aerobic capacity (VO2max) was determined by the test course navette 20 meters. The results of student T test showed significant improvement (p<0.05) comparing before and after the program in VO2max (p=0.000) and percentage change (Δ%) of 11.3. CONCLUSIONS: Physical activity with moderate to vigorous under the model CATCH was able to enhance aerobic capacity in overweight or obesity children, however, will be appropriated in the future more studies to better clarify the possibilities of improvements in the percentage of body fat.

Gross motor coordination (GMC) is positively associated with physical activity (PA) and inversely associated with sedentary behaviour (SB) in childhood. Although children behave sedentarily while sitting and playing there is effectively movement in this behaviour. We considered the transitions between SB (≥150 c.p.m) and light physical activity (LPA) (≤300c.p.m) as sit & play (SP), that is when preschoolers are sitting but there is some movement playing. No studies to date have examined how GMC is related to SP.PURPOSE: To examine the association between SP and GMC during the early years regardless physical activity levels.

METHODS: The sample comprised 209 children aged 3-6 years, GMC was assessed according to the Movement Assessment Battery for Children (MAIBC-2). The battery comprised the aiming & catching and balance component. Binary logistic regression analysis showed that preschoolers who had a low level of SP were 2.9 times more likely to be classified as having poor GMC level in aiming & catching than their counterparts with high SP level. The results of binary logistic regression that examined the relationship between SB and GMC, did not show statistical significant association.

CONCLUSIONS: This study showed an association between low SP levels with poor GMC regardless of physical activity levels. Thus, children are sitting position, doing some movement playing looks good for GMC. No association has been found between SB and GMC. Further longitudinal studies are needed to confirm this data. Supported by the CFAEL under Grant UID/DTP/00617/2015; FCT under Grant SFRH/BD/86538/2012; and CAPES under Grant 6099/13-0.

Lack of physical activity (PA) and sleep are associated with several negative health outcomes. Two populations that are particularly vulnerable to these risk factors are postpartum mothers (<1 year of childbirth) and overweight/obese individuals. Thus, postpartum mothers who are also overweight/obese may be especially susceptible to issues related to lack of PA and sleep. However, research exploring this topic is lacking. PURPOSE: To compare PA and sleep of overweight/obese and normal weight mothers.

METHODS: Physical activity and sleep levels were objectively measured using accelerometers worn on the non-dominant wrist. A total of 21 mothers (n=13 overweight/obese, n=8 normal weight) were recruited as part of a larger study. Mothers’ BMI and sleep levels (minutes) were assessed three times - when their infant was three months old, the onset of their child’s sitting (~5 months of age), and one month post onset of sitting (~6 months of age) – for four days (two weekdays, two weekend days). Anthropometric measures (i.e., height weight) were collected at each visit to calculate BMI. Average BMI was used to classify mothers as normal weight or overweight/obese. A mixed-design ANOVA was used to examine differences between visits while comparing normal weight and overweight/obese mothers. RESULTS: Increases (p < 0.05) in normal weight mothers’ PA was observed between visits one (M = 78.98 ± 20.83 min/day) and three (M = 99.89 ± 14.57 min/day, p = 0.01), and visits two (M = 84.49 ± 17.33 min/day) and three (p = 0.045). Overweight/obese mothers displayed no significant change in PA over time. No significant change in sleep over time was observed in either group. No significant differences were observed between the PA and sleep levels of overweight/obese and normal weight mothers. CONCLUSION: Normal weight mothers tended to increase PA levels while overweight/obese mothers did not significantly change their PA levels over time. These findings can help guide future efforts aiming to increase the health of postpartum mothers, especially those that are also overweight/obese.

Low-income pregnant women are less likely to meet physical activity (PA) recommendations compared to higher income counterparts. Some studies suggest that the difference in activity levels is diminished when household (HPA) and job physical activities (JPA) are considered but little is known about factors that may influence HPA and JPA levels. PURPOSE: To examine personal, social, and environmental factors impacting HPA and JPA during pregnancy in low-income women based on the Ecological Model. METHODS: Low-income pregnant and postpartum women were recruited nationwide using an online platform. Participants (n=109) recalled pregnancy HPA and JPA using the International Physical Activity Questionnaire (IPAQ) and answered a survey on personal (demographics, self-efficacy, lifestyle beliefs), social (social support, social perceptions, social roles strain) and environmental factors (safety, community involvement). Descriptive statistics were assessed for all variables. Median split was used to categorize HPA and JPA. Correlation matrices were created for personal, social, and environmental factors. Based on established criteria, significant variables were selected to be included in confirmatory factor analysis (CFA). A CFA model for each personal, social, and environmental latent factor and two structural equation models were created for predicting HPA and JPA. RESULTS: Participants’ mean age was 29.5 years (±5.6) and 51.9% of women were on Medicaid. Median, range HPA was 28, 0-354 MET-hrs/wk and JPA was 0.2, 0-367 MET-hrs/wk. Latent personal, social, and environmental factors were not significantly related to HPA or JPA. However, significant interactions occurred between personal and environmental factors (-0.218, p<0.05) and social and environmental factors (-0.207, p<0.05) in the HPA model as well as personal and environmental factors.
There is some evidence to suggest that social support and self-efficacy aid in goal directed behaviors and may increase levels of physical activity (PA). PURPOSE: To examine the relationship between social support from family and friends, self-efficacy, and PA in a sample of pregnant women. METHODS: Participants (n=23) ≥18 years of age and 14-20 weeks gestation were enrolled in a nutrition and physical activity intervention. A survey assessing demographics (age, marital status, education, and race) was administered. Social support and self-efficacy for engaging in PA was also assessed. Height and weight were objectively measured to calculate body mass index (BMI). An accelerometer was worn to assess percent of day spent sedentary, in light PA, and in vigorous PA. For social support from friends, Pearson correlations showed a significant negative relationship with light PA (r=-0.43, p=0.04), a significant positive relationship with moderate to vigorous PA (r=0.45, p=0.03) but no relationship with sedentary time (r=0.36, p=0.09). Pearson correlations also indicated significant positive relationships between self-efficacy and sedentary time (r=0.43, p=0.03) and light PA (r=0.45, p=0.02), but no relationship with moderate to vigorous PA (r=0.07, p=0.71). No significant relationships were found between social support from family and any intensity of PA. CONCLUSIONS: Findings indicate that social support from friends may be an important factor to consider when encouraging participation in moderate to vigorous PA during pregnancy. Future research is needed to fully understand the effects of social support and self-efficacy on PA during pregnancy. Prospective research will allow for larger sample sizes should consider including more diverse samples of pregnant women. Furthermore, relationships between social support from family and friends, self-efficacy, and PA should be assessed across trimesters.

Physical activity (PA) during pregnancy has an important impact on public health as it reduces the risk of common pregnancy complications and chronic diseases and provides numerous protective factors for prevent women and their children, although national and international guidelines have recommended regular PA for all pregnant women since the 1980s, only a small proportion of women achieve the recommended levels of PA during pregnancy, and longitudinal studies have shown a decline in PA levels as pregnancy progresses. PA levels are also lower in pregnant women compared to their non-pregnant counterparts. Understanding correlates of PA during pregnancy is crucial in order to target effective interventions to preclude inactivity among pregnant women.

**PURPOSE:** To systematically review the literature regarding different correlates of PA during pregnancy including studies from all over the world.

**METHODS:** A comprehensive and systematic search of the Medline, Embase, PsycInfo, Cochrane Library, SwoMed+, Sociological Abstracts and Web of Science databases up until January 14 2016 was conducted by a professional librarian. Only studies in which PA was assessed prospectively during pregnancy were included. We conducted the present review as suggested by the PRISMA group and used a predefined PICO (Population, Intervention, Comparison, and Outcome) worksheet.

**RESULTS:** Out of 342 records, we reviewed 16 original studies. Half of these used a cross-sectional design. We identified different types of correlates and categorized them into 1) demographic or biological variables; 2) psychological variables; 3) behavioral variables; and 4) social and cultural variables. Most studies reported demographic variables; and biological correlates (e.g. pre-pregnancy PA, smoking and diet) of PA during pregnancy but the results varied widely. Pre-pregnancy PA was the most robust correlate reported. None of the studies reported environmental correlates such as the environment, trimester or weather conditions.

**CONCLUSIONS:** PA before pregnancy was the most consistent correlate of pregnancy PA across studies. We need more knowledge on psychological, social and environmental correlates of pregnancy PA, particularly from low- and middle income countries.
CG at T2 (p=0.0001) and at T3 (p<0.0001). PH was not different between the groups in T1 but the best one was in TG compared to CG in T3 (flexibility p<0.002, walking, balance, curling and running p<0.0001). TG is associated with more than four times less of caesarean and 4.5 hours less of labor time.

Conclusion. Strengthening exercises centered on the trunk reduce pain, increase QoL and PH in late pregnancy and at two months in the post-partum period.

3421 Board #326  June 2 2:00 PM - 3:30 PM
Pregnancy Physical Activity Beliefs and Attitudes in a Non-pregnant Population
Mallory R. Marshall, 35229, Katie Hammond, Christian Watts, Caroline Ellis, Bailey Gray, Emily Stallings, John Petrella, FACSM. Sanford University, Birmingham, AL.  
Email: mmarshal@samford.edu

No relationships reported.

PURPOSE: The purpose of this study was to examine the attitudes and beliefs about pregnancy physical activity (PA) in non-pregnant individuals.

METHODS: Participants were non-pregnant individuals between the ages of 20 and 60 years and were recruited by word-of-mouth and social media, or through one of five doctor’s offices located in the southeastern United States. 738 participants completed at least some of the survey and 454 have complete data. The survey consisted of 27 items in five sections: basic demographic information, PA over prior six months, agree/disagree questions regarding safety and efficacy of PA during pregnancy, importance of exercise for different women, and safety of moderate or vigorous intensity PA for mother and offspring. For analysis, participants were dichotomized by age (20 to 40 years; 41-60 years), sex (male; female), and education (Bachelor’s degree; no Bachelor’s degree).

RESULTS: For age, the older group (age 41 to 60) was more likely to view pregnancy PA favorably (p=0.001 to 0.010). Females were more likely than males to view pregnancy PA positively (p=0.007 to 0.024). Participants with a college degree were more likely to agree that pregnant women can begin an exercise program during pregnancy (p=0.047) and benefit from moderate exercise (p=0.017), but were less likely to believe PA is safe for mother and baby (p=0.000 to 0.001).

CONCLUSIONS: Overall, participants who were older, female, and did not have college degrees viewed pregnancy PA more favorably.

F-65 Free Communication/Poster - Ultrasound and Spectroscopy Applications

3422 Board #327  June 2 2:00 PM - 3:30 PM
Associations Of DXA-derived Appendicular Lean And Fat-Free Adipose Tissue Mass With A Single Forearm Ultrasound Image
Takashi Abe, Jeremi P. Loennecke, Robert S. Thiebaud, Eiji Fujita, Takuya Akamine, Mark Loofin, FACSM. National Institute of Fitness and Sports in Kanoya, Kanoya, Japan. The University of Mississippi, Oxford, MS. Texas Wesleyan University, Fort Worth, TX.  
(Sponsor: Mark Loofin, FACSM)  
Email: tabe@nis-k.ac.jp

No relationships reported.

Dual-energy x-ray absorptiometry (DXA) is used to assess appendicular lean soft tissue mass (aLM), however, the aLM measured by DXA contains non-skeletal muscle tissue components (fat-free adipose tissue, FFAT). These components, if not accounted for, could falsely inflate the aLM in individuals with a relatively high amount of adipose tissue mass. Ultrasound is an imaging technique used to estimate body composition. Recently, we developed prediction equations for estimating aLM (aLM = 4.89 x MT-ulna x body height - 9.15). Pearson correlation coefficients were performed for all variables. Statistical significance was set at p<0.05. RESULTS: There was no significant difference between DXA-derived (17.1 [SD 4.0] kg) and ultrasound predicted (16.9 [SD 3.9] kg) aLM. The ultrasound predicted aLM was strongly correlated to DXA-derived aLM (r=0.910, p<0.001). In addition, DXA-derived appendicular FFAT was significantly correlated to AT forearm (r=0.680, p<0.001).

CONCLUSIONS: Ultrasound forearm measurement correlates well with both aLM and FFAT. This one site measurement might be a quick and useful method for estimating muscle mass in older adults.

3423 Board #328  June 2 2:00 PM - 3:30 PM
Ultrasound Imaging Before and After Bilateral Tenotomy in a Collegiate Basketball Player: A Case Study
Scott K. Crawford, Aaron J. Engel, Greg R. Bashford, Jack W. Ransone, FACSM. University of Nebraska-Lincoln, Lincoln, NE.  
(No relationships reported)

Patellar tendinopathy is a debilitating condition that often occurs in athletes who participate in jumping sports, such as volleyball or basketball. Ultrasound imaging has previously been used as a diagnostic tool in identifying tendon morphology. However, previous research has not tracked the time course of patellar tendon morphology changes following tenotomy. PURPOSE: The purpose of this study was to track and quantify changes in tendon morphology after bilateral patellar tenotomy in a female collegiate basketball player. METHODS: A Division I female basketball player (height=1.9 m, weight=85 kg) with chronic bilateral patellar tendon pain was recruited for participation in the study. Longitudinal B-mode images were taken of the patellar tendon with a research-grade ultrasound machine (Versonics Inc, Kirkland, WA, USA) and high frequency (5-12 MHz) linear transducer at a center frequency of 10 MHz. The subject performed all rehabilitation exercises as prescribed by the athletic trainer and returned for weekly imaging sessions. As secondary measures of recovery, perceived pain and knee function were evaluated using the Victorian Institute of Sport Assessment (VISA) scale which was completed at each visit. Tendon micromorphology was evaluated using a custom MATLAB code (MathWorks, Natick, MA, USA). A region of interest was manually selected from the images and a two-dimensional fast Fourier transform was performed. The peak spatial frequency radius (PSFR) parameter was used to assess the micromorphology of the tendon, where higher PSF values were associated with increased collagen organization.

RESULTS: At the time of abstract submission, the subject had completed two post-surgical visits. The average PSKR increased for both knees (right: 1.00 vs. 1.28; left: 1.07 vs. 1.54). There was a small increase in the total VISA score between visits (5 vs. 8).

CONCLUSION: Ultrasound imaging was used to characterize initial micromorphology changes in the patellar tendon following bilateral tenotomy. Preliminary results showed increased collagen organization and improved VISA scores. Future findings may suggest a correlation between self-reported measures of knee pain and function and tendon morphology.

3424 Board #329  June 2 2:00 PM - 3:30 PM
Diagnostic Ultrasound Imaging In Assessing Medial Elbow Joint Space In College Baseball Pitchers
Shawn D. Felton, Arie J. van Duijn, Eric Shamus, Mitchell L. Cordova, FACSM. Florida Gulf Coast University, Fort Myers, FL.  
(Sponsor: Mitchell L. Cordova, FACSM)  
Email: sfelton@fgcu.edu

No relationships reported.

Athletes participating in overhead throwing sports such as pitchers, volleyball players, and javelin are prone to ulnar collateral ligament (UCL) injuries of the elbow. UCL sprains typically occur when the elbow is subjected to repetitive or sudden valgus stress causing the UCL to exceed its tensile limits. Recently, the use of musculoskeletal ultrasound (MSK) during a valgus stress exam of the UCL has gained great interest. Because the UCL is a ligament, sprains typically occur when the elbow is subjected to repetitive or sudden valgus stress causing the UCL to exceed its tensile limits. Preliminary findings have indicated that MSK may help identify those patients at increased risk for UCL sprain. PURPOSE: To evaluate the use of MSK in identifying UCL injury in collegiate baseball pitchers. METHODS: Thirteen Division I college baseball pitchers with a mean age of 20.4 ± 1.45 yrs and body mass index of 24.56 ± 1.78 participated. Ultrasound images of the medial joint space were obtained using a GE LOGIQ E ultrasound unit. The participants were placed in a supine position with a wedge placed underneath their throwing hand to maintain their elbow angle at 30 deg. A hand held dynamometer was used to apply a 3 kg valgus force to the medial epicondyle to maintain a constant 5 Nm valgus stress to each participant. The mean joint space of the elbow was imaged at the beginning of the spring baseball season.  

ACSM May 30 – June 3, 2017
Denver, Colorado
then 16 games or 6 weeks after baseline testing. Three images were taken during each session, where specific measurements from the apex of the trochlea to the apex of the ulna were taken.

RESULTS:
The MJS width increased approximately 15% from an initial baseline testing value of .49 cm±.06 to .56 cm±.02 after 16 games or 6 weeks [F(1,10)= 8.51, p<.01]. The covariates of total innings pitched [F(1,10)= .19 p>.68] and [year of participation [F(1,10)= .011 p>.75], were not significant factors in the change of MJS width over time.

CONCLUSIONS:
The results of this investigation demonstrate that MJS width and UCL integrity can be assessed accurately using diagnostic ultrasound during a valgus stress test. Moreover, these data indicate that total innings pitched during a season and year of participation did not have an influence on the MJS width. Further research is recommended to perform multiple imaging testing throughout the entire year (Fall and Spring seasons) to determine specific time points at which MJS width changes in collegiate baseball pitchers.

3425 Board #330
June 2 2:00 PM - 3:30 PM
Assessing UCL Width during Valgus Load for College Baseball Pitchers using Ultrasound Imaging
Arie J. van Duijn, Shawn D. Felton, Eric Shamus, Brandon Smith, Mitchell L. Cordova, FACSM. Florida Gulf Coast University, Fort Myers, FL. (Sponsor: Mitchell L. Cordova, FACSM)
Email: avanduijn@gfcu.edu
(No relationships reported)

Injuries to the Ulnar Collateral Ligament (UCL) of the elbow are common in overhead throwing athletes. A repetitive valgus force during the throwing motion places significant stress on the UCL. More research needs to be conducted to investigate new methods to assess potential thickening of the anterior bundle of the UCL in order to understand ligament changes that may occur throughout the season.

PURPOSE: To examine the reliability of ultrasound imaging measurements of UCL width at 2 different anatomical locations using 5Nm valgus stress; and to determine if a difference in ligament width exists between the two measurements 4 weeks apart within the season.

METHODS: Thirteen Division I college men’s baseball pitchers participated with a mean age of 20.4 ± 1.45 SD) and body mass index (BMI) 24.56 ± 1.78 SD). Ultrasound images were obtained of the anterior bundle of the UCL on the participant’s throwing arm using a GE LOGIQ E ultrasound unit with a linear probe at 12Mhz. Participants were placed in a supine position with a wedge placed underneath their forearm to maintain their elbow position at a 30 deg. flexion angle. A 5 Nm valgus stress was applied 20 centimeters distal to the medial epicondyle. Measurements at the mid substance and the apex of the trochlea were taken at the beginning of the baseball season and then again 4 weeks later. Three images were measured during each session.

RESULTS: Intra-rater reliability as expressed by ICC (3, 3) was .929 (SEM= 0.18mm) & .935 (SEM=0.20mm) for the apex of trochlea measurement site and .861 (SEM= 0.22mm) & .920 (SEM=0.16mm) for the mid-substance measurement site, indicating excellent intra-rater reliability. There was no difference between the measurements obtained on the two testing dates (Apex of trochlea mean width 2.90mm & 2.92mm; t=-.155; p>0.05) and (Mid-substance mean width 4.49 mm & 4.44 mm; t=.571; p>0.05)

CONCLUSIONS: Excellent intra-rater reliability was found at all four measurement sites. There was no significant difference in UCL width from the beginning of the season and one-month into the season. Further research is recommended to perform multiple imaging sessions throughout the year to determine the long term physiological effects of overhead throwing on the anterior band of the UCL and to study the connection between UCL width changes, tissue quality, and injury risk.

3426 Board #331
June 2 2:00 PM - 3:30 PM
Epidemiological Study of Achilles Tendon Morphology Using Ultrasound Tissue Characterization Technology
Angela R. Lucero, Laura E. Stanley, Madison F. Kennedy, Qzefeng Li, Mark Dyson, David J. Berkoff. UNC Chapel Hill, Chapel Hill, NC.
(No relationships reported)

Ultrasound tissue characterization (UTC) imaging is a novel technology to objectively quantify tendon structural integrity. Previous UTC studies have primarily been performed in small, homogeneous samples, and varied in analysis parameters. No studies to date have examined a large, asymptomatic population.

PURPOSE: To characterize asymptomatic Achilles tendon (AT) structure in an adult population, identify factors that may be associated with tendon structure variation as measured by UTC, and provide a foundation for future research.

METHODS: 575 asymptomatic subjects (male: 217, female: 291) were recruited. Each subject completed a medical history questionnaire and underwent UTC scanning of the right AT. The motorized tracking device moved an ultrasound probe along the long axis of the AT capturing 598 transverse images at intervals of 0.2 mm over 12 cm. UTC algorithms quantified the stability of pixel brightness over every 17 contiguous images into four echotypes (ET): (I) aligned tendon bundles, (II) waving tendon bundles, (III) mainly fibrillar tissue, and (IV) mainly amorphous matrix. A region of interest (ROI) was selected from the calcaneus to the musculotendinous junction. Tendon borders were outlined manually in the transverse view at intervals no greater than every 25 frames (0.5 cm) across the ROI. Contours were interpolated to generate average percentages (%) of each ET for the total tendon volume. 67 subjects were excluded due to poor quality scans or not meeting inclusion criteria, resulting in 508 subjects in final analysis.

RESULTS: Average ET % for the volume was: I-65.73% (SD:6.61, range 35.29-80.17), II-32.00% (SD:6.64), range 18.41-64.28), III-1.74% (SD:0.85, range 0.54-6.22), and IV-0.57% (SD:0.45, range 0.07-3.59). Differences between subgroups were compared and p-values <0.05 were considered significant. Higher % of ET I and lower % of ET II were associated with age 50-65 years old, male gender, African American race, and hypertension. Higher % of ET III was associated with age 50-65 years old, BMI-30, diabetes, and COPD.

CONCLUSION: This work provides a baseline ET distribution that can be used in future AT research. We have shown numerous associations between tendon morphology and patient demographics/health that begin to help stratify differences in asymptomatic Achilles tendons.

3427 Board #332
June 2 2:00 PM - 3:30 PM
Micro-vascular Blood Flow During Post-Occlusive Reactive Hyperemia Assessed By Diffuse Correlation Spectroscopy
Kaylin D. Didier, Shane M. Hammer, Andrew M. Alexander, Jacob T. Caldwell, Shelbi L. Sutterfield, Carl J. Ade, Thomas J. Barstow, FACSM. Kansas State University, Manhattan, KS.
(No relationships reported)

Email: kaylink@ksu.edu

PURPOSE: The purpose of this investigation was to determine if Diffuse Correlation Spectroscopy (DCS) provides a reproducible measure of micro-vascular blood flux during post-occlusive reactive hyperemia (PORH). Previous techniques utilized to assess forearm muscle blood flow include brachial artery blood flow and Near Infrared Spectroscopy (NIRS). DCS provides a novel ability to examine red blood cell (RBC) flux within the muscle microvasculature. We hypothesized that DCS would provide a reproducible measure of muscle microvasculature RBC flux during PORH.

METHODS: 7 healthy male subjects (25.9 ± 4 yrs) performed 3 trials of brachial artery PORH tests. The DCS probe was placed on the flexor digitorum superficialis m. of the cuffed arm and provided Blood Flow Index (BFI). Brachial artery blood flow was assessed using Doppler Ultrasound to provide time-averaged maximum velocity (TAMAX). Following a 10 min supine rest period baseline measurements were performed for 1 min at which time a pneumatic cuff was inflated to at least 250 mmHg for 5 minutes. Measurements continued to be made for the 5 min of occlusion and 3 min post cuff release. The subjects were given 10 min rest between trials.

RESULTS: The peak TAMAX of the brachial artery for PORH1, PORH2, and PORH3 occurred at 7.3 ± 3.4, 6.0 ± 2.4, and 6.4 ± 2.7 sec respectively (p=0.397). The peak in BFI for PORH1, PORH2, and PORH3 occurred at 25.6 ± 4.5, 26.4 ± 8.3, and 22.3 ± 3.5 sec respectively (p=0.311). The time to peak for TAMAX was significantly different between the time to peak in BFI (p<0.001).

CONCLUSIONS: Similar time to peak for BFI across trials indicates that the DCS provides a reproducible signal of muscle microvasculature blood flux during PORH conditions. We speculate that the significant difference between time to peak for TAMAX and BFI may be due to compliance between the brachial artery and the microvasculature.

F-66 Free Communication/Poster - Weight Control
FRIDAY, JUNE 2, 2017
Room: Hall F

3428 Board #333
June 2 3:30 PM - 5:00 PM
Sugar-Sweetened Beverages And Short-duration Exercise On Glycemic Response And Subjective Appetite In Young Boys
Julia O. Totosy de Zepetnek, Kerry Miller, Melissa Da Silva, Nick Bellissimo. Ryerson University, Toronto, ON, Canada.
Email: jttotosy@ryerson.ca
(No relationships reported)

PURPOSE: Sugar-sweetened beverage consumption is thought to be a contributor to weight gain through its effects on the control of food intake and glucose homeostasis. It has been suggested that energy from sugar-sweetened caloric beverages bypass Abstracts were prepared by the authors and printed as submitted.
physiologic systems regulating food intake, leading to weight gain. Despite a lack of reported evaluation, short-duration exercise is promoted in schools as a means of achieving energy balance and glucose homeostasis. The purpose of the present study was to investigate the interaction between sugar-sweetened beverage consumption and short-duration exercise on glycemic response and subjective appetite in young boys.

METHODS: Eight normal weight boys (age: 11.25 ± 0.7 years) consumed isovolumetric amounts (240mL) of either a commercial fruit drink or 1% chocolate milk, matched for available carbohydrates (25g) 2 hours after a standardized breakfast. The boys then exercised on a motorized treadmill at their ventilatory threshold or sat quietly for 15min, followed by 45min of quiet sitting. Subjective appetite and capillary blood glucose were assessed at baseline, and at 15 and 60min during the test condition.

RESULTS: There was a beverage (fruit drink vs. chocolate milk) x test condition (exercise vs. rest) x time (0, 15, 60min) interaction for blood glucose response (p<0.01). There was a main effect of beverage on glucose response (p<0.01). Exercise increased subjective average appetite to 60min compared to quiet sitting (p<0.05). CONCLUSIONS: Fifteen minutes of moderate-intensity exercise attenuates the rise in blood glucose following sugar-sweetened beverage consumption. Chocolate milk has the lowest glycemic response, which may be due due its milk protein and fat content and effect on gut hormone release. Further investigations are required to determine whether increased subjective appetite following short duration exercise would result in greater next-meal food intake.

#334 | Self-monitoring as a predictor for weight loss in a family-based pediatric obesity treatment program

**Avá Coughlin, Katie Heelan, FACSM, Todd Bartee. University of Nebraska at Kearney, Kearney, NE.**

Email: coughlinat@lopers.unk.edu

(No relationships reported)

Family-based pediatric obesity treatment programs for children in the 95th-99th BMI percentile are suggested to be comprehensive and multidisciplinary to change behaviors and decrease weight. Self-monitoring (SM) has shown to be an effective strategy in child weight loss. **PURPOSE:** To determine if child and parent SM of weekly nutrition (NUTR), physical activity (PA), and body mass (BM) predict weight loss during a 12-week pediatric obesity treatment program. **METHODS:** 51 children (age: 9.8 ± 2.3 years, BMI percentile: 98.0 ± 13.3), 45 mothers (age: 41.5 ± 6.2 years), and 37 fathers (age: 41.5 ± 6.2 years) participated in 12 weekly healthy living education sessions. SM scores were determined as the number of weeks participants logged energy intake (SM-NUTR), physical activity (SM-PA), and weighed-in (SM-BM) over the 12 weeks. A sum score (SM-SUM) of the three SM components was created. Stepwise multiple regression models were used to predict parent and child weight loss from SM scores. **RESULTS:** In 12 weeks, children lost 5.1 ± 4.4% of BM, mothers lost 5.3 ± 8.0% of BM, and fathers lost 8.2 ± 4.7% of BM. SM-SUM was 79% for fathers, 81% for children, and 98% for mothers. Table 1 represents Pearson correlation coefficients between parent body mass loss and self-monitoring scores.

| SM-NUTR | r = 0.33* | r = 0.41* | r = 0.49* |
| SM-PA   | r = 0.20  | r = 0.36* | r = 0.17  |
| SM-BM   | r = 0.13  | r = 0.38* | r = 0.15  |
| SM-SUM  | r = 0.34* | r = 0.49* | r = 0.36* |

Stepwise multiple regression models suggested that Child’s SM-SUM accounted for 19% of the variance in Child’s % BM loss after 12 weeks (R2 = 0.19, p<0.05). Mother’s SM-NUTR score (R2 = 0.47, p<0.05) and Child’s SM-SUM score (R2 = 0.08, p<0.05) accounted for 55% of the variance in Mother’s % BM loss (p<0.05). Father’s SM-NUTR score accounted for 24% of the variance (R2 = 0.29, p<0.05) in Father’s % BM loss. **CONCLUSION:** SM-NUTR, SM-PA, and SM-BM all appear to play a role with family weight loss, with SM-NUTR being most influential. Continuance of self-monitoring post-intervention and its influence on weight loss should be examined.

#335 | Effects of Physical Exercise on the Modulation of Aquaglyceroporin 7 From Visceral Adipose Tissue

**Jorge Beleza, Silvia Rocha-Rodrigues, Inês O. Gonçalves, António Ascensão, José Magalhães. Faculty of Sports, University of Porto, Porto, Portugal.**

(No relationships reported)

A role for aquaglyceroporin 7 (AQ7) in the control of lipid accumulation in white adipose tissue (WAT) has been hypothesized; however limited information is available regarding the impact of physical exercise. **PURPOSE:** We aimed to analyze the role of voluntary physical activity (VPA) and endurance training (ET) on WAT AQ7 expression of HFD-fed rats. **METHODS:** Male Sprague-Dawley rats were assigned into sedentary (S), VPA and ET groups fed an isocaloric Lieber-DeCarli liquid diet—a standard diet (35% fat derived Kcal) or a high-fat diet (HFD), (70% fat derived Kcal), as follows: SS, SVPAn, SET, HS, HVPAn and HET, during 17 wks. VPA groups had free access to running wheel throughout the entire protocol. After 9 weeks of HFD, SET and HET animals were submitted to 8-wks of ET on treadmill while maintained dietary treatments. Plasma non-esterified fatty acid (NEFA), glycerol and insulin levels were determined and epididymal white adipose tissue (eWAT) was used to determine gene and protein expression of AQ7 and fatty acid translocase (FAT/CDB36). Diet and exercise effects were performed using 2-way ANOVA. **RESULTS:** The relative caloric intake was constant between groups. HFD increased visceral adiposity index (r = 0.10 ± 0.2 vs. r = 11.8 ± 0.4; p < 0.0001) and adipocyte area mean (t = 3716.1 ± 301.4 vs. 5343.6 ± 471.5; p < 0.001), ET reduced these obesity-related anatomical features (p < 0.001). Both AQ7 and FAT/CDB36 protein and gene expression remained unchanged after HFD regimen. VPA decreased plasma glyceral levels (12.6 ± 0.8 vs. 12.5 ± 0.6; p < 0.001) and eWAT AQ7 gene expression (p < 0.001) in S diet-fed animals. Protein expression did not impact tumors on plasma NEFA levels nor FAT/CDB36 protein content. Eight-wks of ET decreased NEFA (SS vs. SET, 16.4 ± 0.5 vs. 12.0 ± 0.4; HS vs. HET, 14.7 ± 0.7 vs. 10.8 ± 0.7; p < 0.001) and glycerol (SS vs. SET, 17.4 ± 0.7 vs. 12.5 ± 0.6; HS vs. HET, 15.6 ± 0.5 vs. 10.3 ± 0.9; p < 0.001) plasma levels. ET decreased gene and protein expression of AQ7 (p < 0.001) in eWAT in both diet types and increased FAT/CDB36 gene (p < 0.001) in SET group and its protein expression (p < 0.001) in both diet types. **CONCLUSION:** Our data suggest that 8-wks of ET decreased AQ7 expression, which might play an important role preventing lipid overaccumulation in visceral adipose tissue of obese rats. Supported by: UID/TTP/00617/2013, POCI-01-0145-FEDER-016690.

#336 | Effects of Intermittent Periods of Severe Negative Energy Balance on Weight Maintenance During US Special Operations Forces Training

**John J. Sepowitz, Nicole J. Armstrong, Stefan M. Pasiakos, FACSM. USARIEM, Natick, MA. (Sponsor: Stefan M Pasiakos, FACSM).**

(No relationships reported)

Physically active individuals often fail to meet energy requirements during sustained periods of increased physical activity, resulting in negative energy balance. Failure to increase energy intake during periods of high energy expenditure may compromise body mass and subsequent performance. Whether individuals adequately restore body mass between intermittent periods of severe negative energy balance during long-term training is not well characterized. **PURPOSE:** To examine energy balance and changes in body mass during US Special Operations Forces (SOF) training. **METHODS:** Energy expenditure (EE, doubly labeled water), energy intake (EI, 24 hr recall), energy balance (EB, intake - expenditure) and body mass were measured in 22 US Marines (mean ± SD; 25 ± 2.8; 86 ± 10 kg) during the 4 most physically demanding phases of a 261d SOF training program (days 15-29 (I), 115-123 (II), 191-201 (III), and 243-261 (IV)). **RESULTS:** EE was highest during phase II (6376 ± 712 kcal/d) compared to phase I (4011 ± 475 kcal/d), III (4189 ± 476 kcal/d), and IV (3735 ± 314 kcal/d) (P < 0.05). EI was lowest during phase I (300 ± 0 kcal/d) compared to phase II (2410 ± 338 kcal/d), III (2816 ± 488 kcal/d), and IV (2702 ± 738 kcal/d) (P < 0.05). EB was more negative during phase I (3711 ± 475 kcal/d) and II (3966 ± 776 kcal/d) compared to phase III and IV (P < 0.05). Body mass was lost during phases I, II, and IV, and the degree of body mass lost was equivalent between phase I (6.5 ± 1.5%, 5.6 ± 1.7 kg) and phase II (5.8 ± 2.0%; 4.9 ± 1.9 kg), and greater than phase IV. Initial body mass predicted the loss of body mass (r = 0.67, P < 0.05) during phase I. Body mass did not change during phase III. Body mass was restored before the start of each subsequent phase and was not different between the start (86.4 ± 9.8 kg) and end of the 261 d training (86.7 ± 9.0 kg). **CONCLUSION:** These data suggest that well-trained Marines adequately compensate EI to restore body mass between intermittent periods of severe negative EB. Supported by U.S. Army Medical Research and Material Command The Operations 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 Department of Defense.
METHODS. Eight exercise-training studies performed from 2002–2014 were examined relative to tertiles of PRO ingestion (Low; <0.8 g/kg/d; Moderate; ≥0.8–1.2 g/kg/d; High; ≥1.2 g/kg/d). The Primary outcome is clinically significant weight loss (CSWL; 5%). Secondary outcomes include anthropometry and measures of cardiovascular health. Data were analyzed using GLM adjusted for age, study and respective baseline values. Chi-square and adjusted residual analyses were used to determine categorical differences.

RESULTS. Protein ingestion was: Low (n=278; 0.65 g/kg/d ± 0.12; range 0.24–0.80), Moderate (n=223; 0.98 g/kg/d ± 0.12; range 0.89–1.19) and High (n=142; 1.66 g/kg/d ± 0.42; range 1.20–3.28). Weight change was: Gained weight (12%; 1.01 kg, 95% CI, 0.24, 1.78), exhibited non-CSWL (50%; -1.81 kg, 95% CI, -2.04, -1.59) and achieved CSWL (39%; -7.17 kg, 95% CI, -7.42, -6.92). Post-hoc assessment showed that High PRO consumers did not gain a significant amount of weight (0.70 kg, 95% CI, -0.42, 1.81), while Low (0.97 kg, 95% CI, 0.30, 1.64) and Moderate PRO consumers did (1.36 kg, 95% CI, 0.84, 1.89). No other significant differences were observed for weight loss or lean body mass relative to PRO tertiles. Interestingly, 57% of those consuming High PRO (1.66 ± 0.42 g/kg/d) achieved CSWL vs. ~33% in Low (0.65 g/kg/d) and moderate PRO (0.98 g/kg/d ± 0.12) consumers (P<for-trend, 0.003). Further comparison demonstrated that Low PRO consumers were significantly less likely to achieve CSWL (odds < 3.1), while those ingesting High PRO were significantly more likely to achieve CSWL (odds > 4.9).

CONCLUSION. Despite the lack of difference for magnitude of weight loss between PRO groups, high PRO consumers were significantly more likely to achieve CSWL during a short exercise intervention consisting of resistance and aerobic training. Equally, higher PRO consumption may offset the magnitude of weight gain vs. lower PRO intakes if weight loss is not achieved.

Sponsor. Curves International
Male endurance athletes have been reported to have lower testosterone concentrations than their sedentary counterparts, which may have detrimental health effects including increased risk of musculoskeletal injury and fertility complications secondary to decreased sex hormone production. Cholesterol supplementation has been reported to increase serum sex hormones. PURPOSE: The purpose of this study was to investigate whether a treadmill endurance exercise program would cause exercise-induced reproductive dysfunction in male rats and assess the impact of increased dietary cholesterol on sex hormone levels. METHODS: Male Sprague-Dawley Rats (n=20) were randomly assigned to a control group (C) or an exercise training group (EX) that performed treadmill running 40 min, 6 days/week for a duration of 12 weeks. At study midpoint (wk 6), rats were randomized to receive either a High-Cholesterol (HC) Diet (n=10) or remain on standard purified diet (n=10). Fasting blood samples were collected at baseline, wk 6, and wk 12. Serum testosterone (T) and leptin were measured via ELISA. Serum lipids (TC, HDL, LDL, TG) were measured via clinical chemistry analyzer. Body weight (BW) and voluntary food intake (EI) were measured weekly. RESULTS: At wk 6, EX had significantly lower BW (494.3±34.7 g versus 565.3±47.9 g, p<0.001), mean daily EI (775.5±3.5 kcal versus 916.6±5.2 kcal, p<0.001), and serum leptin (90.8±40.1 pg/mL versus 635.7±225.6 pg/mL, p=0.001) in comparison to C. No difference was observed between EX and C in serum T (12.7±6.0 ng/mL versus 12.9±5.8 ng/mL, p>0.05) at wk 12. Exercise groups (EX and EX+HC) had significantly lower BW (539.4±40.6 g versus 645.1±60.7 g, p<0.001), mean daily EI (817.2±79.9 kcal versus 916.6±5.2 kcal, p<0.001), and serum leptin (132.8±110.3 pg/mL versus 916.6±5.2 pg/mL, p<0.001) in comparison to C and C+HC. HC diet did not have significant impact upon serum T in comparison to standard diet (3.8±3.4 ng/mL versus 4.9±2.4 ng/mL). CONCLUSIONS: Despite low energy availability, exercise-induced reproductive changes may not occur in training programs ≥12 weeks. Lower EI observed in exercise groups despite higher energy expenditure may indicate that low energy availability in endurance-trained individuals may be insufficient. Supported by American Egg Board Graduate Fellowship Research Grant.

**3436** Board #341

**June 2 3:30 PM - 5:00 PM**

**12-Week Treadmill Program Elicits Low Energy Availability Without Changes in Serum Testosterone in Male Rats**

Lyra R. Clark, Thomas Wilson, Michael Delligo, Erin Chenette. *University of Massachusetts Lowell, Lowell, MA.* (No relationships reported)

Increased water consumption has potential to promote weight loss but previous studies with regard to both effectiveness and safety, both gave enough ineffective and unsafe advice that consumers should use extreme caution when interpreting weight loss advice from pharmacists and retailers.

Increased water consumption has potential to promote weight loss but previous studies with regard to both effectiveness and safety, both gave enough ineffective and unsafe advice that consumers should use extreme caution when interpreting weight loss advice from pharmacists and retailers.

Increased water consumption has potential to promote weight loss but previous studies with regard to both effectiveness and safety, both gave enough ineffective and unsafe advice that consumers should use extreme caution when interpreting weight loss advice from pharmacists and retailers.
Recently, a new rule has been suggested to replace the 3500 calorie rule to predict long term weight loss (WL) but whether practitioners are aware of this is not known. PURPOSE: To assess the awareness of recent facts related to the misuse of the 3500 calorie rule for predicting WL and to determine whether awareness differs by certification status, a person's training level and their perceived WL knowledge. METHODS: Students (S), faculty (F), and professionals (P) (n = 352, 68% females, 31 ± 8 years) were recruited and an anonymous online survey was sent via email lists and social media platforms. Each participant responded yes or no regarding their awareness of 8 statements focused on the misuse of the 3500 calorie rule, compensation that takes place with WL, the recommendation of a new rule, and the nonlinear nature of WL. Participants reported current exercise and nutrition certifications and were grouped as certified or not certified. They also reported their level of WL knowledge on a 5 point Likert scale and were divided into 2 groups for analysis: very good or excellent (EX) knowledge vs good, fair and poor (Poor) knowledge. Chi squared analyses were used to test for differences in the proportions of respondents who were aware of each statement between knowledge, certification, and training level groups. RESULTS: The % who were aware of WL statements was lowest in S (26.1 - 61.8% for S, 19.4 - 93.5% for F and 19.7 - 84.5% for P). The lowest awareness for all groups was regarding the new rule to predict WL and did not differ between groups (26.1%, 19.4%, and 19.7% for S, F, and P, respectively; p=0.48). For 7 of 8 statements, more of those with EX self-reported knowledge had an awareness (30.4 - 83.0%) of WL statements than those with Poor knowledge (18.4 - 63.3%; p<0.05). For 4 of the 8 statements, more of those who were certified (71.7 - 82.8%) had an awareness of WL statements than those without a certification (54.4 - 65.0%; p<0.05). CONCLUSIONS: S were the least aware of the newest developments in the misuse of the 3500 calorie rule while F were the most aware, though awareness of some concepts were low for all. Awareness levels were highest in those who self-reported EX knowledge. Those with certifications had higher awareness levels of some WL concepts. More dissemination is needed to raise awareness of WL concepts.

Research conducted in rodents and humans present conflicting results on the relationship between carbohydrate intake and the browning of subcutaneous white adipose tissue (scWAT). For example, exercise combined with caloric restriction did not change brown adipose tissue volume from human scWAT samples. In another study, caloric restriction in mice resulted in the browning of both scWAT and visceral white adipose tissue (WAT). In other studies, dietary macronutrient intake and browning indices assessed from scWAT samples of healthy adults. These data may have important public health implications for periods of inactive overconsumption such as during seasonal celebrations.

Research conducted in rodents and humans present conflicting results on the relationship between carbohydrate intake and the browning of subcutaneous white adipose tissue (scWAT). For example, exercise combined with caloric restriction did not change brown adipose tissue volume from human scWAT samples. In another study, caloric restriction in mice resulted in the browning of both scWAT and visceral white adipose tissue (WAT). In other studies, dietary macronutrient intake and browning indices assessed from scWAT samples of healthy adults. These data may have important public health implications for periods of inactive overconsumption such as during seasonal celebrations.

Purpose: The purpose of this study was to investigate the relationship between carbohydrate intake as a percentage of total kilocalories was positively associated with PPARγ in scWAT from healthy adult males. It is, however, difficult to determine if the association between carbohydrate intake and PPARγ indicates browning processes in scWAT given that the mRNA of UCP1 was not related to macronutrient intake. More research is needed to expand on these findings with the use of longitudinal intervention based studies.

Research conducted in rodents and humans present conflicting results on the relationship between carbohydrate intake and the browning of subcutaneous white adipose tissue (scWAT). For example, exercise combined with caloric restriction did not change brown adipose tissue volume from human scWAT samples. In another study, caloric restriction in mice resulted in the browning of both scWAT and visceral white adipose tissue (WAT). In other studies, dietary macronutrient intake and browning indices assessed from scWAT samples of healthy adults. These data may have important public health implications for periods of inactive overconsumption such as during seasonal celebrations.

Purpose: The purpose of this study was to investigate the relationship between carbohydrate intake as a percentage of total kilocalories was positively associated with PPARγ in scWAT from healthy adult males. It is, however, difficult to determine if the association between carbohydrate intake and PPARγ indicates browning processes in scWAT given that the mRNA of UCP1 was not related to macronutrient intake. More research is needed to expand on these findings with the use of longitudinal intervention based studies.

Purpose: The purpose of this study was to investigate the relationship between carbohydrate intake as a percentage of total kilocalories was positively associated with PPARγ in scWAT from healthy adult males. It is, however, difficult to determine if the association between carbohydrate intake and PPARγ indicates browning processes in scWAT given that the mRNA of UCP1 was not related to macronutrient intake. More research is needed to expand on these findings with the use of longitudinal intervention based studies.
**Unpredicted Weight Gain Following Long Term Increased Mvpa Is Linked To Elevated Respiratory Quotient**

Robin P. Shook1, Gregory A. Hand, FACSM2, John Thysfaut, FACSM3, Tarin Phillips2, Steven N. Blair, FACSM.1. Children’s Mercy Hospital, Kansas City, MO. 2University of West Virginia, Morgantown, WV. 3University of Kansas Medical Center, Kansas City, MO. 4Iowa State University, Ames, IA. 5University of South Carolina, Columbia, SC. (Sponsor: Steven Blair, FACSM)

Email: rpshook@cmh.edu

(No relationships reported)

**PURPOSE**: Randomized controlled trials demonstrate that exercise alone, if completed in adequate amounts, will result in weight loss for most individuals but with large variation in amount. The purpose of the current study is to evaluate the role of respiratory quotient (RQ), which represents contributions in substrate oxidation of stored carbohydrates and fats, on weight change among young adults who increased their moderate-to-vigorous physical activity (MVPA).

**Methods**: Participants included 417 young adults; during the 12-month observation period, 114 participants increased their MVPA and were included in the subsequent analyses. Body composition was assessed via dual-energy X-ray absorptiometry, MVPA via arm-based activity monitor, self-reported energy intake (EI) via 24-hour dietary recalls, and RQ via by indirect calorimetry; all were assessed every 3 months, except for RQ which was assessed every 6 months. The study was approved by the local institutional review board.

**Results**: Participants were classified according to 12-month weight change; weight loss (n=38; group mean±SD: −4.0±3.7 kg), weight maintenance (n=38; 0±3.0±3.8 kg), and weight gain (n=38; 2.9±1.4 kg). The weight maintenance and loss groups were subsequently combined. Between group analysis at baseline indicated no difference in body weight (P=0.13), fat mass (P=0.51), fat-free mass (P=0.29), MVPA (P=0.07), EI (P=0.8), or percent of carbohydrates in the diet (P=0.83). RQ was lower in the maintenance/loss group compared to the gain group (0.78 versus 0.801, P=0.02). At 12-month follow-up, there was no between-group difference in MVPA (P=0.14), self-reported EI (P=0.083) or percent of carbohydrates (P=0.18). Total MVPA was significantly higher in the maintenance/loss group (103.7 versus 78.1 min/day, P=0.05). Linear modeling of fat mass change indicated a positive association with RQ at baseline (P=0.06) after adjustment for baseline values and changes in MVPA and EI. Conclusion: These results suggest that resting substrate oxidation may explain the unexpected body weight responses following increases in physical activity. These findings support previous research, which suggests that lower levels of fat oxidation, independent of changes in energy intake and physical activity, contribute to changes in fat mass.

**Hypoxia-inducible Factor 2 Alpha Mediates Exercise-induced Hypothalamic Glucose Sensing**

Vagner Ramon R. Silva1, Carlos K. Katashima2, Luciene Lenhare2, Carla G B Silva1, Rafael L. Camargo1, André V. Cordeiro1, Lucas D M Forte1, Rafael C. Gaspar, Victor R. Muñoz3, Denys E. Cintra1, José R. Pauli1, Clemence Blouet1, Antonio Vital-Puig3, Eduardo R. Ropelle1.1Faculdade de Ciências Aplicadas - UNICAMP, Limeira, Brazil. 2Faculdade de Ciências Médicas - UNICAMP, Campinas, Brazil. 3University of Cambridge Metabolic Research Laboratories WellCome Trust-MRC Institute of Metabolic Science, Cambridge, United Kingdom.

(No relationships reported)

**PURPOSE**: The hypothalamus controls the energy homeostasis integrating of hormonal and nutritional signals. In this context, glucose plays a critical role in the control of energy balance acting in specific hypothalamic neurons. It has been demonstrated that the lost selective of glucose sensitivity in the hypothalamic neurons are related to the hyperphagia and obesity. Recently, the hypoxia-inducible factor 2 alpha (HIF2α) has emerged as regulated important in maintenance of glucose sensitivity in hypothalamic neurons. In this context, the maintenance of neuronal HIF2α function can be considerate a determinate strategy for maintenance of lean phenotype. At the same time, the physical exercise is considered a main contributor to increase HIF2α protein levels in the hypothalamus of rodents.

**METHODS**:Physical exercise, Western blot and stereotaxic surgery were combined to explore HIF2α protein levels and hypothalamic glucose sensitivity. The intracerebroventricular (ICV) injection of glucose was performed to measure the food intake and the quantification of HIF2α pathway in hypothalami of both lean and obese (diet-induced obesity) male Wistar rats. For statistical analysis we used the ANOVA one-way.

**RESULTS**:We observed the reduction of hypothalamic glucose sensitivity in obese mice, which was accompanied by a lower protein expression of HIF-2α, as well as reduction of prolyl hydroxylases (PHDs) and increased expression of HIFα ligase PVHL, product Hippel-Lindau (VHL) gene, when compared to the control group. Interestingly, we found that the exercise restored hypothalamic of HIF-2α expression and glucose sensitivity in obese rats.

**CONCLUSIONS**:Our preliminary results demonstrate that high-fat diet disrupts hypothalamic HIF2α protein and affects the glucose sensitivity in neurons, contributing with hyperphagia. On the other hand, exercise increased HIF-2α protein levels in the hypothalamus and potentiated glucose sensitivity in obese rats, reducing the food intake.

**The Effects of a Clinical Outpatient Behavioral and Nutritional Intervention Program on Body Mass**

Chelsey R. Gregg1, Kim D. Efink2, Christie R. Hudson3, Candice A. O’Hare3, Andrea D. Dodge4, Britney L. Essary5, Amanda C. Bruenlernant6, Jason D. Wagganer6. 1Southeast Missouri State University, Cape Girardeau, MO. 2Saint Francis Medical Center, Cape Girardeau, MO. (No relationships reported)

**PURPOSE**: The purpose of this study was to assess the effects of a clinical outpatient behavioral/nutritional intervention on body mass in overweight and obese individuals. However, further research needs to be conducted to determine the most successful behavioral and/or nutritional intervention for overweight and obese individuals.

**METHODS**: Forty-eight overweight (n=2) and obese (n=46) males (n=17) and females (n=29) [56 (13.1) years, height 1.70 (0.10) m, body mass 120.55 (33.83) kg, and BMI 41.45 (8.55) kg/m2] participated in this 15 week study. Participants self-selected one of two meal plans, offered through Healthy Management Resources, Decision Free or Healthy Solutions. The Decision Free meal plan required the consumption of 500-800 kilocalories per day through a minimum of five shakes or three shakes and two entrees. The Healthy Solutions meal plan required the consumption of 1,200 to 1,400 kilocalories per day through a minimum of three shakes, two entrees and five servings of fruits and vegetables. Both meal plans required regular physical activity of at least 2,000 kilocalories per week. Body mass was measured weekly. **RESULTS**: An independent samples t-test found no significant changes in body mass between the two meal plans. A paired samples t-test showed a significant decrease in the Decision Free meal plan pre- [125.71 (32.50) kg] vs. post-body mass [105.49 (27.01) kg] (t=11.688, p<.001) and the Healthy Solutions diet pre [115.40 (35.06) kg] vs. post-body mass [98.55 (29.88) kg] (t=12.452, p<.001). **CONCLUSIONS**: The results of this study support past research and suggests that behavioral and nutritional interventions are effective strategies for reducing body mass.

**Do Weight Concerns Put Female Prisoners at Risk for Re-Offending?**

Anne R. Lindsay, Sara C. Velasquez. University of Nevada, Reno, Las Vegas, NV. (Sponsor: Melinda Manore, FACSM)

Email: alindsay@ unr.edu

(No relationships reported)

Incarceration and substance abuse are two of the largest public health issues in America. Substance abuse is prevalent (80%) among imprisoned women; particularly stimulant use (e.g., methamphetamine) due to its appealing side effects including weight loss and increased energy. Ironically, newly abstinent from stimulant-type drugs during incarceration, metabolic activity and appetite suppression are removed and women experience significant amounts of unwanted weight. **PURPOSE**: Examine female prisoner’s body weight, perceived weight concerns, and weight loss behaviors as risk factors for re-offending. **METHODS**: Prior to participation in a health and body image program, 364 female inmates completed questionnaires to assess drug history and weight concerns/behaviors. Height, weight and body fat (4-site skinfolds) were assessed and body mass index (BMI) calculated. RESULTS: In the study population, 60% of female prisoners had a history of drug use during incarceration, metabolic activity and appetite suppression are removed and women experience significant amount of unwanted weight. **CONCLUSIONS**: The results of this study support past research and suggests that behavioral and nutritional interventions are effective strategies for reducing body mass.
to lose weight after leaving treatment. **CONCLUSIONS:** Female prisoners were typically overweight or obese and used risky behaviors to manage weight, which may increase their risk of re-offending. Poor weight management behaviors, combined with a lack of PA, in this vulnerable and underserved population leads to “self-medication” to lose weight, which may lead to life-threatening eating disorders and other compensatory behaviors. Health, PA, nutrition and healthy body image programs are warranted in this population.

3448  Board #353  June 2 3:30 PM - 5:00 PM  
**Association Between Health-related Quality Of Life And Weight Loss, Fitness, And Physical Activity**  
Sara J. Kovacs, Renee J. Rogers, Meghan R. McGuire, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.*  
(Sponsor: John M Jakicic, FACSM)  
Email: sjk89@pitt.edu  
(No relationships reported)

Weight loss is associated with improved health-related quality of life (HRQOL); however, it is important to know whether change in physical activity or fitness that also occurs during the weight loss process influences this relationship.  
**Purpose:** This study examined the associations between change in HRQOL and weight loss, fitness, and physical activity in response to a 12 month behavioral weight loss intervention.  
**Methods:** Participants (N=280; Age=45.1±7.9 years, BMI=32.3±3.9 kg/m²) engaged in a 12-month behavioral weight loss intervention program. Participants were randomized to a reduced calorie diet (DIET), diet plus a moderate dose of physical activity (MOD-EX), or diet plus a high dose of physical activity (HIGH-EX). All groups received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Diet was prescribed at 1200-1800 kcal/day. MOD-EX was prescribed physical activity that progressed to 150 min/wk with HIGH-EX progressed to 250 min/wk. Weight, fitness, physical activity, and HRQOL were assessed at 0 and 12 months.  
**Results:** There was significant (p<0.05) weight loss at 12 months (-10.2±7.9 kg; -11.1±7.8%), with no significant difference between intervention conditions. HRQOL, measured by the SF-36, also significantly improved across 12 months (p<0.05), with no significant difference between intervention conditions. Change in HRQOL was associated with change in weight (r=-0.35, p<0.001), percent weight change (r=-0.39, p<0.001), change in fitness (r=0.29, p<0.001), and change in physical activity (r=0.21, p<0.001). While somewhat diminished after controlling for change in fitness, the correlation between change in weight (r=-0.25, p<0.001) and percent change in weight (r=-0.29, p<0.001) remained significant. A similar pattern was shown when controlling for change in physical activity (r=0.34, p<0.001; r=0.38, p<0.001).  
**Conclusions:** Weight loss across a period of 12 months is significantly associated with improved HRQOL in adults who are overweight or obese. It appears that change in fitness and physical activity partially mediate these associations. Thus, it appears that weight loss interventions should target improved fitness and physical activity to maximize improvements in HRQOL.  
Supported by: NIH (R01 HL103646)
A large and consistent body of evidence supports a relationship between aerobic fitness and cognitive function. Alternatively, it is well known that stress and adverse life events impact brain structure and function, and may produce enduring alterations in cognition and behavior. It remains unclear, however, whether fitness moderates the relationship between life stress and cognition. The majority of studies examining the relationship between fitness and cognitive function have relied on behavioral performance measures, while the influence of fitness on select temporal aspects of information processing remains less well known. Given the considerable variation in age-related cognitive decline, it may be important to investigate the relationship of fitness with discrete information processing stages, which may aid in future intervention development.

**METHODS**: The purpose of this study was to examine the relationship between aerobic fitness and different stages of information processing in older adults using the P3 and lateralized readiness (LRP) potentials.

**RESULTS**: Reaction time measures and P3 difference waves supported previous research indicating differences in stimulus evaluation speed between high-fit and low-fit older adults, ps < .05. Higher perceived stress was also associated with a reduction in P3 amplitude and a delay in P3 latency, ps < .05, but not moderated by fitness. **CONCLUSION**: These findings indicate that fitness is associated with preserved cognitive processing that occurs as early as stimulus evaluation. Future research may focus on earlier ERP components (e.g., sensory ERPs) to document the precise temporal relationship between fitness and cognition.

**G-08 Highlighted Symposium - The Role of Exercise in Neuroplasticity: Intervention to Manage Stress and Promote Well-Being**

Saturday, June 3, 2017, 9:00 AM - 11:00 AM
Room: 201

**Chair**: Erica M. Taylor, FACSM. Delaware State University, Dover, DE.
(No relationships reported)

**Co-Chair**: Steven J. Petruzzello, FACSM. University of Illinois at Urbana-Champaign, Urbana, IL.
(No relationships reported)

**June 3 9:10 AM - 9:40 AM**

**Keynote - Integrating Stress, Cognition, and Emotion in Exercise Interventions**

Brandon J. Alderman. Rutgers University, New Brunswick, NJ.
(No relationships reported)

**June 3 9:40 AM - 9:55 AM**

**The Relation of Fitness and Life Stress on the Temporal Dynamics of Cognition in Older Adults: Evidence from the P3 and Lateralized Readiness Potentials**

Christopher J. Brush, Brandon J. Alderman. Rutgers University, New Brunswick, NJ.
(No relationships reported)

**June 3 9:55 AM - 10:10 AM**

**Effects of Exercise on Neurocardiac Responses to a Sad Mood Induction in MDD**

Peter J. Ehmann, Brandon J. Alderman. Rutgers University, New Brunswick, NJ.
(No relationships reported)

Peak positive tibial acceleration (PTA) immediately following foot strike during running is greater in runners with a history of tibial stress fracture. PTA does not increase over the course of a 20min run at lactate threshold pace (i.e., moderate effort) in highly trained runners. However, injury incidence in novice runners is higher, which may suggest that novice runners do not have the control strategy to prevent PTA from increasing over a prolonged run. **PURPOSE**: To assess the effects of a prolonged submaximal run on PTA in novice runners.

**METHODS**: Male (n = 2) and female (n = 8) novice runners (24±5yrs; 5.7±0.12m; 70.7±15.6kg; 24.5±3.8kg/m²) who had been training for less than two years and ran on average at least 1km per week completed a 30min treadmill run at a self-selected speed equivalent to a rate of perceived exertion using the Borg scale between 10-13. A 3D accelerometer (480Hz, PCB Piezotronics, USA) used to measure PTA immediately following foot strike was attached to the distal anteromedial aspect of the right tibia along its longitudinal axis. Sagittal plane foot contact angle and ankle angle were also computed using 3D motion capture data (240Hz, Qualisys, Sweden). Data from five consecutive runs were collected after four (start), 15 (middle) and 30 min (end) of the prolonged run. A one-way repeated measures ANOVA was used to assess main effect of time on PTA (p ≤ 0.05).

**RESULTS**: PTA was not different among time points (p = 0.87). PTA was unchanged between time points during the prolonged run (start: 3.58±1.43g; middle: 3.67±1.09g; end: 3.60±1.47g). Both foot underlying mechanisms have yet to be explored. Preliminary evidence suggests that respiratory sinus arrhythmia (RSA) responses elicited during a sad mood induction, as opposed to a more traditional laboratory stressor, predict symptomatic improvement in currently depressed individuals. **PURPOSE**: To determine the effect of a single bout of moderate-intensity aerobic exercise on affective and neurocardiac responses to a sad film induction. **METHODS**: Using a within-subjects design, 40 young adults (20.1 ± 1.8 yrs) with (or high symptoms of depression; n = 20) and without MDD (n = 20) completed a 30-min session of exercise or a sedentary control condition, in counterbalanced order on two separate days. After a 15-min recovery period, neurocardiac function was assessed during a 3-min sad film induction. Pre-exercise period (PEP) and RSA measures were derived using impedance cardiography and served as proxies of sympathetic and parasympathetic activity, respectively. Affective valence and perceived activation were also assessed at 5-min intervals throughout each session. **RESULTS**. Individuals with MDD demonstrated more robust RSA withdrawal during the sad film following exercise relative to the control condition, p < .05. Importantly, RSA reactivity to the sad film following exercise was similar in individuals with MDD to typical responses among nondepressed control subjects, p > .05. **CONCLUSION**: These findings suggest that exercise may serve as a protective factor preceding exposure to stress in individuals at risk for MDD. Future trials investigating the antidepressant effect of exercise should aim to establish predictive biomarkers of exercise treatment response.

**G-14 Thematic Poster - Biomechanics of Prolonged Running**

Saturday, June 3, 2017, 9:00 AM - 11:00 AM
Room: 403

**Chair**: Allison H. Gruber. Indiana University Bloomington, Bloomington, IN.
(No relationships reported)

**June 3 9:00 AM - 11:00 AM**

**Effect of a Submaximal 30-Minute Run on Peak Tibial Acceleration in Novice Runners**

Max R. Paquette, Kris Carnell, Douglas W. Powell, Allison H. Gruber. University of Memphis, Memphis, TN. Indiana University, Bloomington, IN. (Sponsor: D.S. Blaise Williams III, FACSM)
Email: m.r.paqette@memphis.edu
(No relationships reported)
Fatigue during running decreases the body’s ability to attenuate shock during impact, which may increase overall injury risk. Muscles may assist in the attenuation of shock, and fatigue may induce redistribution in energy absorption during a single leg landing from the ankle to hip, but it is unknown whether there is a change in how joints function to dissipate energy after a high-intensity run. **PURPOSE:** To determine the effect of a high-intensity run on lower extremity energy distribution during running. **METHODS:** Ten experienced male runners, running 30+ minutes at least three times per week participated in this study. Optical motion capture was used to assess overground running mechanics at preferred running speed prior to completing a high-intensity run. A high-intensity training run was then performed at 80% of estimated VO2 max for 30 minutes, or until participants were unable to continue. Running mechanics were assessed again within 20 minutes of completing the run at the same preferred speed observed prior to the training run. Joint powers for the dominant leg hip, knee, and ankle were calculated, and net joint work and total joint work from initial contact to the end of weight acceptance were calculated and normalized to body mass. Repeated measures ANCOVA were used to assess time x joint interactions for net joint work and total joint work, with rating of perceived exertion at the end of the run included as a covariate. Statistical significance was set at p < 0.05.

**RESULTS:** There were no time x joint interaction effects from pre to post run in either net joint work (Hip: 0.087 vs. 0.095 J/kg; Knee: 0.384 vs. -0.366 J/kg; Ankle: -0.362 vs. -0.346 J/kg; p = 0.198) or total joint work (Hip: 0.175 vs. 0.160 J/kg; Knee: 0.452 vs. 0.446; Ankle: 0.365 vs. 0.348; p = 0.282). There were also no main effects of time for both net and total joint work (p = 0.849 and 0.075). **CONCLUSIONS:** No changes were observed in mechanical energy dissipation by the lower extremity joints after a 30-minute high-intensity run, indicating that lower extremity muscle function while running at a self-selected speed may not be affected by general fatigue. Self-selected running may not be intense enough to elicit changes, so further research should be performed to determine the effect of running at higher intensity on muscle function.

---

**Table 1:** Variables of interest at minute one and minute 30 between runners with previous ITBS and controls (CON) (mean ± standard deviation); d is effect size (ES).

<table>
<thead>
<tr>
<th>Time</th>
<th>Group</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>ITBS</td>
<td>CON</td>
</tr>
<tr>
<td>Peak hip adduction (degrees)</td>
<td>1</td>
<td>13.6(3.0)</td>
</tr>
<tr>
<td>30</td>
<td>14.3(3.7)</td>
<td>13.5(3.4)</td>
</tr>
<tr>
<td>Hip adduction excursion (degrees)</td>
<td>1</td>
<td>2.7(2.0)</td>
</tr>
<tr>
<td>30</td>
<td>3.8(3.1)</td>
<td>4.5(1.3)</td>
</tr>
<tr>
<td>Pre-heelstrike gluteus medius activation (%MVIC)</td>
<td>1</td>
<td>80.4(19.7)</td>
</tr>
<tr>
<td>30</td>
<td>93.9(36.9)</td>
<td>63.7(25.2)</td>
</tr>
<tr>
<td>Weight acceptance gluteus medius activation (%MVIC)</td>
<td>1</td>
<td>96.5(13.3)</td>
</tr>
<tr>
<td>30</td>
<td>96.4(7.7)</td>
<td>72.2(26.4)</td>
</tr>
</tbody>
</table>

**CONCLUSION:** Runners with previous ITBS had weak hip abductors but similar peak hip adduction angle to controls. The ITBS group activated their hip abductors more to achieve the same hip adduction angle as controls.

---

**Board #4 June 3 9:00 AM - 11:00 AM**

**The Effect of Compression Tights on Muscle Vibration and Energy Expenditure during a High-Intensity Run**

Hannah Harris, Margaret E. Raabe, Michael P. McNally, Ajit M.W. Chaudhari, FACSM. The Ohio State University, Columbus, OH.

**Email:** harris.2169@osu.edu

(No relationships reported)

**BACKGROUND:** Compression garments are believed to provide performance benefits to runners. It has been shown that wearing these garments leads to reduced muscle vibrations during running and jumping. However, little research has investigated performance benefits that result from a reduction in muscle vibration. It has been proposed that the reduced muscle vibrations may lead to increased performance through a reduction in energy expenditure. **PURPOSE:** Investigate the effect of compression tights on muscle vibration and change in energy expenditure during an endurance run. **METHODS:** Twenty healthy experienced male runners participated. Participants ran at 80% VO2 max speed, previously estimated from an incremental treadmill procedure. Vibration data was collected using a passive marker capture system. The peak amplitude of muscle vibrations (axial direction) was calculated 150ms after foot strike for the quadriceps, hamstrings, gastrocnemius, and tibialis anterior muscles. A run was then performed on a treadmill at the same speed for 30 minutes or until voluntary exhaustion. Participants’ heart rate (HR) was recorded in 5-min increments during the run and energy expenditure (EE) was estimated using the model: EE (kcal/min) = 3.56 - 0.0136(weight) + 0.0019(weight^2). The percent change in EE over the course of the run was analyzed. This protocol was repeated on two separate days, one with running shorts and one with high compression tights (20-25 mmHg). The order of conditions was randomly assigned. **RESULTS:** Paired two-sided t-tests revealed significant difference in muscle vibrations between the running shorts and tights conditions (quads: 15.0±5.2 mm vs 7.6±2.5 mm, p=0.0001), with significantly less muscle vibration in the tights condition for all muscle groups except for the hamstrings (7.6±3.6 mm vs 7.2±2.2 mm, p=0.70). However, there was no significant difference found in the percent increase in EE (9.4±6.1% vs 10.1±5.0%, p=0.43) from the start to end of the run. **CONCLUSION:** Compression tights significantly reduced muscle vibration during running but had no effect on energy expenditure during an endurance run. Future work should investigate other performance variables that may be affected by wearing compression tights to better understand potential performance benefits.

---

**Board #5 June 3 9:00 AM - 11:00 AM**

**The Effect of Cushioned Insoles on Tibial Acceleration During Running**

Anisa Rohilla, Natalie Turner, Jake Glazer, Ryan Smith, Dimitrios Katsavelis. Creighton University, Omaha, NE.

**Email:** AnisaRohilla@creighton.edu

(No relationships reported)

**BACKGROUND:** Running through fatigue has been found to place an excessive amount of stress to lower extremities that may increase the risk of overuse injuries. Cushioned insoles are suggested to help attenuate shock and reduce impact forces caused by running. **PURPOSE:** To investigate the effect of implementing cushioned insoles on subjects before and after a fatigue protocol run to determine whether the insoles significantly lessened impacts. **METHODS:** Four male college students (age = 22.8±4yr, weight = 80.2±5kg, height = 187.3±3cm) participated in the study. The participants were of approximately the same speed with or without cushioned insoles. Impact data was collected using a passive marker capture system. The peak amplitude of muscle vibrations (axial direction) was calculated 150ms after foot strike for the quadriceps, hamstrings, gastrocnemius, and tibialis anterior muscles. A run was then performed on a treadmill at the same speed for 30 minutes or until voluntary exhaustion. Participants’ heart rate (HR) was recorded in 5-min increments during the run and energy expenditure (EE) was estimated using the model: EE (kcal/min) = 3.56 - 0.0136(weight) + 0.0019(weight^2). The percent change in EE over the course of the run was analyzed. This protocol was repeated on two separate days, one with running shorts and one with high compression tights (20-25 mmHg). The order of conditions was randomly assigned. **RESULTS:** Paired two-sided t-tests revealed significant difference in muscle vibrations between the running shorts and tights conditions (quads: 15.0±5.2 mm vs 7.6±2.5 mm, p=0.0001), with significantly less muscle vibration in the tights condition for all muscle groups except for the hamstrings (7.6±3.6 mm vs 7.2±2.2 mm, p=0.70). However, there was no significant difference found in the percent increase in EE (9.4±6.1% vs 10.1±5.0%, p=0.43) from the start to end of the run. **CONCLUSION:** Compression tights significantly reduced muscle vibration during running but had no effect on energy expenditure during an endurance run. Future work should investigate other performance variables that may be affected by wearing compression tights to better understand potential performance benefits.

---

Abstracts were prepared by the authors and printed as submitted.
were tested three times over a period of three weeks. During the first visit, lactate threshold speed (LTS) was assessed via blood samples (7.8 ± 5.3ml/h). During the second and third visits participants were randomly assigned to undergo incremental treadmill tests with and without insoles. The incremental runs included two rounds of seven 30-second bouts at stages -20% below to +40% above the LTS, with a 20 minute run at LTS in between the two trials. A triaxial accelerometer that was placed at each subject’s dominant tibial plateau recorded acceleration before and after the 20min run. Tibial acceleration (TA), stride length and frequency were calculated through Matlab.

**Results:** A two way repeated ANOVA (2 fatigue states by 2 insoles conditions) showed that there was a main effect of state (p = 0.003) and a main effect of insole condition (p < 0.001), as well as an interaction (p = 0.044). Post hoc analysis revealed that TA was significantly lower during the non-fatigue control run with insoles when compared to the other conditions. Over the course of both pre- and post-fatigue incremental tests, stride length and frequency did not change. **Conclusion:** The findings indicate that insoles are an effective way to reduce tibial acceleration during running, but to a greater extent in the absence of fatigue (22% vs. 13%).

**METHODS:** Eighteen competitive runners (8M; 20.3 ± 1.8 yrs; 59.9 ± 7.8 kg) recorded informed consent and completed a VO2 peak test on the LBPP-TM and two separate trials consisting of a 30-min continuous run at 65% VO2 peak. Each continuous run started with a 10-min familiarization segment at 100% BW before 5-min segments at 100, 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).

**RESULTS:** There was a significant main effect of BW level (F(2,4,14)=81.3, p<0.001) and DM (F(1,17)=6.8, p<0.01) on VO2. SR was significantly reduced at 90, 80, and 70% BW. In a counterbalanced design, SR was controlled in one trial as runners matched a digital metronome (DM) set to their SR recorded during the familiarization run. VO2 was collected over the last two-minutes of each segment. Hi-speed video (210 Hz) was recorded for each trial and SR subsequently determined. All dependent variables were compared using repeated-measures ANOVAs with Bonferroni post hoc testing (SPSS Statistics 23).
than the Intermediate and Novice athletes (304±25, 258±26, 212±29 repititions, respectively; p<0.001). Regression analysis revealed experience was the greatest predictor of performance in this 15-min HIIT workout (r²=0.658, p<0.001).

**CONCLUSIONS:** These data support the notion that individuals with different training levels respond differently to a specific HIIT workout. Further studies should continue to explore these differences among athletes with different training levels.

**Board #3**  
June 3 9:00 AM - 11:00 AM  
**Effects Of High-intensity Functional Circuit Training On Motor Function And Exercise Motivation: A Randomized-controlled Trial**  
Jan Wilke, Stefanie Kaiser, Daniel Niederer, Tobias Engeroff, Lutz Vogt, Winfried Banzer, FACSM. Goethe University Frankfurt, Frankfurt am Main, Germany.  
Email: wilke@sport.uni-frankfurt.de  
(No relationships reported)

**PURPOSE:** Only a small share of the world population meets current physical activity guidelines, which recommend regular engagement in endurance, strength, and neuromotor exercise. As lack of time has been reported to constitute a major cause of inactivity, multidimensional methods with short training duration might be a promising alternative to classical, volume-oriented approaches. This randomized controlled trial aimed to examine the effects of a high-intensity functional circuit (HIFCT) training program on motor function and motivation to exercise in healthy, untrained adults.

**METHODS:** 25 inactive participants (26±5 yrs, 9/7) were randomly allocated to two groups. The intervention group (HIFCT, n=15) performed functional exercises incorporating complex whole-body movements (e.g. Squats, Step-Ups, Burpees) in a circuit format. The 15 min workouts were composed of repetitive 20s all-out bouts with 10s breaks. In the comparison group (moderate aerobic exercise, MAE) the participants walked 3/5k/wk for 50 min at moderate intensity (progressively increased from 50 to 60% of the individual heart rate reserve). Motivation outcomes, measured prior to and after the six-week intervention, were cycling capacity (maximum work load), dynamic maximum strength (leg and shoulder press), postural control (force plate), and jump capacity (reactive strength index, counter-movement jump, single leg hop for distance). Motivation to exercise was assessed using the self-concordance index. Systematic group differences were detected with the Mann-Whitney test (p<.05).

**RESULTS:** In comparison to MAE, HIFCT increased maximum leg strength (difference of relative median pre-post changes between groups: 6%), shoulder strength (8.4%), and cycling workload (6.5%; p<.05). No differences were found for postural control and jump capacity (p>0.05). Although not statistically significant, there was a tendency for increased self-concordance following HIFCT (p=1).

**CONCLUSION:** Despite considerably shorter training duration, HIFCT enhances motor function in healthy untrained adults more effectively than MAE. It might moreover be better suited to motivate inactive people to engage in regular activity. Further research should thus investigate long-term adherence to the program and its effectivity in other settings.

**Board #4**  
June 3 9:00 AM - 11:00 AM  
**Strength and Power Acute Responses to Suspension Training**  
Cristina Cortis1, Giuseppe F. Giancotti2, Carlo Varalda2, Francesca De Cecio1, Gabriel Risil2, Francesco Di Siena1, Giuseppe Di Micco3, Andrea Fusco4, Laura Capranica5.  
1University of Cassino e Lazio Meridionale, Cassino, Italy.  
2Italian Weightlifting Federation FIPE, Rome, Italy.  
3University of Rome Foro Italico, Rome, Italy. (Sponsor: Carl Foster, FACSM)  
Email: c.cortis@unicas.it  
(No relationships reported)

Suspension Training (ST) is a form of resistance training aiming at improving strength, endurance, coordination, flexibility, power, and core stability. Although ST is thought to elicit higher muscle activations than traditional exercises, only limited information is available on its acute effects on strength and power performances. **PURPOSE:** To evaluate strength and power acute responses after group ST in relation to gender.

**METHODS:** 32 college students (16 M, 16 F; Age: 17.2 ± 1.2 yrs; height, 173.7 ± 8.9 cm; mass, 67.7 ± 14.0 kg; VO2 = 47.3 ± 7.9 ml.kg⁻¹.min⁻¹) were assigned to 3 matched groups, high-intensity intermittent training (HIFIT), continuous training (CET) and a no-training control group (CG), based on maximally accumulated oxygen deficit (MAOD) scores. HIFIT completed 8 x 20s sprints at 170% W-VO2max with 10s recovery 3 times a week for 4-weeks, CET completed 30min cycling at 70% W-VO2max (70 rpm) 3 times per week for 4-weeks. Pre and post training VO2max, MAOD, cardiac output (Q), HR were assessed using breath-by-breath analysis and exercising on an electronically controlled cycle ergometer. Additionally blood glucose, blood lactate and key haematological parameters were assessed. Plateau criteria was determined as ΔVO2 ≤1.5 ml.kg⁻¹.min⁻¹ over the final 60s of the VO2max trial.

**RESULTS:** HIFIT increased MAOD from 37.4 ± 10.7 to 41.9 ± 9.6ml.kg⁻¹(P<0.02) while there was no change in either CG or CET. ΔVO2 during final 60s of the VO2max test showed no change for HIFIT or CET following 4-weeks of training, while total exercise time increased by 13.2% for HIFIT (P=0.004) and 15.6% CET (P=0.036) with no change for CG. VO2max showed no change for HIFIT but increased from 47.9 ± 7.7 ml.kg⁻¹.min⁻¹ to 51.5 ± 10.0 ml.kg⁻¹.min⁻¹ (P=0.015) Qmax decreased by 2.0 ± 2.1 l.min⁻¹ following HIFIT (P=0.019) coupled with an increase in ΔQmax from 2.5 ± 3.4 ml.100m⁻¹ (P=0.042) while for CET there was no change in either Qmax or ΔQmax. HIFIT also showed a significant increase in HRR post training (P=0.002) with no change in either CG or CET.

**CONCLUSIONS:** These data suggest that 4-weeks of HIFIT training was sufficient to induce a large increase in the finite anaerobic capacity but could not show any effect on the incidence of plateau at VO2max. It is thus concluded that the plateau is simply not a product of anaerobic energy provision but a more complex psychobiological component.

**Board #5**  
June 3 9:00 AM - 11:00 AM  
**The Effects Of 4-weeks HiiT And Continuous Based Training On The Incidence Of Plateau At VO2max And The Anaerobic Capacity**  
Dan A. Gordon, Viviane Merzbach, Adrian Scruton, Justin Roberts, Henry Chung. Anglia Ruskin University, Cambridge, United Kingdom.  
Email: dan.gordon@anglia.ac.uk  
(No relationships reported)

**PURPOSE:** The plateau at VO2max has been attributed to the size of the finite anaerobic capacity which has previously been shown as a trainable parameter. Therefore the purpose of this study was to assess the effects of 4-weeks HIIIT or continuous training on the incidence of plateau at VO2max and the anaerobic capacity. **METHOD:** Following Institutional ethics approval n=30 physically active adolescents agreed to participate (age, 17.2 ± 1.2 yrs; height, 173.7 ± 8.9 cm; mass, 67.7 ± 14.0 kg; VO2 = 47.3 ± 7.9 ml.kg⁻¹.min⁻¹). They were assigned to 3 matched groups, high-intensity intermittent training (HIIIT), continuous training (CET) and a no-training control group (CG), based on maximally accumulated oxygen deficit (MAOD) scores. HIIIT completed 8 x 20s sprints at 170% W-VO2max with 10s recovery 3 times a week for 4-weeks, CET completed 30min cycling at 70% W-VO2max (70 rpm) 3 times per week for 4-weeks. Pre and post training VO2max, MAOD, cardiac output (Q), HR were assessed using breath-by-breath analysis and exercising on an electronically controlled cycle ergometer. Additionally blood glucose, blood lactate and key haematological parameters were assessed. Plateau criteria was determined as ΔVO2 ≤1.5 ml.kg⁻¹.min⁻¹ over the final 60s of the VO2max trial.

**RESULTS:** HIIIT increased MAOD from 37.4 ± 10.7 to 41.9 ± 9.6ml.kg⁻¹(P<0.02) while there was no change in either CG or CET. ΔVO2 during final 60s of the VO2max test showed no change for HIIIT or CET following 4-weeks of training, while total exercise time increased by 13.2% for HIIIT (P=0.004) and 15.6% CET (P=0.036) with no change for CG. VO2max showed no change for HIIIT but increased from 47.9 ± 7.7 ml.kg⁻¹.min⁻¹ to 51.5 ± 10.0 ml.kg⁻¹.min⁻¹ (P=0.015) Qmax decreased by 2.0 ± 2.1 l.min⁻¹ following HIIIT (P=0.019) coupled with an increase in ΔQmax from 2.5 ± 3.4 ml.100m⁻¹ (P=0.042) while for CET there was no change in either Qmax or ΔQmax. HIIIT also showed a significant increase in HR during post training (P=0.002) with no change in either CG or CET.

**CONCLUSIONS:** These data support the notion that individuals with different training levels respond differently to a specific HIFT workout. Further studies should continue to explore these differences among athletes with different training levels.
protocols. Separate 2 (sex) X 3 (protocol) repeated measures ANOVA techniques (SPSS v22; p < 0.05) with post hoc analysis were applied to examine differences.

**RESULTS**: There were no sex effects of protocol. However, a significant effect of sex, although not found for BLA and VO₂, was observed for RPE (M=17.2±2.0; F=16.1±5.1; p=0.034), W (M=165±33W; F=137±24W; F=7.519; p=0.021), HR (M=168±16bmp; F=181±58bmp; F=14.218; p=0.002) and EE (M=11.2±1.5kcal·min⁻¹; F=9.0±0.15 kcal·min⁻¹; F=11.635; p=0.004); peak W also differed by sex (M=674.5±147W; F=420±61W; F=14.393; p=0.002). There were no sex by protocol effects.

**CONCLUSION**: Our 1.1-, 1.2- and 1.3 work-to-rest HIT bouts, which held work constant at 30 sec, did not elicit a change in cardiovascular or metabolic responses. However, there were sex specific differences for 4 variables; this is most likely explained by physiological and training differences between the men and women in this study. Future studies and exercise programs should consider sex differences during HIT training when developing exercise protocols.

---

**G-16 Thematic Poster - Muscle Physiology**

*June 3 9:00 AM - 11:00 AM*

**Board #1**

**Mechanomyographic Responses to Blood Flow Restricted, Fatiguing Isometric Muscle Actions**

Jakob J. Rosengarten, Jared W. Coburn, FACS, Lee E. Brown, FACS, Andrew J. Galpin, Cal State Fullerton, Fullerton, CA. (Sponsor: Jared W Coburn, FACS)

Blood flow restriction (BFR) during low intensity resistance exercise (LIRE) has been shown to increase activation of lower body musculature. It is unclear if this is due to increases in motor unit recruitment (MU) or firing rate. Mechanomyography (MMG) has been used to investigate motor unit recruitment (MMG amplitude) and motor unit firing rate (MMG frequency).

**PURPOSE**: To use MMG to investigate the neuromuscular effects of BFR in the lower body during LIRE.

**METHODS**: Ten males (age = 27.1 ± 3.1y; height = 177.6 ± 6.2 cm; mass = 86.9 ± 13.0 kg) performed 3 knee extensor maximal voluntary isometric contractions (MVIC) with the right limb. Occlusion (OCC) was then applied to the right thigh using a KAATSU master unit while two sets (set 1 = 30 ± 7.96 repetitions; set 2 = 13.0 ± 11.29 repetitions) of repeated 5-second isometric knee extensions at 30% of peak torque were performed. Each set was performed to fatigue, defined as the inability to reach 30% of MVC torque, with 2-seconds rest between repetitions. The same procedure was repeated during a second visit without occlusion (NONOCC), while matching the number of repetitions per set to the first visit. An accelerometer was used to collect MMG data from the vastus lateralis during the MVICS and both sets. Prior to data analysis, repetitions were normalized as percentages (25%, 50%, 75% and 100%) of total repetitions completed, and MMG data were normalized to the values from MVIC testing.

**RESULTS**: For MMG frequency, a significant 3-way interaction between set (2), condition (2) and percent repetitions (4) (p=0.046) was found. Follow-up tests revealed no interaction or main effects for set 1 (p=0.05) and no interactions for set 2. When collapsed across percent repetitions, MMG frequency was lower for OCC (0.837 ± 0.045) than for NONOCC (1.116 ± 0.099) during set 2 (p=0.046). For MMG amplitude, there was a significant condition by set interaction (p=0.023). MMG amplitude was higher for the OCC condition (0.754 ± 0.187) than for the NONOCC condition during set 2 (0.481 ± 0.163; p=0.001). MMG amplitude during set 1 (0.599 ± 0.179) was lower than set 2 (0.754 ± 0.187; p=0.042) for OCC.

**CONCLUSION**: OCC exhibited lower levels of MMG frequency and higher values for MMG amplitude. This suggests that higher MU recruitment, rather than firing rate, was responsible for increased muscle activation during BFR.
Whether an inhibitory feedback mechanism explains sex-related discrepancies in muscular fatigue is unclear. PURPOSE: To examine sex-related differences in the influence of inhibitory sensory feedback during fatiguing contractions. METHODS: A fatigue task was performed by 20 subjects (7 males and 13 females; 18-30 years), which consisted of 1) baseline assessments; 2) a 20-s sustained maximum voluntary contraction (MVC) while blood flow to the shank was occluded; 3) a 20-s MVC performed 3 minutes after the fatiguing task, while blood flow remained occluded; and 4) a 5-s MVC performed 3 minutes after blood flow was returned. Force of the ankle dorsiflexors and EMG of the tibialis anterior were monitored during all contractions. Maximal M-waves were recorded from the tibialis anterior via stimulation of the peroneal nerve prior to and immediately following each contraction. RESULTS: No significant differences were observed between males and females for baseline measures of MVC (P = 0.72), EMG (P = 0.44), or M-wave amplitude (P = 0.40) or latency (P = 0.37). The 20-s contraction resulted in a significant reduction in MVC force (P = 0.001), which was similar between males and females (P = 0.33). MVC force remained reduced following 3 minutes of rest while blood flow was occluded, but returned to baseline when blood flow was restored (P = 0.18). EMG amplitude remained similar at all time points of the experiment (P = 0.11). The amplitude of the M-wave was similarly reduced (P = 0.001) in men and women (P = 0.60) at the end of the fatiguing contraction, increased following rest with blood flow occluded (P = 0.03), and returned to baseline following the return of blood flow (P = 0.21). M-wave latency did not change significantly at any time point (P = 0.11). CONCLUSION: These results indicate the importance of peripheral feedback during fatigue for both men and women and suggest that a potential oxidative advantage for women is eliminated during a time of the experiment (P = 0.11). The importance of peripheral feedback during fatigue for both men and women and suggest that a potential oxidative advantage for women is eliminated during a time of the experiment (P = 0.11).
CONCLUSIONS: Fatigue is a major limiting factor for application of ES in sports injury and rehabilitation. Muscles with different fiber type composition respond differently to stimulation frequencies and fatigue development. These differences should be considered when developing treatment plans. Supported by NSF EFRI 1332329.

PURPOSE: To use a deterministic model of individual motor unit and whole muscle fatigue to evaluate MU recruitment during low and high relative force efforts to volitional fatigue.

METHODS: Our deterministic model predicts the forces and force capacities of 120 motor units, and the whole muscle, for the full range of excitations. We estimated: relative force, excitation threshold, initial firing rate, maximum firing rate and excitation adaptation of each MU. During sustained, constant force contractions, we calculated the required excitation level to meet the force demand, and monitored the instantaneous levels of each variable listed above, to determine force and force capacity changes in each active MU and the whole muscle over 0.1 s intervals. The model provided very good estimates of endurance times for intensities ranging from 15% to 90% MVC, compared to published values.

RESULTS: The model predicted endurance times of 509.0 s and 14.4 s at 20% and 80% MVC, respectively, at which time all MUs were recruited for both intensities. The 20% MVC condition resulted in larger relative decreases in strength (i.e., ‘fatigue’) for 120 MUs. At the endurance time for the 20% condition, fatigue was 6.4%, 81.8%, 7.4% and 54.3% for the lowest MU (#1), middle MU (#60), and highest threshold MU (#120) and average MU, respectively. In contrast, at the endurance time for the 80% condition, fatigue was 0.2%, 2.3%, 3.8% and 4.3% for MUs 1, 60, and 120, and average MU, respectively. Excitation adaptations resulted in decreases in firing rates for all motor units, relative to initial maximum rested values.

CONCLUSION: The 20% MVC endurance trials resulted in the eventual recruitment of all MUs and >10-fold greater average fatigue for the MU population compared to the 80% MVC condition. Therefore, low intensity contractions, sustained to volitional fatigue, may provide more challenge to the motor unit population, and a more profound overall stimulus for muscle hypertrophy, compared to high intensity contractions.

G-17 Thematic Poster - Vascular Function
Saturday, June 3, 2017, 9:00 AM - 11:00 AM
Room: 404

Board #7
June 3 9:00 AM - 11:00 AM
Muscle Specific Endurance of the Lower Back Erectors Using Electrical Twitch Mechanography
Kevin K. McCully, FACSM,1 Caio Morales,1 Sahil V. Patel1, Max Green2, T. Bradley Willingham1. 1University of Georgia, Athens, GA. 2UAGA-AMU Medical Partnership, Athens, GA. Email: mccully@uga.edu
Reported Relationships: K.K. McCully: Intellectual Property; Infrared Rs, Inc. Consulting Fee; NovaCrite, Ownership Interest (Stocks, Bonds); Infrared Rs, Inc. Employee of an ACCME Defined Commercial Interest; Infrared Rs, Inc.

Lower back pain is a common symptom that may be associated with skeletal muscle dysfunction. PURPOSE: This study evaluated the endurance of the lower back muscles in healthy participants using accelerometer-based mechanomyography (aMMG). METHODS: Surface electrodes and a tri-axial aMMG device were placed on the belly of the erector spinae muscles along the T11-L1 vertebrae. Current intensity to maximize the acceleration at the end of each stage of stimulation was determined as the maintenance of acceleration at the end of each stage of stimulation relative to the peak acceleration. Subjects (N=7) were tested on two separate days to calculate an endurance index (EI) as the percent of acceleration at the end of each stage of stimulation compared to initial maximum rested values. EI values for the arm and the leg (all comparisons, p<0.05). B-HO2 values for the erector spinae were 86.4 + 10.9% at rest, and 77.2 + 15.5%, 84.3 + 14.1%, and 84.1 + 18.9% for 2, 4, 6 Hz, respectively. CONCLUSION: EI is a reproducible method of assessing muscle endurance of the lower back erector muscles that is not related to low oxygen levels. The erector spinae muscles have lower muscle endurance relative to limb muscles.:

Evaluation of muscle endurance is important for many clinical populations. PURPOSE: Evaluate the utility of a clinical assessment of muscle endurance that uses twitch electrical stimulation and accelerometer-based mechanomyography (aMMG). METHODS: Twenty healthy participants (9 males; 11 females) and three participants with multiple sclerosis (MS) were tested. Muscle twitch acceleration was measured using an accelerometer placed over the surface of the muscle. The relationship between acceleration and torque was measured during twitch stimulation of the vastus lateralis muscle. Muscle endurance of the forearm and gastrocnemius was measured during 9 minutes of twitch electrical stimulation, in three stages (3min/stage) of increasing frequency (2Hz, 4Hz, and 6Hz). Endurance Index (EI) was calculated as the percent of acceleration at the end of each stage of stimulation relative to the peak acceleration. Oxygen saturation of HbO2 was measured using near-infrared spectroscopy. RESULTS: Acceleration correlated with torque during twitch electrical stimulation of the vastus lateralis(mean R2= 0.96±0.04; p<0.05). Measures of EI reproducibility were CV= 2.49±3.67% for the 2Hz stage, CV= 7.36±8.11% for the 4Hz stage, and CV= 4.30±3.09% for the 6Hz stage. EI was significantly higher in the gastrocnemius at the 4Hz (EI=96.1±2.9%) and 6Hz (EI=95.5±2.03%) stages compared to the forearm (4Hz: EI=87.1±9.3%; 6Hz: EI=68.3±17.6%) in healthy controls (p<0.01). Muscle oxygen saturation was not reduced during stimulation of the forearm (72.6±9.8% at 2Hz, 73.2±11.6% at 4Hz, and 71.0±12.5% at 6Hz) compared to baseline (74.3±15.1%; p>0.1). Participants with MS had significantly lower gastrocnemius muscle endurance at the 2Hz (EI=53.6±10.2%), 4Hz (EI=57.2±5.1%), and 6Hz (EI=20.6±8.7%) stages compared to healthy controls (p<0.01). CONCLUSION: Muscle endurance as measured by twitch electrical stimulation and aMMG has the potential to evaluate endurance in various muscles and clinical populations.

Current continuous flow left ventricular assist devices (LVAD) decrease peripheral vascular pulsatility, which may contribute to side effects such as bleeding, thrombotic events and orthostatic intolerance. PURPOSE: To investigate the impact of manipulating LVAD pump speed, documented as revolutions per minute (RPM), on peripheral (brachial artery) pulsatility index (PI) in 20 heart failure patients implanted with a HeartWare (HAVAD, n = 10) or HeartMateII (HMII, n = 10) LVAD. METHODS: Doppler ultrasound blood velocity in the brachial artery was recorded at baseline and 5 minutes after altering RPM, at three different RPM settings above and below baseline (60 RPM increments for HVAD and 200 for HMII). Brachial PI was calculated for each cardiac cycle by dividing the difference between minimum and maximum blood velocity by the time averaged mean blood velocity. LVAD device pulsatility indices that are used clinically were also recorded: maximum blood velocity (Vmax) and minimum blood velocity (Vmin) (HVAD and HMII) and PI (HMII). Relationships were evaluated using multilevel linear modeling with random intercepts and data are reported as mean±SE. RESULTS: Baseline RPMs were 2590±44 (HAVAD) and 9220±75 (HMII). Brachial PI changed significantly across the range of LVAD RPM speeds tested (HAVAD: 360; HMII: 1200), from 2.3±0.6 to 4.1±0.9 with the HVAD and from 1.8±0.6 to 3.6±1.0 with the HMII, with no differences in brachial PI between
Moving from a supine to a standing position typically reduces plasma volume (PV) and while this increases the concentration of some molecules in the blood, the effect on plasma nitrate ([NO3]−) and nitrite ([NO2]−) has not been reported. PURPOSE: To determine the change (Δ) in PV, [NO3]− and [NO2]− while lying supine, sitting, standing, and following short-duration exercise. METHODS: Fourteen participants (9 male, age 27 ± 4 yr, body mass 71 ± 11 kg) completed two trials. The first was conducted with no dietary intervention (control; CON) and the second was preceded by ingestion of 3 x 70 ml of NO3-rich beetroot juice the day before and 2 x 70 ml two hours before the trial (BR; total of ~31 mmol NO3−). Both trials comprised 30 min lying supine followed by 2 min of standing, 2 min of sitting, and then 5 min of cycling at 60% of the age-predicted maximal heart rate. Repeated blood samples were collected to allow measurements of haemoglobin and haematocrit in whole blood and plasma [NO3]− and [NO2]− by chemiluminescence. The ΔPV was calculated using the Dill and Costill formula. RESULTS: Following the supine phase, PV increased from baseline in both trials (CON Δ 12 ± 10% and BR Δ 13 ± 9%; both P < 0.01) and then decreased upon standing (CON Δ 5 ± 8%; P < 0.01; BR Δ 4 ± 3%; P < 0.02), sitting (CON Δ 10 ± 1 ± 3%; BR Δ 6 ± 4 ± 3.6%; both P < 0.001) and following exercise (CON Δ 18 ± 15 ± 8.4%; BR Δ 15 ± 15 ± 3.4%; both P < 0.001). Plasma [NO3]− levels at baseline were 120 ± 49 nM and 327 ± 129 nM in CON and BR, respectively. Plasma [NO2]− decreased from baseline after lying supine in both trials (CON 77 ± 30 nM vs. BR 231 ± 69 nM, both P < 0.001) but before increasing during standing (CON 109 ± 42 nM vs. BR 297 ± 105 nM, both P < 0.001) and following sitting (CON 131 ± 43 nM, BR 385 ± 125 nM, both P < 0.002). Plasma [NO2]− remained elevated following exercise in the CON trial (125 ± 61 nM, P < 0.05) but was not different to the 30 min supine value in the BR trial. There were no statistical differences in [NO2]− between measurement points in either condition (P < 0.05). CONCLUSIONS: Plasma [NO2]− changes in the opposite direction to PV during changes in posture, both in the presence and absence of prior dietary NO3− supplementation. It has been shown that [NO2]− offers the best approximation of nitric oxide bioavailability; researchers must be cognizant of these outcomes when designing and interpreting dietary NO3− research.
protocol consisted of eccentric contractions of the TA in one leg, while the contralateral leg served as control. At baseline, and 48h after eccentric exercise, participants were positioned in a 3T magnet, and BOLD images were acquired bilaterally in TA muscle during i) brief maximal contractions (MVC), and ii) cuff occlusion (5 min, 260mmHg) to monitor the hyperemic responses. The time-to-peak (TTP, s) of the hyperemic response was used as an index of microvascular reactivity. Data were analyzed using mixed model, three-way (Leg, Group, Session (0h, 48h)) repeated measures ANOVA. RESULTS: The ANOVA revealed leg-by-session interactions for TTP following brief MVCs and cuff occlusion (P < 0.001), with no main or interaction effects of group. Specifically, 48h after eccentric exercise, TTP (MVC) was prolonged in all groups compared with baseline (BR: 8.6±1.0 vs.10.9±1.0 s; AO: 8.4±0.4 vs.10.1±0.4 s; PLA: 9.0±0.9 vs.11.0±0.8 s), with no changes in control leg. Similarly, 48h after eccentric exercise, TTP (cuff) was prolonged in all groups compared with baseline (BR: 45.5±4.7 vs.68.6±7.7 s; AO: 36.8±5.7 vs.54.5±8.5 s; PLA: 42.1±6.6 vs.68.1±7.1 s), with no changes in control leg. CONCLUSION: Ingestion of BR and AO do not preserve microvascular reactivity after eccentric exercise, indicating that elevated oxidative stress and lower NO bioavailability do not contribute to altered microvascular function after eccentric exercise. Supported by Danish Ministry of Culture grant.

Bikram (hot) yoga is a style of hatha yoga practiced at 40.5°C with 40-60% relative humidity. We have previously documented improvements in endothelium-dependent vasodilation with a Bikram yoga intervention in middle-aged adults. Presently, it is not known whether the effect of hot yoga on endothelial function might be attributed to the yoga postures or the heated environment. PURPOSE: The purpose of this investigation was to determine the effects of Bikram yoga performed in standard baseline conditions and in a thermoneutral environment on endothelium-dependent vasodilation. METHODS: Fifty-two sedentary but apparently healthy adults aged 40-60 years were randomly assigned to one of three groups: Bikram yoga practiced at 40.5°C (n=19); Bikram yoga practiced at 23°C (n=15); or sedentary time-control (n=19). The 12-week yoga intervention consisted of 3 weekly 90-minute Bikram yoga classes. The time control group was instructed to maintain current lifestyle patterns for the study duration. Body composition was determined via dual energy x-ray absorptiometry (DXA). Endothelium-dependent vasodilation was measured noninvasively using brachial artery flow-mediated dilation (FMD) after 5 minutes of blood flow occlusion. RESULTS: Age, anthropometric variables, lipid, glucose, and triglyceride concentrations were not different among the three groups at baseline. Body fat percentage declined (p<0.01) and LDL-cholesterol concentration tended to decline (p=0.09) only in the hot (40.5°C) yoga group. Brachial artery FMD increased (P<0.05) in both yoga groups. There were no significant changes in any outcome variables in the time control group. CONCLUSIONS: Bikram yoga practiced at both/humid and thermoneutral conditions produced similar improvements in endothelium-dependent vasodilation in healthy, middle-aged adults. However, the addition of the heat/humidity led to further improvements in body composition.

This study was funded by Pure Action, Inc. Austin, TX, USA.

**Additional Reading**
- **MEDICINE & SCIENCE IN SPORTS & EXERCISE®**
  - Vol. 49 No. 5
  - Supplement

**G-18 Clinical Case Slide - Cervical Spine**

**3525 Chair:** Joseph Ihm, FACSM. Rehabilitation Institute of Chicago, Chicago, IL.

**3526 Discussant:** Scott Laker. University of Colorado, Denver, CO.

**3527 Discussant:** Matthew Sedgley. MedStar Ortho and Sports Medicine, Ellicott City, MD.

**3528 Chair:** Joseph Ihm, FACSM. Rehabilitation Institute of Chicago, Chicago, IL.

**3529 Chair:** Joseph Ihm, FACSM. Rehabilitation Institute of Chicago, Chicago, IL.

**PHYSICAL EXAMINATION:** There was no deformity to the neck or upper extremity. No cervical or left shoulder tenderness to palpation. His range of motion in the left glenohumeral joint was full. Strength was full throughout the entire left upper extremity.


**TREATMENT AND OUTCOMES:** 1. Orthopaedic spine referral recommended to treat with non-operative management 2. Physical therapy for cervical strengthening, flexibility, and traction. 3. Current being withheld from competition with undetermined return to play date.

**HISTORY:** A 20-year-old male community college football defensive end developed left shoulder paresthesia during a game. He was tackling an opponent and his head was forced into a left lateral rotation. After this, he developed immediate paresthesia in the left upper trapezius and upper deltoid. He was evaluated on the side line by medical staff and removed from the remainder of game. Symptoms resolved within the next two days, and he returned to competition. Two weeks later, he again had his head forced into a left lateral rotation during a tackle. Paresthesia immediately returned in the left upper trapezius and upper deltoid. However, this time pain was increased and had onset of a burning sensation. After sideline evaluation, he was removed from competition. Following the game, he continued to have severe burning pain.

He was sent to a local emergency department and ultimately released home. Paresthesia resolved over the next five days, but he was not cleared to return to competition.


**TREATMENT AND OUTCOMES:** 1. Orthopaedic spine referral recommended to treat with non-operative management 2. Physical therapy for cervical strengthening, flexibility, and traction. 3. Currently being withheld from competition with undetermined return to play date.
he began experiencing weakness and paresthesias in both hands. This progressed to his right lower extremity, then all four extremities, and by the time of the PT evaluation, the patient was no longer able to stand. He also endorsed several episodes of bladder incontinence, constipation, and painful muscle spasms. He was scheduled for imaging of the spine and a follow-up with his physician in two months. Review of the medical record revealed that the patient was evaluated by a physical therapist nine months prior. His presentation then was consistent with the working diagnosis of PN. However, a sinister diagnosis was suspected due to the involvement of all four extremities without risk factors for polyneuropathy. At that time, no further steps were taken as the patient did not follow up in clinic.

**PHYSICAL EXAMINATION:** The patient presented in a wheelchair, though was unable to propel or stand without assistance due to significantly worsening weakness. Neurologic exam revealed several upper motor neuron signs including hypertonia and hyperreflexia. This presentation was no longer consistent with the working diagnosis of PN (see table).

**DIFFERENTIAL DIAGNOSIS:**
1. Cervical spine stenosis with myelopathy
2. Space occupying lesion in cervical region
3. Progressive motor neuron disease

**TESTS AND RESULTS**
Cervical Thoracic spine MRI: 12.4 cm intradural intramedullary mass from C5 to T5, likely related to multiple tumoral cystic areas, with syrinx from T3 to T4

**FINAL DIAGNOSIS:**
Intradural intramedullary ependymoma extending from C5 to T5 with associated syrinx.

**TREATMENT AND OUTCOMES:** Based on the examination and presence of multiple red flags, the physical therapist referred the patient to the Emergency Department for further evaluation.

**3531**
June 3 9:40 AM - 10:00 AM
17 yo Football Player with Central Cord Syndrome after Negative Initial Neck Exam
Hersh Bhatia 1, Teri McCambridge 2. 1University of Maryland, Baltimore, MD. 2Towson Sports Medicine, Towson, MD.

**HISTORY:** A 17 year old HS football receiver was injured when he sustained a hit from the opposing safety. Reported mechanism by opposing player was shoulder to head impact. He fell to the ground in the prone position. He was immediately evaluated on the field by the nearby opposing athletic trainers. He had no LOC, no neck pain on the field, and he denied tenderness to palpation. He complained of having the wind knocked out of him. He reported that he got hit in the back of the leg and it felt odd. He had an ACL brace on his right knee. Care was transitioned to his team athletic trainers. He was turned supine and his helmet was removed. Afterwards, his right arm was noted to be in an awkward position. He could not move his arms or his legs. He had good sensation but had tingling in his upper and lower extremities. He had no prior history of weakness, neck pain, or concussion. His neck was immobilized. He regained motion in the upper extremity, but continued to demonstrate weakness in grip strength. He could not move his lower extremity. On EMS arrival he was spine boarded, and then taken to the ED for further management. **PHYSICAL EXAMINATION:** He was A0 x 3. He had no tenderness over the cervical spinous processes and paraspinal muscles. He had normal sensation of his bilateral extremities. After being turned supine and having his helmet removed, he developed weakness of his upper and lower extremities, but no sensory deficit. Respiratory and Cardiovascular exams were normal. **DIFFERENTIAL DIAGNOSIS:**

**3532**
June 3 10:00 AM - 10:20 AM
Neck Injury
 Özlem G. Ulger 1, Aynur Demirel 2, Mehmet Yorubulut 1.
1Hacettepe University, Ankara, Turkey. 2Acibadem Hospital, Ankara, Turkey.
Email: ozlemulger@yahoo.com

**HISTORY:** A 34-year-old woman has severe neck and radiating pain to left arm applied to our clinic. Two years ago she had strain and she used myorelaxative drugs and felt better. When she performing heavy weights in bench press position at the gym, she felt pain suddenly both neck and left arm.

**PHYSICAL EXAMINATION:** Paravertebral and shoulder muscle spasm were palpated. Cervical compression and distraction tests were positive. Vertebralbasilar artery test, Adson and Roos test were negative. There was no limitation in range of motion. There was strength (20%) and sensorial deficit (hypoesthesia in C3-C4-C5 dermatomes).

**DIFFERENTIAL DIAGNOSIS**
Cervical disc herniation
Peripheral nerve entrapment

**TEST AND RESULTS**
Cervical Joint T1 and T2 MRI:
- Left posterolateral foraminar extrude herniation (C5-C6 level, herniation volume decreased from 4.5 mm to 3 mm, intervertebral disc height increased from 3.6 mm to 3.9 mm. Regression was seen in this level)
- Right posterolateral protrusion (C4-C5 level, there was no change in herniation thickness and disc height)

**FINAL WORKING DIAGNOSIS:**
Cervical disc herniation

**TREATMENT AND OUTCOMES**
15 sessions of Physiotherapy programme which included Non-invasive Spinal Decompression, manual therapy applied.
- Physiotherapist guided spinal stabilization exercise applied (4 months follow-up)  
- After therapy strength and sensorial problems resolved.

**3533**
June 3 10:20 AM - 10:40 AM
Sternoclavicular Injury - Rugby Union (15-players-a-side)
1Rugby Research and Injury Prevention Group, Inc, Hospital for Special Surgery, New York, NY. 2Missouri Orthopaedic Institute & Thompson Laboratory for Regenerative Orthopaedics, Columbia, MO. 3State University of New York Medical Center (Downstate), Brooklyn, NY. 4Lake Erie College of Osteopathic Medicine, Bradenton, FL. 5Hospital for Special Surgery, New York, NY. (Sponsor: Robert C. Cantu, FACSM)
Email: drvictorlopezjr@gmail.com

**HISTORY:** A 19-year-old men’s college Rugby-15s winger collapsed during match play. The player had no impact with another player, dizziness and no loss of consciousness. A medical history revealed the player had sustained a right clavicular injury in a previous match 25 days prior to this incident. Where he complained of right shoulder pain, after impacting the ground with a multi-player tackle. The player had presented to an Urgent Care facility after that injury and provisionally diagnosed with shoulder sprain -vs- pectoralis strain, placed in arm-sling and sent home on oral analgesics. Right shoulder radiographs at Urgent Care visit were read as normal. **PHYSICAL EXAM:** Exam in ED revealed slurred speech, and complaints of localized pain and tenderness on right medial clavicle. Right sternoclavicular joint pain on palpation. Limited upper extremity range of motion secondary to pain, no facial droop, decreased left sided upper and lower extremity sensation, reflexes and strength. Symmetrical radial pulses with brisk capillary refill. **DIFFERENTIAL DIAGNOSIS**
A 19 year-old collegiate runner presented to her pre-participation exam with primary amenorrhea and a high female athlete triad risk score placing her in the “no clearance” range for participation. She denied intentionally restricting her caloric intake, purging behaviors, or psychiatric disorders.

History:
A 19 year-old collegiate runner presented to her pre-participation exam with primary amenorrhea and a high female athlete triad risk score placing her in the “no clearance” range for participation. She denied intentionally restricting her caloric intake, purging behaviors, or psychiatric disorders.

Physical Exam:

Differential Diagnosis:
- Hypothalamic hypogonadotropic primary amenorrhea
- PCOS
- Mullerian agenesis
- Androgen insensitivity syndrome
- PCOS
- Isolated GnRH deficiency

Tests and Results:
- Total T3 61* 
- Free T4 6.0
- LH 0.9*
- FSH 4.0*
- Estradiol <12* 
- DHEA 1830
- TSH 0.57
- CMP normal
- Vitamin D 42
- Total testosterone 12 
- Urine pregnancy test negative 

DXA Z scores: total body 0.7, total hip 0.3, femoral 0.8, spine 0.3

*indicates abnormal

Final working diagnosis:
Female athlete triad with primary amenorrhea due to hypothalamic hypogonadotropism

Treatment and Outcomes:
The athlete was provisionally cleared. Although very reluctant, with the support of her coach, she signed a contract which required her to meet at regular intervals with the team dietitian, physician, and psychologist, and included weekly weigh-ins. Goal and minimum weights were established, with lower weekly mileage permitted at the team dietitian, physician, and psychologist, and included weekly weigh-ins. Goal and minimum weights were established, with lower weekly mileage permitted at lower body weight. She established care with a psychologist but did not engage during sessions and discontinued. Labs from the spring: estradiol <12, FSH 3.8, LH 0.9, BUN 23, AST 49, low T3, and normal prolactin, TSH, T4, and 17-alpha-OH progesterone. Transdermal hormonal treatment was considered to maintain BMD, but the patient refused. She sustained bilateral tibial stress reactions in May, 2016. She blamed her coach, she signed a contract which required her to meet at regular intervals with

History:
A 10-year-old gymnast initially presented with three weeks of right hamstring pain, and was started on a home exercise program. After 4 weeks without improvement, the patient was started on a program of formal physical therapy. After ten weeks of therapy, the patient began to develop core muscle weakness and right anterior hip pain, and reported an inability to walk more than a mile without limping. She went on to develop similar pain with stair climbing, as well as activities of daily living. Shortly thereafter, the patient began to complain of quadriceps weakness and thoracic back pain.

Physical Examination:

Differential Diagnosis:
1. Juvenile Dermatomyositis
2. Polymyositis
3. Viral myositis
4. Lupus Erythematosus
5. Myotonic dystrophy
6. Myasthenia gravis
7. Myositis
8. Progressive muscular atrophy
9. Primary aldosteronism
10. Sarcoidosis
11. Scleroderma
12. Systemic lupus erythematosus
13. Thalassemia
14. Thrombotic thrombocytopenic purpura
15. Tuberculosis
16. Viral myositis

Tests and Results:
- Lveal CPK 524 H, AST 75 H, ALT 32 H, ESR 18 wnl, Aldolase 11 H, CRP <0.3 wnl, LDH Total 317 H
- X-Ray: 3V of bilateral hips-No acute fractures, subluxation, or dislocations.
- MRI Pelvis: Diffuse intramuscular edema, predominantly involving gluteal muscles.
- Consistent with myositis.

Final Working Diagnosis:
Juvenile Dermatomyositis

Treatment and Outcomes:
1. Patient admitted to outside hospital, and patient started on daily prednisone, weekly methotrexate, and hydroxychloroquine.
2. Patient started on IV methylprednisolone weekly, and monthly IVIG infusion by rheumatology.
3. Evaluation at NIH Myositis Clinic. Recommended increasing IVIG dosing and pulse doses of IV steroid with every IVIG infusion.

History:
A 13-year-old soccer player was struck in the back of the head by a soccer ball. She was diagnosed with a concussion without loss of consciousness. Concussion symptoms improved over ten days, but mild headache and fatigue persisted. Her ImPACT scores were at or above baseline. She completed her soccer season. One month later, she began cross country and reported exertional headaches with running.

The certified athletic trainer reduced her training to the point of exercise biking. Upon evaluation at the clinic for shortness of breath and abdominal pain, the patient was treated for exercise-induced asthma and constipation. She was started on an albuterol inhaler, polyethylene glycol, and ranitidine. At three months follow-up, the patient reported abdominal pain despite taking ranitidine twice daily. She was diagnosed with dyspepsia and irritable bowel syndrome at gastroenterology. Ultimately, she was unable to complete her cross country season. Six months later, the patient started training for nordic skiing and now presents with escalating headaches. Her mother believes that the patient was having concussion symptoms again due to the patient’s irritability, dizziness, nausea, and return of headaches upon pushing herself at a recent nordic ski meet. She was unable to get out of bed and appeared depressed.

Nine months post-concussion, neurosurgery was consulted for work-up of exertional headaches. She was later evaluated by psychiatry for anxiety.


DIFFERENTIAL DIAGNOSIS:
1. Post-concussion syndrome

G-19 Clinical Case Slide - Medical Issues II
Saturday, June 3, 2017 - 9:00 AM - 10:40 AM
Room: 402

3534 Chair: Holly J. Benjamin, FACSM. University of Chicago, Chicago, IL.
(No relationships reported)

3535 Discussant: Sourav Poddar. University of Colorado Health Sciences Center, Denver, CO.
(No relationships reported)

3536 Discussant: Natalie Voskanian. UCSD Sports Medicine, San Diego, CA.
(No relationships reported)

3537 June 3 9:00 AM - 9:20 AM
Primary Amenorrhea and High Triad Risk: The Reluctant Runner
Andrea Kussman, Aurelia Nattiv, FACSM. University of California Los Angeles, Santa Monica, CA. (Sponsor: Aurelia Nattiv, FACSM)
Email: akussman@mednet.ucla.edu
(No relationships reported)

3538 June 3 9:20 AM - 9:40 AM
Proximal Muscle Weakness in 10-year-old Female Gymnast
Peter Waller, David Lessman, Philip Skiba. Advocate Lutheran General Hospital, Park Ridge, IL.
Email: pwaller189@gmail.com
(No relationships reported)

3539 June 3 9:40 AM - 10:00 AM
Not All Headaches Are Concussion Related
Jennifer Oberstar. University of Minnesota, Minneapolis, MN.
(Sponsor: Steven Stovitz, FACSM)
Email: ober0042@umn.edu
(No relationships reported)
2. Exertional headaches
3. Thyroid disease

TEST AND RESULTS:
T3 TOTAL: 106
T4 TOTAL: 4.6
THYROID STIMULATING HORMONE: 52.57
MRI/MAVR: -Conspicuous enlargement of the adenohypophysis, concern for possible pituitary hyperplasia
-No vascular abnormalities detected

FINAL/WORKING DIAGNOSIS:
1. Hashimoto’s autoimmune thyroiditis with secondary pituitary enlargement
2. Depression and Anxiety

TREATMENT AND OUTCOMES:
1. Evaluated by pediatric neurosurgery, endocrinology, neurology, psychiatry.
2. Started on levothyroxine 50mcg po daily for 3 months.
3. Three years later, the patient is enrolled in several AP courses and joined the robotics team.

3540 June 3 10:00 AM - 10:20 AM
Heat Illness- Running
José J. Correa, Anita M. Rivera-Brown, FACSM, William F. Micheo, FACSM. University of Puerto Rico School of Medicine, San Juan, Puerto Rico.
Email: jjcorrea@coqui.net

(No relationships reported)

HISTORY: A 14 year-old highly competitive runner presented to our sports medicine clinics one week after collapsing during his first 10 km race in a hot and humid climate. His goal was to achieve a time similar to adult elite runners. He felt dizzy but did not want to slow down. At 8 km he was seen disoriented and stumbling and soon after collapsed. He was taken unconscious to a local ER, where IV hydration was given. After ~25 min he regained consciousness but was disoriented and irrational. He did not remember having collapsed or transport to the ER. After ~2 hours he was alert and felt better, and was discharged. Upon arrival to his home he showered with cold water. He reported a mild sore throat the day before and leg pain after the race.

PHYSICAL EXAMINATION:
Normal vital signs (BP: 116/68; HR: 68 bpm), alert, oriented, and neurological exam.

DIFFERENTIAL DIAGNOSIS:
1. Syncope associated to dehydration
2. Syncope associated to hypoglycemia
3. Rhabdomyolysis
4. Syncope associated to exertional heat stroke

TEST AND RESULTS:
In ER: According to the athlete’s parents: his blood pressure was low, body temperature was not measured nor any blood analysis performed. He was discharged with a diagnosis of “dehydration”.

Two days after discharge from ER his primary care physician ordered urinalysis and CBC: Blood and protein trace in urine; Blood glucose=84 mg/dl; Creatinine=0.94 mg/dl; N= 142 and K= 4.7 mmol/L; AST: 1,923 and ALT: 1,996 U/L. CK was not ordered.

At 9 days: AST: 100 and ALT: 424 U/L; CK ordered but not done.
At 16 days: AST: 55 and ALT: 170 U/L; CK=151 U/L

Five weeks after discharge from ER: Heat Tolerance Test (running outdoors @ 12.8 to 13.8 km/hr in 32°C; 75% RH). Test stopped at 40 min when Tc= 39.3°C. HR=145-173 bpm. Sweat rate=1.8 L/h; Fluid replaced=16% Dehydration=1.9%; Rating of hot/overheated= 8 and thirst= 8 (0-10 scale).

FOLLOWING WORKING DIAGNOSIS:
Exertional heat stroke related to inadequate heat acclimatization.

TREATMENT AND OUTCOMES:
1. Allowed to swim and run in cool environment after 2 weeks at reduced pace but no running in the heat for 5 weeks.
2. Recommendations about proper hydration and gradual heat exposure to acclimatize to heat.
3. Referred to sports psychologist.
4. Repeat heat tolerance test for clearance to compete in the heat.

3541 June 3 10:20 AM - 10:40 AM
Gastrointestinal - Track and Field
Email: langleykj@ufl.edu

(No relationships reported)

HISTORY: A collegiate track athlete presented with a two-day history of nausea, non-bloody, non-bilious vomiting, bloating, inability to tolerate PO, and waves of sharp, crampy abdominal pain. He denied fevers, chills, diarrrhea, sick contacts, or recent NSAID or alcohol use. His last bowel movement was two days prior. He endorsed a history of similar symptoms due to constipation that resolved with a laxative suppository. He was evaluated the previous day and noted to have mild epigastric and RLQ tenderness. He was able tolerate PO after Zofran ODT and discharged with strict return precautions. Surgical history includes laparoscopic right sports hernia repair with mesh, open right adductor tenotomy, and umbilical hernia repair in 2014 and left adductor tenotomy in 2016.

PHYSICAL EXAMINATION:
Afebrile, normotensive, bradycardic. Appears uncomfortable.

DIFFERENTIAL DIAGNOSIS:
1. Gastritis
2. Constipation
3. Ileus

TEST AND RESULTS:
Abdominal radiographs showed gaseous small bowel distension in a non-obstructive pattern with a large amount of stool in rectal vault. He received IV fluids, glcerin suppository, and a Fleet enema with no bowel movement but recurrent emesis. Repeat Fleet enema, 4 mg IV Zofran, and additional IV fluids were given. On re-examination he had worsening abdominal tenderness and guarding. He was transferred to the ED and the differential diagnosis was broadened to include small bowel obstruction and intrabdominal perforation. On arrival to the ED he was in distress with significant bilateral lower quadrant tenderness, rebound, and guarding. CT abdomen and pelvis showed a high-grade distal small bowel obstruction with moderate wall edema along distal ileum with concern for vascular compromise.

FOLLOWING WORKING DIAGNOSIS:
Small bowel obstruction related to prior sports hernia repair.

TREATMENT AND OUTCOMES:
1. Emergently to OR for exploratory laparotomy.
2. Intraoperatively found to have herniation of distal ileum through peritoneum in RLQ inferior to prior mesh placement for sports hernia repair. Herniated loop of bowel non-viable with chronic ischemic changes and stricture requiring 30 cm resection and ileoleoectomy.
3. Uneventful post-operative course.
4. Return to sport pending.

G-26 Free Communication/Poster - Beyond the Bounds Category!
Saturday, June 3, 2017, 7:30 AM - 11:00 AM
Room: Hall F

3554 Board #1 June 3 8:00 AM - 9:30 AM
Photographic Method for Measuring Body Composition by Level of Physical Activity Level in Adults
Amber Kinsey, Howard W. Wiener, Ligia Prahdan, Olivia Affuso, FACSM. University of Alabama at Birmingham, Birmingham, AL. (Sponsor: Olivia Affuso, FACSM)
Email: akinsey@uab.edu

(No relationships reported)

Our laboratory has previously shown that photographic methods can be used to accurately measure body composition in adults. Given the limitations of the body mass index (BMI) for assessing obesity status across different levels of physical activity (PA), we wanted to test our method to see if there were any differences in the prediction of body fatness by level of PA in a diverse sample of women and men.

PURPOSE: To examine the performance of a photographic method to estimate body composition amongst adults that differ in PA status.

METHODS: Our sample consisted of 723 black and white adults (women: n= 309, age, 39.4 ±14.4 years, height 163.2 ± 6.1 cm, weight 74.5 ± 19.5 kg, BMI 27.9 ± 7.0 kg/m2; men: n= 414, age, 40.4 ±14.6 years, height 175.8 ± 6.9 cm, weight 84.7 ± 18.0 kg, BMI 27.4 ± 5.5 kg/m2). Self-reported PA level was classified as low, moderate or high. Body fat percentage was measured with dual energy x-ray absorptiometry (%BFDXA) and predicted with digital photographic methods (%BFPHOTO). The photographic method measures pixel volume and body shape to predict body volume. The regression model to predict %BFPHOTO included age, sex, race, BMI, body volume and body shape. Pearson correlations between %BFDXA and %BFPHOTO were calculated for each level of PA.

RESULTS: There was a strong positive correlation between %BFDXA and %BFPHOTO for all levels of physical activity in black women (low, r= 0.89, p =<0.0001; moderate: r = 0.91, p =<0.0001; high: r = 0.86, p =<0.0001) and white women (low, r = 0.83, p =<0.0001; moderate: r = 0.82, p =<0.0001; high: r = 0.71, p =<0.0001). Similarly,
strong positive correlations between %BF_fem and %BF_men, at all PA levels were observed in black men (low: r = 0.80, p = 0.0001; mod: r = 0.84, p = 0.0001; high: r = 0.79, p = 0.0001) and white men (low: r = 0.85, p = 0.0001; moderate: r = 0.80, p = 0.0001; high: r = 0.70, p = 0.0001).

CONCLUSIONS: The determination of body fat percentage from digital photographs was strongly correlated with DXA measurements in black and white men and women regardless of physical activity status. Photographic methods may be a viable, cost effective alternative for the assessment of body composition.

Supported by NIH Grant R01HL107916, T32DK062710, and P30DK056336

3555 Board #2
June 3 8:00 AM - 9:30 AM
Cannabis Use And Neurological Disease: An Alternative Therapy To Improve Neurological Disability?
John Harvey Kindred¹, Kaigang Li¹, Nathaniel B. Ketelhut¹, Felix Proesel¹, Brett W. Fling¹, William R. Shaffer¹, Thorsten Rudroff, FACSM¹, Colorado State University, Fort Collins, CO. ¹Banner Health, Greeley, CO. (Sponsor: Thorsten Rudroff, FACSM)

Email: jhkindred@gmail.com (No relationships reported)

Medicinal cannabis use has a long history. Despite this fact current federal regulations greatly restrict research into the medicinal uses of cannabis, although this sentiment is changing. PURPOSE: To investigate cannabis use parameters in people with neurological diseases. METHODS: An anonymous online survey was created using modified neurological assessment questionnaires. Guy’s Neurological Disability Scale and Nottingham Health Profile, and posted to the National Multiple Sclerosis Society and Michael J. Fox Foundation websites. The survey also included measures of past/current cannabis use, fatigue (Fatigue Severity Scale), balance confidence (Activities of Balance Confidence), physical activity (International Physical Activities Questionnaire), pain (visual analogue scale), and spasticity. The survey was available online from 15 Feb 2016 to 15 Oct 2016. RESULTS: There were a total of 637 records with 52% (n = 326) men and 48% (n = 311) women (mean: age 57 SD 13; BMI 27 SD 5.7). Forty-three percent (n = 277) reported currently using cannabis, although 57% (n = 158) do not have a state medical marijuana card. Smoking was the most common method of use (79%, n = 213). Among the cannabis users 75% (n = 204) have been using for > 1 year and 48% (n = 131) are using 7 days a week. Most, 85% (n = 231), felt that cannabis at least moderately improved their symptoms. Medicinal purposes (74%, n = 200) were reported as the reason for use and 60% (n = 164) stated purposes (74%, n = 200) were reported as the reason for use and 60% (n = 164) stated

3556 Board #3
June 3 8:00 AM - 9:30 AM
Identifying Politically Motivated Medical Withdrawals From International Competition
Peter A. Harmer, FACSM, Willamette University, Salem, OR.
Email: pharmer@willamette.edu (No relationships reported)

The IOC and many international federations (IF) have clear regulations prohibiting participants in sanctioned events from refusing to compete against athletes from other countries for political, cultural or religious reasons. Failing to abide by these regulations can result in significant penalties for the offending athletes and their federations. However, being injured or ill provides plausible deniability for those committed to not competing for political purposes. PURPOSE: To explore the use of quantitative analysis to uncover patterns of medical withdrawal from competitions that indicate systematic abuses of medical waivers for political purposes.

METHODS: Demographic information (number of participants, event, country) was compiled from the official entry and results lists of the Federation Internationale d’Escrime (FIE) for 1.5 competition seasons 2014-2016 for 3 countries (Iran (IRI), Kuwait (KUW), Saudi Arabia (KSA)) anecdotal reported to be systematically avoiding competing against Israel (ISR) by using medical withdrawals.

RESULTS: Athletes from the three countries had a total of 623 competition exposures during the observation period (IRI: 279 vs. other nations; 4 vs. ISR; KUW: 239 vs. other nations; 6 vs. ISR; KSA: 101 vs. other nations; 3 vs. ISR). For IRI there was 100% (279) participation against non-ISR opponents but 0% (0/4) participation against ISR athletes. KUW had 99% (233/235) participation against non-ISR and 0% (0/6) against ISR. KSA had 100% (99/99) against non-ISR and 0% (0/3) for ISR.

CONCLUSIONS: Although it is not reasonable to determine the legitimacy of requests for medical withdrawal from competition on a case-by-case basis in instances where non-medical motivation may be involved, it is possible to identify systematic abuses of medical exemptions through data analyses. To reaffirm the integrity of sports competition and the independence of medical care, it is incumbent on the IOC and IFs to investigate suspect action using available entry and withdrawal data and move to hold non-conforming nations accountable.

3557 Board #4
June 3 8:00 AM - 9:30 AM
Application of Environmental Sensors to a Military Combatives Training Environment
Tyler F. Rooks, Katie P. Logsdon, B. Joseph McEntire, Valeta Carol Chancy, U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL.
Email: tyler.f.rooks.civ@mail.mil (No relationships reported)

Timely and accurate identification is important for effective concussion management and has implications for extended return-to-play/duty timelines. An environmental sensor (ES) for measuring head impact events is one method for timely identification of a potential concussion. Civilian ESs were used in the Modern Army Combatives Program (MACP). Each course has its own instructional requirements with varying levels of direct head impact or inertial loading possibilities, and protective equipment requirements. The training environment, drills, and equipment limited the ES evaluated to specific form factors including: (1) adhesive-mounted and (2) headband or skullcap worn. PURPOSE: Characterize ES performance in MACP. METHODS: Students were instrumented with multiple ES types during combatives drills to record head impact events. Human factors and environmental issues were recorded. The students were videotaped during the drills to visually identify head and body impact events. The drills were recorded from multiple views and all videos were time synchronized. RESULTS: The ESs used were dependent on the drill type and the required protective equipment for the drill. During a Level 1 drill, the video analysis identified 26 to 41 impacts per student with the ES recording 30 to 35 impacts. Peak linear accelerations (PLA) for all students ranged from 4.9 to 162.1 G. One student, required to wear headgear, had a maximum linear acceleration of 67.3 G (compared to 162.1 and 117.5 G for students with no headgear). For the Level 2 drills, video analysis identified between 90 to 271 impacts per student per day with the ES recording 78 to 239 impacts per student per day. PLA ranged from 4.3 to 158 G. For the Level 3 drills, video analysis identified between 10 to 76 impacts per student per day with the ES recording 44 to 191 impacts. PLA ranged from 1.6 G to 220.6 G. Human factors issues identified included sensor mounting, stability, and the need for a properly sized skullcap. For skullcap/headband use, protective headgear was required to keep the cap in place. None of the ESs evaluated were compatible with grappling drills. CONCLUSION: Both form factors are usable, though not perfect, in the MACP; further development is required. The ES data variance shows that ESs cannot yet be used as a diagnostic standard for likelihood of concussion.

3558 Board #5
June 3 8:00 AM - 9:30 AM
Assessment Of The Relationship Between Body Composition And Bioavailability Of Diclofenac Sodium In Healthy Volunteers
Andrea Navés¹, Valden Capistrano Júnior², Maria Elisabete Amaurul de Moraes², ¹IP Research Institute, São Paulo, Brazil. ²Federal University of Ceará, Ceará, Brazil. (No relationships reported)

PURPOSE: The objective of this study was to evaluate the relationship between body composition and pharmacokinetics of diclofenac sodium formulation in healthy volunteers.

METHODS: This was a cross-sectional study. Twenty-four healthy subjects (age range: 18-42 years) received 50 mg of sodium diclofenac single oral dose. Hematologic and biochemical analysis and body composition (bioelectrical analysis) were assessed with simple Pearson correlations. Student’s t-test was used for continuous variables and type 1 error was set at p<0.05.

RESULTS: There were significant inverse correlation between area under the curve (AUC) and total body water in the high-arm index (r = -0.85, p = <0.001; mod: r = 0.80, p = <0.001; low: r = 0.79, p = <0.001). Visceral fat area was positively correlated with AUC (r = 0.83, p = <0.001). Both forms of fat had higher AUC, regardless of physical activity status. Photographic methods may be a viable, cost effective alternative for the assessment of body composition.

CONCLUSION:

Supported by NIH Grant R01HL107916, T32DK062710, and P30DK056336

MEDICINE & SCIENCE IN SPORTS & EXERCISE®
Children with Sickle Cell Disease (SCD) may have had brain damage throughout childhood that lead to neuropsychomotor changes, such as an increase in reaction time (RT). An evaluation of RT can aid in the early detection of increased brain information processing speed. This capability is of fundamental importance for full child development and can be assessed by tests such as psychometric tests and motor skills tests or computer games. In this study, the assessment was performed using an easy to handle toy-like device, developed for this purpose in Arduino platform. PURPOSE: To evaluate the RT in children with sickle cell anemia (SCA), using simple reaction time (SRT) and choice reaction time (CRT) tests. METHODS: The 46 participants, 24 SCA group (9.4±1.17 yrs) and 22 healthy children of control group (CON) (8.3±1.54 yrs), were subject to the tests SRT and CRT developed on Arduino platform. Children had to trigger the fastest response possible button, after seeing the luminous stimulus. The Arduino was programmed to generate random light stimuli, according to the purpose of each test, as well as the capture, transfer and register the data of motor responses on the computer via Bluetooth. RESULTS: SRT was significantly higher (p<0.01) in children with SCA (747.80 ± 523.58 ms) when compared to CON (364.48 ± 90.66 ms). In SCA group the SRT (478,06 ± 114,03 ms) was significantly lower when compared to CRT (747,80 ± 523,58 ms). CONCLUSIONS: Children with SCA have a higher CRT than children without the disease.

The 2018 Physical Activity Guidelines Advisory Committee (PAGAC) will provide independent recommendations based on current scientific evidence to aid the federal government in the development of the second edition of the Physical Activity Guidelines for Americans (PAG). PURPOSE: To describe the analytic frameworks and systematic literature reviews used by the PAGAC to evaluate the science and develop evidence-based conclusions and recommendations for its Advisory Committee Scientific Report (Report). METHODS: The U.S. Department of Health and Human Services (HHS) contracted a systematic literature review to evaluate and synthesize peer-reviewed physical activity literature. The approach is designed to maximize transparency, minimize bias, and ensure systematic reviews are relevant, timely, and high quality. The PAGAC’s first task was to develop and prioritize research questions. The highest priority questions were those with potential for the greatest public health impact (Table 1). Each question will be evaluated using de novo systematic reviews, high-quality existing systematic reviews, meta-analyses, and reports, or a combination of approaches. RESULTS: The output from the literature review is an evidence portfolio summarizing the findings for each question. The Committee will grade each question as strong, moderate, limited, or grade not assignable. During a series of public meetings, subcommittees will review and deliberate on their conclusions, implications, and research recommendations in order to come to consensus. Analytic frameworks and search strategies for initial questions and information discussed during the first three public meetings will be presented. CONCLUSIONS: HHS will use the Report, along with agency and public comments, to develop the second edition of the PAG. This edition will provide updated science-based advice on how physical activity can help promote health and reduce the risk of chronic disease.
Purpose Fitness professionals are well placed to simultaneously facilitate improvements in physical activity and dietary behaviours. However, concerns regarding the competence of fitness professionals to provide nutrition care have been raised. More than 85% of fitness professionals provide nutrition care beyond the recommended scope of practice. It is currently unclear if the provision of nutrition care beyond scope of practice is intentional, or if it arises as a consequence of discussions around lifestyle modification. The aim of this study was to investigate the intention of fitness professionals to provide nutrition care, by comparing the advertised nutrition content of fitness business websites and social media pages with a national scope of practice document for fitness professionals. Fitness businesses were targeted because advertisement of a service indicates that it would be provided, and advertisements may influence public expectations of fitness professional services. METHODS Inductive content analysis of websites and social media sites was undertaken for 35 registered fitness businesses in Queensland, Australia. This review included 8 franchise fitness businesses with more than 400 sites each across Australia and was conducted from August to October, 2014. Advertisements were considered within scope if they referred to national nutrition guidelines or dietetic services, at risk of being beyond scope if they advertised services that were not clearly in line with national nutrition guidelines, or beyond scope if they advertised nutrition care beyond the fitness professionals' scope of practice, such as personalized dietary prescription outside of national dietary guidelines. RESULTS Of the business individuals, 15% of the advertisements classified as within scope, 34% were at risk, and 51% were beyond scope. These included advertisements for diet planning and nutrition counselling, as well as food or nutrition claims, and recipe provision. CONCLUSIONS Many fitness businesses advertised nutrition care, provided by their staff members, which extended beyond the recommended scope of practice for fitness professionals. Strategies that support fitness professionals to provide nutrition care of value to clients, without extending beyond their scope of practice, are warranted.

RESULTS: The mean ± SE of total energy expenditure for the SED and ACT groups were 1,694 ± 27.8 and 3,032 ± 39.2 kcal, respectively. The fat mass (kg) was lower (P<0.001) in the ACT group compared with the SED group. The glucose and insulin concentrations were measured for 240 minutes after the light meal on separate occasions. The study included 17 participants (mean age 26.8 ± 3.4 years; mean body mass index of 25.5 ± 2.7 kg/m²; 10 women and 7 men). The meal was a light meal that included carbohydrates and protein. The participants were randomly assigned to either SED (n=8) or ACT (n=9) condition. The study was conducted from August to October, 2014. Advertisements were considered within scope if they referred to national nutrition guidelines or dietetic services, at risk of being beyond scope if they advertised services that were not clearly in line with national nutrition guidelines, or beyond scope if they advertised nutrition care beyond the fitness professionals' scope of practice, such as personalized dietary prescription outside of national dietary guidelines. RESULTS: Of the business individuals, 15% of the advertisements classified as within scope, 34% were at risk, and 51% were beyond scope. These included advertisements for diet planning and nutrition counselling, as well as food or nutrition claims, and recipe provision. CONCLUSIONS: Many fitness businesses advertised nutrition care, provided by their staff members, which extended beyond the recommended scope of practice for fitness professionals. Strategies that support fitness professionals to provide nutrition care of value to clients, without extending beyond their scope of practice, are warranted.

China relies on foreign vendors such as the American College of Sports Medicine (ACSM) certifications and related workshops to educate its exercise specialists. PURPOSE: Examine the relevancy of the current ACSM Job Task Analysis (JTA) for the Certified Personal Trainer (CPT) certification in China. METHODS: Seventeen Chinese (including six females) and six Taiwanese (including two females) fitness professionals (age: 34.95 ± 5.10 years) attended an ACSM CPT workshop in Shanghai, China in 2016. At the end of the workshop, U.S. presenters verbally read each JTA in English to the participants, and these were simultaneously translated verbally into Mandarin. The JTAs consist of knowledge and skills (N=191) covering four domains (D): Initial Client Consultation & Assessment (D1; N=58), Exercise Programming & Implementation (D2; N=53), Exercise Leadership & Client Education (D3; N=27), and Legal, Professional, Business & Marketing (D4; N=53). The participants were asked, “How relevant is the JTA in China?” on a scale of 1 to 3 (1: excellent, 2: somewhat relevant; 3: poor). RESULTS: Response rate was 87%. 67% of the participants reported that the JTA’s relevancy was excellent and 21% somewhat relevant. When individual JTAs were combined to represent their specific domain collectively, the frequency of partial relevance was 12% for D1, 5% for D2, 10% for D3, and 34% for D4. Tests revealed that 48 JTAs were significantly (p<0.05) higher than the hypothesized score of 1. D4 and D1 contained the majority of these higher scores, 64% and 30% respectively (v. D2 and D3, around 10%). Specifically, the initial client consultation and interview for health appraisals, medical clearance, seeking client feedback for exercise enjoyment, dietary guidelines, liability, safety policies, professional attire, business models and plans, marketing materials and networking, copyright and client confidentiality were significantly different. CONCLUSIONS: This is the first time that the ACSM CPT JTAs are investigated abroad showing an impact on their relevance for a foreign country. The desire to create a set of international JTAs outside of the U.S. should be recommended by certified and culturally sensitive ACSM professionals. The new international JTAs should also be specific to the culture for the concerned region of the world.

The results of this study may be the first step for ACSM in developing a model for globalizing the JTA. PURPOSE: Investigate the relevancy of the JTA for a group of Chinese fitness professionals currently practicing in China. This review included 8 franchise fitness businesses with more than 400 sites each across Australia and was conducted from August to October, 2014. Advertisements were considered within scope if they referred to national nutrition guidelines or dietetic services, at risk of being beyond scope if they advertised services that were not clearly in line with national nutrition guidelines, or beyond scope if they advertised nutrition care beyond the fitness professionals' scope of practice, such as personalized dietary prescription outside of national dietary guidelines. RESULTS: Of the business individuals, 15% of the advertisements classified as within scope, 34% were at risk, and 51% were beyond scope. These included advertisements for diet planning and nutrition counselling, as well as food or nutrition claims, and recipe provision. CONCLUSIONS: Many fitness businesses advertised nutrition care, provided by their staff members, which extended beyond the recommended scope of practice for fitness professionals. Strategies that support fitness professionals to provide nutrition care of value to clients, without extending beyond their scope of practice, are warranted.
CONCLUSIONS: To examine the association between nutritional risk and physical function and PA in older adults. METHODS: One hundred four participants (age=71.0 yrs±7.7; BMI=33.1±7.9) completed questionnaires related to nutritional risk (SCREEN Nutritional Risk Questionnaire) for older adults, physical function (Physical Function Questionnaire, PFQ), and physical activity (PA, CHAMPS physical activity questionnaire). Additional physical function measures included: 1) timed up and go (TUG), which involved rising from a chair, walking three meters, returning to the chair and sitting down, 2) usual gait speed (UGS) over a six-meter distance, and 3) 6-minute walk (6MW). Spearman correlation coefficients were used to examine the association between nutritional risk and the different measures of physical function and PA. RESULTS: In this population of community dwelling older adults, 34.4% were considered to be at risk of under nutrition. There was a significant association (p<0.05) between nutritional risk and PFQ (r=0.291), TUG (r=-0.247 and UGS (r=0.263). There were also significant associations between PFQ and TUG (r=0.508), PFQ and UGS (r=0.524). There was not a significant association between nutritional risk and PA. CONCLUSIONS: These results suggest that risk of under nutrition is prevalent in older adults living in the community. In addition, risk of undernutrition is related to objective and subjective measures of physical function. Given the association between nutritional risk and mobility, community based exercise and PA programs for older adults designed to improve mobility and physical function should include screening for nutritional risk with appropriate follow-up.

3568 Board #15 June 3 8:00 AM - 9:30 AM Association Between Nutritional Risk, Physical Function, and Physical Activity in Older Adults

Randall J. Gretebeck, Wan-Chin Kuo, Carly E. Babino, Kimberlee A. Gretebeck. University of Wisconsin-Madison, Madison, WI.

Email: rgretebeck@wisc.edu

(No relationships reported)

Under nutrition in older adults leads to increased incidence of illness, disease, disability, slow recovery, and poor outcomes, as well as worsening of existing disease and illness. While community based exercise programs are available to help older adults improve mobility and increase physical activity (PA) levels, screening for adequate nutrition is often overlooked and may impede improvements in mobility and PA. PURPOSE: To examine the association between nutritional risk, physical function and PA in older adults. METHODS: One hundred four participants (age=71.0 yrs±7.7; BMI=33.1±7.9) completed questionnaires related to nutritional risk (SCREEN Nutritional Risk Questionnaire) for older adults, physical function (Physical Function Questionnaire, PFQ), and physical activity (PA, CHAMPS physical activity questionnaire). Additional physical function measures included: 1) timed up and go (TUG), which involved rising from a chair, walking three meters, returning to the chair and sitting down, 2) usual gait speed (UGS) over a six-meter distance, and 3) 6-minute walk (6MW). Spearman correlation coefficients were used to examine the association between nutritional risk and the different measures of physical function and PA. RESULTS: In this population of community dwelling older adults, 34.4% were considered to be at risk of under nutrition. There was a significant association (p<0.05) between nutritional risk and PFQ (r=0.291), TUG (r=-0.247 and UGS (r=0.263). There were also significant associations between PFQ and TUG (r=0.508), PFQ and UGS (r=0.524). There was not a significant association between nutritional risk and PA. CONCLUSIONS: These results suggest that risk of under nutrition is prevalent in older adults living in the community. In addition, risk of undernutrition is related to objective and subjective measures of physical function. Given the association between nutritional risk and mobility, community based exercise and PA programs for older adults designed to improve mobility and physical function should include screening for nutritional risk with appropriate follow-up.
The process of atherosclerosis is increasingly frequently initiating during preadolescence. The early onset of atherosclerosis has been linked to cardiometabolic complications, including obesity, which in turn are associated with deficient lifestyle behaviors.

**PURPOSE:** Assess the associations between body fatness and lifestyle behaviors with cardiometabolic health in prepubescent children aged 8-10 years.

**METHODS:** Three hundred ninety two children aged 8-10 years (195 male, 197 female; 9.5 ± 1.1 y) were recruited from three regions across New Zealand. Body composition was evaluated using anthropometric measurements (waist: hip ratio) and bio-electrical impedance analysis (body fat %). Cardiorespiratory fitness was calculated using the 20-meter shuttle run. Physical activity and sedentary behavior was evaluated using the Youth Physical Activity Questionnaire. Nutritional behavior was evaluated using the New Zealand Adolescent food Frequency Questionnaire (processed food, fruit/vegetable consumption, breakfast foods). Quality of sleep was assessed using the Child Sleep Habits Questionnaire (duration, habits, social jet lag). Cardiometabolic health was gauged using pulse wave analysis to assess blood pressures (diastolic, systolic, central systolic) and arterial wave reflections (augmentation pressure), and finger prick procedures to evaluate fasting blood lipids (LDL, HDL, total cholesterol, triglycerides), glucose, and glycosylated hemoglobin.

**RESULTS:** The cardiometabolic variables were reduced to 4 factors using principle component analysis: (blood pressure, cholesterol, vascular, carbohydrate-metabolic). Following adjustment for co-founders, body fat % associated with blood pressure and vascular factors. Cardiorespiratory fitness and strength associated with CHO-Met, whereas sedentary associated with cholesterol and vascular factors. Processed foods associated with vascular, whereas fruit/vegetable associated with cholesterol. Social lag associated only with cholesterol.

**CONCLUSION:** One common factor is unlikely to define cardiometabolic health in preadolescent children, and each of the underlying cardiometabolic health factors is associated with different lifestyle behaviors.

**BACKGROUND:** Atherosclerosis begins during pre-adolescence and is occurring at an accelerated rate. This acceleration has been linked to poor lifestyle behaviors and subsequent cardio-metabolic complications. Although the clustering of cardio-metabolic risk factors has been recognized for well over two decades, previous studies in children have predominantly examined the relationships between atherosclerosis and individual cardio-metabolic risk factors, or have grouped together pre-adolescent and adolescent children. Further, no known studies have included glycosylated haemoglobin (HbA1c), or central hemodynamic measures such as central blood pressure (cSBP), augmentation pressure, and finger pricks to evaluate fasting blood lipids (LDL, HDL, total cholesterol, triglycerides), glucose, and glycosylated hemoglobin.

**RESULTS:** The cardiometabolic variables were reduced to 4 factors using principle component analysis: (blood pressure, cholesterol, vascular, carbohydrate-metabolic). Following adjustment for co-founders, body fat % associated with blood pressure and vascular factors. Cardiorespiratory fitness and strength associated with CHO-Met, whereas sedentary associated with cholesterol and vascular factors. Processed foods associated with vascular, whereas fruit/vegetable associated with cholesterol. Social lag associated only with cholesterol.

**CONCLUSION:** One common factor is unlikely to define cardiometabolic health in preadolescent children, and each of the underlying cardiometabolic health factors is associated with different lifestyle behaviors.
PURPOSE: High fat–very low carbohydrate diets (HFLC) have become increasingly popular in the endurance community, but there is little data concerning the effects of HFLC on markers of cardiovascular disease risk. The aim of this study was to examine glucose and lipid marker responses following a prolonged real HFLC. 

METHODS: Eight middle-aged (39 ± 9.9 y), trained but non-elite (VO\textsubscript{2peak} = 48.5 ± 4.5 mL/kg/min) runners (1.77 ± 0.08 m; 81.7 ± 7.0 kg; 19.3 ± 6% body fat) served as participants. Venous blood was drawn from an antecubital vein after an overnight fast with standardized evening fluid intake on 4 occasions. During the first phase, runners simply consumed their habitual high carbohydrate diet (HC). Blood was collected around 0600 following ~48 h of restriction from any intense exercise. A 50-min run in the heat followed by a 5-km time trial was implemented following blood collection to induce significant heat and exercise stress. A fasted blood sample was acquired the subsequent morning to further delineate the influence of exercise stress. This protocol was repeated after 3 weeks during which time runners continued normal training but consumed <50 g of carbohydrate/day with ~70% of daily calories derived from fat. 

RESULTS: Diet intervention approached (p = 0.07) but did not reach significance for glucose. Triacylglycerol did not differ between treatments (pre-exercise HC = 65 ± 17; HFLC = 67 ± 35 mg/dL) but decreased (p < 0.05) for both treatments 24-h after exercise (HC = 42 ± 16; HFLC = 35 ± 21 mg/dL). There was a main effect for diet on HDL-C (pre-exercise: HC = 48 ± 10 and 50 ± 11; post-exercise: HFLC = 57 ± 13 and 60 ± 13 mg/dL). There was also an effect main (p = 0.02) for diet on LDL-C with HFLC exceeding HC at both collection points by ~20 mg/dL. Total cholesterol was approximately 30 mg/dL higher for HFLC both before and 24-h after exercise (p < 0.05). There was no change in VLDL-C and Lp(a).

CONCLUSIONS: Diet intervention approached but did not reach significance for glucose. Triacylglycerol did not differ between treatments but decreased for both treatments 24-h after exercise. There was a main effect for diet on HDL-C, no change in VLDL-C and Lp(a).

Abstracts were prepared by the authors and printed as submitted.
would be most effective. Results indicated that 5 out of the 7 colleges were prediabetic and that a preventative treatment for prediabetic and diabetic patients at risk for neuropathy. Omega-3 (n-3) fatty acids have anti-inflammatory properties and may hold therapeutic potential as a preventative treatment for prediabetic and diabetic patients.

**RESULTS:** Females fasting glucose (92.56±27.23 mg/dL), A1C levels (5.74±0.92%), and BMI (96.25±27.52 mg/dL), A1C levels (5.77±1.05%), and BMI (32.41±9.30) were below the blood biomarker levels that define diabetes. However, students showed risk for prediabetes at this young age according to the 2015 ADA prediabetes A1C criteria (5.7-6.4%). The A1C levels across colleges ranged between 5.6% College of Health and Human Sciences (COHHS), 5.2% College of Arts (COLA), 6.0% College of Fine Arts (COFA), and 6.1% College of Engineering and Computer Science (COECS). Females showed a greater prevalence in prediabetic A1C levels at 40.13% with a mean of 5.74, while males exhibited 27.94% at an average of 5.72. The t-test assessment concluded that no statistically significant differences (p=0.05) in fasting glucose levels (p=0.36), A1C levels (p=0.9), and BMI (p=0.81) between genders were found.

**CONCLUSIONS:** This research targets a young population where early intervention would be most effective. Results indicated that 5 out of the 7 colleges were prediabetic according to the A1C levels. Moreover, the gender comparison in prevalence proposed that females were at a greater risk for prediabetes and diabetes than males. These findings suggest that surveillance and education is recommended for the prevention of chronic metabolic conditions in college-aged students at a Hispanic-serving institution.

**METHODS:** Fasting glucose levels and hemoglobin A1C levels, along with BMI from two hundred college-aged students 18-30 years old at a Hispanic-serving institution in south Texas. The purpose of this study was to investigate the efficacy of genetic overexpression of PGC-1α1 alone and in combination with physical activity to alleviate lipid overload-induced mitochondrial dysfunction. Yet current data remain controversial on the efficacy of artificially promoting PGC-1α1 as a therapeutic modality.

**PURPOSE:** The purpose of this study was to investigate the efficacy of genetic overexpression of PGC-1α1 alone and in combination with physical activity as a therapeutic agent during lipid overload. **METHODS:** Wild type (WT, ~20) mice and mice with muscle-specific overexpression of PGC-1α1 (MCK-PGC-1α, ~20) were given Western Diet (WD) at 8 wks of age and allowed to consume food ad libitum throughout the course of the study. At 12 wks of age, animals were further divided into sedentary (SED) and physical activity (voluntary wheel running [VWR]) interventions. At ages 7, 11, and 15 wks animals underwent glucose tolerance tests (GTT). At 16 wks of age animals were humanely euthanized and tissues collected for analysis. Results were analyzed by 2X2X3 repeated measures ANOVA with an α=0.05. RESULTS: MCK-PGC-1α1 animals were lighter and had less epididymal fat compared to WT (~6% and ~28% respectively). Food efficiency (weight gained:food consumed) was ~17% lower in MCK-PGC-1α1 animals. While there was no difference at 7 wks age, at 11 wks age MCK-PGC-1α1 had ~50% greater GITT integrated area under the curve (IAUC) compared to WT. Yet at 15 wks, VWR had ~30% lower IAUC compared to SED, regardless of genotype. MCK-PGC-1α1-VWR ran ~3X more per day compared to WT-VWR. Correlations for wheel running distance per day vs. IAUC, body weight, and epididymal fat were significant and moderately strong (r=0.67–0.71) for WT-VWR, but in MCK-PGC-1α1 there was no correlation between these variables and wheel running distance per day (r=0.10-0.20). CONCLUSION: These results suggest increasing PGC-1α1 promotes exercise-induced adaptations regardless of exercise volume, but overexpression of PGC-1α1 during lipid overload without physical activity does not mitigate insulin resistance and may in fact exacerbate the condition.

**DIFFERENTIAL METABOLIC RESPONSES TO ACUTE FATMAX AND LACTATE THRESHOLD EXERCISE**

Timothy D. Allerton1, Kate Early2, Carl Lavie, Jr3, Neil Johansson1. 1Louisiana State University, Baton Rouge, LA. 2Columbus State, Columbus, GA. 3Ochsner, New Orleans, LA. Email: taller2@lsu.edu

**PURPOSE:** In this study we investigated the effect of acute aerobic exercise at an intensity that maximizes the rate of fat oxidation (FM) on glucose tolerance, insulin action, and metabolic flexibility (MF) compared to acute aerobic exercise at lactate threshold (LT) resulting in greater carbohydrate (CHO) oxidation.

**METHODS:** Improvements in glucose tolerance and insulin action with aerobic exercise may be the result of increase glucose utilization and/or complete oxidation of intramuscular triglycerides. **PURPOSE:** To investigate the effect of acute aerobic exercise at an intensity that maximizes the rate of fat oxidation (FM) on glucose tolerance, insulin action, and metabolic flexibility (MF) compared to acute aerobic exercise at lactate threshold (LT) resulting in greater carbohydrate (CHO) oxidation. **METHODS:**
Several novel biomarkers of risk for diabetes in adults have been reported that correlate with insulin sensitivity, including PEDF and 2AAA. The results suggest a disconnect between glucose tolerance and MF and that preferential substrate utilization does not promote comprehensive metabolic improvements acutely in young overweight men.

Conclusion: Long-term exercise training appears to have deleterious effects on oral glucose tolerance in young overweight men.

Physical activity is important for blood glucose management in people with Type 2 diabetes (T2D). Little research has explored the relationship between sedentary bout duration and mean glucose and glucose variability in people with T2D using objective and continuous measurements.

Aims: To explore the relationship between sedentary bout duration and mean glucose and glucose variability in people with T2D using objective continuous measurements.

Methods: 16 participants with T2D managed with diet, Metformin or DPP4 inhibitors were recruited (mean age 61±11.9 years and BMI 29.4±4.9 kg/m²). Participants completed a demographic questionnaire and wore an actiPAL accelerometer and FreeStyle Libre continuous glucose monitor for 3-14 days whilst documenting sleep, food and medication. Average proportion of time spent sitting/lying, during the waking day were calculated. Bouts of wake time sedentary behaviour were identified and defined as a period of at least 30 minutes continuous, uninterrupted sitting/lying during the waking day. Correlation analysis was conducted to investigate the relationships between sedentary bout duration and mean glucose, glucose range and glucose coefficient of variation.

Results: On average, participants spent 65% of their day sitting/lying, 76% of sedentary bouts were ≥30minutes and 2% of bouts were ≥60minutes. Mean glucose was negatively correlated with sedentary bout duration (r = -0.08, p < 0.01) and glucose coefficient of variation (r = 0.26, p < 0.001) both positively correlated with sedentary bout duration. Participant characteristics such as age, gender and BMI appear to influence the relationship between sedentary bout duration and glucose response.

Conclusion: Results indicate increased sedentary time leads to improved mean glucose and increased glucose variability.

Physical activity is highly beneficial in patients with type 1 diabetes (T1D). The American Diabetes Association recommends at least 150min/week of moderate intensity aerobic physical activity, defined as 50–70% of maximum heart rate (HR_max), however, exercise intensity prescribed as percentages of HR_max leads to inhomogeneous cardio-respiratory acute responses when dealing with individuals with T1D where chronic stress may affect β1-receptor sensitivity.

Purpose: To determine the exercise intensity given as percentages of HR_max in T1D patients versus healthy controls (nT1D) related to the degree and direction of the HR acute responses when dealing with individuals with T1D where chronic stress may affect β1-receptor sensitivity.

Methods: Eight male T1D patients (25±5 y, BMI: 24±2 kg/m², HBA1c: 7.3±1.0%, duration of diabetes: 15±9 yrs) and eight male nT1D (26±5 yrs, BMI: 23±2 kg/m²) performed an incremental exercise test (IET) until exhaustion (start 40 W; increase 20 W/min). nT1D were matched for age and maximum power output (P_max), respectively. The first and the second lactate turn points (LTP, LTPP), as well as the direction and degree of the time course of HPC (k_HPC), were determined form IET and compared to 50% and 70% of HR_max, k_HPC, power output (P) and HR at LTP were compared between groups in relation to 50% and 70% of HR_max. Group differences were calculated by an ANOVA with post-hoc testing.

Results: No significant differences were found between both groups for HR_max (p=0.05), HR at LTP, vs 50%HR_max and 70%HR_max were significantly different for both groups, except for the nT1D group at 70%HR_max. P at 50%HR_max was significantly lower than at LTP in both groups; at 70%HR_max, P was significantly higher only in the nT1D group at 70%HR_max, at 50%HR_max was significantly different lower than at LTP, in both groups; at 70%HR_max, P was significantly higher only in T1D (p<0.05). Significant differences for P between both groups were only found at 70%HR_max (133.1±17 W vs 91.38 W, p<0.05) 50%HR_max was as low as resting conditions (0 W) in 3% of the T1D group and 50% of the nT1D k_LTP was lower in T1D (0.21±0.30 vs. 0.39±0.27) but the difference was not statistically significant (p=0.05).

Conclusion: 50%HR_max is clearly too low to induce any training effects even when exercising 150min/week. A lower k_LTP for the acute HR response in T1D patients indicates a reduced β1-receptor sensitivity, which needs to be respected for the calculation of target exercise intensities.
Neuropathy, a debilitating complication of diabetes, has primarily been attributed to poor glycemic control, but has recently been associated with obesity and the metabolic syndrome in nondiabetic individuals. A robust body of evidence indicates that a high-fat diet can induce signs of neuropathy in mice but the pathogenesis of high-fat diet-induced neuropathy remains unknown.

**PURPOSE:** To determine if neuronal inflammation is a potential contributing mechanism for the development of mechanical hypersensitivity and nerve fiber changes (signs of neuropathy) in high-fat fed mice.

**METHODS:** Male C57Bl/6 mice were randomized to a standard (Std, 15% kcal from fat) or high-fat diet (HF, 54% kcal from fat) for 4, or 8 wks. Lumbar dorsal root ganglia were harvested and inflammatory mediators (IL-1α, IL-1β, IL-2, IL-3, IL-4, IL-5, IL-6, IL-10, IL-12p70, IL-17, MCP-1, IFNγ, TNFα, MIP-1α, GMCSF, RANTES) were quantified by an ELISA assay and normalized to total protein. Neuropathy was characterized by the von Frey test for mechanical sensitivity at wk 0 and every other week thereafter. Hindpaw foot pad skin was harvested at end study and used to quantify intradipidermal nerve fiber density (INFD) and pain-sensing (TrkA) nerve fibers via immunohistochemistry.

**RESULTS:** After 8 wks, HF had greater body weight (33.3 ± 1.0 vs. 26.7 ± 0.5 g, p < 0.001), fasting blood glucose (160.3 ± 9.4 vs. 138.5 ± 3.4 mg/dL, p < 0.05) and insulin (3.58 ± 0.46 vs. 0.82 ± 0.14 µg/L, p < 0.001) compared to Std. IL-1α and IL-5 were higher in HF compared to Std after 2 wks and 4 wks, respectively (IL-1α: 4.8 ± 1.1 vs. 0.5 ± 0.6 µg/mL, p < 0.05; IL-5: 5.8 ± 0.7 vs. 3.1 ± 0.5 µg/mL, p < 0.05). INFD and TrkA fiber density were higher in HF vs. Std after 4 wks (INFD: 4.9 ± 1.2 vs. 3.2 ± 1.3 fibers/mm, p < 0.001; TrkA: 30.4 ± 1.8 vs. 22.4 ± 1.3 fibers/mm). There were no significant differences in hindpaw sensitivity for Std vs. HF at any time point.

**CONCLUSION:** Increased inflammatory mediators preceded and accompanied an increase in a specific population of pain sensing nerve fibers (TrkA) in the hindpaw footprint of high-fat fed mice. Their high fat in may increase neuronal inflammation and initiate nerve fiber changes responsible for painful neuropathy in nondiabetic and diabetic individuals.

Supported by SIUE Seed Grants for Transitional and Exploratory Projects.

---

**Table 1. Clinical, anthropometric and metabolic characteristics**

<table>
<thead>
<tr>
<th>BASE LINE</th>
<th>AEROBIC</th>
<th>BASE LINE</th>
<th>AEROBIC</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE (yr)</td>
<td>45.8</td>
<td>46.9</td>
<td>46.6</td>
<td></td>
</tr>
<tr>
<td>WEIGHT (kg)</td>
<td>71.1 ± 7.5</td>
<td>69.1 ± 7.2</td>
<td>70.1 ± 7.6</td>
<td>0.6</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.6 ± 4.7</td>
<td>28.9 ± 4.5</td>
<td>29.1 ± 7.2</td>
<td>0.015</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>120 ± 10.4</td>
<td>121 ± 9.6</td>
<td>120 ± 15.3</td>
<td>0.102</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>73 ± 7.9</td>
<td>75 ± 8.0</td>
<td>74 ± 8.0</td>
<td>0.171</td>
</tr>
<tr>
<td>HR (%)</td>
<td>35.1 ± 6.9</td>
<td>34.7 ± 7.2</td>
<td>0.71</td>
<td>0.946</td>
</tr>
<tr>
<td>SUCRE (%)</td>
<td>45.1 ± 5.6</td>
<td>45.3 ± 5.6</td>
<td>0.5</td>
<td>0.560</td>
</tr>
<tr>
<td>RACT (C, %)</td>
<td>57.8 ± 10.3</td>
<td>57.8 ± 10.3</td>
<td>0.3</td>
<td>0.917</td>
</tr>
<tr>
<td>GLUCOSE (mg/dL)</td>
<td>15.16 ± 60.8</td>
<td>14.22 ± 50.8</td>
<td>0.632</td>
<td>0.420</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>0.9 ± 0.93</td>
<td>0.73 ± 0.73</td>
<td>0.144</td>
<td>0.343</td>
</tr>
<tr>
<td>IL-6 (pg/mL)</td>
<td>30.5 ± 10.4</td>
<td>25.7 ± 13.4</td>
<td>0.187</td>
<td>0.513</td>
</tr>
<tr>
<td>CRP (mg/dL)</td>
<td>15.16 ± 60.8</td>
<td>14.22 ± 50.8</td>
<td>0.632</td>
<td>0.420</td>
</tr>
<tr>
<td>IL-1α (pg/mL)</td>
<td>18.34 ± 80.6</td>
<td>18.39 ± 80.6</td>
<td>0.203</td>
<td>0.199</td>
</tr>
<tr>
<td>IL-5 (pg/mL)</td>
<td>90.92 ± 267.5</td>
<td>100.46 ± 38.8</td>
<td>0.079</td>
<td>0.520</td>
</tr>
<tr>
<td>TrkA (fibers/mm)</td>
<td>170.00 ± 58.54</td>
<td>170.00 ± 58.54</td>
<td>0.001</td>
<td>0.976</td>
</tr>
<tr>
<td>VO2 MAX (ml/kg/min)</td>
<td>20.9 ± 6.9</td>
<td>23.75 ± 4.02</td>
<td>0.001</td>
<td>0.976</td>
</tr>
</tbody>
</table>

**Board #33**

June 3 8:00 AM - 9:30 AM

**Association Between Whole-body VO2Peak And Skeletal Muscle Mitochondrial Respiration In Adults At Risk Of Diabetes**

William M. Castle, Adam R. Konopka, Jaime Laurin, Christopher A. Wolff, Karyn L. Hamilton, FACSM, Benjamin F. Miller, FACSM. Colorado State University, Fort Collins, CO.

**No relationships reported**

Whole body oxygen consumption (VO2peak) is a strong predictor of morbidity and mortality. In populations at risk for chronic disease, the relationship between skeletal muscle mitochondrial respiratory capacity and VO2peak is relatively unexplored.

**PURPOSE:** To identify associations between VO2peak and mitochondrial respiration in adults at risk for Type 2 Diabetes (T2D).

**METHODS:** We enrolled 23 older adults (63±6 yrs) at risk for T2D as defined by impaired fasting glucose (100-125mg/dL), HbA1c (5.7-6.4%), impaired glucose tolerance (140-200mg/dL), or a family history of T2D. VO2peak was measured during a graded exercise test on a cycle ergometer while mitochondrial respiration was assessed in permeabilized skeletal muscle fibers obtained from muscle biopsy samples of the vastus lateralis. Two different substrate-uncoupler-inhibitor-titration (SUIT) protocols were implemented. SUIT1 evaluated carbohydrate supported respiration during complex I-linked electron transport (C1) and maximal coupled oxidative phosphorylation (OXPHOS; C1+C2&FAOP) and complex II-linked carbohydrate substrates to determine OXPHOS (C1+C2&FAOP) and uncoupled electron transport system (ETS) respiration. SUIT2 utilized an ADP titration to determine mitochondrial ADP sensitivity, as defined by apparent ADP Km, followed by OXPHOS and ETS capacity.

**RESULTS:** VO2peak (ml/kg/min) correlated with C1 (r=0.687, p=0.0003) and ETS (r=0.454, p=0.047). When analyzing relative to VO2peak expressed as fat free mass (FFM), these correlations were further strengthened (C1: r=0.694, p=0.0002; ETS: r=0.547, p=0.007).

**CONCLUSIONS:** Our findings demonstrate skeletal muscle mitochondrial respiratory capacity is significantly correlated to VO2peak in those at risk for T2D and is strengthened when adjusted for FFM. The data may provide a mechanistic link between mitochondrial dysfunction and the predictive value of VO2peak on morbidity and mortality.

Supported by the National Dairy Council.

---

**Board #34**

June 3 8:00 AM - 9:30 AM

**Medicine & Science in Sports & Exercise®**

**No relationships reported**

**April 18, 2017**

**Table 1. Clinical, anthropometric and metabolic characteristics**
Non-alcoholic steatohepatitis (NASH) is characterized as a dysregulation of hepatic lipid metabolism and a chronic inflammatory state. It is hypothesized the link between lipid dysregulation and inflammation may be due in part to defective hepatic autophagy and reduced mitochondrial capacity to oxidize fatty acids. It remains to be determined, however, the effects of a Western diet on hepatic autophagy and mitochondrial function during aging. PURPOSE: The purpose of this study was to determine the effect of a high-fat-high-fructose diet (HFF) on markers of hepatic autophagy and mitochondrial function in an age-accelerated mouse model. METHODS: Twenty-week old, male and female, SAMP8 mice (n=49) were randomly assigned, matching for gender, to either a standard chow (SC) or HFF (45% fat, 24% fructose) diet for 32 weeks. Liver tissue was analyzed for mRNA expression of autophagic (BNIP3, Beclin 1, p62, and Atg7) and mitochondrial (PGC-1α and COX-IV) genes. Differences between gender and dietary groups were identified by a 2 x 2 ANOVA and statistical significance was set at p<0.05. RESULTS: Following 32 weeks of feeding, male mice fed the HFF diet were significantly heavier than male mice in the SC group (31.6 g vs 26.5 g; p<0.001); however, no difference was observed between diet groups for female mice. The HFF diet resulted in higher autophagic activity as observed by Beclin1 (+:36%; p<0.001) and BNIP3 (+40%; P=0.003) expression. Despite the higher autophagic activity, p62 was higher (+31%; p<0.001) in the HFF compared to the SC group, suggesting increased β-oxidation. Overall, the expression of all autophagic and mitochondrial markers was (+43%; P<0.001) in the HFF group compared to the SC group suggesting increased p62 was higher (+31%; p<0.001) in the HFF compared to the SC group, suggesting however, no difference was observed between diet groups for female mice. The HFF group showed a 1.7 fold (p=0.017) higher expression of TGF-β1 in HFFO when compared to HFL post-LPS stimulation. In comparison to untreated tissue, BAMBI was 1.7 fold (p=0.017) higher in the HFFO LPS-stimulated tissue, which best explained the 1-fold (p=0.004) lower expression of TGF-β1 in HFFO when compared to HFL post-LPS stimulation. CONCLUSION: Despite the increase in extracellular LPS signaling receptor CD14, the consumption of fish-oils protected hepatic β-oxidation. Overall, the expression of all autophagic and mitochondrial markers was (+43%; P<0.001) in the HFF group compared to the SC group suggesting increased p62 was higher (+31%; p<0.001) in the HFF compared to the SC group, suggesting however, no difference was observed between diet groups for female mice. The HFF group showed a 1.7 fold (p=0.017) higher expression of TGF-β1 in HFFO when compared to HFL post-LPS stimulation. In comparison to untreated tissue, BAMBI was 1.7 fold (p=0.017) higher in the HFFO LPS-stimulated tissue, which best explained the 1-fold (p=0.004) lower expression of TGF-β1 in HFFO when compared to HFL post-LPS stimulation. CONCLUSION: Despite the increase in extracellular LPS signaling receptor CD14, the consumption of fish-oils produced a protective intracellular response as observed by an increase in Bambi and decrease in TGF-β1. These results suggest that a diet high in ω-3 fatty acids may protect against the development of hepatic fibrosis. PURPOSE: To examine differences in adiposity, physical activity (PA) and sedentary time (ST) between overweight and obese children with or without non-alcoholic fatty liver disease (NAFLD). METHODS: A total of 35 overweight and 54 obese (IOTF) children aged 8-12y were included in this study. Hepatic fat content was measured by magnetic resonance imaging and body fat percent (BF%) by Dual X-ray Absorptiometry. Children were categorized into two groups according to the presence (n=41) or absence (n=48) of NAFLD (≥4.85% or <3.85% of hepatic fat, respectively). PA and ST were measured using accelerometers over 7 days. PA was categorized into light (LPA), moderate to vigorous (MVPA) and VPA. RESULTS: There were not found significant differences in BMI (26.2±0.5 vs. 25.1±0.4 kg/m², respectively, age and sex adjusted P=0.10) and obesity percentage (63.4% vs. 58.4%, respectively, adjusted P=0.60) between children having or not having NAFLD. However, BF% was higher in children with NAFLD than in those without NAFLD (41.4±0.7% vs. 38.7±0.7%, respectively, adjusted P=0.01). Children with NAFLD spent less time in VPA (6.28±0.85 vs. 8.5±1.07 min/day, respectively, P=0.06) and total PA (3517±99 vs. 3815±91 cpm, respectively, P=0.03) than those without NAFLD regardless of age, sex and accelerometer wear time, but were diminished after further adjustment for BF%. There were no significant differences in ST, LPA and MVPA between children with or without NAFLD (P>0.05). CONCLUSIONS: Overweight children with NAFLD had higher adiposity and spend less time in total PA, particularly in VPA, than their peers without NAFLD, regardless of their overweight/obesity status. These results suggest that health intervention programs should promote total PA, especially VPA, to prevent an excess of adiposity and hepatic steatosis in overweight and obese children. Supported by: P113/01335, GIU/14/21 and FPU14/03329.
CONCLUSIONS when individuals experienced acute exhaustive exercise with high interindividual variance. These results were reflected in their glucose status.

INTRODUCTION: White adipose tissue is the main source of circulating Asprosin - a newly identified protein hormone encoded by FBN1. It triggers hepatic glucose release into the bloodstream in order to maintain hemal energy standards between meals and is suggested to serve as target battle obesity and T2D. In obese male individuals plasma Asprosin levels were found to be increased twofold and in male Ob/Ob-mice, the Fbn1 mRNA expression was also elevated in skeletal muscle compared to non-obese animals (Romero et al. Cell 2016).

PURPOSE: To evaluate Asprosin response to an exhaustive bout of exercise 14 obese individuals (10 women and 4 men) underwent an adapted treadmill running test at a starting speed of 6 km/h with 2 km/h increments every 3 min accompanied by venous blood draws pre- and immediately post exercise.

RESULTS: Resting Asprosin levels among obese women and men were comparable (19.9±36.7 and 7.1±7.5) and also similar to non-obese subjects (9.2±9.5 and 12.4±10.4) yet with huge individual variations. The results were reflected when individuals experienced acute exhaustive exercise with high interindividual distributions but low intradividual spreadings applied to obe and lean subjects.

CONCLUSIONS: Contrary to findings of Romero et al. we could not reproduce differences in Asprosin levels between obese and non-obese subjects. Also an acute bout of treadmill exercise did not affect Asprosin secretion in order to refuel hemal glucose status.

PURPOSE: Establishing valid criteria for the diagnosis of obesity is important for screening and treating obesity-related disorders. Several different cut-off points (CP) have been developed for obesity to predict cardiovascular disease risk factors (CDRF) such as hypertension, dyslipidemia, and diabetes mellitus (DM) in Korean adults; however, there are no cross-validation studies for the developed obesity CP. Therefore, the aim of this study is to examine the diagnostic accuracy of obesity CP.

METHODS: Data (9,425 adults ≥18 years, male = 4,031) from the 2008 and 2011 Korea National Health and Nutrition Examination Survey was analyzed to examine the accuracy of obesity CP developed using three obesity indices: body mass index (BMI; 23, 24, 25, & 28kg/m²), waist circumference (WC; 84, 85, & 90cm for male; 78, 80, & 85cm for female), and waist-to-hip ratio (WHR; 0.85, 0.86, & 0.90). Participants with CDRF were operationally defined as having one or more of the following: hypertension, dyslipidemia, and/or DM. CP of BMI, WC, and WHR were evaluated using Youden Index (YI; sensitivity [SE] + specificity [SP] - 1). To evaluate the CP with highest YI, adjusted odds ratios (OR) of having CDRF were calculated while controlling for age, sex, physical activity status, smoking, alcohol consumption, household income, and education level.

RESULTS: Overall, SE and SP of the CP were low across three obesity indices (SE=29.26-75.86%, SP=46.51-95.89%). CP with highest YI were BMI of 23 (SE=69.25%, SP=53.21%), WC of 84 (SE=62.68%, SP=66.67%), and BMI% of 20 (SE=75.86%, SP=46.51%) and BMI% of 23 (SE=75.86%, SP=66.67%). WC% of 78 (SE=69.12%, SP=72.39%), and BMI% of 35 (SE=50.73%, SP=69.64%) for male and female, respectively. Obese adults were more likely to have CDRF compared to non-obese adults (OR=2.61-2.96, 95% CI=2.19-3.63 for male; OR=2.05-3.00, 95% CI=1.69-3.60 for female, respectively). CP of WC had the highest YI and OR while the CP of BMI% had the lowest for both male and female.

CONCLUSIONS: WC of 84cm for male and 78cm for female were identified as the best obesity CP to predict CDRF for Korean adults. The overall diagnostic accuracy (i.e., SE and SP) of the obesity CP, however, was performed poorly. Therefore, caution is necessary when using the developed obesity CP.

PURPOSE: It has been shown that visceral adipose tissue (VAT) does not increase linearly with an increase in total body fat percentage (BF%). Instead, a BF% threshold was identified above which VAT increases more rapidly. The primary purpose of this study was to investigate the effect of age, ethnicity, and sex on the BF% threshold at which the accumulation of VAT increases significantly.

METHODS: A convenience sample of 3,211 (1,756 females and 1,455 males) participants, 18-75 years of age, who had a dual X-ray absorptiometry scan conducted at The Fitness Institute of Texas between 2008-2016, were included in this study. Self-selected ethnicities were Asian (18.1%), Black (6.7%), Hispanic (19.8%) and White (55.4%). A set of segmented linear regression models for each sex and ethnicity category were specified to estimate thresholds at which the relationship between BF% and VAT mass changed.

RESULTS: The BF% threshold above which VAT increased more rapidly was identified and it varied between females and males and among ethnicities. The BF% threshold for females were: Asian 29.2%, Black 35.6%, Hispanic 31.7%, and White 34.2%. For males, the BF% thresholds were: Asian 25.3%, Black 23.9%, Hispanic 24.3%, and White 22.8%. There was more variability in VAT mass among participants above the BF% threshold than those below. In order to attempt to explain this additional variability, age and ethnicity were added as covariates in multiple linear regression models applied to post-threshold participants, for both females and males separately. Post-threshold, the impact of BF% is amplified for older participants controlling for ethnicity for both females (β = 0.28, SE = 0.03, p < 0.001) and males (β = 0.81, SE = 0.06, p < 0.001), meaning that the VAT increased at a faster rate for older individuals. Controlling for age, BF% has a significantly lower impact on VAT mass for Black females compared to their White counterparts (β = 3.05, SE = 1.44, p < 0.05) and Asian males compared to their White counterparts (β = 0.11, SE = 2.3, p < 0.001), meaning that the VAT increased at a faster rate for White females and males than Black females and Asian males.

CONCLUSION: The BF% threshold above which VAT increased more rapidly was identified and it varied by sex and ethnicity. Post threshold the increase in VAT was affected by age and ethnicity.

PURPOSE: Skeletal muscle dysfunction is a consequence of obesity, where changes in the extracellular matrix (ECM) and adiponectin dysregulation may play a role. To determine if an exercise regimen can prevent these changes we investigated the effect...
of 10 weeks of two isocaloric training programs; moderate-intensity endurance (END) (70%) of maximal running capacity (MRC) or high intensity interval training (HIIT) (50-90% of MRC), in a mouse model of diet-induced obesity.

**METHODS:** Ten-week-old male C57BL/6 mice were fed a high fat diet (HFD) (45% kcal from fat) ab 

*libitum*, and simultaneously underwent END or HIIT (3x30min sessions/week). Untrained HFD and chow-fed mice acted as controls. After 10 weeks mice were euthanased and *quadriceps* muscle was extracted for analysis.

**RESULTS:** END and HIIT, each with HFD, showed similar prevention in body weight (BW) gain (p < .05) (HFD=45±2g; END=37±2g; HIIT=36±2g), preserved fat-free mass (%FFM) (HFD=58±3; END=72±6; HIIT=72±7), and improved insulin sensitivity (blood glucose,*) in an insulin tolerance test (0.65 IU/kg BW) (HFD=41±15; END=350±57; HIIT=320±66 A.U.). HFD induced decreases in grip strength (N) were prevented by END and HIIT similarly (HFD=1.42±0.06; END=1.53±0.10; HIIT=1.51±0.17; p<.05). Aerobic performance (treadmill progressive test) was higher in END and HIIT groups compared to untrained HFD, with END being superior to HIIT (2.8±0.5 and 2.1±0.3 fold-change respectively; p<.05). Fasting hyperglycemia and hyperinsulinemia found in HFD untrained mice (each p<.05 vs controls) were each partially prevented by END.

The higher collagen protein deposition found in HFD untrained mice, was not prevented by END or HIIT. However, decreased collagen-I (~50% of controls; p<.05) and increased collagen-III (~2-fold controls; p<.05) seen in HFD untrained mice was prevented by both END and HIIT. Only END increased skeletal muscle adiponectin mRNA (14-fold; p<.05 compared to HFD untrained). Furthermore, END but not HIIT prevented the HFD downregulation in mRNA level of PGC1α, and upregulation of UCP2 (1.5-fold; p<.05).

**CONCLUSIONS:** Whilst further research is needed to clarify the differential impact of END and HIIT in muscle function this data favours END training rather than HIIT in having muscle specific and metabolic advantages during high fat feeding.

**Epidemiological data** suggests that physical activity (PA) has the potential to decrease the risk of high-grade prostate cancer (PCa). However, for various reasons, cancer patients fail to meet minimum standards for physical activity. For this reason, efforts need to be made to discover biologics that confer the physiological benefits of exercise, serving as an “exercise mimetic.” Previous work by our group has discovered that the natural product Nexrutine® (Nx), a bark extract of the *phellodendron amurense* can inhibit tumor development in prostate, pancreatic and skin cancers. **PURPOSE:** To compare the effectiveness of Nx and exercise in modulating carcinogenesis of the prostate using the transgenic adenocarcinoma of mouse prostate (TRAMP) model.

**METHODS:** 10-week old, male TRAMP mice were randomized to exercise, Nx or control groups (n=15 each). Mice randomized to the exercise group were given access to a running wheel and Nx treated mice were fed 600 mg/kg pelleted into their chow. Mice were sacrificed at weeks 4, 8, 12 and 20 weeks. Mice were monitored weekly for tumor development, activity and food consumption. Efficacy of exercise and Nexrutine was determined by histopathological evaluation of the prostate and tissue expression of pAkt and p65, key signaling proteins for carcinogenesis. One-way analysis of variance was performed with significance set at p<0.05. **RESULTS:** No significant pathological changes were observed as a function of time, therefore, data were pooled for analysis.

Animals on exercise intervention group ran an average of 4.4 km/day. Both exercise and Nx groups presented with palpable tumors 4 weeks later than the control group. While 100% of animals developed tumors (varying stages), Nx treated and exercising TRAMP mice had fewer poorly differentiated tumors compared to controls (p<0.05). Only Nexrutine expressed lower pAkt in tumors. No differences were seen in p65 expression. **CONCLUSIONS:** Our data provides preliminary evidence that Nx can act as an exercise mimetic in protecting against tumor development in prostate cancer. Though both Nx and exercise decreased advanced stage tumors, only Nx has lower pAkt expression. Therefore, continued efforts need to be made to decipher the mechanisms by which exercise reduces tumors development.

**Doxorubicin (DOX), a powerful anthracycline antibiotic commonly used to treat many different forms of cancer, is associated with the production of reactive oxygen species that cause oxidative damage resulting in cardiac dysfunction. Kefir is a naturally fermented milk product containing antioxidants, probiotic bacteria and yeast. The antioxidants contained in kefir interact with several types of reactive oxidative species, some of which act to manage oxidative stress. While recent studies suggest that consumption of kefir may have anti-tumor and antimicrobial properties, none have explored its potential for protecting against DOX-induced cardiac dysfunction.**

**PURPOSE:** To explore the effects of dietary kefir on DOX-induced cardiotoxicity in rats. **METHODS:** Singly housed, 10 week old, male Sprague Dawley rats were placed on 1 of 2 isocaloric diets: milk control diet (CON; n=24) or kefir diet (KEF; n=23) with equivalent macronutrient profiles. After 8 weeks of dietary intervention, all animals were given either a bolus injection (15 mg/kg) of DOX (CON-DOX, n=12; KEF-DOX, n=11) or saline (CON-SAL, n=12; KEF-SAL, n=12). Cardiac geometry and cardiac function were evaluated using echocardiography 5 days post injection, and data were analyzed using a 2 X 2 ANOVA.

**RESULTS:** Significant effects were observed for left ventricular dimension at systole (diet p<.01, drug p=0.002), left ventricular dimension at diastole (diet p=0.01 and drug p<.0001), peak mitral flow velocity (diet p=0.02 and drug p<.0001), septal wall thickness at diastole (drug p=0.0013), ejection time (drug p = 0.0039), left ventricular mass (drug p = 0.0085), relative wall thickness (drug p=0.0002), and filling time (diet p<0.0006). **CONCLUSION:** Incorporation of kefir into the diet altered DOX-induced changes in rat cardiac function and morphology. We speculate that kefir may be an alternative strategy in mitigating the deleterious cardiac side effects of anthracycline chemotherapy.
Physical activity (PA) is an important component in the prevention and management of type 2 diabetes and chronic kidney disease (CKD). Determining current patterns and predictors of PA is essential to implement programs that encourage behavior change for patients with these diseases. PURPOSE: To describe self-reported PA and self-efficacy among adults with type 2 diabetes and CKD and determine predictors of overall PA patterns. METHODS: 76 overweight/obese participants (age: 66±8 y; body mass index [BMI]: 33.0±5.3 kg/m²; sex: 60% male; ethnicity: 91% non-Hispanic white; race: 80% white) with type 2 diabetes and CKD, participating in a technology-delivered lifestyle intervention, completed two well-validated surveys at baseline: International Physical Activity Questionnaire-Short Version and Self-Efficacy for Exercise (SEE) Scale. Biomarkers (hemoglobin A1c, glomerular filtration rate, C-reactive protein) were collected via blood draw. Multiple linear regression was performed to predict total metabolic equivalent (MET)-minutes/week of PA based on biomarkers, BMI, and SEE. Preliminary analyses were conducted to ensure no violation of the assumptions of the regression model. Statistical analyses were conducted using IBM SPSS Statistics (version 22.0). RESULTS: Participants self-reported completing (median [interquartile range, IQR]) 107 [346] min/week vigorous intensity, and 1431 [2938] total MET-minutes/week. 40.8% of participants met the PA guidelines of 150 minutes/week. RESULTS: Significant predictors of PA were determined to be self-efficacy for exercise (β=0.364, p=0.004). Higher self-efficacy for exercise was a strong predictor of PA in patients with type 2 diabetes and CKD. Social cognitive theory-based programs that build self-efficacy and incorporate PA should be developed to promote risk reduction of these chronic diseases. Given the tendency to self-report higher levels of PA, future studies should include more objective measures of PA to explore these relationships. Supported by NIH Grant R01 DK100492 (PM Sevick)

Removal of endogenous sex steroids appears to alter an organism’s molecular and cellular biology resulting in immediate decreases in physical activity levels. In particular, several skeletal muscle genes have been shown to change following removal of gonadal tissues. The observed changes in expression level may be related to skeletal muscle contractile efficiency and may lead to the notable reductions in physical activity. PURPOSE: The purpose of this study was to evaluate changes to physical activity patterns and to quantify differences in expression in several muscle-related genes after loss of the sex hormones. METHODS: Physical activity patterns were observed in C57BL/6j male mice (n=28) beginning at nine weeks of age. Wheel running distance (km), duration (min), and speed (m/min) were quantified following acclimation to wheel running use. Following acclimation, wheel running patterns were assessed under physiological (n=14, sham orchidectomy) and low circulating sex hormone conditions (n=12, bilateral orchidectomy) for ten days. Wheel running distance was assessed with a computer program that uses a marked turntable to track the mouse position. RESULTS: Wheel running distance (sham=8.37±1.99 vs. orch=2.82±1.80; p=0.0000001), duration (sham=265.51 vs. orch=98.54; p=0.0000004), and speed (sham=31.4±2.8 vs. orch=26.1±5.4; p=0.008) were higher in sham treated mice than orchidectomized mice. No expression differences were identified for any of the genes of interest. CONCLUSIONS: The results of this study further support the notion that wheel running patterns are immediately affected by the loss of the sex hormones in male mice. Observations decreased in wheel running patterns following sex hormone loss are most likely unrelated to changes in expression of several sex hormone responsive genes in gastrocnemius tissue.

Autophagy is one of the most ancient and crucial cellular defense mechanisms against invading pathogens. Recently, autophagy has been shown to restrict HIV-1 infection through lysosomal degradation of the HIV-1 transactivator of transcription, a protein necessary for viral replication in CD4+ T-lymphocytes. However, as HIV-1 has evolved strategies to block the autophagic process, it is important to investigate novel approaches of autophagy upregulation. PURPOSE: We investigated whether grape seed extract (GSE) would induce autophagy in CD4+ T-lymphocytes from patients infected with HIV-1 when compared to rapamycin (Rapa) treatment (a known inducer of autophagy). METHODS: To test the concept of GSE as a novel HIV-1 treatment, CD4+ T-lymphocytes were harvested from three male HIV-1 subjects (45.7±14.2 years) and incubated at 37°C for 24 hours. The cells were then exposed to either dimethylsulfoxide (DMSO; control), baflomycin (BAF; 100 nM; autophagy inhibitor), BAF + rapamycin, or BAF+GSE (40 μg/mL) and harvested after 2 hours to determine the efficacy of GSE when compared to Rapa (0.5 nM). Cells were then treated with GSE for 6, 24, and 48 hours and harvested for analysis. LC3-II and p62/SQSTM1 proteins and genes were analyzed via Western blot and qRT-PCR, respectively. RESULTS: We found no significant difference in LC3-II or SQSTM1/p62 protein responses between 2 hours Rapa (3.09±4.98RQ) and 143±2.06RQ, respectively) and GSE treatment (2.25±3.37RQ and 1.13±1.28RQ, respectively) in HIV-1 infected CD4+ T-lymphocytes. Following 48 hours GSE exposure, an increase in both LC3-II (p=0.01; ±12.29RQ) and SQSTM1/p62 (18.22±30.23RQ) protein expression was observed, indicating increased autophagy. Expression of MAP1LC3B mRNA and SQSTM1/p62 genes increased above baseline for all measured time points, peaking at 6 hours GSE exposure (2.73±3.10RQ and 15.11±7.17RQ, respectively). CONCLUSIONS: Our preliminary findings suggest that GSE may be a potent inducer of autophagy in HIV-1 infected CD4+ T-lymphocytes. Further, GSE treatment resulted in elevated autophagy for up to 48 hours following exposure, suggesting GSE supplementation may be beneficial when used with current antiretroviral therapies.

Lactic acid levels are associated with mortality in sepsis, making clearance a treatment goal. However it is unknown if lactic acid contributes to immunosuppression in the late phase of sepsis or if it is solely a consequence of bacterial infection. PURPOSE: To determine the effects of lactic acid on LPS-mediated mast cell activation in vitro and in a mouse model of septic shock. METHODS: Bone marrow derived mast cells (BMMCs) were cultured in vitro ± lactic acid for 24-hours prior to lipopolysaccharide (LPS, 1 μg/mL) activation. For the septic shock model, an intraperitoneal (IP) injection of lactic acid (80 mg/kg) or PBS was given to C57BL/6 mice 2-hours prior to an IP injection of LPS (25 mg/kg) or PBS. Cytokine production was determined via ELISA in the supernatant or plasma, respectively. RESULTS: In vitro, lactic acid significantly suppressed cytokine production (pg/mL ± SEM) compared to the media control: IL-6 (-10,666 ± 352.9 vs. 3734.9 ± 953.6, p < 0.01) at concentrations ≥ 12mM and TNF (12.2 ± 2.9 vs. 87.4 ± 16.4, p < 0.01) and MCP-1 (296.5 ± 47.6 vs. 717.2 ± 75.9, p < 0.01) at concentrations ≥ 12.5 mM. These effects are dependent upon pH, as sodium lactate had no effect on IL-6 (15391.0 ± 2541.0 vs. 17909.1 ± 1948.6, p < 0.79) and formic acid suppressed IL-6 (9797.1 ± 935.4 vs. 17909.1 ± 1948.6, p < 0.01). Additionally, lactic acid effects are transient, since activation in fresh media following a 24-hour treatment with lactic acid did not suppress IL-6 (7423.3 ± 1094.9 vs. 6975.8 ± 538.5, p < 0.91). Similar to the results in vitro, lactic acid significantly suppressed IL-6 (54, 917.6 ± 4508.0 vs. 69,451.6 ± 2283.6, p < 0.01) and MIP-1α (531.1 ± 9.9 vs. 149.8 ± 47.9, p < 0.01) levels in vivo, with a trend towards reduced TNF and MCP-1. There were no changes observed in the late phase of sepsis.
was no effect of lactic acid on temperature or observational score. CONCLUSION: These findings suggest that elevated lactic acid levels in sepsis patients may attenuate immune cell activation. This information may improve our understanding of immunosuppression in the late phase of sepsis and could reveal new molecular targets for treatment, for which there are currently none. Supported by NIH grants: 1R01AI011153 and 2R01AI059638

3603 Board #50 June 3 9:30 AM - 11:00 AM
The Effect of Creatine Supplementation on Upper Body Strength and Immune Function in Men
Joan M. Eckerson, FACSAM1, Lisa A. Riesberg1, Kyle Serreyen1, Jennifer Yee1, Geri A. Moore2, Dimitrios KatSavelis2, Eric Bredahl1, Kristen Drescher1, David Fukuda1, Laura Kurata1, Brittany Moul1, Creighton University, Omaha, NE.1University of Central Florida, Orlando, FL. (No relationships reported)

PURPOSE: The purpose of this study was to examine the effect of creatine (CR) loading on upper body strength and immune system function in men. METHODS: Using a double-blind design, physically active males (N ≥ 35, 22 ± 3 yr) were randomly assigned to a CR (n=22) or placebo (PL; n=22) group and were instructed to consume their respective treatments (20 g/d); CR monohydrate or maltodextrin in powder form) dissolved in water over four equal time periods for 5 d. At baseline (BL) and after the 5 d loading phase, body weight (BW) and one-repetition maximum bench press (1 RM BP) were assessed. At BL and 5 d, a 50 ml blood draw was also extracted in five EDTA tubes and one serum separation tube to obtain lymphocytes and serum. Immunomodulatory effects of CR were determined using RT-PCR to analyze the mRNA expression of pro-inflammatory cytokine tumor necrosis factor-α (TNF-α), while a creatine assay was used to measure the amount of creatine present in the sera. Data were analyzed using 2 x 2 (group x time) repeated measures ANOVA and statistical significance for all tests was p < 0.05. RESULTS: There were no significant interactions or treatment effects for BW or 1 RM BP, however, there was a significant main effect for time with both groups demonstrating an increase in BW (PL: 0.13 kg; CR: 0.46 kg) and 1 RM BP (PL: 1.76 kg; CR: 2.06 kg). There was a significant interaction for serum creatine, and a significant treatment effect for TNF-α mRNA levels. Post-hoc tests revealed that the CR group demonstrated a significant increase in serum creatine levels, and significantly lower TNF-α mRNA levels after the 5 d loading phase compared to PL. CONCLUSIONS: The changes in BW and serum creatine observed in the CR group following a 5 d loading phase are consistent with previous research. However, this is one of the first studies using human subjects to support the results. Creatine observed in the CR group following a 5 d loading phase are consistent with previous research. However, this is one of the first studies using human subjects to support the results. Creatine: Supported by LB692 and MusclePharm® (CR supplement).

3604 Board #51 June 3 9:30 AM - 11:00 AM
Exercise During Chemotherapy May Reduce Pain By Strengthening Co-regulatory Couplings In The Cytokine Network
Ian R. Kleckner1, Calvin Cole1, Charles Heckler1, Steven Rousey2, Samer Kasbari1, Jessica Miller1, Pavan S. Reddy2, Shelli Kesler1, Karen Mustian1.1University of Rochester Medical Center, Rochester, NY. 2Minneapolis VA Medical Center, Minneapolis, MN. (No relationships reported)

PURPOSE: Chemotherapy is hypothesized to cause pain partly via dysregulation of the inflammatory cytokine network - namely, by weakening the normal co-regulatory couplings between concentrations of pro- and anti-inflammatory cytokines. Although research suggests that exercise reduces pain in cancer patients by favorably influencing exercise participants, decreased pain was associated with strengthened co-regulatory coupling between changes in concentrations of IL-6 and IL-10 (r = 0.18, p = 0.047). CONCLUSIONS: Exercise strengthened the regulation of the inflammatory cytokine network via strengthened co-regulatory couplings between concentrations of pro- and anti-inflammatory cytokines. The strength of co-regulatory coupling between IL-6 and IL-10 may mediate the beneficial effects of exercise. Future analyses in men and IL-10 are known to contribute to the physical conditioning effects of exercise. Our novel methods to analyze cytokine data may complement traditional analytic approaches in the investigation of immune-mediated phenomena beyond this study.

3605 Board #52 June 3 9:30 AM - 11:00 AM
The Influence of Menstrual Cycle on Salivary Antimicrobial Proteins during Endurance Exercise
Harumi Hayashida, Saori Yoshida. Tokoha university, Hamamatsu, Japan. Email: h-hayashida@fuji.waseda.jp (No relationships reported)

The oral-respiratory mucosal immunity is important to prevent upper respiratory tract infection after exercise for athletes. Lysozyme and lactoferrin, as salivary antimicrobial proteins, play an important role in first-line defense against invading microbes. The responses of saliva flow rate and composition during exercise are influenced by the sympathetic nervous system. Additionally, the sympathetic nervous system is affected by the menstrual cycle. However, the changes in salivary antimicrobial proteins following exercise at different phases of the menstrual cycle remains unclear. PURPOSE: To examine the influence of the menstrual cycle on salivary antimicrobial proteins level at rest and in response to an acute bout of endurance exercise. METHODS: Eight healthy recreationally active females completed a cycling exercise at 70% Vo2peak for 45 minutes at two time points of the menstrual cycle: during the follicular phase (day 8 ± 2) and the mid-luteal phase (day 21 ± 2). All participants have a regular menstrual cycle and have never taken oral contraceptives. Timed unstimulated saliva samples were obtained before, immediately after, and 1 hour after exercise and analyzed for salivary antiglucocorticoids proteins. The concentrations of lysozyme and lactoferrin were measured using enzyme immunoassays. RESULTS: The menstrual cycle modified the resting levels of lysozyme (follicular: 23435.0 ± 3140.0 vs. luteal: 15951.7 ± 7743.4 ng/mL, p<0.05). The menstrual cycle did not significantly modify the levels of lactoferrin at rest (follicular: 4896.6 ± 1885.0 vs. luteal: 5300.0 ± 2488.2 ng/mL, NS). Lysozyme concentration was increased after exercise (p<0.01) and lactoferrin concentration was increased immediately after exercise (p<0.01) and 60 minutes after exercise (p<0.05) but unaffected by the menstrual phase. Saliva flow rate was slightly reduced after exercise but not significantly altered by the menstrual cycle. CONCLUSION: The pattern of salivary antimicrobial protein secretion in response to endurance exercise was not influenced by the menstrual cycle. These findings indicate that the regular menstrual cycle may not need to be considered when assessing oral-respiratory mucosal immune responses to acute endurance exercise.

3606 Board #53 June 3 9:30 AM - 11:00 AM
Post-STEMI Age-related Non-classical Monocyte CCR2 Expression Differences In Response To Stress Hormones
Anson Blanks, Charles S. Schwartz, Lauren N. Pedersen, Leo F. Buckley, Edmund O. Accvedo, FACSAM, Antonio Abbate, R. Lee Franco. Virginia Commonwealth University, Richmond, VA. Email: blanksam2@vcu.edu (No relationships reported)

C-C chemokine receptor 2 (CCR2) plays an important inflammatory role following ST segment elevation myocardial infarction (STEMI) by regulating the chemotaxis of monocytes to damaged tissue. Circulating non-classical monocytes are responsible for debris clearance following STEMI and are positively correlated with age in healthy individuals, as well as increased plaque area in cardiovascular disease (CVD) patients. While post-STEMI non-classical composition within the monocyte population has been defined in CVD patients, age related differences in monocyte phenotypic characteristics and response to stress hormones remains unclear. Specifically, epinephrine (EPI) and cortisol (COR) each which are elevated during major exercise have been shown to both affect immune cell function and positively correlate to infant size. PURPOSE: To determine the in-vitro effects of COR and EPI on non-classical monocyte CCR2 expression in young and old patients post-STEMI. METHODS: Blood was collected from 19 volunteers 72 hours post-STEMI. Samples were grouped by age (<50 [YNG, n=7, 38.7±6.0 yrs] or ≥50 [OLD, n=12, 61.7±6.9 yrs]). Blood was diluted to 1 x 10^4 cells/mL and cultured for 24 hours either without (EPI + COR) or with (EPI + COR) EPI (10^{-8} M) or COR (10^{-8} M). Cultures were stained against CD14, CD16, and CCR2. Flow cytometry was performed and non-classical monocytes were determined based on CCR2 + and CD16 + expression. RESULTS: Unstimulated CCR2 expression was prepared by the authors and printed as submitted. Abstracts were prepared by the authors and printed as submitted.
Adipose tissue (AT) immunometabolic health predicts systemic metabolic health. Exercise improves metabolic function and insulin sensitivity and is thought to improve AT metabolism by reducing AT inflammation. Fibroblast growth factor 21 (FGF21) is a pleotropic hormone-like protein that has been shown to have beneficial effects on AT metabolism by reducing AT inflammation. Fibroblast growth factor 21 (FGF21) is a pleotropic hormone-like protein that has been shown to have beneficial effects on AT metabolism by reducing AT inflammation. Fibroblast growth factor 21 (FGF21) in exercise-induced adaptations in white (W) and brown (B) AT.

**METHODS**

To determine the role of FGF21 in exercise-induced adaptations in white (W) and brown (B) AT. METHODS: Male FGF21 knockout (KO) and wild type (WT) mice were fed normal chow and either exercise trained via voluntary wheel running (EX) or kept sedentary (SED) for 8 weeks. Fullers (i.e., epididymal, subcutaneous (inguinal region) WAT, and BAT (interscapular region) depots were removed, weighed and flash-frozen in liquid nitrogen. Techniques used: EchoMRI - body composition, real-time PCR - gene expression, Western blotting - protein content, and H&E staining - histology.

**RESULTS:** FGF21KO mice weighed more (p<0.05) and had greater overall adiposity. In addition to having greater systemic insulin resistance (IR) based on HOMA-IR (p<0.01), AT from FGF21KO mice tended to decrease HOMA-IR (p=0.112). Phospho-Akt and GLUT4 proteins were linked immunosorbent assay. A 2x2 repeated measures ANOVA with a Tukey post-hoc test was used to examine the main effects of exercise and genetic variation on lipolytic activity, lipid oxidation and peripheral insulin sensitivity.

**CONCLUSIONS:** Our data suggest that FGF21 and exercise induced-FGF21 play a role in adipose tissue metabolism and provide a new perspective on the role of FGF21 in the regulation of adipose tissue metabolism in health and disease. The present study also highlights the importance of considering genetic background in the design of future exercise intervention studies.
Slopes from the motor unit action potential size (MUAP size) vs. recruitment threshold (RT) relationships provides a non-invasive measurement of MU sizes. As such, the slopes (AP slope) may be able to quantify age-related MU atrophy. PURPOSE: To determine if AP slope differed between young and old individuals. METHODS: Twenty two young (YG, age = 22.5±2.7 yrs) and ten aged (OG, 61.0±2.0 yrs) subjects completed the investigation. Surface electromyography signals were recorded from the first dorsal interosseous (FDI) during an isometric trapezoidal muscle action with the steady force plate set at 50% maximal voluntary contraction (MVC). The signals were decomposed to yield MUAP size and RTs for each MU. The AP slope was calculated in relation to RT, likely due to reduced sizes of higher threshold MUs. Higher threshold MUs have been suggested to contain a greater proportion of type II muscle fibers, which demonstrate greater age induced atrophy than type I fibers commonly associated with lower threshold MUs. As such, the difference in AP slope suggested atrophy of higher threshold MUs in OG. In addition, OG’s elevated EI indicates greater infiltration of adipose and connective tissue into the muscle. Greater EI in combination with similar CSA may indicate a reduced contractile tissue volume in the OG, supporting the speculation that the AP slope differences were due to MU atrophy.

Evidence suggests that ankle proprioceptive ability is significantly correlated with soccer performance level. It has not been determined if ankle proprioception is associated with specific soccer skills in youth recreational soccer players. PURPOSE: To investigate the relationship between ankle proprioception and soccer skills in youth recreational players. METHODS: Twenty-seven youth recreational soccer player (mean 14.8 years old, range 13-17), without ankle injury during the past 3 months, participated in this study. Their passing, shooting and dribbling skills were assessed by using the reliable and valid Soccer Skill Tests (Russell et al. 2010). Ankle proprioception was assessed by using the reliable and valid AMEDA in standing. RESULTS: Ankle proprioceptive discrimination accuracy scores were significantly positively correlated with passing, shooting and dribbling accuracy scores (r=0.52, r=0.71, and r=0.53, respectively; all p<0.01). Further, participants who had history of ankle injury beyond 3 months performed significantly worse in both ankle proprioception and shooting accuracy tests than those who did not (F=5.01, p<0.03, and F=5.77, p<0.02, respectively). CONCLUSION: Results here highlight the importance of ankle proprioception for soccer skills in youth recreational soccer players. Future research is needed to determine if there is a causal relationship between poor ankle proprioception and injury history, because this is crucial for talent identification, ankle injury prevention and rehabilitation in youth soccer players.

[Table 1. Force-time curve characteristics during a reactionary gripping task before and after the 10-week intervention]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Judo (n=8)</th>
<th>Controls (n=8)</th>
<th>Pre</th>
<th>Post</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP (mV)</td>
<td>1.707 ± 0.240</td>
<td>1.773 ± 0.201</td>
<td>1.697 ± 0.220</td>
<td>1.696 ± 0.183</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPF (s)</td>
<td>2.539 ± 0.985</td>
<td>2.025 ± 0.682</td>
<td>2.346 ± 0.772</td>
<td>2.622 ± 0.510</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AvgF (mV)</td>
<td>1.498 ± 0.215</td>
<td>1.551 ± 0.157</td>
<td>1.483 ± 0.218</td>
<td>1.533 ± 0.176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUC1 (mV·s)</td>
<td>1.412 ± 0.206</td>
<td>1.454 ± 0.166</td>
<td>1.378 ± 0.188</td>
<td>1.436 ± 0.155</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUC2 (mV·s)</td>
<td>2.987 ± 0.472</td>
<td>3.162 ± 0.336*</td>
<td>2.965 ± 0.415</td>
<td>3.048 ± 0.323*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDF (mV/s)</td>
<td>6.600 ± 1.260</td>
<td>6.182 ± 1.297</td>
<td>6.971 ± 1.613</td>
<td>6.880 ± 1.812</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F@RFD (mV)</td>
<td>1.196 ± 0.167</td>
<td>1.241 ± 0.150</td>
<td>1.205 ± 0.129</td>
<td>1.243 ± 0.139</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant from Pre (p<0.05). PP = Peak force; TPF = Time to peak force; AvgF = Average force; AUC1 = 1s impulse; AUC2 = 2s impulse; RDF = Maximal rate of force development; F@RFD = Force at maximal rate of force development. Data presented as Mean±SD.

Advancing age is often accompanied by declines in muscle function and walking performance, which likely involve changes in the discharge characteristics of motor units in key leg muscles. PURPOSE: To determine the associations between the discharge characteristics of motor units in leg muscles during steady contractions and performance on functional tests of walking endurance, chair rise time, and maximal walking speed of older adults. METHODS: Twenty healthy older adults (8 men, 72 ± 4 yrs) were recruited to participate in up to 4 experimental visits spanning ~10 wks. Motor unit characteristics were assessed by decomposing surface EMGs detected with a grid of 4x8 electrodes placed over the medial gastrocnemius (MG), lateral soleus (LS), and tibialis anterior (TA) muscles during 30 s isometric contractions with the plantarflexors (PF) or dorsiflexors (DF). The target torque was 10% or 20% of maximum. Time to walk 400 m (205 ± 43 s), time to rise and sit as quickly as possible from a chair five times (8 ± 2 s), and maximal walking speed over 10 m (2.3 m/s) were assessed by using the reliable and valid Soccer Skill Tests (Russell et al. 2010). Ankle proprioception was assessed by using the reliable and valid AMEDA in standing. RESULTS: Ankle proprioceptive discrimination accuracy scores were significantly positively correlated with passing, shooting and dribbling accuracy tests (r=0.52, r=0.71, and r=0.53, respectively; all p<0.01). Further, participants who had history of ankle injury beyond 3 months performed significantly worse in both ankle proprioception and shooting accuracy tests than those who did not (F=5.01, p<0.03, and F=5.77, p<0.02, respectively). CONCLUSION: Results here highlight the importance of ankle proprioception for soccer skills in youth recreational soccer players. Future research is needed to determine if there is a causal relationship between poor ankle proprioception and injury history, because this is crucial for talent identification, ankle injury prevention and rehabilitation in youth soccer players.
An emerging technique to quantify supra-spinal contributions to neuromuscular function is the V-wave. However, little data exist regarding its day-to-day reliability in comparison to traditional measures such as MVC and motor unit recruitment assessed via twitch interpolation. PURPOSE: To determine the reliability of the V-wave in comparison to MVC, evoked twitches, and motor unit recruitment across 4 testing visits. METHODS: Eleven men and women were tested on 4 separate occasions over the course of 7-10 days. During each visit, transcutaneous electrical stimulation was applied over the tibial nerve while surface EMG recordings were obtained from the soleus muscle. Initially, single 1 ms pulses were delivered every 5 to 10 seconds in ascending increments of 5 mA until evoked M-wave amplitude peaked. Participants then performed 3, 3-second maximal voluntary isometric contractions. During each contraction, a supramaximal stimulus (150% M-max) was applied 2.5 seconds into the contraction with control twitches occurring 2 and 4 seconds following relaxation. V-wave amplitudes were determined from the peak-to-peak amplitudes of the EMG signal following the stimulation of MVC. Intraclass correlation coefficients (ICC) were calculated to determine test-retest reliability and repeated-measures ANOVAs were used to evaluate the means between the 4 testing visits. RESULTS: No differences were observed between visits for motor unit recruitment 83 ± 19, 89 ± 14, 95 ± 9, and 95 ± 9% (p = 0.06); twitch force 117 ± 33, 109 ± 29, 112 ± 28, and 108 ± 23 (p = 0.61), or the V-to-M ratio 0.42 ± 0.23, 0.50 ± 0.28, 0.49 ± 0.21, and 0.48 ± 0.22 (p = 0.008). MVC increased across the test days (p = 0.0001), but did not differ (p = 0.68) between days 3 (707 ± 220 N) and 4 (695 ± 188). Mean ISI during the 20% MG task (145 ± 25 ms) explained 18% of the variance for 10 m walking time (p = 0.0001). CONCLUSION: Significant amounts of the variance in tests of physical function for older adults were explained by the discharge characteristics of motor units during steady state isometric contractions and the strength of the plantarflexors. However, the predictor variables differed across the three tests of physical function.

### 3614 Board #61 June 3 9:30 AM - 11:00 AM
**Reliability of the V-Wave during Maximal Voluntary Plantar Flexion Exercise**

Alwyn T. Quashie, Robert E. Hight III, Christopher D. Black. University of Oklahoma, Oklahoma City, OK. (Sponsor: Pat O’Connor, FACSM) (No relationships reported)

Despite the compensatory process of collateral reinnervation to counteract human age-related muscle fiber denervation, a substantial loss of functioning motor units (MUs) occurs which seems to be accelerated after the 7-8th decades of life. However, it is not known whether there is a limitation or cessation of this process in very old age because to date MU remodelling has not been explored in those above ~85 years of age. PURPOSE: To explore in an accessory elbow extensor muscle electrophysiological factors including, motor unit number estimations (MUNE) and measures of compensatory MU remodeling in men in their 9th and 10th decades of life. METHODS: A maximal compound muscle action potential (CMAP) was recorded from the anconeus in 8 healthy men aged to 82-91 years. Decomposition-enhanced spike-triggered averaging was used to collect surface and intramuscularelectromyography (EMG) from the anconeus during a series of submaximal (30% and 50% of the maximal root mean squared (RMS) EMG of the anconeus) voluntary isometric elbow extensor contractions. In addition, motor unit potential (MUP) analysis was performed to provide a detailed assessment of neuromuscular status. RESULTS: Results were compared with a young cohort (~25 of age) published previously using the same procedures. Participants in the current study had CMAPs of ~3 mV, surface motor unit potentials (S-MUPs) of ~168 and ~232 µV at 30 and 50 RMS, resulting in a MUNE of ~23 and ~16 at the 30 and 50% intensities. In contrast, young adults had CMAPs of ~5.5 mV, but similar S-MUPs of ~155 and ~240 µV at 30% and 50% RMS compared with the old. These values indicate a significant loss of muscle mass, but due to no difference in S-MUPs the old do not show signs of collateral reinnervation. CONCLUSION: Thus, compensatory remodelling may no longer be a viable process to counteract age-related loss of MUs in the very old; although this could be muscle or activity dependent. Supported by NSERC.

### 3615 Board #62 June 3 9:30 AM - 11:00 AM
**Unilateral Fatiguing Exercise And Its Effect On Relative, Percent Change Differences Between Vastus Lateralis Muscles**

Nathan Wages1, Travis Beck1, Xin Ye2, Joshua Carr1, Hayden Tharp2. 1University of Oklahoma, Norman, OK. 2University of Massachusetts, Oxford, MS. Email: Nathan.P.Wages-1@ou.edu (No relationships reported)

**ABSTRACT.** Relative, percent change differences between homologous vastus lateralis muscles across different resting muscular lengths have not previously been reported following the application of unilateral fatiguing exercise. PURPOSE: The purpose of the present study was to compare contralateral cross-over adaptations following unilateral fatiguing exercise, between different aerobically trained populations, across resting posture positions (RPPs) that incorporated different hip and knee joint angles. METHODS: Twenty healthy, college-aged men (mean ± SD; age = 22.9 ± 3.5 years and 22.8 ± 2.6 years; height = 181 ± 7.5 cm and 180 ± 5.9 cm; body mass = 85.2 ± 10.5 kg; BMI = 26.6 ± 3 kg/m² and 26.2 ± 2.2 kg/m²; dominant thigh skinfold thickness = 15.1 ± 4.6 mm and 14.55 ± 5.3 mm; non-dominant thigh skinfold thickness = 15.55 ± 3.5 mm and 15.2 ± 3.8 mm; and VO2 peak 25.1 ± 4.3 ml/kg/min and 44.7 ± 3.7 ml/kg/min, for the 10th novice and 10 advanced trained participants, respectively) exercised on an upright cycle ergometer, using only their dominate limb, for 30 minutes at 60% of their VO2 peak. Resting surface electromyography (sEMG) and mechanomyographic (MMG) signals were measured prior to and following exercise. RESULTS: The results indicated that the relative, percent change difference of the normalized MMG amplitude values were 7.6% and 4%; 9.1% and 7.5%; 5.7% and 3.9%; and 3.7% and 2% while the results for the relative, percent change difference of the normalized MMG mean frequency values were 4.7% and 5.7%; 8.4% and 7.4%; 4.2% and 3.2%; and 2.7% and 3.7% (for the upright sitting position with legs extended 180° [1]; upright sitting position with legs bent 90° [2]; lying supine position with legs extended 180° [3]; and lying supine with legs bent 90° [4], respectively), for the novice and advanced groups, respectively. CONCLUSION: Our results provide further evidence to the concept that muscles are capable of possessing MMG activity post-exercise, despite a lack of sEMG signals. Additionally, our results suggest that there may be multiple neural and mechanical mechanisms concurrently contributing to the contralateral cross-over adaptations observed across the post-exercise recovery time course.
The interpolated twitch technique is used to assess motor unit recruitment during voluntary activities. The V-wave is a complementary measure indicating supra-spinal contributions to force. No study has examined the relationship of these measures as a function of increasing force production. PURPOSE: To compare the magnitude of iTT assessed motor unit recruitment to V-wave amplitude during contractions of increasing force. METHODS: Thirty men and women volunteered to participate in this study. Transcutaneous electrical stimulation was applied over the tibial nerve while surface EMG was recorded from the soleus muscle. Single 1 ms pulses were delivered every 5 to 10 seconds in ascending increments of 5 mA until the M-wave amplitude plateaued. Participants then performed 3, 3-second maximal voluntary contractions. During each contraction, a supramaximal stimulus (150% M-max) was applied 2.5 seconds into the contraction with control switches occurring 2 and 4 seconds following relaxation. Lastly, 3 randomized series of submaximal contractions (20%, 40%, 60%, and 80% of MVC) were performed under the same stimulation conditions. Values for % recruitment and the V-to-M ratio were averaged across the 3 efforts at each force level. Repeated measures ANOVAs were conducted to examine changes in recruitment and the V-to-M ratio as a function of force. RESULTS: Recruitment increased as force increased (p < 0.01) from 6 ± 14% to 51 ± 18% to 82 ± 13% to 94 ± 11% to 95 ± 8% at 20%, 40%, 60%, 80%, and 100% of MVC, respectively. All values differed from each other (p < 0.05) except for values from 80% and 100% of MVC (p = .75). Similarly, the V-to-M ratio also increased (p < .01) as force was increased—with values increasing from 5 ± 3% to 13 ± 8% to 23 ± 7% to 38 ± 18% to 48 ± 20% at 20%, 40%, 60%, 80%, and 100% of MVC, respectively. Unlike recruitment all values for the V-to-M ratio differed from each other (p < 0.05). The increase in recruitment as a function of force was modeled with a polynomial equation (R² = 0.99) while a linear (4 of 20, R² = 0.72), quadratic (12 of 20, R² = 0.49), and cubic (4 of 20, R² = 0.86) models.

CONCLUSIONS: These results demonstrated that the MMG MNF response was capable of monitoring the fatigue-based changes in muscle function that progressed to task failure. The consistent declines exhibited for MMG MNF during the sustained isometric force task likely reflects alterations in the twitch properties of the contributing motor units. The inter-individual variability in the patterns of response may be due to differences in training status, muscle fiber type composition, or subject-specific motor control strategies related to the demands of the fatigue task.

It is known that aging is accompanied by a loss in muscle mass and motor units. However, the direct cause for the loss of motor units has not been identified. One possible mechanism could be related to changes in the sensory input motor neurons receive. Therefore, it is important to study the objective measures to quantify sensory function that are sensitive to changes with aging. PURPOSE: To determine if the conduction velocity of a patellar tendon reflex is sensitive to aging. METHODS: One hundred and one volunteers participated in this study. Tendon taps were delivered to the patellar tendon of each subject while surface electromyographic (EMG) signals were recorded from the rectus femoris. The pre-motor reflex latency was calculated as the time from the onset of the hammer-strike to the onset of EMG activity. This latency (s) was adjusted for femur length (m) to instead provide a pre-motor conduction velocity (CV, m/s). The subjects were then grouped and averaged into intervals based on age as follows: 18 - 29 yrs. (n = 50), 30 - 39 (n = 10), 40 - 49 (n = 6), 50 - 59 (n = 30) and 60 - 79 yrs. (n = 21). The inter-individual variability in the patterns of response may be due to differences in training status, muscle fiber type composition, or subject-specific motor control strategies related to the demands of the fatigue task.

Interhemisphere cooperation plays an important role in daily living because the most functional performance of daily activities require the participation of bilateral hands simultaneously. However, the influence of stroke-related impairments on bilateral handgrip forces control between hands was still unclear. Therefore, it is necessary to develop a quantitative method to directly evaluate the coordination performances of two hands in stroke patients. PURPOSE: The purpose of this preliminary study was to investigate interhemisphere cooperation by analyzing inter-limb force control and coordination during inter-limb coordination tasks. METHODS: Seven stroke participants (Brunstrom motor recovery stage III recovery or beyond, mean age =57.0±7.8y/o) were recruited and asked to execute maximal voluntary contraction (MVC) tests and inter-limb coordination tasks with reciprocal grasping, holding, and releasing of a dynamometer of two hands at two target force levels (20% and 40% MVC of paretic hand). The force outputs of the participant’s hands were recorded and the alternating time of cross point (from non-paretic to paretic hand and paretic to non-paretic) in force generation was calculated and identified for the evaluation of bimanual coordination in both hands. Differences in non-paretic and paretic grip force and changes in hand-grip performance at two targeted force levels were determined using paired t-test two way ANOVA. RESULTS: The results demonstrated that the alternating time in non-paretic to paretic hand was longer than in paretic to non-paretic hand condition at 20% (41.3±15.6% vs. 23.7±12.0%, p<.006) and 40% (52.8±19.4% vs. 26.0±14.6%, p<.004) inter-limb coordination tasks. No significant changes in the force modulation timing between the non-paretic and paretic hand at different force levels were found (P>0.06, p<.443). CONCLUSION: This is the first study to directly evaluate the capacity and quality of inter-limb coordination via the grip force between two hands and demonstrate the non-hemiparetic brain controlling non-paretic hand has greater coordination control ability than hemiparetic brain during bilateral force modulation for stroke patients, which may provide useful information on developing effective exercise interventions in stroke rehabilitation.

Inter-individual variability in the mechanomyographic frequency response during a sustained isometric force task. Joshua C. Carr, Travis W. Beck, Xin Ye, Nathan P. Wages, and Hayden M. Tharp The University of Oklahoma, Norman, OK.

There is recent evidence that suggests a relationship exists between the frequency content of the mechanomyographic signal (MMG MNF) and motor unit activity. The fatigue-based changes that occur in the MMG MNF during a sustained force task may provide insight regarding the alterations in motor control that lead to task failure. PURPOSE: To examine the individual patterns of response for MMG MNF during a sustained submaximal isometric force task to failure. METHODS: Twenty males (mean ± SD: age = 24 ± 3 years) volunteered for this investigation and were familiarized with the procedures prior to testing. Before the fatigue task, the subjects performed a sustained submaximal isometric force task (60% MVC) for as long as possible. A piezoelectric accelerometer was used to detect the MMG signal from the biceps brachii. Polynomial regression was used to determine the relationships for MMG MNF versus time for each subject. RESULTS: The results indicated significant (p<0.05) relationships for MMG MNF versus time for each subject. CONCLUSIONS: These results demonstrated that the MMG MNF response was capable of monitoring the fatigue-based changes in muscle function that progressed to task failure. The consistent declines exhibited for MMG MNF during the sustained isometric force task likely reflects alterations in the twitch properties of the contributing motor units. The inter-individual variability in the patterns of response may be due to differences in training status, muscle fiber type composition, or subject-specific motor control strategies related to the demands of the fatigue task.
Arthrogenic muscle inhibition (AMI) is characterized by decreased spinal excitability, and has been suggested to be one of the neurophysiological mechanisms responsible for muscle dysfunction following joint injury. AMI has been found in individuals with chronic ankle instability, yet it is unclear whether AMI is present in patients who perform isometric abduction with their left index fingers (contracting hand) at 5 and 16% MVC, respectively. The slope of the decrease in firing rate during de-recruitment did not differ at 50% of MVC: $-0.1113 \times + 24.216$. The group averaged data as well as the line of best fit are shown in the figure below. CONCLUSION: Our findings show that the conduction velocity of a patellar tendon reflex is significantly related to age. Therefore, this variable may be useful in future studies that wish to track changes in sensory function across age.

Hoffman reflex (H-reflex) was used to quantify AMI. H-reflex tests of the soleus, fibularis longus, and tibialis anterior were performed bilaterally in the prone position. Maximum peak-to-peak amplitudes of H-reflexes (H-max) and motor waves (M-max) were recorded. Since H-max significantly varies between individuals, it was normalized to M-max to obtain a $H_{\text{rel}}:M_{\text{rel}}$ ratio for each muscle. Separate two-way ANOVAs with repeated measures were performed to compare groups (AAS, control) and limbs (injured, uninjured) for each of the muscles. The alpha level was set at $<0.05$. RESULTS: There were no significant group-by-limb interactions for all muscles: the soleus ($F_{(1,34)}=1.763$, $P=0.19$), fibularis longus ($F_{(1,34)}=1.94$, $P=0.28$) and tibialis anterior ($F_{(1,34)}=0.87$, $P=0.35$). However, there was a significant group main effect for the soleus ($F_{(1,34)}=5.219$, $P=0.029$). The $H_{\text{rel}}:M_{\text{rel}}$ ratio in the AAS group (0.56±0.04) was significantly lower than in the healthy control group (0.68±0.04). No significant main effects were found in the fibularis longus or tibialis anterior ($F_{(1,34)}=0.804$, $P=0.77$) and tibialis anterior ($F_{(1,34)}=1.255$, $P=0.27$). CONCLUSION: AMI in the soleus muscle was present bilaterally in patients with AAS, which provides insight into neurophysiological mechanisms responsible for bilateral muscle dysfunction following the unilateral acute injury.

Supported by Texas State University College of Education

**3624 Board #71 June 3 9:30 AM - 11:00 AM Changes In Motor Unit Recruitment And De-recruitment Strategies Are Not Associated With The Repeated-bout Effect**

Jessica Peterson, 73019, Robert Hight, Cameron Lohman, Christopher Black. University Of Oklahoma, Norman, OK. (Sponsor: Kevin McCully, FACSM)

Email: jessica.a.peterson-1@ou.edu

(No relationships reported)

The “repeated bout effect” (RBE) is an adaptation that attenuates muscle damage following eccentric exercise. Several neural adaptations have been proposed to underlie the RBE. PURPOSE: This study used decomposition of surface EMG signals (DEMG) to examine the relationship between recruitment (RT) and de-recruitment thresholds (DRT) and changes in firing rates or motor units during recruitment and de-recruitment prior to and following eccentric exercise resulting in the RBE. METHODS: Nine participants performed 5 sub-maximal isometric trapezoidal contractions at force levels corresponding to 50% and 80% of maximal isometric strength (MVC). Eccentric exercise was then performed until biceps brachii MVC decreased by ~40%. MVC, range-of-motion (ROM), and delayed onset muscle soreness (DOMS) were measured 24-hours, 72-hours, and 1-week following eccentric exercise. Three weeks later all procedures were repeated. EMG signals of the biceps brachii were decomposed into individual motor-unit action potential trains. The relationship between RT and DRT was examined using linear regression. The slope of the change in mean firing rate (MFR) during the ramp-up and ramp-down phase of the trapezoid contraction was also examined. RESULTS: No changes were found in the slope of the RT vs DT relationship for 50% MVC ($1.13\pm0.17$ vs $1.29\pm0.43$; $p=0.42$) and 80% MVC (1.09±0.18 vs 1.25±0.41; $p=0.25$). There were also no changes in the y-intercept of the RT vs DT relationship at 50% (+3.79:6.77 vs +5.17:17.07; $p=0.80$) and at 80% (+9.29:10.71 vs +23.07:20.28; $p=0.06$) of MVC. The mean slope of the increase in firing rate during recruitment did not change between bouts 10.2±1.8 vs 10.5±2.2 pps ($p=0.77$) and 8.4±0.7 vs 9.0±1.6 pps ($p=0.28$) for 50% and 80% of MVC, respectively. The slope of the decrease in firing rate during de-recruitment did not differ at 50% of MVC: $-9.7\pm1.5$ vs $-10.2\pm1.8$ pps ($p=0.48$), but became steeper during contractions at 80% of MVC: $-7.3\pm0.9$ vs $-8.7\pm1.7$ pps ($p=0.04$). However, no relationship was observed between the change in RT slope and the magnitude of the RBE. CONCLUSION: A bout of eccentric exercise conferred protection from a subsequent identical bout. Few changes in motor-unit recruitment and de-recruitment behavior were observed suggesting changes in these parameters are not responsible for the RBE.

**3625 Board #72 June 3 9:30 AM - 11:00 AM Myosin Heavy Chain Influences Firing Rate Behavior From Moderate To High Intensity Targeted Forces**

Michael A. Trevino, Philip Michael Gallagher, Andrew C. Fry, Jonathan D. Miller, Adam J. Sterczala, Trent J. Herda. University Of Kansas, Lawrence, KS. (No relationships reported)

Email: mtrevino@ku.edu

PURPOSE: It is suggested the ratio of myosin heavy chain (MHC) isoforms and their influence on twitch forces and fatigability effect motor unit (MU) behavior. However, no study has correlated changes in MU firing rates among moderate- to high-intensity contractions with MHC area in vivo.

METHODS: Twelve individuals (age=20.89±2.52 yrs, weight=72.03±14.02 kg) performed 3 isometric maximal voluntary contractions (MVC) of the leg extensors on an isokinetic dynamometer followed by randomly ordered isometric muscle actions at 50, 70, and 90% MVC. An electromyographic (EMG) sensor was placed over the
VL. EMG signals were decomposed to extract action potentials and firing events of single MUs. Only MUs with >90% accuracy were used for analysis. Recruitment thresholds (REC Thresh) and mean firing rates (MFR) were calculated for each MU. MFR was calculated as the average value of the MFR trajectory during steady force. Subjects gave a muscle biopsy of the VL. Type I %MHC area was determined by SDS-PAGE. Linear regressions were performed for the 50% MVC, whereas inverse exponential regressions were performed on the 70% and 90% MVC to determine the slopes and y- intercepts for the MFR vs REC Thresh relationships. Predicted firing rates at target force were calculated from the regression equations for each subject for MUs with a REC threshold of 5-45% MVC in 5% increments. To examine changes in MU firing rates in relation to REC Thresh, predicted firing rates from the 70% and 90% MVC were normalized to the predicted firing rate value for the 50% MVC. For each REC Thresh, linear regressions were performed on the normalized firing rate values vs contraction intensity. Pearson’s product moment correlations were calculated comparing the slopes and type I %MHC area. Alpha was set at 0.05.

RESULTS: Pearson’s product moment correlations were significant among type I %MHC area and the slopes of the change in predicted firing rates vs contraction intensity for MUs with a REC Thresh of 35, 40, and 45% MVC (P = 0.05; R = -0.754 to -0.669).

CONCLUSIONS: Individuals with lower percentages of type I MHC area had greater increases in MU firing rates with increments in targeted forces for MUs with REC Thresh of 35 - 45% MVC. This may indicate that MU firing rate and recruitment patterns differ as a function of MHC area.

3626 Board #73 June 3 9:30 AM - 11:00 AM Fatiguing Knee Extensors Has Differential Effects on Contralateral Homologous and Non-Related Heterogenous Muscles

Xin Ye1, Travis W. Beck2, Nathan P. Wages3, Joshua C. Carr4, Hayden M. Tharp5, Michael G. Bemben, FACSM6, Rebecca D. Larson7, Carr J. Adel8, 1University of Mississippi, University, MS. 2University of Oklahoma, Norman, OK. 3Kansas State University, Manhattan, KS. Email: xyel1@olemiss.edu

Non-local muscle fatigue (NLMF), defined as a temporary motor performance deficit in a non-exercised muscle group following a fatiguing protocol on a different muscle group, has been gaining attention in the recent decade. PURPOSE: To examine the possible NLMF-induced changes in isometric strength and surface electromyographic (EMG) of both the contralateral homologous and non-related heterogenous muscles after fatiguing the unilateral knee extensor (KE) muscle group. METHODS: Ten men (27 ± 3 years) and five women (27 ± 2 years) participated in a 3-visit investigation which consisted of a familiarization visit and 2 separate randomly sequenced experimental visits. During the experimental visits, the same fatiguing intervention (6 sets of 30-second maximal isometric KE contractions, with 30-second rest interval between sets) were applied. Before and after the fatiguing intervention, the maximal isometric strength and the corresponding surface EMG amplitude were measured on the non-exercised left elbow flexors (EF) or KE. Separate paired sample t-tests were used to examine the potential changes in the dependent variables described above. RESULTS: After the fatiguing intervention, there was a significant decrement in isometric strength for the non-fatigued EF (Pre - Post-fatigue = 382.06 ± 34.28 vs. 354.20 ± 120.76 N, t = 1.676, p = 0.001), but not for the non-fatigued KE. For the non-fatigued EF, there was also a decreased normalized EMG amplitude in the biceps brachii (Pre- vs. Post-fatigue = 100.0 ± 0.0% vs. 86.5 ± 6.6%, t = 2.049, p = 0.03). However, the normalized EMG amplitude did not change in the non-fatigued vastus lateralis (VL). CONCLUSIONS: Fatiguing the unilateral KE did induce the NLMF in the non-related heterogenous upper body muscle group (the EF), which was possibly due to the fatigue-induced decreased voluntary drive. However, for its contralateral homologous muscle group (non-fatigued KE), the NLMF effect on isometric strength was absent, but fatigue-induced decreased voluntary drive. However, for its contralateral homologous muscle group (the EF), which was possibly due to the lateralis (VL).

Board #74 June 3 9:30 AM - 11:00 AM Recruitment Properties In Vastus Medialis And Vastus Medialis Oblique In Individuals With Patellofemoral Pain Syndrome

Yi-Ling Peng1, Matthew S. Tenan2, Lisa Griffiin1, 1UT Austin, TX. 2US Army Research Laboratory, Aberdeen Proving Ground, MD. Email: elena.peng@utexas.edu

Patellofemoral pain syndrome (PFPS) is a commonly diagnosed knee pathology that is twice as prevalent in women. Sports medicine clinicians commonly use exercises to attempt to preferentially activate the vastus medialis oblique (VMO) to enhance medially vectored forces on the patella. Recently, our group confirmed clinical theory that the VMO is neurologically distinct from the vastus medialis (VM). However, the ability to voluntarily activate these muscle sub-sections is still disputed. PURPOSE: To determine how PFPS affects neuromuscular control of VM/VMO and examine if hip rotation during a straight leg raise (SLR) modifies motor patterns. METHODS: Thirteen healthy women and four women with PFPS performed isometric SLR in neutral hip rotation (SLR-NR) and during 30 degrees hip lateral rotation (SLR-LR). Participants performed ramp contractions by tracing a line on a screen with a rate of rise of 7.5% maximal voluntary contraction (MVC) per second up to 75% MVC. Bipolar intramuscular fine-wire electrodes were inserted into the VM and VMO. Initial motor unit firing rates (IFR) and recruitment threshold (RT) forces were measured. Generalized linear mixed models and Taylor post hoc tests were used to assess significant differences. The recruitment thresholds were log-transformed to meet the assumptions of normality of residuals and constant variance within each level. Results: A total of 420 motor units were analyzed. There was a significant interaction effect for Muscle × Group for RT (p=0.02), demonstrating that women with PFPS activated their VM later (29.0 ± 2.5% MVC) than healthy women (11.2 ± 1.5% MVC; p<0.01). The Group × Hip Position interaction effect was also significant for RT (p=0.02). Healthy women activated their VM earlier during SLR-NR (9.9 ± 1.5% MVC) than during SLR-LR (14.9 ± 1.5% MVC; p=0.02). Women with PFPS had a delayed VM onset time (19.1 ± 2.5% MVC) compared to healthy women (9.9 ± 1.5% MVC) in SLR-NR (p=0.02). There was no significant difference in IFR between muscles or hip positions between groups. Conclusions: Targeted strengthening of the VMO in SLR with a neutral hip rotation is a more effective training position for women with PFPS than using lateral hip rotation.

3628 Board #75 June 3 9:30 AM - 11:00 AM Sensorimotor Cortex Neuroplasticity Following Neuromuscular Training Augmented With Real Time Biofeedback

Dustin R. Grooms1, Jonathan D. Ellis1, Katie Kitchen1, Staci Thomas2, Adam W. Kieler3, Christopher DiCesare1, Brooke Gadd1, Scott Backstrom1, Kim D. Barber Foss1, Weihong Yuan1, James Leach1, Kate Berz2, Michael A. Riley1, Gregory D. Myer, FACSM4, 1Ohio University, Athens, OH. 2University of Cincinnati, Cincinnati, OH. 3Cincinnati Children’s Hospital Medical Center, Cincinnati, OH. Email: grooms.dusty@gmail.com

Non-contact anterior cruciate ligament (ACL) injury is associated with motor coordination errors leading to comprised knee positioning and resultant knee loads that exceed ligament structural integrity. The nature of the ACL injury event (non-contact) and typical occurrence during high neurocognitive demand situations indicate a nervous system mechanism underlying the inciting event associated with injury. A better understanding of the neural contribution to ACL injury prevention training may enhance the ability to target the underlying mechanisms associated with injury risk. However, it is unknown what neuroplastic mechanisms contribute to the improved motor control documented after neuromuscular training. PURPOSE: To compare the knee sensorimotor cortex activation level before and after neuromuscular control training. METHODS: Ten high school female soccer participants from the local community (age: 15.7±0.95 years; height: 168.4±4.60 cm; mass: 59.9±5.62 kg.) were included in the study. Participants performed ramp contractions by tracing a line on a screen with a rate of rise of 7.5% maximal voluntary contraction (MVC) per second up to 75% MVC. Bipolar intramuscular fine-wire electrodes were inserted into the VM and VMO. Initial motor unit firing rates (IFR) and recruitment threshold (RT) forces were measured. Generalized linear mixed models and Tukey post hoc tests were used to assess significant differences. The recruitment thresholds were log-transformed to meet the assumptions of normality of residuals and constant variance within each level. Results: A total of 420 motor units were analyzed. There was a significant interaction effect for Muscle × Group for RT (p=0.02), demonstrating that women with PFPS activated their VM later (29.0 ± 2.5% MVC) than healthy women (11.2 ± 1.5% MVC; p<0.01). The Group × Hip Position interaction effect was also significant for RT (p=0.02). Healthy women activated their VM earlier during SLR-NR (9.9 ± 1.5% MVC) than during SLR-LR (14.9 ± 1.5% MVC; p=0.02). Women with PFPS had a delayed VM onset time (19.1 ± 2.5% MVC) compared to healthy women (9.9 ± 1.5% MVC) in SLR-NR (p=0.02). There was no significant difference in IFR between muscles or hip positions between groups. Conclusions: Targeted strengthening of the VMO in SLR with a neutral hip rotation is a more effective training position for women with PFPS than using lateral hip rotation.
Conclusions: The saccadomotor increased activation associated with neuromuscular training is similar to motor recovery after injury and after long-duration (weeks) motor skill training. The increased saccadomotor cortex activation indicates the cortical representation may be functionally increased for knee motor control after the focused intervention. Future work with expanded sample sizes will map whole brain connectivity and other brain region activation changes associated with neuromuscular training.

PURPOSE: Scientific literature addressing the association between Gross Motor Skills (GMS), attention, and inhibition is scarce. Studying these relations helps better understand the interactions and their behavioral repercussions. The aim of this study is to search for relations between gross motor skills, attention, and inhibition.

METHODS: GMS of adolescents (n=220, range=13–17; mean 15.0±1.4 yrs) were assessed using protocols from UQAC-UQAM research team. Measures included: Arm and Leg Limb Speed, Agility, Coordination, Balance and Simple Reaction Time. Attention and inhibition assessments were collected using a Continuous Performance Test (CPT) protocol. Reaction times, number of errors, types of errors and derived measures from the CPT were used. Statistical analysis includes Spearman correlation test and Kruskal Wallis ANOVA. Both parents and adolescents gave their written consents.

RESULTS: Reaction Time was in relation with all agility measurements (Circle Run: r = 0.19, p < 0.01; Shuttle Run: r = 0.17, p = 0.01, but also with Limb Speed measures (r = -0.21, p < 0.01). Variability of Reaction Time was correlated with Agility (Circle Run test: r = 0.16, p < 0.05). Slalom Run test: r = -0.15, p < 0.05). Limb Speed (r = -0.24, p < 0.01) and Balance (r = -0.15, p < 0.05). Girls showed more correlations between GMS and neuropsychological measures.

CONCLUSIONS: Some neuropsychological measures obtained with CPT protocol were related to Limb Speed, Agility, Balance. Simple Reaction Time in adolescents. This conclusion suggests that motor and psychomotor development may play a role in helping adolescents to better perform in attention and inhibition ability. The relations between functions were affected by gender. Future research is needed to better understand the role of motor and psychomotor development program on psychological measurements.

Neuromuscular electrical stimulation (NMES) is often used to artificially generate muscle contraction; however, the stimulation parameters that optimally modulate torque output during prolonged stimulation protocols are not well-established.

PURPOSE: To compare torque output between low-frequency and high-frequency NMES protocols with increasing stimulation intensity throughout the protocol to achieve a constant submaximal torque output. METHODS: Ten healthy individuals (age, 24.8 ± 1.2 yrs) participated in the study. This study employed a quasi-experimental crossover design in which each subject received a low-frequency (20 Hz) and a high-frequency (60 Hz) NMES intervention on different days. Repetitive, intermittent stimulation of 10 seconds on and 5 seconds off was applied for 60 min over the quadriceps muscles. Stimulation intensity was increased every 5 min throughout the course of the intervention to achieve a target torque of 15% maximal voluntary contraction (MVC). Mean torque and peak torque were measured for each contraction. Force-time integral (FTI) was also measured for each contraction and the sum of all contractions was compared between protocols. Frequency was compared using paired t-tests. RESULTS: The 20 Hz protocol compared to the 60 Hz protocol produced a higher overall mean torque (11.2 ± 0.5% MVC vs. 8.0 ± 0.6% MVC, p < 0.01) and FTI sum (38.030 ± 1724.9 Nm vs. 32.128 ± 1668.0 Nm x s, p < 0.01). There was no difference between frequencies for peak torque (1.40 ± 0.6% MVC vs. 12.3 ± 0.7% MVC) or stimulation intensity required to achieve 15% MVC during the first 5 mins (80.2 ± 3.8 mA vs. 120.7 ± 8.0% mA) or during the last 5 mins of the NMES protocol (74.7 ± 5.0 mA vs. 120.8 ± 10.6 mA, p > 0.05) for 20 Hz and 60 Hz, respectively. CONCLUSION: Torque maintenance was greater during a low-frequency protocol. An increase in frequency NMES protocol when stimulation intensity was increased to achieve a constant submaximal torque output. When the goal is to optimize torque output during functional electrical stimulation, low frequency stimulation may be preferred.
Force steadiness and neuromuscular activities during isometric knee extension have been investigated in a condition of only one joint angle, e.g. 90°. Muscle length may modify force steadiness by change in neuromuscular activation patterns of working muscles; however, it has not been well understood. In terms of the quadriceps femoris muscle (QF), muscle activation differences dependent upon knee joint angle (i.e. muscle length), and its magnitude of difference is muscle dependent during knee extension force exertion. Therefore, there is a possibility that knee joint angle affects to the force accuracy (FA) and neuromuscular activation during force tracking task.

**PURPOSE:** The purpose of this study was to examine FA and neuromuscular activity of QF during isometric knee extension force tracking task for 3 knee joint angles.

**METHODS:** Thirty healthy men and women (23 ± 4 years) performed force tracking task during isometric knee extension to match a given constant force signal on a computer monitor. Each task was lasted 30 seconds. The force level of the task was 6% of maximal voluntary contraction (MVC). The tasks were performed in 70°, 110° and 150° knee joint angle (180° full knee extension). During the tasks, surface electromyogram (EMG) was recorded from 4 QF muscles. We calculated FA as follows: (produced force - target force) / target force * 100. The root mean square (RMS) of EMG signals of each muscle was calculated in the middle of 10 seconds during 30 seconds task. The RMS of the individual muscles was normalized by that of the MVC.

**RESULTS:** There was significant difference in FA between knee joint angles. FA at a knee joint angle of 70° was significantly greater than that at knee joint angle of 110° and 150° (p = 0.026 and 0.028). RMS of vastus intermedius (VI) was smaller at 70° knee joint angle of 70° was significantly greater than that at knee joint angle of 110° and 150° (p = 0.026 and 0.028). RMS of vastus intermedius (VI) was smaller at 70° knee joint angle of 70° was significantly greater than that at knee joint angle of 110° and 150° (p = 0.026 and 0.028).

**CONCLUSIONS:** The FA of the QF was worse at a flexed knee joint position than other extended knee joint positions. Furthermore, neuromuscular activation pattern of VI was different depend on knee joint angles, whilst that of other muscles was similar. That result suggests that force control strategy may be modified by neuromuscular activation of VI with respect to knee joint angle (i.e. muscle length).
this effect. For the other hand, some adipokines like the Tumoral Necrosis Factor alpha and the leptin contribute to have greater sympathetic and lower parasympathetic activity.

### Table 1 - Correlation between muscle strength and resting vagal CAM

<table>
<thead>
<tr>
<th>Variables</th>
<th>t-MSSD</th>
<th>r-MSSD</th>
<th>Aibs</th>
<th>SD1</th>
<th>SDort</th>
<th>AibsSD1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT (NM)</td>
<td>(t = 0.27) ((p = 0.17))</td>
<td>(t = 0.09) ((p = 0.36))</td>
<td>(t = 0.45) ((p = 0.05)^*)</td>
<td>(t = 0.27) ((p = 0.17))</td>
<td>(t = 0.09) ((p = 0.36))</td>
<td>(t = 0.45) ((p = 0.05)^*)</td>
</tr>
<tr>
<td>PT (%)</td>
<td>(t = 0.51) ((p = 0.03)^*)</td>
<td>(t = 0.32) ((p = 0.12))</td>
<td>(t = 0.51) ((p = 0.03)^*)</td>
<td>(t = 0.32) ((p = 0.12))</td>
<td>(t = 0.51) ((p = 0.03)^*)</td>
<td></td>
</tr>
</tbody>
</table>

PT: peak torque; (NM: normotens-meters; \%) relative; sup: supine; ort: orthostatic; Aibs: absolute variation; *: Spearman correlation test \((p < 0.05)\).

**Conclusion:** We found significant positive correlation between relative MS with resting vagal CAM on supine position and significant positive correlation between absolute and relative MS with vagal responsiveness (withdrawn) after active orthostatic stress. Our results demonstrate that the higher is the MS the higher is the tonic (resting supine) and phasic (withdrawn on standing up) vagal modulation.

**G-31 Free Communication/Poster - Perception**

Saturday, June 3, 2017, 7:30 AM - 11:00 AM

**Room:** Hall F

**3640 Board #87**

**June 3 8:00 AM - 9:30 AM

Sport Events, Task Motivation Climate and Motivation in Physical Education Learning**

Yu Su1, Xiang-yang Fan2. 1Dalian Maritime University, Dalian, China. 2Dalian Education Bureau, Dalian, China.

Email: 1760902161@qq.com

(No relationships reported)

The impact of differences in sport events on the motivation of Phisical Education Learning (PEL) has rarely been investigated although it has been reported that task
motivation climate is beneficial to the improvement of PEL. PURPOSE: To investigate the impact of differences in sport events (individual event and group event) and three types of needs (competence, autonomy and relatedness) on motivation and further to explore the causes for the lack of motivation. METHODS: The present study combines experiment and questionnaire. With 65 male students randomly selected from a high school in Dalian as subjects (age: M=16.1, SD=3.4; height: M=176.4cm, SD=9.2; weight: M=69.7kg, SD=7.5), an 8-week experiment was conducted. All the subjects were divided into two groups: 31 of which were allocated to a roller-skating class, the others to a basketball class. In order to control the variable of task motivation climate, the same teacher completed the tasks of teaching in both classes. Before the experiment, a pretest was conducted based on the Sport Situational Motivation Scale and a post-test was carried out based on the Post-Experimental Intrinsic Motivation Inventory when the experiment was completed. RESULT: The task motivation climate helped students to improve the intrinsic motivation in PEL (P<0.05). The satisfaction of competence needs is more important in the environment of autonomous learning (Motivation: F=7.808, P<0.01; Efforts: F=12.090, P<0.01). The needs of autonomy, relatedness and competence are the intermediary variables which influenced the motivation level, interests and efforts in PEL. Relatedness is an important factor to account for the effects on motivation and efforts in PEL(T relatedness=-3.995, P<0.01). CONCLUSION: In the autonomic learning environment and the group event is helpful to improve the students’ relatedness.

3641 Board #88 June 3 8:00 AM - 9:30 AM
Perceived Impact Of Restorative Flow Movement Patterns On NCAA Division II Football Athletes
Justin R. Geijer, Connie A. Mettille. Winona State University, Winona, MN.
Email: jgeijer@winona.edu
(No relationships reported)

The Restorative Flow Movement Patterns are a combination of yoga principles, functional movements, and various other training principles. The traditional yoga movements are essentially modified to improve function, recovery, mobility, and stability. The goal of the Restorative Flow Movement Pattern sessions was to improve recovery, prevent injury, and improve symmetry, which is acquired through improved mobility, stability, and functionality. Previous research has indicated a significant decrease in games missed due to injury after implementation of the Restorative Flow Movement Patterns injury prevention program.

PURPOSE: The purpose of this investigation was to determine the perceived effectiveness of the injury prevention program implemented for an NCAA Division II football program, as measured by a qualitative, online survey of the student-athletes. METHODS: A newly developed injury prevention program (Restorative Flow Movement Patterns) was implemented prior to the 2014 football season. Athletes participated in a modified yoga flow, which combined functional movement patterns with yoga movements, twice a week for the duration of the pre-season, regular season, and spring season. Online survey data was collected after the 2015 football season.

RESULTS: Thirty-six student-athletes responded to the survey. Participants self-reported decreased muscular soreness after games and workout sessions (1-10 scale, 5.47±2.48), improvements in flexibility (1-10 scale, 6.53±2.24) and overall well-being (1-10 scale, 5.94±1.91) as a result of the injury prevention program. Of the 36 respondents, 14 (39%) claimed the program was a useful addition to their training regimen, and 12 (33%) reported that the program improved their physical health and recovery, and another 12 (33%) reported that the program actually improved their physical health and recovery.

CONCLUSIONS: NCAA Division II football student-athletes perceive that the combination of functional movements and yoga movements can be useful in improving flexibility, decreasing muscular soreness, and improving overall well-being.

3642 Board #89 June 3 8:00 AM - 9:30 AM
Is Vo2max Related To Rating Of Perceived Capacity (RPC) And What Is Vo2max At Onset Of Training? (RPC)?
Email: christina.gjestvang@nih.no
(No relationships reported)

ABSTRACT
Objective: To examine how maximal oxygen uptake (VO_{2max}) is related to rating of perceived capacity (RPC) and evaluate VO_{2max} at onset of training in healthy untrained adults.

Methods: In this methodological comparison study, 125 newly registered members, equally males and females, at 25 fitness centers answered an electronic questionnaire including the RPC scale and performed measurements of VO_{2max}. Eligible criteria was >4 weeks of fitness center membership, ≥18 years, and not pregnant. The RPC is a one-page scale based on metabolic equivalents task (MET), where the individual choose the most strenuous activity that can be sustained for at least 30 minutes, rated from 1 to 20. RPC was answered before measurement of VO_{2max} (using a stepwise modified Balke protocol) at the laboratory. The strength of agreement between the two methods was analyzed by Bland-Altman plot, as well as Pearson correlation coefficient to enable comparison of these results with other studies. VO_{2max} at onset of training is presented as means with standard deviations (SD).

Results: Agreement as seen in Bland-Altman plot demonstrated a tendency of overestimation, meaning that the participants ranked their own aerobic capacity estimated from the RPC scale higher than objectively measured values of VO_{2max}. The mean differences between the two methods were +0.98 (± 1.96) and +1.31 (± 1.96) METs, with 95% confidence limits of agreement varying from +4.57 to 2.60 and +5.35 to -2.72 METs, in men (n = 62) and women (n = 63), respectively. The Pearson correlation coefficient were moderate, with r = 0.426 (p < 0.01). VO_{2max} was mean (± SD); 37.7 ± 7.2 ml/min·kg⁻¹, with 40.5 ± 7.2 for men and 35.0 ± 6.0 ml/min·kg⁻¹ for women.

Conclusions: The RPC scale may be useful in large scale studies of healthy untrained individuals, but may overestimate VO_{2max} individually.

Key words: Rating of perceived capacity, RPC scale, VO_{2max}, METs
specific rating of perceived exertion (RPE) scale measuring repetitions in reserve (RIR). PURPOSE: The purpose of this study was to examine the efficacy of this method using the bench press exercise. METHODS: Twenty-five college aged men were assigned to one of two groups based upon training age: experience benchers (EB) (n=14, 47±10.2 y of training) and novice benchers (NB) (n=11, 13.1±6.0 y of training). Subjects performed a one-repetition maximum (1RM) followed by single-repetition sets at 60, 75, and 90% of 1RM and finally an 8-repetition set at 70% 1RM. Subjects reported verbally called RPEs following every set. Average concentric velocity (ACV) was recorded via the TENDO Weightlifting Analyzer during the 1RM and all single repetitions sets, along with the first and last repetitions of the 8-repetition set. Pearson product moment correlations were used to assess relationships between RPE and velocity, while two-tail independent-sample t-tests examined differences in RPE and velocity between EB and NB. RESULTS: ACV at 100% of 1RM in EB was slower (10.7±0.4 m/s) compared to NB (10.3±0.4 m/s) (p<0.001). EB recorded greater RPE than NB at 100% of 1RM (EB: 8.96±0.14 vs. NB: 9.53±0.60) (p=0.011). No between-group differences existed for average velocity or RPE at any other intensity. Both EB (r=0.85, p<0.001) and NB (r=0.85, p<0.001) had strong inverse significant correlations between average velocity and RPE at all intensities. CONCLUSION: Our findings suggest that the RIR-based RPE scale may be an efficacious approach for AR of bench press training load and volume in EB and NB; however, EB may record more accurate RPEs at near maximal loads.

3645 Board #92 June 3 8:00 AM - 9:30 AM Perceived Versus Actual Health Related Fitness Among College Students Marla M. Jones, 645071, Surya Nallamalla1, Tom M. Adams2, Brian Church3, Lance Bryant1. 1Missouri Western State University, St. Joseph, MO. 2Arkansas State University, Jonesboro, AR. (Sponsor: Justin Kraft, FACSM) Email: mjones69@missouriwesern.edu (No relationships reported)

Half of all young adults between the ages of 18 and 24 years have at least one coronary heart disease risk (CHD) factor significantly increasing their risk for heart disease1. Health-related fitness components are used to measure physical fitness and may facilitate in determining one’s risk for CHD and other hypokinetic diseases. PURPOSE: The purpose of this study was to compare college students’ perceived health-related fitness and their measured health-related fitness. METHODS: Health related fitness assessments for flexibility, body composition, cardiovascular fitness, muscular strength, and muscular endurance were selected from ACSM’s Guidelines for Exercise Testing and Prescription (8th ed). Participants (n=100; 54 males and 46 females) were asked to complete an electronic questionnaire in which they selected a perceived category for each of the health-related fitness components. Participants then performed the health-related fitness assessments and categorical values were assigned to their fitness test scores. Crosstabs were used to compare actual versus perceived categories of fitness for each assessment and percentage agreement was calculated using Kendall’s tau-b. RESULTS: There were significant differences (p=0.05) between self-perceived and measured categories of fitness for all health-related fitness components. The area with the least amount of agreement between perceived and actual fitness was cardiovascular fitness where only 6% of participants accurately identified their fitness category. Perceived body fat and muscular endurance (curl-up test) also had low levels of agreement with only 19% of participants accurately identifying their body fat category and muscular endurance category. Flexibility was the category with the highest level of agreement (33%) between actual and perceived category. CONCLUSION: The results of this study suggest that college students do not accurately perceive their actual health-related fitness compared to their measured fitness. Thinking one is more fit than one is could impact behaviors such as food choice and exercise that increases one’s risk of hypokinetic diseases. 1. Arts, J., Fernandez, M. L., & Lofgren, I. E. (2014). Coronary heart disease risk factors in college students. 1. Arts, J., Fernandez, M. L., & Lofgren, I. E. (2014). Coronary heart disease risk factors in college students. 1. Arts, J., Fernandez, M. L., & Lofgren, I. E. (2014). Coronary heart disease risk factors in college students.

3646 Board #93 June 3 8:00 AM - 9:30 AM Physiological, Gait, And Perceptual Responses At 5-km Race Pace On Motorized Vs. Non-motorized Treadmills Emily P. Kennedy, Chandon L. Hines, Hunter S. Waldman, Alex J. Heathely, Gavin W. Hall, Eric K. O’Neal, University of North Alabama, Florence, AL. (Sponsor: Matt Gregor, FACSM) Email: ekennedy1@una.edu (No relationships reported)

PURPOSE: This study examined physiological, gait, and perceptual differences of running at 5-km race pace on a non-motorized (NMT) versus a traditional motorized treadmill (MT). METHODS: Twenty-five trained (VO2max = 53.0 ± 8.8 ml/kg/min) and untrained (n = 11) of varying skill level and age (30 ± 10 y) completed 3, 5-km time trials on a NMT. During a later session, the average finishing time of the trials was used as the goal pace to maintain during a 5 min run on the NMT. Participants also ran at their personal best 5-km race pace within the last 6 months on a MT for 5 min with a 10 min rest period between bouts (counter-balanced crossover design). RESULTS: NMT resulted in a slower pace (10.6 ± 1.5 vs 13.9 ± 2.6 km/h; p < 0.001), shorter stride length (1.27 ± 0.18 m; p < 0.001), and decreased cadence (175 ± 12 vs 181 ± 13 steps/min; p = 0.01). However, VO2 (NMT = 3.4 ± 0.4; MT = 3.4 ± 0.5 L/min), RER (NMT = 0.96 ± 0.04; MT = 0.96 ± 0.04), lactate at 3 min into recovery (NMT = 6.9 ± 3.7; MT = 5.7 ± 3.4 mmol), and heart rate at the end of each trial (NMT = 172 ± 10; MT = 170 ± 10 bpm) did not differ significantly. Likewise, RPE for legs, breathing, and fatigue did not differ significantly between the NMT and MT conditions. CONCLUSION: Although gait and pace were altered significantly, physiologically and perceptual responses between the MT and NMT were similar. NMT time trial testing can be expected to elicit similar endurance exercise stress when the use of “free” running task is desired, but interpretation of results need to be made with the consideration that performance is expected to decline by ~25% or more likely due to excess resistance from the NMT belt.

3647 Board #94 June 3 8:00 AM - 9:30 AM Training and Chronological Age Effect Repetitions in Reserve-based Rating of Perceived Exertion Accuracy Michael H. Haischer1, Jacob A. Goldsmith1, Daniel M. Cooke2, Ryan K. Byrnes1, Jared H. Perlmutter1, Jose C. Velazquez1, Adam Sayih1, Eric R. Helms1, Chad Dolan1, Michael C. Zourouds1. 1Florida Atlantic University, Boca Raton, FL. 1University of Houston, Houston, TX. (Sponsor: Michael Whitehurst, FACSM) Email: mhaischer15@fau.edu (No relationships reported)

PURPOSE: The purpose of this study was to examine the relationship between training age (TA) and chronological age (CA) on the accuracy in intra-set recorded rating of perceived exertion (RPE) values on the repetitions in reserve (RIR)-based RPE scale. METHODS: Twenty-five college-aged and resistance trained men (Body Mass: 88.95±14.72kg, squat one-repetition maximum-1RM: 175.76±34.68kg) performed a 1RM back squat followed by one set of maximum repetitions at 70% of 1RM. Subjects were blinded to the load during the 70% set via an opaque trash bag covering the weight discs. During the 70% set subjects verbally called a 5RPE (i.e. 5RIR), 7RPE (i.e. 3RIR), and 9RPE (i.e. 1RIR) when the subject believed he was at the respective threshold. Pearson correlations were used to assess relationships between total repetitions performed and the absolute RIR difference from the actual RIR when each RPE was verbally called. For example, if a subject completed 15 total repetitions and called a 5RPE after 7 repetitions then the RIR difference would equal 3. RESULTS: Average TA was 47.3yrs and CA was 25.3yrs. There were moderate inverse correlations approaching significance between TA and the RIR difference at the called 5RPE (r=−0.35, p=0.094) and 7RPE (r=−0.34, p=0.096), however no relationship for TA at the called 9RPE (r=−0.23, p=0.32). Regarding CA, no difference existed with the RIR difference at 5RPE (r=−0.27, p=0.20), however, CA had a moderate inverse relationship with RIR difference at 7RPE (r=−0.36, p=0.07), and a moderate significant correlation with a 9RPE (r=−0.50, p=0.021). CONCLUSION: Our findings suggest that a lower TA is related to increased difficulty of RIR assessment when 3 or more RIR exist. However, TA was not related to RIR accuracy close to failure (i.e. 9RPE). Interestingly, greater CA is associated with more accurately assessing RIR closer to failure.

3648 Board #95 June 3 8:00 AM - 9:30 AM Total Repetitions Per Set Effects Repetitions in Reserve-based Rating of Perceived Exertion Accuracy Jared H Perlmutter1, Jacob A. Goldsmith1, Daniel M. Cooke2, Ryan K. Byrnes1, Michael H. Haischer1, Jose C. Velazquez1, Adam Sayih1, Eric R. Helms1, Chad Dolan1, Michael C. Zourouds1. 1Florida Atlantic University, Boca Raton, FL. 1University of Houston, Houston, TX. (Sponsor: Michael Whitehurst, FACSM) Email: jperlmul1@my.fau.edu (No relationships reported)

The resistance training-specific rating of perceived exertion (RPE) scale measuring repetitions in reserve (RIR) has been validated to gauge effort per set in resistance exercise. However, it is unknown what descriptive factors of the lifter influence RPE/ RIR accuracy. PURPOSE: The purpose of this study was to examine the relationship between total repetitions per set and the accuracy of intra-set RPEs of 5, 7, and 9 RIR from the 1-10 RIR-based RPE scale. METHODS: Twenty-five college-aged and resistance trained men (Age: 25.3±3yrs, Body Mass: 88.95±14.72kg) performed a one-repetition maximum (1RM) back squat followed by one set of maximum repetitions at 70% of 1RM. Subjects were blinded to the load during the 70% set via an opaque trash bag covering the weight discs. During the 70% set subjects verbally called a 5RPE (i.e. 5RIR), 7RPE (i.e. 3RIR), and 9RPE (i.e. 1RIR) when the subject believed he was at the respective threshold. Pearson product moment correlations were used to assess relationships between total repetitions performed and the absolute RIR difference.
from the actual RIR when each RPE was verbally called. For example, if a subject completed 15 total repetitions and called a RPE after 7 repetitions then the RIR difference would equal 3. RESULTS: Average squat 1RM was 175.76±34.68kg and the mean number of repetitions performed at 70% of 1RM was 16/14. There were moderate and significant correlations between total repetitions performed and the RIR difference at the called RPE (r=0.64, p<0.01) and RIR (r=0.56, p<0.004), however no relationship between total repetitions and the RIR difference existed at the called 9RPE (r=-0.10, p=0.97). CONCLUSION: Our findings suggest that the greater amount of repetitions performed per set is related to increased difficulty to accurately gauge RIR further from failure. However, total repetitions per set do not seem to effect RIR accuracy when close to failure (i.e. 9RPE).

**3649 Board #96 June 3 8:00 AM - 9:30 AM**

**The Role of the Rating of Perceived Exertion Template in Pacing**

Jos J. de Koning, FACSM,1 Wouter Schallig,2 Tim Veneman3, Dione A. Noordhoff1, José A. Rodriguez-Marroyo,2 John P. Porcari, FACSM,4 Carl Foster, FACSM,4 Vrije Universiteit, Amsterdam, Netherlands. 2University of León, León, Spain. 3University of Wisconsin - La Crosse, La Crosse, WI. Email: jj.de.koning@vu.nl

(No relationships reported)

The Rating of Perceived Exertion (RPE) template is thought to regulate pacing and has been shown to be very robust in different circumstances. **Purpose:** The primary purpose was to investigate whether the RPE template can be manipulated by changing the anticipated race distance during the course of a time trial. The secondary purpose was to study how athletes cope with this manipulation, especially in terms of the RPE template. **Method:** Trained male cyclists (N=10) performed three cycling time trials: a 10 km (TT10), a 15 km (TT15) and a manipulated 15 km (TTman). During the TTman, subjects started the time trial believing that they were going to perform a 10 km time trial. However, at 7.5 km they were told that it was a 15 km time trial. **Results:** A significant main effect of time-trial condition on RPE scores until kilometer 7.5 was found (P=0.016). Post-hoc comparisons showed that the RPE values of the TT15 were significantly lower than the RPE values of the TT10 (Diff:0.60; CI:0.11, 1.0) and TTman (Diff:0.73; CI:0.24, 1.2) until kilometer 7.5. From kilometer 7.5 onward, the RPE values of the TT15 were not statistically different (P=1.00).

**G-32 Free Communication/Poster - Pulmonary Diseases**

Saturday, June 3, 2017, 7:30 AM - 11:00 AM

Room: Hall F

**3651 Board #98 June 3 8:00 AM - 9:30 AM**

**Exercise Capacity In Cystic Fibrosis: Changes In C-Reactive Protein Matter**

Paula Rodriguez Miguez, Nichole Seigler, Reva Crandall, Daneby Eidson, Kathleen McKie, Caralee Forsseen, Ryan Harris, FACSM. Augusta University, Augusta, GA. (Sponsor: Ryan A. Harris, FACSM)

Email: prodriguezmigue@gru.edu

(No relationships reported)

**INTRODUCTION:** Exercise capacity, assessed by peak oxygen uptake (VO2 peak), has been shown to predict mortality in patients with cystic fibrosis (CF), independent of lung function. Systemic chronic inflammation is a common phenotype in patients with CF characterized by an excessive production of circulating inflammatory mediators. Inflammation contributes to dysfunctional mitochondria, which in turn contributes to exercise intolerance. The link between inflammation and exercise capacity, however, has yet to be investigated in patients with CF. **PURPOSE:** This study sought to test the hypothesis that 1) C-reactive protein (CRP) is related to exercise capacity and 2) changes in CRP are related to changes in exercise capacity.

**METHODS:** A prospective longitudinal cohort study was completed in 33 patients with CF (18 males and 15 females; age 20±10 yrs) involving a total of 127 visits over a 4 year period (average 4.2 visits per subject). At every visit, anthropometrics, pulmonary function test, exercise capacity, and circulating levels of CRP were evaluated. **RESULTS:** Overall, a significant inverse relationship was identified between VO2 peak and circulating concentrations of CRP (r=-0.389, p<0.001). Longitudinal changes in VO2 peak were negatively associated with changes in CRP (r=-0.336, p=0.004) and remained significant when both FEV1 (% predicted) (r=-0.345, p=0.004) and BMI (r=-0.281, p=0.018) were considered. In addition, changes in VO2 peak were also significantly associated with changes in CRP (r=-0.248, p<0.041) after controlling for FEV1 (% predicted), BMI, and sex. Longitudinal changes in VO2 peak were also correlated with changes in CRP (r=-0.248, p=0.043) even after controlling for FEV1 (% predicted) (r=0.263, p=0.039) or BMI (r=-0.237, p=0.043).

**CONCLUSION:** Circulating CRP is inversely related to exercise capacity in patients with CF. Additionally, for the first time in CF, we have documented that the changes in CRP over time may predict meaningful changes in exercise capacity. These findings support the use of CRP to provide prognostic information into exercise capacity in patients with CF. Supported in part by NIH/NIDDK R21DK100783 and Vertex Pharmaceuticals Inc (RAH).

**Purpose:** To evaluate the differences in perceived exertion (RPE) and cardiovascular intensity (%HRmax), and to determine the differences in metabolic stress (RER) during two exercise interventions following guidelines for (1) general health and (2) weight loss. **Methods:** Sedentary, overweight or obese men and women (N=133, age 47.68, range 21-65 y) were randomly assigned to one of two intervention groups for 24wks. Exercise for general health and weight loss was prescribed at 8 and 20 kcal/kg body weight per week. Exercise was performed at a target HR associated with 65% and 85% of peak oxygen consumption. **Results:** RPE and RER were recorded every 5min during exercise. Respiratory variables (VO2, VCO2, and RER) were measured at the start of exercise at BL and periodically during training (weeks 2, 4, 6, 8, 12, 16, 20, and 24) to determine energy expenditure and RER. Data were analyzed using a group by time analysis. **Results:** RPE (mean±SD, 12.10±0.13 vs. 12.18±0.13, resp, treatment p=0.67, interaction p=0.14) and HR (133.96±1.60 vs. 135.48±1.68, resp, treatment p=0.53, interaction p=0.62) were not different between healthy exercise and weight loss groups. HR plateaued by week 8 for both the healthy exercise and weight loss groups (treatment p=0.53; 134.7±1.9 vs. 136.2±1.9, resp). %HRmax was not different between the healthy exercise and weight loss groups at any time point (treatment p=0.59, interaction p=0.58). RER was significantly different between groups at Week 8 (0.93, 95% CI [0.91, 0.94]; 0.89, 95%CI [0.87, 0.91], resp, p<0.001) and Week 12 (0.93, 95% CI [0.91, 0.93]; 0.85, 95% CI [0.87, 0.91], resp, p<0.0003). **Conclusions:** Despite no difference in perceived exertion or cardiovascular intensity, exercise for general health seemed to have a higher RER compared to exercise for weight loss. Physiological adaptations seemed to plateau at a similar time point between groups; however the increased caloric expenditure of weight loss may have induced metabolic adaptations at a faster rate compared to general health. Exercise for weight loss could induce metabolic adaptations without greater perceived or cardiovascular stress.
Asthma and Exercise-Induced Bronchoconstriction (EIB) are pulmonary conditions associated with narrowing of the airways, one chronically and the other one activated by exercise. Screening in college athletes is valuable, as there is a dearth of evidence and great variability (range 3-42%) among the prevalence rates published. PURPOSE: The purpose of this ongoing analysis is to systematically investigate these pulmonary conditions in athletes across the University-affiliated athletics program. METHODS: Participants were 33 student-athletes (wrestlers). Athletes underwent baseline spirometry following American Thoracic Society (ATS) guidelines, to determine each athlete’s individual baseline FEV1. Each individual’s FEV1 was used to calculate 50-60% of exercise target ventilation (VE) (35*FEV1 * 0.5 and 35* FEV1 * 0.6). After the baseline spirometry was obtained the athlete performed exercise on a treadmill at 80-90% of their age predicted maximum heart rate or 40-60% of their maximal ventilation for at least 4 minutes. After exercise the athlete repeated maximum spirometry efforts at 2, 5, 10, 15, and 20-min. A fall in FEV1 >10% from baseline was considered positive for EIB. RESULTS: Thirty-three wrestlers volunteered for the testing. Three (9.09%) had been previously diagnosed with asthma were excluded. Two of the subjects (6.67%) failed to obtain a minimum of 70% of predicted FEV1 at pre-test were also excluded. Of the 28 subjects (84.8%) who completed the protocol, 4 (13.3%) had been previously diagnosed with asthma, failed to obtain 90% of their pre-exercise FEV1 (mean drop 11.6±1.2%) at one of the post-test time points; an indication of EIB. In one subject (6.67%), results were not conclusive.

CONCLUSIONS: Results of this study are important for raising awareness and potentially improving performance due to unknown pulmonary conditions in college wrestlers.

Exercise-Induced Bronchoconstriction (EIB), a transient narrowing of the airways, is activated by vigorous exercise in approximately 10% of the general population. Published articles indicate in college athletic populations, EIB is identified in between 3% and 4% of the tested population. PURPOSE: The purpose of this study was to identify the prevalence of asthma and EIB in college wrestlers. METHODS: Participants were 33 student-athletes (wrestlers). Athletes underwent baseline spirometry following American Thoracic Society (ATS) guidelines, to determine each athlete’s individual baseline FEV1. Each individual’s FEV1 was used to calculate 50-60% of exercise target ventilation (VE) (35*FEV1 * 0.5 and 35* FEV1 * 0.6). After the baseline spirometry was obtained the athlete performed exercise on a treadmill at 80-90% of their age predicted maximum heart rate or 40-60% of their maximal ventilation for at least 4 minutes. After exercise the athlete repeated maximum spirometry efforts at 2, 5, 10, 15, and 20-min. A fall in FEV1 >10% from baseline was considered positive for EIB. RESULTS: Thirty-three wrestlers volunteered for the testing. Three (9.09%) had been previously diagnosed with asthma were excluded. Two of the subjects (6.67%) failed to obtain a minimum of 70% of predicted FEV1 at pre-test were also excluded. Of the 28 subjects (84.8%) who completed the protocol, 4 (13.3%) had been previously diagnosed with asthma, failed to obtain 90% of their pre-exercise FEV1 (mean drop 11.6±1.2%) at one of the post-test time points; an indication of EIB. In one subject (6.67%), results were not conclusive.

CONCLUSIONS: Results of this study are important for raising awareness and potentially improving performance due to unknown pulmonary conditions in college wrestlers.
report respiratory symptoms during exercise. The prevalence is highest in swimmers suggesting airway hyperresponsiveness that may be associated to a previous history of asthma, allergen, rhinitis, and/or exposure to chlorine irritants. Athletes with previous diagnosis of asthma and/or respiratory symptoms should be screened with a challenge test so EIB can be detected and prevented.

Patients with cystic fibrosis (CF) have compromised exercise capacity (VO\textsubscript{peak}) and impaired vascular health. Sildenafil, a phosphodiesterase type 5 inhibitor, has not only been shown to improve vascular health, but also improve maximal exercise capacity in various patient populations. However, it is unknown if improvements in vascular health contribute to improvements in exercise capacity in CF. PURPOSE: To investigate the relationship between the change in vascular health and the change in VO\textsubscript{peak} following sub-acute treatment with sildenafil in patients with CF. METHODS: 14 patients with CF (age 9.4±3.9, BMI = 20.7 ± 4.1 kg/m\textsuperscript{2}) participated in this study. At baseline and 4 weeks following sildenafil treatment (20 mg thrice daily), vascular health was assessed via flow-mediated dilation (FMD) and pulse wave velocity (PWV) to determine endothelial function and arterial stiffness, respectively. In addition, forced expiratory flow in 1 second (FE\textsubscript{V} \textsubscript{1}) was assessed via spirometry as an index of disease severity, and VO\textsubscript{peak} was determined on a cycle ergometer using the Godfrey protocol. Pearson correlations were used to investigate associations between changes (Δ) in VO\textsubscript{peak}, peak FMD, and PWV while controlling for potentially confounding variables. RESULTS: VO\textsubscript{peak} increased from 44.4 ± 8.7 to 46.6 ± 10.0 ml/kgFFM/min (p = 0.010) after controlling for baseline disease severity (FE\textsubscript{V} \textsubscript{1}). FMD increased from 8.3 ± 5.2 to 9.3 ± 3.6 % (p = 0.07). There was a significant relationship between ΔVO\textsubscript{peak}, peak FMD, and PWV (r = 0.636, p = 0.035) when controlling for age, BMI, and baseline FMD. PWV tended to decrease following treatment (5.4 ± 0.9 to 5.3 ± 0.9 m/s, p = 0.07); however, the change was not associated with ∆VO\textsubscript{peak} (r = 0.400, r = 0.373 or r = 0.063, r = 0.894) when controlling for age and baseline values. CONCLUSIONS: These data suggest that improvements in maximal exercise capacity can, in part, be explained by concomitant increases in FMD following 4 weeks of sildenafil treatment in patients with CF.

The Chronic Obstructive Pulmonary Disease (COPD) is a lung disease with a significant deterioration of the quality of life, functional capacity, and important morbidity. However, exercise can improve fitness and functional capacity, linked with a better quality of life for these patients. PURPOSE: Motion capture devices with a high intensity interval training active video game never been tried with COPD patients. Thus, the objective was to observe the feasibility of using this device safely and order to observe the benefits in comparison to a traditional training program and to determine maximal O\textsubscript{2} uptake and peak power output (PPO). Participants then completed SIE (4 x 30 second sprints at 0.075kg/kg bodyweight, separated by 4.5 minutes of unloaded cycling) and MICE (65% PPO for 20 minutes) sessions in random order separated by at least 72 hours. All exercise sessions were completed on a cycle ergometer. Lung function was assessed pre and post exercise (1, 5, 10, 15, and 20 mins post) as well as at 3.5, 8.5, 13.5 and 18.5 minutes during exercise to coincide with time points post-sprint. Expired O\textsubscript{2} and CO\textsubscript{2} were collected breath-by-breath, and deoxygenated hemoglobin (HHb) was continuously monitored throughout exercise using near-infrared spectroscopy. Results: No statistically significant difference was observed for FE\textsubscript{V} \textsubscript{1} comparing SIE and MICE (85.6±7.0% vs. 84.8±3.0%, respectively, p=0.98) among those with AHR. One participant with AHR experienced a ≥10% decline in FE\textsubscript{V} \textsubscript{1} following SIE and another had a clinically relevant decline following MICE. In participants with AHR, no statistically significant differences were observed in average ventilation during MICE compared to SIE (66.97±10.69 vs. 64.20±9.88, p=0.35). Peak ventilation was greater during SIE (108.27±17.00) compared to MICE (87.66±13.88, p<0.05). In participants with AHR, maximum AHR was not significantly different when comparing SIE and MICE (5.03±3.73 vs. 5.79±2.67, respectively, p=0.43). Conclusion: SIE and MICE lead to similar post-exercise declines in lung function. This may be due to the similar average ventilation observed in both sessions.

Over the last two decades, more than 3 million veterans have experienced at least one combat deployment to the Middle East. Some veterans present with respiratory complaints that began after deployment and frequently attribute these symptoms to deployment-related airborne hazards exposure (e.g., sand and dust, burn pits), but spirometry is often within normal limits. PURPOSE: To compare cardiopulmonary exercise responses in veterans reporting frequent (High Sx) and infrequent respiratory symptoms (Low Sx) who have normal spirometry. METHODS: 28 veterans were referred to our post-deployment tertiary care clinic for a dyspnea evaluation. 15 veterans (43±11.6 years) reported ≥2 lower respiratory symptoms on a bi-weekly basis over the preceding 6 months (High Sx) and 13 (46±8.5 years) reported ≤1 lower respiratory symptom at least bi-weekly. All veterans underwent complete pulmonary function testing and cardiopulmonary exercise testing (CPX).

RESULTS: Forced vital capacity (High Sx, Low Sx: 99±1:10, 98±0:128 %predicted) and forced expiratory volume in 1 second (99.5±12.5, 97.0±14.7 %predicted) were similar between groups. On CPX, veterans in the High Sx group had lower peak oxygen consumption (VO\textsubscript{2} peak) relative to body mass (22.6±2.7, 27.8±6.0 ml/kg/min, p=0.05); though both groups achieved ventilatory threshold at an acceptable level of exercise (15.1±2.9, 15.1±2.1 %peak VO\textsubscript{2}). High Sx veterans had a significantly higher ventilatory equivalent for carbon dioxide (VE/VO\textsubscript{2} peak) compared to Low Sx (34.7±11.4, 27.0±3.2, p=0.05), and revealed significantly lower end-tidal carbon dioxide (PetCO\textsubscript{2}) levels at ventilatory threshold (36.6±7.3, 41.4±3.2 mmHg, p<0.05). CONCLUSIONS: Despite similar resting lung function, veterans who reported more frequent lower respiratory symptoms had reduced exercise capacity and poorer gas-exchange in comparison to their less symptomatic counterparts. These findings may suggest an underlying gas exchange pathology that is not yet detectable at rest. Therefore, CPX should be considered when evaluating deployed veterans with respiratory complaints; especially when resting measures of pulmonary function are normal.
3660 Board #107 June 3 8:00 AM - 9:30 AM
Postoperative Complications After Surgical Treatment For Exercised Induced Laryngeal Obstruction
Magnus Hilliard, Ingvild Engesæter, Astrid Sandnes, Lorentz Sandvik, Ola Rolksund, John-Helge Heimdal, Thomas Halvorsen, Hege H. Clemm. 1Haukeland University Hospital, Bergen, Norway. 2University of Bergen, Bergen, Norway. 3Dublin City University, Dublin, Ireland. 4Columbia University, New York, NY. (No relationships reported)

PURPOSE: Exercised induced laryngeal obstruction (EILO) is a situation in which an apparently normal larynx instead of opening fully during exercise adducts, and thus represents an obstruction to free airflow. In principle, EILO can be primarily glottic or supraglottic. Surgery has been suggested as treatment for highly motivated patients suffering from severe forms of the latter. We would like to report on complications after surgical treatment for supraglottic EILO.

METHODS: During 2010-2015, 66 patients underwent laser supraglottoplasty due to a primary severe supraglottic EILO verified using continuous laryngoscopy during exercise. The surgical procedure was performed in general anaesthesia by one of three surgeons. Care was taken to avoid patients with glottic EILO or other upper airway malformations.

RESULTS: Of 66 patients operated at mean age 15.8 (range 5-26) years, 43 (65%) were females, three (4.5 %) required two surgical procedures, and 63 (95 %) met for a postoperative follow-up exercise laryngoscopy (mean interval 3.8 months). Complications were reported for two patients: (A) Male, 15 years at surgery, diagnosed with postoperative left recurrent laryngeal nerve palsy. Injury caused by intubation or a direct complication from surgery were possible explanations. A mediastinal mass discovered on chest x-ray and a concomitant Epstein-Barr infection, prompted comprehensive work-up; however, with no conclusive findings. At a second follow-up 1.5 year later, the patient had nearly fully recovered and had no problems performing daily activities. (B) Male, 13 years at surgery, diagnosed with postoperative extensive scarring needing a re-operation. Fifteen months after the last surgery, he still had breathing problems during heavy exercise, but reported no problems performing daily activities. Exercise laryngoscopy performed at that time indicated better laryngeal opening when compared to the findings before the first surgery, despite the postoperative scarring.

CONCLUSIONS: Complications were experienced by 2/66 (3%) highly motivated patients operated with supraglottoplasty for severe supraglottic EILO. At follow-up approximately 1.5 years after last surgery, none had symptoms influencing their daily activities.

3661 Board #108 June 3 8:00 AM - 9:30 AM
Influence of Respiratory Limitation on Exercise Capacity with Potential Implication of Ventilatory Muscle Fatigue
Monira I. Aldhahi, Liana C. Wooten, Randall E. Keyser, FACSM. George Mason University, Fairfax, VA. (No relationships reported)

Introduction: It is known that respiratory muscles are prone to fatigue in women with systemic lupus erythematosus (SLE) but the extent to which this limits their cardiorespiratory capacity is yet unclear. Purpose: This study characterized the ventilatory response during maximal exercise testing in women with SLE, examining the potential contribution of respiratory muscle fatigue to diminished cardiorespiratory fitness. Methods: Fifteen women participated in the study (control: n=7, age=36.8 yr, SLE: n=8, age=37.9 yr). Each subject performed a modified Bruce treadmill exercise test to volitional exhaustion. The ventilatory response was characterized by measures of expired minute volume (Ve), tidal volume (Vt), respiratory rate, expiratory time (Te), ventilatory quotients for O2 and CO2 and ventilation-perfusion matching using expired gas analysis and exponential rise CO2 rebreathing methods. Results: Women with SLE had lower Vt (1449±83 vs 1795±124 ml; p=0.04) and Ve (61±6.7 vs 71±4.1 l/min) and Te (21±1 vs 29±2 s ml/kg/min p=0.01) were significantly diminished in those with SLE. Conclusion: Poor cardiorespiratory endurance has been reported in women with SLE. In the current study, group similarity in ventilatory efficiency and ventilation-perfusion matching eliminate the observation of any impairment of ventilatory drive. Conversely, the decline in Ve and Vt, and an increase in Te, coupled with a decreased time to exhaustion suggest that respiratory muscle fatigue may have contributed to low cardiorespiratory fitness and endurance in these subjects. NIH/NICHD 1R03HD39775

3662 Board #109 June 3 8:00 AM - 9:30 AM
Health Related Quality of Life in COPD Patients Completing Aerobic and Resistance Training
Michael J. Berry, FACSM, Katherine Shields, Jordan Irwin. Wake Forest University, Winston-Salem, NC. (No relationships reported)

Both aerobic and strength training have been found to improve health related quality of life in chronic obstructive pulmonary disease (COPD) patients. However, these finding are not unequivocal, and there has been no direct comparison between the two training methods. PURPOSE: To compare improvements in health related quality of life in a group of COPD patients completing both an aerobic and strength training program. METHODS: Eleven mildly diseased patients completed a 3 month aerobic training program and, approximately 5 years later, a 3 month strength training program. Differences between 3 month and baseline scores were examined for the 4 domains of the Chronic Respiratory Disease Questionnaire (CRQ) - a disease specific measure (dyspnea, fatigue, emotional function, mastery) and the 2 summary measures (physical (PCS) and mental (MCS)) component scales of a generic survey (SF-36) and the physical function subscale of the SF-36. RESULTS: Fatigue scores improved by 0.9 ± 0.3 units (p = 0.02) for the aerobic group and 0.8 ± 0.4 units (p = 0.07) for the strength training group. These differences were not significantly different from one another. No other domains of the CRQ were found to increase significantly in either group. PCS scores improved by 5.7 ± 2.5 units (p = 0.05) in the aerobic training group, but only by 0.7 ± 2.9 units (p = 0.82) in the strength training group. MCS scores did not improve significantly for either group. Physical function scores improved by 3.3 ± 1.4 units (p = 0.04) in the aerobic training group, but only by 0.5 ± 1.2 units (p = 0.70) in the strength training group. CONCLUSIONS: These results suggest that an aerobic training program may be a better training modality to improve health related quality of life in patients with COPD.
A physical fitness test gets its information by test takers performing under a load, e.g.,
carrying one’s own body while running, lifting a weight, and using a handgrip device.
The load of one’s own body weight (BW) varies from person to person and the loads of
weights or devices are constant. Therefore, the former can be called a “relative load”
and the latter can be called an “absolute load.” The relationship of these loads in
regards to test takers’ weight in youth fitness testing have not been carefully examined.

**Purpose:** To examine the role of BW in the youth physical fitness tests with absolute
and relative load.

**Method:** A subset of raw data from the 2012 National Youth Fitness Survey were used
for the study, in which a total of 1,640 children and youth (Male: SD: Age = 9.07±3.70
yr; height = 136.98±22.90 cm; weight = 39.55±20.68 kg; BMI = 19.58±5.04) were tested for
two sets of tests with body weight as the load (relative load), consisting of
maximal endurance time on a treadmill test, modified pull-up, and plank, and without
body weight as the load (absolute load), using handgrip strength and leg extension
(combined). After analyzing the data using descriptive statistics by age and sex, the
correlations between BW and absolute and relative load tests were computed.

**Results:** Descriptive statistics (Mean±SD) of the tests and their correlations (r) with BW
were summarized below:

<table>
<thead>
<tr>
<th>Endurance Time (sec)</th>
<th>Pull-up (r)</th>
<th>Plank (sec)</th>
<th>Handgrip (kg)</th>
<th>Leg extension (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>663.30±152.44</td>
<td>6.32±6.38</td>
<td>63.86±49.58</td>
<td>45.84±67.24</td>
<td>113.88±65.16</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>636.83±122.74</td>
<td>3.56±4.15</td>
<td>58.08±40.92</td>
<td>39.32±14.33</td>
<td>104.25±50.67</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>649.52±138.31</td>
<td>4.94±5.55</td>
<td>60.96±45.52</td>
<td>42.57±18.49</td>
<td>109.02±58.47</td>
</tr>
</tbody>
</table>

**Male .49 12 22 .79 .07**

**Female .47**

**Conclusion:** BW has a negative correlation with relative load fitness tests and has a
positive relationship with absolute load fitness tests. The question then is which load
should be used in physical fitness testing, absolute or relative one? While more studies
are needed to answer this question, it seems that absolute load is more appropriate for
performance-related fitness since the best performance in a sport competition is the key
interest while relative load is more appropriate health-related fitness since one’s own
health is the main focus.

**3665 Board #112 June 3 8:00 AM - 9:30 AM The Importance of Accurate Measurements In Voluntary Wheel Running In Mice**

Ayland C. Letsinger1, Jorge Z. Granados2, Heather L. Vellers1, Victor A. Garcia1, Jeremiah D. Velasco3, Nick R. Walker1, Madison Spier2, Isabel Lambertz2, Robin Fuchs-Young2, J. Timothy Lightfoot, FACSM1, Texas A&M University, College Station, TX. (Sponsor: J. Timothy Lightfoot, FACSM)

Email: aylandletsinger@gmail.com

(No relationships reported)

**PURPOSE:** Accuracy of data collection is essential in reducing variability in voluntary
wheel running which could potentially hide statistically significant results. When measuring
physical activity in rodents, a large portion of each collection period is unobserved and thus, systematic checks to reassure functionality must be a priority.

**METHODS:** The TAMU 1ACUC approved all procedures. SENCAR breeder pairs were
mated and at 3 weeks of age, the female pups were co-caged. At 4 weeks of age, two running
wheels were mounted in each cage, with an odometer attached to the top of the
cage to record daily distance (km/day), duration (mins/day), and to calculate
speed (m/min). At 14 weeks of age, the number of manual rotations required to reach
a 0.01 km change on the odometer was determined with the number of rotations
averaged across three trials. Each wheel’s position in relation to the computer pick-
up was then adjusted until the total spins to reach a 0.01 km odometer change were
as close to 61 (calculated to be the true distance of 0.01 km) as possible. Resulting
average daily distance, duration, and speed were compared to the amount of rotations
before and after adjustment using a one-way ANOVA.

**RESULTS:** Wheel rotations needed to reach 0.01 km before adjustments to the wheel
were significantly higher (p=0.002) than after adjustments (74.7±15.3 vs. 64.5±6.6
rotations, respectively). Before adjustments, rotations had varying correlations with
distance (R²=0.008; 0.188), speed (R²=0.027; 0.044), and speed (R²=0.050; p=0.0001).
After adjustments, all correlations were lower and insignificant with distance (R²=0.0034; p=0.79), duration (R²=0.0032; p=0.51), and speed (R²=0.0091; p=0.66).

**CONCLUSIONS:** Completing ongoing and regular manual checks on the functionality
of running wheels will allow for higher accuracy and lower variance in data, especially running speed, which could otherwise hide significant differences
between treatment groups.

**3666 Board #113 June 3 8:00 AM - 9:30 AM New Analysis Software To Evaluate Performance**

Rochus Pokan, FACSM1, Herwig Allemani1, Seiler Philip1, Maria Hausharter1, Christoph Weber1, Stefan Heber1, Serge P. von Duvillard, FACSM1,2 University of Vienna, Vienna, Austria. 2Technical University of Munich, Munich, Germany. 3University of Salzburg, Salzburg, Austria.

Email: rochus.pokan@univie.ac.at

(No relationships reported)

Vienna CPX-tool is newly developed software that evaluates cardiopulmonary exercise
test by assessing the transitions (T) between 3 phases of energy supply, i.e., T1 and
T2. We integrated 3 calculation methods (angle, regression and error variance).
Each allows for estimation of threshold indicators (IND) of blood lactate turn point 1 (LTP1),
first ventilatory threshold (VT1), and ventilatory equivalent (VE/VO2) for T1 and LTP1, VT2, VE
and heart rate turn point (HRTP) for T2. Since each T is based on a common physiological
mechanism, we assume that an accurate calculation method would yield a small range of power output (PO) estimates within each T.

**PURPOSE:** The aim of the present study was to compare the 3 methods via the Vienna
CPX-tool. METHODS: Sixty-five incremental cardiopulmonary exercise tests were analyzed
for PO estimates of LTP1, VT1, lowest turn point of VE/VO2, and the HRTP with any of the three calculation methods. To compare the results with the PO at the maximal lactate steady state (MLSS), the following criterion was used: a valid MLSS prediction was provided if the difference between the PO estimate and the PO at the MLSS was within a range of 0.5–4% from the maximum PO resulting from the
incremental test. Pearson’s chi-square was used to test for the effects. To determine
the association between the variables, pairwise comparisons were calculated via
Bonferroni-Holm tests.

**RESULTS:** Prediction frequencies were only significantly different between the angle and regression for LTP, as well as the angle and regression and regression and error variance in VT1. **CONCLUSION:** The implemented calculation methods had a prediction accuracy of ~75–80% using a 4% criterion.

Based on the present results it is not possible to identify a single best method whereby
angel seems to be the most robust variable. To improve calculations and estimations of
the above listed variables should be the leading priority for future research endeavors.

**3667 Board #114 June 3 8:00 AM - 9:30 AM Effect Of Neighborhood-unit Definition On The Relationship Between Physical Activity And The Built Environment**

Deborah Salvo1, Casey P. Durand2, Alexandra E. Evans1, Adriana Perez1, Harold W. Kohl III, FACSM1. 1The University of Texas Health Science Center at Houston - School of Public Health (Austin), Austin, TX. 2The University of Texas Health Science Center at Houston - School of Public Health (Houston), Houston, TX.

(No relationships reported)

**PURPOSE:** Substantial evidence demonstrates that built environment features, like
density, connectivity, land-use, pedestrian/transit infrastructure, and recreational
facilities, can influence physical activity. However, inconsistent findings remain
in terms of significance, direction and strength. The purpose of this paper was to
determine if the lack of a standardized definition for a neighborhood unit contributes
towards these inconsistencies. METHODS: Published literature (PUBMED & SCOPUS) was abstracted to identify studies examining the relation between physical
activity and Geographic Information Systems (GIS)-based environment measures.
Data were abstracted to determine the various definitions of neighborhood units
used for GIS built environment measures. Each tested association was coded per the
SCOPUS) was abstracted to identify studies examining the relation between physical
activity and GIS built environment measures. Each tested association was coded per the

define neighborhoods, 28.4% used network buffers, and 44.8% used administrative units of different shapes and sizes (e.g., census tracts). Relative to studies using large administrative units to represent a neighborhood, those using buffers of 400-500m (OR: 3.2, 95% CI: 1.4, 5.8), and 800-1000m (OR: 2.9, CI: 1.3, 7.1), had greater odds of reporting a significant association between GIS built environment measures and physical activity outcomes. Among those using buffers, no significant differences were found between Euclidean vs. network buffers: (OR: 1.07, 95% CI: 0.46, 4.29).

CONCLUSIONS: The use of subjective and built environment constructs, and the application of GIS to examine neighborhood effects on physical activity behavior (SB) and physical activity (PA) measurements. Yet, it remains unclear if using imputed data for low participant wear time improves SI and PA estimates.

PURPOSE: To determine if a data imputation technique improves SI and PA estimates in accelerometer data with low participant wear time. METHODS: One-hundred participants were an accelerometer at the hip for ≥23.2 hours/day, at least 4 days including 1 weekend day, to capture habitual SB, light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) levels. After removing sleep time (RAW: 15.9±3.5 hours/day), random 60-minute blocks of data were removed from the RAW data set until participants had a unique data set with wear time adherence at 10 hours/day. A minute-by-minute, mean data imputation technique was used to impute estimates of SB, LPA, and MVPA in place of the missing data for the 10-hour adherence level. A series of paired t-tests with a Bonferroni correction (alpha level=0.006) compared the estimates of SB, LPA, and MVPA to the RAW data set at the 10-hour adherence level. Similarly, imputed estimates of SB, LPA, and MVPA were compared to the RAW data set at the 10-hour adherence level.

RESULTS: SB, LPA, and MVPA were underestimated by 163.7 (95% confidence intervals [CI]: 156.0, 171.5; p=0.0001), 138.4 (CI: 129.1, 147.9; p=0.0001), and 27.2 (CI: 24.3, 30.1; p=0.0001) minutes/day at 10-hours of wear compared to the RAW data set, respectively. When utilizing the data imputation technique at the 10-hour adherence level, SB and MVPA were underestimated by 16.8 (CI: 8.7, 24.9; p=0.0001) and 17.1 (CI: 14.5, 19.6; p≤0.0001) minutes/day compared to the RAW data set, respectively. LPA at the 10-hour adherence level was overestimated by 35.1 (CI: 25.9, 41.9; p=0.0001) minutes/day compared to the RAW data set after utilizing the data imputation technique. CONCLUSION: A minute-by-minute, mean data imputation technique improved SI, LPA, and MVPA estimates in accelerometer data with low wear time adherence. Future studies should examine the impact of a data imputation techniques on accelerometer data with low participant wear time.

G-34 Free Communication/Poster - Training and Recovery
Saturday, June 3, 2017, 7:30 AM - 11:00 AM
Room: Hall F

3671 Board #118 June 3 9:30 AM - 11:00 AM
Effects Of Different Pull Up Training Strategies On Pull Up Scores
Eric Martin, George Beckham. California State University Monterey Bay, Seaside, CA. (Sponsor: Kent Adams, FACSIM)
Email: ermartin@csumb.edu
(No relationships reported)

PURPOSE: The ability to perform pull ups is important for improving mission readiness and for career advancement and retention for tactical athletes such as military, fire, and police. The purpose of this study was to investigate different strategies for improving pull ups.

METHODS: Healthy adults were recruited via the internet and randomized into one of four training groups: traditional (5 sets of repetitions to failure, n=17), additional

Abdominal circumference (AC) at the umbilical region is used to define metabolic syndrome (SBS) in Japan. The AC is based on a cross section of the abdominal visceral adipose tissue (VAT) area. However, recent studies indicate that using a single-slice image may lead to an erroneous conclusion as to individual VAT accumulation levels. Therefore, relying only on AC may be an inadequate method for evaluating individual VAT accumulation levels and defining MS. Purpose: To develop a new equation model for predicting VAT volume using anthropometric values and to clarify the association between metabolic risk factors and actual and predicted VAT volume values. Methods: The cross-sectional data of 214 participants (derivation group) were used to develop an equation model for VAT volume, and data from 66 of the participants (validation group) were used to validate this anthropometric model for predicting VAT volume.

We collected anthropometric measurements and measured metabolic risk factors: blood pressure, HDL cholesterol, triglyceride and fasting glucose. VAT volume was determined by continuous T1-weighted abdominal magnetic resonance images.

Results: Using multiple regression analyses, we determined the best prediction equation for abdominal VAT volume with a VAT variance of 47% as follows: VAT volume (cm³) = (74.18×AC) + (47.03×age) + (117.79×BMI) - 8792.73. In our validation group, the correlation coefficient between the predicted and actual VAT was 0.71 (p<0.001). Also, the predicted VAT volume correlated significantly with blood pressure and fasting glucose, even though we did not observe significant correlations between AC and these risk factors.

Conclusions: The predicted VAT volume from our equation model was significantly related to metabolic risk factors. This study suggests that the equation model has potential to assess VAT accumulation levels in the field and in clinical settings where CT or MRI is not available.
loading (5 sets of repetitions to failure with additional 10% body weight, n=7), eccentric-only (5 sets of 6-second-eccentric-phase-only repetitions to failure, n=6), and control (no pull-up training, n=9). Participants assessed pull-ups at baseline, week 6, and week 12. Over 12 weeks, participants followed general training guidelines and performed pull-up specific training twice per week. Changes in number of pull-ups were compared with ANCOVAs, using body mass as the covariate.

**RESULTS:** There were no differences between training groups on changes in pull-ups at any point in time. All intervention groups improved significantly, with the control group from baseline to week 12 (p = 0.05). On average, intervention participants improved from 9.3 (± 7.0) repetitions at baseline to 12.9 (± 7.0) repetitions at week 6, to 15.3 (± 8.4) repetitions at week 12. The eccentric training group had the highest drop-out rate and required the greatest time commitment.

**CONCLUSIONS:** On average for all intervention participants, the improvements in pull-ups were large, with a 39% improvement by week 6 and a total of 65% improvement over baseline at week 12. Eccentric training requires more time to complete and potentially decreases adherence to a training program and thus may be a less efficient training program. Any mode of pull up training, performed twice per week, using the basic structure of five sets of maximal repetitions, is effective at improving pull up performance.

---

**3674 Board #121**

**June 3 9:30 AM - 11:00 AM**

**A Study of Sling Exercise Training for Judo Athlete to Improve Technique of Seoi-nage**

Shan-Shan MAO. Beijing Sport University, Beijing, China.

(No relationships reported)

**Purpose:** As an important and the most frequently used Judo skill, the technique of Seoi-nage requires Judo athlete to disturb the balance of the opponent, and maintain his own stability and balance at the same time. This lies on the strong support of core muscles. As we known, sling exercise training (SET) is an effective method for core stability training, which can enhance core strength and stability and improve the ability of balance control. However, very few studies are found about the application of SET in the Judo training. The purpose of the study is to investigate how SET affects the technique of Seoi-nage for Judo athletes.

**Methods:** A total of 14 healthy male Judo athletes has participated in the study. They are all athletes of National Rank 2 from a sports university. They are randomly divided into two groups, the SET group (S, n=7) and the control group (C, n=7). The S group use the SET program particularly designed for them, while the C group take traditional PYR in sub-elite rowers during the final 11 weeks of a preparation period.

**Methods:** Fourteen internationally competing German male rowers participated in the 11-wk intervention and pre-post testing (age: 20 ± 2 y, VO2peak: 66 ± 5 mL/min/kg). The sample was split into a PYR and a POL group by varying the percentage spent in Z2 and Z3 and matched for overall training and rowing volume including strength, unspecified endurance and other training (e.g. stretching). The actual training and intensity distributions were calculated from all athletes’ official training diaries and harasses. To minimize the influence of external factors, all athletes were equally matched on the level of fatigue. Pol-Index = log(Z1/Z2*Z3). Main outcome variable was average power in 2000 m ergometer test (P2k) (Concept 2).

**Results:** PYR and POL did not significantly differ regarding specific training volume (1334 ± 67 km and 1255 ± 264 km) or total volume (3593 ± 315 min and 5919 ± 1216 min), but POL had a significantly higher percentage of Z1 intensities (6 ± 3% vs. 1 ± 1%, p < .005) and lower amount of Z2 (1 ± 1% vs. 3 ± 2%, p < .05) than PYR while Z1 was similar (94 ± 3% vs. 93 ± 2%, p = .7). P2k significantly improved from 443 ± 30 W to 445 ± 26 W (p = .023), but no changes were found between groups or between measurements within groups. 67 (86%) of the rowers with a Pol-Index > 2 improved P2k by more than 13 %, being the estimated error measurement for this type of test.

**Conclusion:** POL was not significantly superior to PYR during 11 wk of preparation in 14 rowers. However, results suggest that POL could be beneficial and advantageous, if it is particularly pronounced.

---

**3675 Board #122**

**June 3 9:30 AM - 11:00 AM**

**Effectiveness and Feasibility of Integrating Video Feedback into Practice to Improve the Collegiate Softball Hit**


(No relationships reported)

Feedback about performance is standard coaching practice to improve acquisition of an athletic skill. Video feedback improves performance during golf and tennis swings; thus may improve performance during softball swings. Still shots with written instructions (task cards) guide peer assessment; yet the benefits for self-assessment are unknown. **PURPOSE:** To determine if self-assessment of performance using task cards and video feedback has the potential to improve hitting mechanics in collegiate softball players more than standard coaching alone.

**METHODS:** Nineteen collegiate DIll softball players (age 19.6 ± 1.3 years; years of experience 12.5 ± 2.3) were randomized into a control or intervention group. The intervention group used task cards and delayed video feedback of their at bats during each hitting practice for 4 weeks. The control group received standard coaching.

Abstracts were prepared by the authors and printed as submitted.
only. Data were collected at: pre-intervention (T1), immediate post-intervention (T2), and delayed post-intervention (T3). Five random hits were coded as “me=1” or “not me=0”. Met was defined as: weight centered between feet during each phase of swing and 1) pre-swing: chin on front shoulder, hands at back armpit, 2) contact: lead with knob of bat, strong lead leg, 3) follow-through: chin on front shoulder. The phase of the hit was coded as “not met” if all criteria were not achieved.

RESULTS: A main effect of time was found for pre-swing (P=0.014), with improvements occurring between T1 and T3 (P=0.009). No other main effects or interaction effects were found for hitting. (Table 1)

CONCLUSIONS: Task cards and delayed video feedback did not improve hitting mechanics more than standard coaching. Regardless of group assignment, all players improved in the pre-swing phase by the end of regular season games. The improvement in pre-swing suggests an improved ability to make contact with the ball because the batters’ pre-swing stance puts them at an advantage to reach a variety of pitches (i.e. inside, outside, high, low).

### Table 1. Hits over time coded as met=1 and not met=0; Means (SD)

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-swing</td>
<td>30 (37)</td>
<td>.51 (.45)</td>
<td>59 (.43)</td>
</tr>
<tr>
<td>Contact</td>
<td>.85 (30)</td>
<td>.76 (.41)</td>
<td>.87 (.19)</td>
</tr>
<tr>
<td>Follow-through</td>
<td>.90 (23)</td>
<td>.83 (.23)</td>
<td>.87 (.20)</td>
</tr>
</tbody>
</table>

PURPOSE: To clarify the physiological effectiveness of various movement on aerobic exercise using Swiss-ball (SB) or chair, we compared the exercise intensity between walking and aerobic exercise using SB or chair.

METHODS: Nine healthy men performed walking and aerobic exercise using SB or chair. Respiratory metabolism and heart rate were measured during walking and aerobic exercise using BB. Subjects walked at 4 speeds (4 km/h, 5 km/h, 6 km/h and 7 km/h) on treadmill ergometer. During aerobic exercise using SB, subject was sitting on the SB and bouncing with upper and lower limb movements. During aerobic exercise using chair, subject was sitting on the chair and exercising with upper and lower limb movements. The movements consisted of four patterns of upper and lower limb movements.

RESULTS: The exercise intensity during aerobic exercise using SB (4.8±0.6 Mets) was significantly higher (P<0.001) compared with aerobic exercise using chair (3.6±1.1 Mets). There was no difference between aerobic exercise using SB and chair on the heart rate (SB: 118±12 beats/min, Chair: 110±14 beats/min). The exercise intensity in Mets). There was no difference between aerobic exercise using SB and chair on the average blood lactate 6.01 vs 5.83 (mM) respectively, changes in baseline vs. altitude exposure were seen in average heart rate, 164 vs 162 (b/min.), respectively and average blood lactate 6.01 vs 5.83 (mM) respectively, across the workload continuum. Maximal oxygen consumption (Max VO2) and time to exhaustion (TE) after altitude exposure improved (increase and decrease, respectively) over baseline. Hematocrit, hydration status via urine specific gravity (USG), fasting blood glucose (mg/dL) and kilocalorie (Kcal) consumption were not significantly altered during five days of altitude exposure. RESULTS-Pedagogical: Students showed proficiency in the following: anthropometry, blood pressure, electrocardiograph (ECG), urine specific gravity (USG), blood glucose, blood lactate, Max VO2. In addition, students were involved in research literature review and article summarization. Following the research data collection, the students were shown statistical procedures for research analysis. CONCLUSION: This project involved a research component and a pedagogical component. Physiologically, exposure to altitude showed tendencies toward positive performance measures after five days of exposure. Pedagogically, this project allowed for experiential learning for undergraduate students and involvement in research.

### Table 1. Participants’ estimated %1RM and estimated %Max for 7 absolute velocities and relative loads, respectively. Data were computed using the participant-specific regression equations, and are expressed as a mean, standard deviation (SD) and range.

<table>
<thead>
<tr>
<th>Absolute Velocity (m/s)</th>
<th>Estimated %1RM</th>
<th>Relative Load (%1RM)</th>
<th>Estimated %Max</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.70</td>
<td>11</td>
<td>11</td>
<td>-32-27</td>
<td>15</td>
<td>42</td>
<td>6</td>
</tr>
<tr>
<td>1.30</td>
<td>33</td>
<td>8</td>
<td>-1-45</td>
<td>30</td>
<td>32</td>
<td>5</td>
</tr>
<tr>
<td>1.00</td>
<td>49</td>
<td>7</td>
<td>23-58</td>
<td>45</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>0.75</td>
<td>62</td>
<td>5</td>
<td>43-71</td>
<td>60</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>0.50</td>
<td>76</td>
<td>4</td>
<td>63-83</td>
<td>75</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>0.25</td>
<td>87</td>
<td>4</td>
<td>82-96</td>
<td>90</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>0.10</td>
<td>98</td>
<td>4</td>
<td>89-105</td>
<td>100</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Although training intensity is commonly adapted by modifying the relative load (e.g. %1RM), absolute velocities are also targeted to facilitate speed- and power-oriented training objectives. PURPOSE: Examine the variation in relative loads and relative velocities used to perform a bench press at 6 absolute velocities. METHODS: Thirty men completed three bench press tests: 1RM, max velocity with 2.5kg bar, and 6 sets of 4 reps with loads of 15-90% 1RM. Participants were instructed to lower and lift the bar as fast as possible. Mean and peak concentric barbell velocity was computed via a linear position transducer. The average mean velocity of each 4-rep set and the relative load lifted were used to create participant-specific regression equations that would capture each individual’s load-velocity relationship. These equations were then used to estimate the %1RM that would have been used to move the bar with the group’s mean velocity with loads of 15-90% 1RM. These “target” velocities were also expressed as a relative percentage of the maximum velocity (%Vmax) achieved by each participant during the 2.5kg test. The variation in %1RM for each velocity was described by the standard deviation and range amongst participants. A similar approach was used to estimate the %Vmax that would have been achieved using a range of loads (15-100% 1RM). RESULTS: Lower %1RM and higher mean velocities were associated with the largest variation in training intensity across participants (Table 1). CONCLUSION: Using specific absolute mean velocities as “targets” could result in substantial variation to the corresponding %1RM and %Vmax across a group of athletes. To accommodate the abilities of each performer, it may be important to use relative velocity targets.
While there is much anecdotal evidence suggesting the importance of time of day (TOD) in which exercise training is performed, there is a paucity of controlled comprehensive studies examining the influence of TOD on training-induced adaptations. PURPOSE: to determine the effect of TOD on mediating training-induced changes in exercise performance, cardio-metabolic health, and body composition in active normal weight women. METHODS: 27 healthy active females (BMI = 24 ± 3 kg/m²; 42.8 yrs) were recruited for this study and randomized to either exercise training in morning (AM) or evening (PM) for 12 weeks. In following recent ACSM guidelines, we employed a multimodal training paradigm (Resistance, Interval, Stretching, and Endurance, RISE). Baseline exercise performance was assessed via abdominal, upper and lower muscular strength (situps, pushups, 1 RM bench and leg presses), power (jump squats and bench throws), aerobic power (5km cycling time trial), flexibility (sit and reach), and balance (stark stand). Cardiovascular health (blood pressure, and augmentation index (AIx)), body composition (DEXA; Fat free mass, fat mass, abdominal/visceral fat, %body fat), hunger/satiety ratings (visual analog scales), and cardio-metabolic profile (energy expenditure, fasting lipids, glucose, insulin).

RESULTS: At baseline, no differences existed between groups in any variable. Training resulted in significant (p<.05) improvements in exercise performance, cardio-metabolic health, and body composition. However, there were significant interactions (p<.05) of TOD x training for DBP (10±11 v. -5±14 mmHg), RMR (-130±65 v. +12±36 A kcal/d), FM (-1.0±0.2 vs. -0.3±0.2 A kg), AIab (-2.6±0.3 v. -0.9±0.5 A kg), HR (122±15 v. 117±13 b/min), and HR 20-60 sec (138±14 v. 133±13 b/min). Overall, training resulted in greater improvements in diastolic blood pressure, fat mass, abdominal fat mass, and lower body peak power. Whereas, training in AM resulted in greater gains in upper body muscle strength, endurance, and power. Support: LGIX.

Small sided games are commonly used in team sports to incorporate live play and high repetition skill execution. There is little data with regard to the physiological requirements of small sided vs. traditional game format in ice-hockey. PURPOSE: Use player mounted sensors (PMS) to compare the accelerations (ACC) and heart rate (HR) between traditional (TRAD) and 3v3 cross-ice games among elite, national-level youth ice-hockey players. METHODS: 29 elite ice hockey players (15.2 yrs ± 0.27, 177.4 cm ± 7.1, 72.9 Kg ± 16.7) who participated in USA Hockey National Player Development Camp consented to procedures approved by the EMU human subjects committee. Players wore Zephyr Bioharness-3 (Zephyr, MD) PMS across their chest. The PMS recorded HR and ACC at 10 Hz over the seven on ice sessions of the five-day camp. This included three practice sessions, three games (G1, G2 and G3) and one 3v3 training session. PMS were downloaded to Omniscence software (Zephyr, MD) and data was exported from Omniscence to WKO4 (Peakwork, CO) for storage and analysis. Peak ACC across multiple time frames (5, 10, 20, 30, 45, 60 sec, 5, 10, 20, 40 min) were quantified. Heart rate was quantified and used in conjunction with ACC to determine exertion profiles for each on-ice session. MANOVAs for Peak and HR between traditional games and 3v3 were performed time and as main effects were performed using SPSS 23.0 (IBM, NY). RESULTS: No differences were observed between sessions for 5 sec, but 10 sec ACC was lower for 3v3 vs G1 and G2 (p<.05), but not G3. No sig differences were observed for 20-60 sec ACC (p> .05), but small effects were present at all time frames (r²=.021 - .077). No sig differences were observed for 5 min ACC, but 10, 20 and 40 min, were all significantly higher for 3v3 than G1, G2 or G3 (p<.05). For HR, no sig differences or effects (η²<.01) were present for any time frame less than 5 min. HR was higher for 5, 10, 20 (p<.05) but not 40 min, for 3v3 vs G1, G2 and G3. CONCLUSIONS: Reduced 10 sec ACC for 3v3 indicates a reduced reliance on phosphagen system than TRAD games while higher ACC and HR for 10, 20 and 40 min indicates that 3v3 is more reliant on aerobic systems than TRAD games. Insignificant differences, with small effects, for 20 - 60 sec between TRAD games and 3v3 indicate there may be practical differences that are less distinct than for other time frames.

CrossFit® (CF) is currently one of the most popular health and fitness activities. However, CF training opinions claiming it causes injury. PURPOSE: To determine the purpose of this study was to investigate if CF participation contributes to overtraining syndrome. A secondary purpose was to determine if there are differences between CF original methodologies and real-world practice. METHODS: Six recreationally trained males (height, 182.8 ± 8.6 cm; weight, 84.3 ± 12.4 kg, and age, 25.0 ± 5.4 yrs) were randomized into two groups, theoretical (TH) or real-world (RW) prior to the intervention. Both groups completed pre-testing assessment of body composition, physiological, biochemical, immunological, psychological, and performance-based data. Both groups participated in CF training 5 days/week. The TH group completed training designed to follow original CF methodology while the RW group followed programming designed by a randomly selected CF affiliate. Prior to and at the end of each week blood was collected for serum analyses and select joint range-of-motions (ROM) were measured. Additionally, prior to each training session, resting heart rate (RHR), blood pressure (BP), muscle soreness (DOMS), and select training variables were collected. Following the completion of each training session, HR and perceived exertion (RPE) were collected. RESULTS: There were no significant differences in physiological, biochemical, immunological, psychological, or performance outcome variables assessed in this study between both groups and post testing (all p> .05). However, there are differences in intervention programming between TR and RW groups. In practice, there were significantly less element priority sessions in practice compared to what was recommended (40% vs 0%; p=28.5; p=0.016). Element priority sessions had significantly lower associated training heart rates (127.4 vs 167.0, 172.4 bpm, F=8.63, p=0.001) and ratings of perceived exertions (9.4 vs 14.8, 14.7; F=15.26; p<0.001) than other session designs common in CF. CONCLUSION: These data suggest that short-term CF participation does not contribute to the development of overtraining syndrome in recreationally trained males.

PURPOSE: To examine the effects of a novel high-intensity training program on fire academy recruits’ health, fitness, and performance. METHODS: 13 participants were recruited from a fire academy and were randomly assigned to the control (CG, n=6) or intervention group (IG, n=7). Due to attrition 10 male recruits (23.8±2.7 years) completed the study (CG, n=3, IG, n=7). The CG was asked to continue their current exercise habits. The IG was asked to complete a 10-week online-based periodized training program developed by firefighters specifically for firefighters that included nutritional and mental readiness education. Participants completed pre- post-intervention assessments including a timed simulated fireground test (SFGT). A feasibility analysis was also completed for the IG. Due to the small sample size and group differences at baseline, descriptive statistics were calculated and each participant was reviewed as an individual case study. The Wilcoxon Signed Rank Test was used to compare pre- and post- changes among groups. RESULTS: The IG showed marked improvement on SFGT performance (40% to 86% passing); four improved their passing time. The IG significantly increased estimated VO2max (p<0.028), improved body composition (decreased fat mass and body fat %p=0.008), and increased grip strength (p=0.018). With a small sample size we were unable to discern if the intervention improved recruit fitness and performance compared to the control group or other covariates, however, the CG showed no statistically significant changes. Though the IG completed ~75% of the assigned workouts, there may be a better way to implement this intervention. Participants mentioned they’d like group workouts led by a certified strength and conditioning coach/patience trainer as opposed to workouts completed on their own. CONCLUSIONS: This study showed that a high-intensity training program improved fireground performance, aerobic fitness, body composition, strength, and agility among fire academy recruits. A larger randomized controlled trial is necessary to further investigate program effects among this population.

Abstracts were prepared by the authors and printed as submitted.
During summer break, ROTC cadets are not required to participate in mandatory physical training. PURPOSE: To investigate the effect of an eighteen-week cessation in regimented physical training on body composition measurements and cardiorespiratory endurance in a cohort of Army ROTC cadets. METHODS: Two testing sessions were completed in the spring and fall, by 35 cadets (males n=29, age=22.9±3.8 vs. 23.1±4.0yrs, height=175.1±5.9 vs. 175.0±5.9cm, weight=76.5±9.7 vs. 77.7±9.1kg and females n=6, 21.4±1.5 vs. 21.6±1.5yrs, 162.7±5.6 vs. 162.5±5.9cm, 63.0±5.4 vs. 64.1±5.6kg, for the spring and fall respectively). Body composition was assessed using circumference and 3-site skinfold measurements. Percent body fat (%BF) was calculated using Brozek formula. Cardiorespiratory endurance was assessed by completion of maximal oxygen uptake (VO2 max) test on a motorized treadmill using a modified Åstrand protocol. RESULTS: Body mass was significantly increased in both male (spring: 76.5±9.7kg vs. fall: 77.8±9.1kg; p<0.05, Δ=1.3kg) and female (spring: 63.0±5.5kg vs. fall: 64.1±5.7kg; p<0.05, Δ=1.1kg) cadets. There was a significant increase in the sum of three skinfolds and %BF in male cadets (spring: 43.0±13.3mm & 12.4±3.8% vs. fall: 49.8±11.8mm & 14.3±3.3%; Δ=-6.8mm & 1.9%, respectively, p<0.05), but not in female cadets. Lean body mass remained unchanged from spring to fall testing sessions (p>0.05). Body Mass Index was significantly increased in male cadets (spring: 24.9±2.7 vs. fall: 25.3±2.4; p<0.05) and female cadets (spring: 23.7±1.5 vs. fall: 24.2±1.9; p<0.05). Time on treadmill decreased significantly in male cadets (spring: 12.3±1.3min vs. fall: 11.5±1.5min; p<0.05). Significant declines in relative VO2 max results were seen in male cadets (spring: 51.1±4.2 vs. fall: 49.4±3.3ml/kg/min; p<0.05, Δ=1.8ml/kg/min). There were no significant changes for time on treadmill or relative VO2 max for female cadets. There was a significant interaction for post-test blood lactate with the female cadets increasing from 7.7±2.1 to 9.7±1.5mmol and male cadets decreasing from 10.6±2.0 to 9.0±2.6mmol. CONCLUSION: An eighteen-week training cessation from physical training negatively affected body composition in both male and female Army ROTC cadets and cardiorespiratory endurance in male cadets.

When athletes experience training distress, a break in training may facilitate recovery and improve performance. Conversely, when team training is interrupted, such as occurs during winter break in collegiate athletes, deconditioning may result. In the current study, physiological responses to exercise were made before and after an unstructured winter break in male collegiate rugby players. PURPOSE: The purpose of the study was to examine detraining effects that occurred when structured training was interrupted for four weeks. METHODS: Fourteen (n=14) male club rugby players underwent exercise testing to assess aerobic capacity (VO2 max), strength (maximal bench press and leg squat), speed (10 yd dash), power (vertical jump), and body composition (body weight and % body fat by underwater weighing). A subject was recorded just prior to, and after the winter school break. T-tests were performed on pre- and post-winter break values. RESULTS: There was no evidence of detraining after four weeks of unstructured training. No changes were observed in bench press strength (183 versus 188.6 lbs) or speed (1.69 versus 1.69 seconds) across the break. However, performance measures for aerobic capacity (45.45 versus 47.70 ml/kg/min), squat strength (269.6 versus 308.2 lbs) and vertical jump (22.52 versus 23.94 inches) all showed significant improvements following the break. Additionally, there were significant increases in body weight (176.96 versus 178.63 lbs) and percent fat (12.76 versus 15.27% fat). CONCLUSION: Four weeks of unstructured training over the winter school break appears to have provided a recovery period that allowed for increases in physiological function despite increases in body fat.

Sled towing is a popular method of overload training in many field sports. The initial acceleration and top speed phases are components in developing peak velocity in athletes. Acute training may lead to postactivation potentiation (PAP), which occurs when subsequent muscle performance is enhanced following a preload stimulus. However, this is highly dependent on rest time. PURPOSE: To investigate acute sprinting in the acceleration and maximum speed phases following different rest periods after sled towing. METHODS: Eleven male field sport athletes (age=23.0± 2.79yrs, height=177.45± 6.34cm, mass=82.52± 8.79kg) completed a standardized warm-up then performed a baseline 30 meter (m) sprint (measured with acceleration and maximum speed splits). They were then attached to a waist harness and towed a sled equal to 30% of their bodyweight for 30m with maximal effort. Following a random rest period (2, 4, 6, 8, or 12min), they performed another maximal effort bodyweight sprint without the sled. RESULTS: A 4x6 (split x condition) ANOVA revealed that baseline split times (split 0.5m: 11.40±0.05s, split 5.10m: 7.77±0.04s, split 10.20m: 3.03±0.06s, split 20.30m: 1.25±0.07s) were not different than split times for any rest condition (collapsed across rest conditions, split 0.5m: 11.40±0.05s, split 5.10m: 7.77±0.04s, split 10.20m: 3.03±0.07s, split 20.30m: 1.27±0.07s). CONCLUSIONS: Sled towing did not increase or decrease acute maximal effort bodyweight acceleration or maximum speed sprint times. The different rest periods did not elicit a PAP effect, which may be attributed to less than optimal loading..

PURPOSE: The purpose of the study was to evaluate the effect of training volume during tapering on kicking performance in college Taekwondo competitors trained under a periodization block model. METHODS: Participants were eight men and four women of the taekwondo team at the University of Costa Rica. All individuals completed a 13-week macrocycle loading phase (10 weeks of load and 3 weeks of taper). Following the loading phase, participants were paired by gender and randomly assigned to either a condition in which they kept the same training volume or a condition where training volume was reduced by 50% using a linear pattern. Kicking motion time was measured by instructing individuals to perform a circular kick to a target located at 1.10m high followed by another kick to a target located at 1.60m high. Kicking time response was obtained by recording the time required to kick a random sequence of 10 targets. The “Fitlight Trainer system” was used to time both dependent variables. Measurements were recorded at the beginning of the loading phase, the sixth week of the load period and twice a week during each of the three weeks of the tapering phase. Effect sizes (ES) were computed and analysis of variance (ANOVA) tests were used to detect significant interactions.

RESULTS: No significant interactions were found on kicking motion-time (Pre = 1.39 ± 0.09s vs. Post = 1.26 ± 0.06s) and kicking time response times (Pre = 9.63 ± 1.01s vs. Post = 8.47 ± 0.51s) in the group following the same training volume and the group with reduced training volume (Pre = 1.35 ± 0.10s vs. Post = 1.26 ± 0.11s; Pre = 9.42 ± 1.52s vs. Post = 9.57 ± 1.78s, respectively). ANOVA results showed that regardless of the training volume, during the tapering phase participants were observed on kicking motion time (p = 0.03) and kicking time response (p = 0.04), with the best performance observed at the end of the third week of the tapering phase. The 50% training volume reduction produced a higher ES on kicking motion time (1.50) and kicking time response (3.32) compared to no reduction in training volume (0.86 and 0.04, respectively).

CONCLUSIONS: The reduction of volume training during tapering under a periodization block model improved kicking performance on taekwondo competitors. In the analyzed conditions, tapering must extend at least three weeks.
Acute Effects of Plyometric Exercise on Blood Glucose
Saldiam R. Barillas, Casey M. Watkins, Megan A. Wong, Jan J. Dobbs, David C. Archer, Cameron N. Munger, Andrew J. Galpin, Jared W. Coburn, FACSMD, Lee E. Brown, FACSMD. California State University, Fullerton, Fullerton, CA.

PURPOSE: To investigate the effect of relatively high intensity plyometric exercise on glycemic control. METHODS: Thirty-six subjects (6 females age=21.8±1.0yrs; height=163.7±7.8cm; mass=60.6±6.7kg and 7 males age=22.0±2.6yrs; height=182.3±3.6cm; mass=87.5±6.2kg) volunteered to participate. Inclusion criteria was the ability to achieve 80% of their age predicted max heart rate (APMHR) following the plyometric exercise. Subjects were awoke a heart rate monitor and completed two random conditions on two separate days, consisting of either five sets of 10 maximal effort countermovement squat jumps (SJ) with 50 seconds rest between sets or quiet sitting (SIT) for the time equated to the SJ duration (~4min). Immediately after each condition, subjects drank 75g of anhydrous glucose in 100ml of water. Blood glucose measurements were taken via finger prick and analyzed by an Accu-Chek Performa device pre and immediately post SJ or SIT, and 5, 15, 30, and 60 min post. RESULTS: A 2x6 (condition x time) ANOVA revealed a significant interaction where SJ blood glucose levels were lower at 15 (110.3±14.6mg/dl), 30 (142.2±22.7mg/dl) min post compared to SIT (15min 130.8±14.0mg/dl & 30min 159.3±21.0mg/dl). Pairwise comparisons revealed that SIT (15min 130.8±14.0mg/dl) & 30min 159.3±21.0mg/dl) min significantly greater than baseline (95.8±8.8mg/dl) for SJ and for SIT 5 (106.1±12.8mg/dl), 15 (114.1±14.6mg/dl), 30 (152.2±25.3mg/dl) & 60 (146.5±34.1mg/dl) min significantly greater than baseline (95.8±8.8mg/dl). CONCLUSIONS: The current plyometric protocol attenuated post-exercise blood glucose levels at 15 and 30 minutes post SJ at 80% APMHR when compared to SIT. This may be due to increased physiological stress applied to the muscles, thus increasing muscular glucose uptake. Reaching 80% APMHR might be the desired physiological stress level to stimulate a change in glycemic control.

Acute Effects of a 3-week Core Training Program on Different Unstable Platforms

No relationships reported.

PURPOSE: To compare the effects of a 3 wk core-training program completed on the ICT or a stability ball (SB). METHODS: Thirty-one active college age students (19 ± 1.4 yrs and 65.2 ± 11.0 kg) were divided into the ICT and SB groups, each of which completed various medicine ball throws, crunches, and Russian twists. Subjects trained 3 d/wk for 3 wks; medicine ball weight and repetitions increased during the program’s midpoint. Changes in core power and strength were measured across time with the Front Abdominal Power Throw (FAPT) and a Cybex dynamometer. Data were analyzed using repeated measures ANOVAs. Dependent t-tests were used to examine changes across time within groups. RESULTS: The ANOVAs revealed no significant main effects between the time points or groups for any dependent variable. The dependent t-tests revealed that SB training significantly increased Cybex flexion and extension power by 2.2% (138.3 ± 38.1 to 141.4 ± 37.6; p<0.036) and 5.6%; (118.3 ± 49.2 to 124.9 ± 50.8; p<0.018), respectively, while ICT training produced no significant changes. A significant interaction was found for flexion power (p=0.036), indicating opposing trends between the two groups across time. A similar relationship was found for flexion work, but the interaction only approached significance (p=0.059). CONCLUSION: The ICT did not improve core function relative to the SB. This study focused on unstable training, but using more weight on the device, thereby increasing stability and resistance, may alter outcomes.

Heart rate variability (HRV) is a popular and accessible monitoring tool utilized ubiquitously in the field to measure autonomic nervous system activity, readiness to train, and training adaptations. Acquisition of this information is essential for coaches, practitioners and athletes in order to effectively monitor positive training adaptations, nonfunctional over-reaching, injury and illness risk. However, longitudinal data assessing HRV changes in athletes during a training blocks is sparse. PURPOSE: To investigate changes in HRV and training load across several weekly training blocks in elite football. METHODS: Six male professional footballers (three defenders, three midfielders) from an English Premier League squad agreed to participate in this study. HRV was assessed with the ithlete application (HRV Fit Ltd, UK) using an Apple iPad2 (Apple Inc, CA), and a Polar T31 heart rate monitor (Polar Electro Ltd, Finland). HRV was calculated for each participant prior to the daily training session. Physical training load was monitored using a Global Positioning System (GPS) to quantify total distance (TD), high speed distance (HSD), training load (TL), impacts, maximum speed (MS), accelerations and decelerations, and energy expenditure (EE). Training sessions were separated into five equal training blocks (weeks 1 - 3, weeks 4 - 6, weeks 7 - 9, weeks 10 - 12 and weeks 13 - 15). RESULTS: There was a significant decrease in TD, HSD, TL, impacts and EE and a significant increase in MS, accelerations and decelerations across the five training blocks (p < 0.05). However, there was no significant change in HRV (p = 0.27). CONCLUSION: TL and HSD decreased in TL across the 15 week period, despite no change in HRV may be due to the heterogeneity that exists in elite football players, where some athletes show smaller reductions in HRV in response to training compared to others. Subsequently it is important that individual changes in HRV are interpreted alongside additional monitoring methods (e.g. wellness, training load) to ensure that quantification of training adaptation, readiness to train and overreaching is accurate.

Changes In Heart Rate Variability And Training Load In Elite Football Players
Bryna C. Chrismas1, Lee Taylor2, Graham Stark3. Qatar University, Doha, Qatar; 1Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar; 2University of Bedfordshire, Bedford, United Kingdom. Email: bchrismas@qatar.edu.qa

No relationships reported.

PURPOSE: Testosterone is associated with lots of physiological functions in men. Obesity results in reduced serum testosterone levels in men. Previously, we demonstrated that combination of dietary modification and regular aerobic exercise increased serum testosterone levels in overweight/obese men. However, the differences in the effects on testosterone levels between dietary modification and regular aerobic exercise are unknown. The aim of this study was to compare the effects of dietary modification and regular aerobic exercise on serum testosterone levels in overweight/obese men.

Abstracts were prepared by the authors and printed as submitted.
METHODS: Twenty-four overweight/obese men completed 12-week dietary modification class (well balanced 1680 kcal/day diet: diet group) and twenty-seven overweight/obese men completed 12-week regular aerobic exercise intervention (1-3 days/week, 40-60 min/day: exercise group). Before and after the intervention, we measured serum testosterone levels in overweight/obese men.

RESULTS: At baseline, there were no significant differences in all parameters between both groups. Body mass was significantly decreased in both groups (both P < 0.01), and the magnitude of weight loss was greater in diet group than exercise group (-7.8 ± 2.9 % vs. -2.1 ± 0.6 %, P < 0.01). While, serum testosterone levels were significantly increased only in exercise group, and we found a significant difference in the percentage change in serum testosterone level (diet group: -0.3 ± 8.6 %, exercise group: 11.6 ± 3.1 %, P < 0.01). Moreover, in diet group, we found a significant correlation between percentage change in body mass and that in serum testosterone levels (r = 0.77, P < 0.001), but not in exercise group (r = -0.16, n.s.).

CONCLUSIONS: We demonstrated regular aerobic exercise significantly increased serum testosterone levels, while dietary modification did not change serum testosterone levels in overweight/obese men. Moreover, percentage change in serum testosterone levels did not differ between diet and exercise groups. In both groups, we suggest that regular aerobic exercise increases serum testosterone levels independent of the change in body mass in overweight/obese men. These findings may provide a new insight into the role of regular aerobic exercise for prevention and/or treatment of obesity-induced health disorders.

---

**3694 Board #141 June 3 9:30 AM - 11:00 AM**

Comparison Between Unilateral and Bilateral Plyometric Training on Single and Double Leg Jumping Performance

Gregory C. Bogdanis1, Olga Kalopheri, Athanasios Tsoukis, Gerasimos Terzis2, Panagiotis Veligekas1, Lee E. Brown, FACSM2. 1National and Kapodistrian University of Athens, Athens, Greece. 2California State University, Fullerton, CA.

Email: gbogdanis@phed.uoa.gr

(No relationships reported)

The phenomenon of bilateral deficit in jumping implies that greater muscle power can be developed when performing maximal single leg jumps, compared with two-leg jumps. Thus, it may be hypothesized that training with single leg plyometric exercises would be more effective compared to an equivalent volume of double leg plyometric training. **PURPOSE.** To compare the effects of unilateral and bilateral plyometric training on single and double leg jumping performance. **METHODS.** Fifteen moderately trained subjects (age: 19.6 ± 2.1 yrs, height: 172±9 cm, body mass: 65.6±10.6 kg) were randomly assigned to either a unilateral (U, n=7) or a bilateral group (B, n=8). Both groups performed maximal effort plyometric leg exercises two times per week for 6 weeks (6 exercises per session, 3 sets of 10 repetitions per exercise), as well as 3 sets of knee extensions and flexions at 70%-90% of their 1 repetition maximum. The U group performed all plyometric and knee flexion/extension exercises with both legs, while the B group performed half the repetitions with each leg, so that the total exercise volume was the same. Jumping performance was assessed by double and single leg countermovement jumps (CMJ) and drop jumps (DJ) from 30 cm, measured using an optical measurement system (Optojump). Reactive strength index (RSI) was calculated from DJ data (jump height and ground contact time).

Results were analyzed using a 2 x 2 ANOVA with repeated measures in one factor and Tukey’s post-hoc test. **RESULTS.** CMJ with both legs significantly improved equally in the U and B groups by 12.7±7.2% and 11.0±5.5% (P<0.001, respectively). However, single-leg CMJ, quantified as the sum of dominant and non-dominant single leg CMJ, only improved in the U group (19.0±7.1%, P<0.001) and was unchanged in the B group (3.4±8.4%, P=0.80). Similarly, RSI for single leg only improved in the U group (from 0.95±0.21 to 1.17±0.25 m/s, P<0.002), but not in the B group. **CONCLUSIONS.** Plyometric training with single leg exercises was more effective in increasing both single and double-leg jumping performance, compared to bilateral training.

---

**3695 Board #142 June 3 9:30 AM - 11:00 AM**

An Integrated Perspective on Firefighter Recruit Academies: Examining the Sustainability of Fitness Gains

Stacy L. Gncinski, Kyle T. Ebersole, David J. Cornell, Barbara B. Meyer. University of Wisconsin-Milwaukee, Milwaukee, WI. (Sponsor: Terry J. Housh, FACSM)

Email: gncinski@uwm.edu

(No relationships reported)

Research indicates that 16-week firefighter recruit academies yield pre-post program fitness gains. However, timelines of academy training protocols have been questioned, as the majority of fitness gains are observed after the first eight weeks of the program. Further, no research has examined the effect of recruit academies through an integrated lens, with physiological and psychological variables assessed concurrently. **PURPOSE.** To examine the effect of a firefighter recruit academy on measures of fitness and stress-recovery state. **METHODS.** Recruits enrolled in a Midwest region academy program (N = 15; 2 females; 29.0 ± 4.6 yrs; 181.7 ± 7.2 cm; 86.8 ± 11.5 kg) completed all measures at three time points throughout the 16-week academy: week 1 (T1), week 6 (T2), week 16 (T3). To assess fitness, we measured body weight, estimated VO_2max, body fat percentage [%], recruits completed handgrip dynamometry, Forestry Step Test, and skinfold measurements. To assess stress-recovery state, recruits completed a 52-item questionnaire on perceptions of stress and recovery (RESTQ-Sport). Repeated measures multivariate analysis of variance (RM MANOVA) tests were conducted to examine the effect of time on fitness (3 levels) and stress-recovery state (2 levels). An alpha of .05 was used to determine statistical significance. **RESULTS.** RM MANOVA test for the effect of time on fitness was significant (F = 3.31, p = 0.043, λ = 0.70) at baseline, with significant increases in VO_2max and CMJ. Post hoc pairwise comparisons demonstrated a
significant increase in fitness between T1 and T2 (p = .005), and a significant decrease in fitness between T2 and T3 (p = .020). In addition, the RM ANOVA test for the effect of time on stress-recovery state was not significant (F = 1.884, p = .194, η² = .067). CONCLUSIONS: Results of the study indicate that current firefighter recruit academies may not generate sustainable fitness gains from onset to graduation. This conclusion is supported by the non-significant stress-recovery state results, as previous research has established a dose-response relationship between acute training load and stress-recovery state. Thus, the periodization of firefighter recruit academies may need careful examination to ensure a progressive physiological and psychological training stimulus is applied throughout the program to achieve sustainable outcomes.

3696 Board #143 June 3 9:30 AM - 11:00 AM Relationship between Training Volume and Dietary Status in Triathletes: A Preliminary Study Barbara S. McClanahan1, Christopher Vukadinovich2, Michelle Stockton1, Kenneth Ward1, Deborah Slawson1. 1University of Memphis, Memphis, TN. 2St. Jude Children’s Research Hospital, Memphis, TN. 3East Tennessee State University, Johnson City, TN. (Sponsor: Lawrence Weiss, FACSM) Email: bmcllnhm@memphis.edu

PURPOSE: Optimal sports training, especially for long endurance athletes, is dependent on favorable genetic, environmental and behavioral profiles. Dietary intake is central to and interacts with each of these domains. Therefore, the purpose of this preliminary study is to explore potential relationships between dietary intake and training volume in triathletes over a competitive period. METHODS: Participants were 18 male (36.6 ± 10.7 years old) and 19 female triathletes (31.8 ± 6.8 years old). Body fat percent, determined through dual-energy x-ray absorptiometry, for male and female triathletes was 12.5% (±4.5%) and 21.3% (±5.0%) respectively. Training volume was determined by exercise duration and intensity over 24 weeks. Nutrient intake was assessed through a seven-day dietary recall. RESULTS: Average daily energy intake for males was 2776 (±774) kcals and 1987 (±386) kcals for females. Relative contribution to total energy intake of fat was 25% for males and 28% for females, protein was 19% for males and 16% for females, and carbohydrates were 52% for males and 53% for females. For males, bivariate correlations revealed that total kcals (r = 0.81), protein (r = 0.86), and carbohydrates (r = 0.72) were significantly associated with total training volume. For females, only protein had a significant association (r = 0.62). Preliminary analyses using multiple linear regression indicated that for males the independent variables (kcals, protein, carbohydrates, fat) explained 79% of the variance in total training volume (p = .045) while controlling for age. However, none of the predictors were significant at a univariate level. The multiple regression for females indicated that the independent variables (kcals, protein, carbohydrates, fat) explained 82% of the variance in total training volume (p = .015) while controlling for age. Protein was the only significant predictor of total training volume (r = 0.86; p < .05) while controlling for age. Protein was the only significant predictor of total training volume (p = .013) and sex (Qbetween = 10.30, df = 2, p = .001) influenced the overall ES. Duration of 12 weeks (ES = 1.36) had a higher ES than other duration periods (60 and 78 weeks for 6 weeks and 6 weeks, respectively). There were larger effects on studies with females than with males (0.76) and both males and females combined (0.46). Age, type of exercise, and ankle action did not influence the overall ES. CONCLUSIONS: The Thorstensson protocol is only sufficient enough to require energy contributed from the phosphocreatine system and not the glycolytic system. Thus improvements in OBLA will have no effect on FI as it was assessed in this study.

3697 Board #144 June 3 9:30 AM - 11:00 AM Relationship Between Fatigue Index and OBLA Before and After Muscular Endurance Training Daniel Blackwood, John W. Farrell, III, David J. Lantis, Gregory S. Cantrell, Debra A. Bemben, FACSM, Rebecca D. Larson. University of Oklahoma, Norman, OK. (Sponsor: Dr. Debra A. Bemben, FACSM) Email: dblackwood@ou.edu

The Thorstensson test has been well established as a valid assessment of fatigability by providing a Fatigue Index (FI) of the knee extensors. The Onset of Blood Lactate Accumulation (OBLA) has also been shown to have a significant influence on the development of fatigue during high intensity exercise bouts. Improvements in OBLA have been seen during muscular endurance resistance (MER) training resulting in enhanced exercise performance. However, the relationship between OBLA and FI remains unclear. PURPOSE: The purpose of the current study was to investigate the relationship between OBLA and FI as well as examine if improvements in FI could be achieved through MER training. METHODS: 17 endurance trained males (age: 23.4±4.92 years and BMI: 23.5±3.11) were recruited to participate in a 6 week study. Subjects were randomly assigned to either an experimental (EX) or control (CON) group: 9 EX and 8 CON. Both groups continued their current aerobic training for the duration of the study. Nutrient measures included baseline measures taken before the first exercise session, 1 repetition maximum (1RM) for: leg press (LP), leg curl (LC), and leg extension (LE). The Thorstensson protocol was also performed using a dynamometer. In addition, the EX group performed supervised MER training (12 to 15 repetitions for 4 sets for LP, LC, and LE) for four weeks. T-test were used to determine if between group differences existed using delta scores (post-pre). Pearson’s correlation was used to assess the relationship between OBLA and FI. RESULTS: No significant group differences were observed in all baseline measurements (p>0.05). There were no significant group differences for OBLA (mmol/L) (EX: -7.24±12.09 vs. CON: 3.54±9.21) and FI (%) (EX: -0.06±17.62 vs. CON: 1.68±10.97) (p>0.05). Pearson’s correlation revealed no significant relationship (r = -0.05, η² = 0.01) exists between FI and OBLA. CONCLUSIONS: Four weeks of MER training was unable to improve both OBLA and FI. It was also observed that no significant relationship existed between OBLA and FI. It can be speculated that the physiological stress associated with the Thorstensson protocol is only sufficient enough to require energy contributed from the phosphocreatine system and not the glycolytic system. Thus improvements in OBLA will have no effect on FI as it was assessed in this study.

Ankle injury is one of the most common injuries that occur during sports activities in Korea. Ankle strengthening exercise (ASE) is often used in the rehabilitation of ankle injuries; however, the degree of ASE effect and the effect of moderating variables are not known. PURPOSE: The purpose of this study was using meta-analysis to determine the effectiveness of ASE on ankle isokinetic strength. METHODS: Articles were searched from 1988 to 2015 using online database: RISS, NDSL, and NAL (National Assembly Library in Korea). Search terms included phrases such as “ankle”, “exercise”, and “ankle strength”, “ankle rehabilitation”, “ankle isokinetic”. Comprehensive Meta-analysis version 2 software was used to calculate the weighted mean effect sizes (ES) and 95% CI and to conduct moderator analyses. ES calculations were based on a comparison of change scores from control and intervention groups using a random effects model. Cochran’s Q statistic and I² were used to assess heterogeneity of ESs. Moderator variables included participants’ sex, age, type of exercise, intervention duration, and ankle action. RESULTS: Overall, 111 ESs were calculated from 29 studies. The results showed a large and positive weighted mean ES of 0.78 (95% CI = 0.64, 0.92). The ESs were heterogeneous, Q = 309.62, df = 10, p < .001, I² = 64.47, which supported a further examination of moderator variables. Intervention duration (Qbetween = 8.68, df = 2, p = .013) and sex (Qbetween = 10.30, df = 2, p = .006) influenced the overall ES. Duration of 12 weeks (ES = 1.36) had a higher ES than other duration periods (60 and 78 weeks for 6 weeks and 6 weeks, respectively). There were larger effects on studies with females (0.18) than studies with only males (0.76) and both males and females combined (0.46). Age, type of exercise, and ankle action did not influence the overall ES. CONCLUSIONS: ASE was determined to be an effective training method to enhance ankle strength with a greater effect from studies with longer interventions and females.

3699 Board #146 June 3 9:30 AM - 11:00 AM Impact of a Firefighter Recruit Training Academy on Movement Quality & Balance Ability Kyle T. Ebersole, David J. Cornell, Stacy L. Gnicinski. University of Wisconsin-Milwaukee, Milwaukee, WI. (Sponsor: Terry J Housh, FACSM) Email: ebersole@uwm.edu

Approximately 55% of the annual injuries to firefighters are classified as sprains and strains and may be related to movement quality and/or balance ability. The Functional Movement Screen™ (FMS™) and Y-Balance Test (YBT) have previously been associated with musculoskeletal injury risk among athletic populations. Although research has reported fitness-related changes in firefighter recruits during a 16-week training academy, the responses of the FMS™ and YBT are unclear. Whether any changes in movement quality and balance are retained after a 22 week, post-academy probationary period are unknown. PURPOSE: To determine the changes in FMS™ and YBT during a 16-week recruit academy and subsequent 22-week active-duty probationary period. METHODS: Twenty-seven male firefighter recruits volunteered to participate (29.3 ± 4.1 y, 179.8 ± 4.6 cm, 87.2 ± 9.7 kg). FMS™ and YBT measures were collected at start and end of the 16-week recruit training program and again at week 38. The FMS™ was scored on a 0–21 scale. The YBT scores for each limb were formed by normalizing the reach distances to limb length, summing these distances in each direction, and dividing by three. The scores for right and left limbs were then averaged to create a composite score (%). Two separate (FMS™ and YBT) repeated measures ANOVAs and follow-up pairwise analyses were used to identify
significant differences across weeks. An alpha of $p < 0.05$ determined statistical significance for all analyses. RESULTS: Significant main effects were identified for both FMS™ ($F_{1,19} = 21.85$, $p < 0.001$) and YFT ($F_{1,19} = 4.32$, $p = 0.053$). Analyses indicated that FMS™ significantly increased from week 1 to 16 ($p < 0.0001$; $11.93 ± 18.73$ vs. $14.75 ± 1.5$) and from week 16 to 38 ($p = 0.002$; $13.7 ± 14.4$ vs. $14.75 ± 1.3$). There was not a significant change in YFT from week 1 to 16 ($p = 0.539$; 97.8% ± 5.7% vs. 97.1% ± 3.8%), but YFT did significantly decrease from week 16 to 38 ($p < 0.001$; 97.1% ± 3.7% vs. 97.1% ± 3.7%). CONCLUSIONS: Firefighter recruits exhibited better movement quality, but decreased balance after 38 weeks. The work of a firefighter may prompt a loss in balance ability, perhaps serving as a key risk factor slips, trips, and falls. Future research should examine longitudinal changes in other measures of fitness to elucidate the underlying mechanism(s) in decreased balance ability.

Nowadays, the sedentary lifestyle and lack of interest in participating in physical activity among the college students in China result in the declining their health and physical fitness. Rock climbing is a newly growing physical exercise which provides excitement and challenges and is attracting more college students to participate in this physical exercise in China. PURPOSE: The purpose of this meta-analysis was to determine the effects of rock climbing on the physical fitness among college students. METHODS: Conducting a thorough electronic search and selection, nine studies were included in this meta-analysis, and the rock climbing intervention periods ranged from 4 to 24 weeks (3-6 times/week and 60-120 minutes each time). Ten variables included in this meta-analysis were: Body fat percentage, VO2 max, Heart rate, Hand grip strength, Lower limb pedaling power, Vertical jump, Push-ups, Pull-ups, Sit-ups and Sit-and-reach. The effect sizes (ES) and forest plots of these ten variables were calculated ($p < .05$) and generated, respectively. RESULTS: Eight variables (Hand grip strength, ES = −81; Lower limb pedaling power, ES = −36; Vertical jump, ES = −73; Push-ups, ES = −38; Pull-ups, ES = −1.09; Sit-ups, ES = −1.16; Sit-and-reach, ES = −1.15; and VO2 max, ES = −7.6) out of ten were significantly improved after rock climbing intervention, while ES values of Heart rate and Body fat percentage did not show significant improvement after the intervention. CONCLUSIONS: Rock climbing as one of fast-growing exercises has some positive effects on the physical fitness among college students, and might be more effective if the college students engage in rock climbing in a longer term.

PURPOSE: Investigate the short (immediately and 30 min post-competition) and the long-term effects (24h post-competition) of passive rest on physical parameters, metabolic, hormonal and inflammatory responses following Mixed Martial Arts (MMA) competition.

METHODS: Twelve male mixed martial artists participated in three rounds of 3 min of MMA competition separated by 1 min of passive rest. Passive recovery was monitored for 24h post-competition. Blood samples, physical measures, arterial blood pressure, perceptual measures, lactate and heart rate (HR) were measured pre-competition, immediately, 30 min and 24h post-competition. During the period rest between rounds, perceptual measures, lactate and HR were recorded.

RESULTS: Blood lactate, HR were affected by the moment ($p < 0.001$), with lower values pre and 24h post-competition compared to post-1, 2 and 3 rounds. Systolic blood pressure changed across the moments with higher values at post-competition compared to 30 min and 24h recoveries. White blood cells count was affected by moments with higher values at post-competition compared to pre-competition, 30 min and 24h post-competition ($p < 0.001$) and higher values at 30 min compared to 24h recovery. Hemoglobin was also affected with higher values at post-competition compared to pre, 30 min and 24h post-competition ($p < 0.001$) and higher values at pre compared to 24h post-competition. Uric acid was affected across time with higher values at 30 min recovery compared to all other moments ($p < 0.001$). Cholesterol, glycemia, pre-competition, 30 min and 24h post-competition. Rating of Perceived Exertion was affected by the moment, with lower values at post-1 compared to post-2 and post-3 and lowest values at post-2 compared to post-3.

CONCLUSIONS: Long-term recovery appears to promote better restoration of physiological changes (allegation), physical performance and psychometric measures than short-term rest.

Phyrometric training (PT) has shown to improve vertical jump height in athletes. However, little is known about its effectiveness for improving strength and speed performance in team sports. PURPOSE: To determine the effect of plyometric exercise on explosive strength and sprint performance in team sports. METHODS: The search for information was conducted in the following electronic databases: Ovid, SportDiscus, Medline, Academic Search, Pubmed, ProQuest, Science Direct and Springer Link. Studies employing a PT intervention and containing data necessary to calculate effect sizes (ES) were included in the analysis. Hedge’s standardized mean difference effect size (ES) was calculated and ESs pooled using random-effects models. Non-overlapping 95% confidence intervals (CI) were considered statistically significant. Heterogeneity was assessed using Q and I². RESULTS: A total of 31 studies with total of 43 ESs met the inclusion criteria for explosive strength and 18 studies with a total of 33 ESs for sprint performance. PT improved explosive strength (ES = −0.98, CI95% = −0.77, 1.20, Q = 174.51, I² = 71.95) in team sports and sprint performance (ES = −0.30, CI95% = −0.59, −0.00, Q = 237.60, I² = 82.32) only in soccer. The improvement occurred regardless of the training season and protocol used. Analysis of moderator variables demonstrated that the strategies to maximize the probability of obtaining significant ($p < 0.05$) improvements in explosive strength included a training volume $> 9$ weeks, at least 27 sessions, 3 to 6 exercises, 20 to 32 repetitions per exercise, 4 to 6 series, 4-min rest between sets, 50 to 150 vertical jumps, and a session duration of approximately 30-min. To improve sprint performance in soccer, moderator variables included training 8 to 10 weeks, 2 times a week, 4 to 6 exercises, 2 to 4 series, 5 to 10 repetitions, 1-min rest between sets, 50 to 200 vertical jumps per session, and a session duration of about 40-min. CONCLUSIONS: PT enhanced explosive strength in team sports and sprint performance in soccer. Post meta-analytical studies on a variety of sports are warranted to confirm the validity of the results of the present study. The findings of this meta-analysis suggest that PT should be considered by coaches to optimize explosive strength and speed performance in team sports athletes.
The contact sport of judo involves throwing an opponent in a variety of ways, with potential risk of concussive head impacts. When thrown, a judo practitioner executes a break fall, theoretically protecting the head from injury. However, little research has directly measured head accelerations of a person executing a break fall in response to various throws in judo. PURPOSE: Quantify and compare head accelerations associated with six standard judo throws and corresponding break falls. METHODS: In random and repeated design, 14 judo martial artists (13 male, 1 female; age = 28 ± 9 yrs; stature = 177 ± 6.7 cm; mass = 80.3 ± 9.4 kg; rank = brown belt) performed five sets of six standard judo throws & corresponding break falls. The six throws were layback throw (tomoe-nage), hand throw (tai-otoshi), or black belt) performed five sets of six standard judo throws & corresponding break falls. The contact point of the head when performing a break fall corresponding with each of the six throws. Minimum threshold for registering acceleration was 16 g. RESULTS: Regardless of gender, acceleration values were comparable. Correlation analysis revealed higher incidence rate of any throw (p < 0.05). CONCLUSION: The judo thigh throw (and break fall) had the highest incidence rate of any throw (p < 0.01). However, none of the judo throws and associated break falls resulted in any impact considered high risk for concussion.

Researchers and practitioners use the resistance training-specific rating of perceived exertion (RPE) scale for individualization of training load prescription. However, an intervention to compare traditional percentage-based load prescription versus RPE-based loading for strength adaptations has not been conducted. PURPOSE: To compare changes in one-repetition maximum (1RM) strength of the back squat and bench press between percentage-based training (PBT) and autoregulated-based training (ABT) via RPE. METHODS: Eleven males (age: 23±4 yrs, body mass: 77.4±7.7 kg, body fat: 9.5±3.8%) with at least two yrs of training experience and a minimum 1RM of 1.5 and 1.25x bodyweight on the squat and bench press respectively, were assigned to one of two groups: PBT (n=6) or ABT (n=5) for 8 weeks. Forty eight hours following pre-testing both groups performed the squat and bench press 3× wk. on non-consecutive days (i.e., Mon., Wed., Fri.,) using the same number of sets and repetitions following an undulating resistance training program, which linearly increased load and repetitions every week. RESULTS: Percentage-Based training (PBT) subjects increased load of 1RM back squat (140.10±22.49 to 153.75±20.40kg; +9.64%), bench press (109.08±15.89 to 116.67±14.61kg; +7.22%), and total strength-TS (256.23±20.12 to 270.42±20.29kg; +5.19%) in PBT. In ABT, 1RM squat (152.20±20.65 to 171.30±24.97kg; +15.22%), bench press (123.00±11.31 to 137.30±14.82kg; +8.58%), and TS (275.20±30.24kg to 305.00±37.61kg; +10.71%) in ABT. However, no significant group differences existed for squat (p=0.31), bench (p=0.11) or TS (p=0.16). CONCLUSION: Our findings indicate that both PBT and ABT are equally effective at increasing maximal strength.

Female Marines can now serve in all military occupational specialty (MOS). A cohort of female Marines participated in ground combat MOS schools as part of the Ground Combat Element Integrated Task Force (GCE ETF), which studied the integration of women into combat arms. It is important to identify characteristics of female Marines who successfully graduated from ground combat MOS schools.

PURPOSE: To explore physical and physiological differences between female Marines who did or did not successfully complete MOS schools. METHODS: Female GCE ETF Marines (N=62, 22±3yrs, 163±6cm, 63±7kg) underwent the following assessments prior to ground combat MOS school: anthropometric, strength (average peak torque % body weight) with an isokinetic dynamometer (knee, shoulder, trunk), or hand-held dynamometer (ankle), maximal oxygen uptake (VO2max) lactate threshold (LT) during an incremental ramped protocol to exhaustion, and anaerobic power (AP) capacity (AC) during a 30-second cycling protocol. Subjects were classified as graduated (N=45) or did not graduate MOS school, due to failed fitness testing or injury (N=16). Statistical significance was set a priori at alpha of 0.05. Between group differences were assessed with an independent t-test or Mann Whitney U test, as appropriate.

RESULTS: Despite no significant anthropometric differences between groups, significant differences were found in right/left ankle invertor strength, right ankle invertor strength, AC, VO2 max and VO2 at LT (all p < 0.05 - Table 1).

CONCLUSIONS: Higher ankle strength and anaerobic capacity were observed in female ground combat MOS school graduates. These results may help female Marines optimize physical readiness for ground combat.
**Effects Of Speed- And Circuit-based High-intensity Interval Training Excess Post-exercise Oxygen Consumption**

Jeffrey M. Janot, Lindey Schleppenbach, Andrea Ezer, Sarah Gronemus, Katelyn Wisdenski, Saori Braun. University of Wisconsin-Eau Claire, Eau Claire, WI. (Sponsor: Mark Blegen, FACSM)

(No relationships reported)

In the United States, there remains interest in developing efficient, effective ways for individuals to increase energy expenditure for weight management. Research has shown that high-intensity exercise elicits a higher excess post-exercise oxygen consumption (EPOC) throughout the day compared to steady-state exercise. Currently, there is no single research study that examines the differences in EPOC resulting from high-intensity interval training (HIIT) modalities. **PURPOSE:** The purpose of this study is to review the impact of circuit training (CT) and speed interval training (SIT) on EPOC in individuals who regularly exercise or are sedentary. **METHODS:** Twenty-six participants were recruited and divided into active and sedentary groups according to self-reported exercise participation status. Oxygen consumption (VO₂) was measured during and after two HIIT sessions and was used to estimate caloric expenditure. Mean VO₂ and caloric expenditure responses during and after exercise were then compared across modality and activity status using a 2-way RM ANOVA. **RESULTS:** There was no significant difference (p > 0.05) in caloric expenditure during exercise between active and sedentary (F = 0.03; p = 0.87), and flexibility (sitting and reaching). Following the 6-wk fire academy, which included daily physical training, recruit FFs repeated the fitness test battery. **RESULTS:** Results indicated significant improvements (Mₚ + SE; all P < 0.001) for weight (1.12 ± 0.14 kg, Cohen’s d = 0.08), 1.5-mile run (0.92 ± 0.04 min, d = 0.57), 60-s sit-ups (5.11 ± 0.25 reps, d = 0.60), 60-s push-ups (13.21 ± 0.38 reps, d = 1.08), bench press (i.e., 38.6 kg; 2.56 ± 0.26 reps, d = 0.23), and flexibility (2.15 ± 0.19 cm, d = 0.28). **CONCLUSIONS:** Following a 6-wk training academy, including daily physical training, recruits FFs made significant improvements in weight, BMI, estimated VO₂max, three measures of muscular endurance, and flexibility. Since the majority of on-duty deaths can be attributed to stress or overexertion-related cardiac events, it is important to recognize the importance of a varied fitness regimen for FFs’ health as well as performance. All areas of fitness need to be examined with training modalities and performance goals that are consistent with the physical demands of firefighting.

**Effects Of Morning Or Evening Exercise On Cardiovascular Fitness And Body Weight**

James D. LeCheminant, FACSM, Jessica Davies, Alyssa Evans, Kaylie Carbine, Michael J. Larson. Brigham Young University, Provo, UT.

(No relationships reported)

**PURPOSE:** To compare the effect of 8 weeks of morning exercise or evening exercise on cardiovascular fitness and body composition in healthy women. **METHODS:** Fifty-five participants were randomized to a morning exercise group (AM) (25.3 ± 4.1 yrs; 25.2 ± 4.7 kg/m²; 37.9 ± 7.6% BF) or an evening exercise group (PM) (25.4 ± 6.7 yrs; 23.5 ± 3.9 kg/m²; 34.1 ± 6.1% BF). The AM group completed exercise between 6:30-9:30am and the PM group between 6:30-9:30pm, both for 4 days per week (3 days supervised), 45 minutes per session, and for 8 weeks. All participants followed a training paradigm that included daily walking (40% heart rate reserve [HRR]) and progressed to include vigorous-intensity exercise (60-89% HRR). Cardiovascular fitness was determined using a maximal treadmill protocol and indirect calorimetry. Body weight/composition was determined using a digital scale and dual-energy x-ray absorptiometry (DXA). **RESULTS:** Eighty-two percent of men and 26.3% of women reached their initial goal for weight (1.12 ± 0.14 kg, Cohen’s d = 0.23), and flexibility (2.15 ± 0.19 cm, d = 0.28). **CONCLUSIONS:** Eight weeks of exercise may improve exercise performance, cardio-metabolic health, and body composition in active normal weight men. **METHODS:** 26 healthy active males (BMI = 26 ± 3 kg/m²; 44 ± 8 yrs) were recruited for this study and randomized to either exercise training in morning (AM) or evening (PM) for 12 weeks. Following current ACSM guidelines, a multimodal training paradigm was used (Resistance, Interval, Stretching, and Endurance, RISE). Baseline exercise performance was assessed via abdominal, upper and lower body muscular strength (situps, pushups, 1 RM bench and leg presses), power (jump squats and bench throws), aerobic power (5km cycling time trial), flexibility (sit and reach), and balance (stork stand), cardiovascular health (blood pressure, and augmentation index [AIx]), body composition (IDEXA: Fat free mass, fat mass, abdominal/visceral fat,%body fat, hunger/satety ratings (visual analog scales), and cardio-metabolic profile (energy expenditure, fasting lipids, glucose, insulin). **RESULTS:** At baseline, no differences existed between groups in any variable. Training resulted in significant (p < 0.05) improvements in exercise performance, cardio-metabolic health, and body composition. Furthermore, there were significant interactions (p < 0.05) of TOD x training for fasting glucose (1.83±0.25 v. 1.75±1.48 µg/dL), LDL-C (6.50±5.78 v. -3.57±2.80 µg/dL), and total cholesterol (4.17±0.88 v. -3.26±2.86 µg/dL) levels, AM vs. PM, respectively. As a result, non-significant trends were found for resting metabolic rate (increase in AM, p = 0.07) and fasting triglycerides (lower in PM, p = 0.06). **CONCLUSIONS:** The multimodal RISE protocol improved performance, cardiovascular health, and body composition, with the TOD altering the magnitude of cardio-metabolic training-induced adaptations. Specifically, training in the AM
exhibited a trend of increasing RMR, while training in the PM resulted in greater improvements in fasting total cholesterol, LDL-C, and triglycerides in healthy men. Supported by Isagenix.

PURPOSE: Previous research has identified considerable variability in training responsiveness associated with exercise intensity prescribed according to heart rate reserve or 2) personalized group (exercise intensity prescribed according to ventilatory thresholds). Exercise training was performed 60-75 min/day on 3 days/wk for 13wk. Maximum oxygen uptake, systolic blood pressure, HDL cholesterol, triglycerides, and blood glucose were measured pre- post intervention, and percent change for each measure was calculated. Based on percent change for each measure, participants were assigned scores (responder: 1, non-responder: 0), and a comprehensive response to training score (scale 0-5) was determined. RESULTS: Training responsiveness as evidenced by the responder composite score was greater (p<0.05) in the personalized treatment group (4.71 ±0.47) when compared to the standardized treatment group (2.86 ±0.66). There were similar (p=0.05) responder composite scores across men and women for both the personalized (men=4.75; women=4.67) and standardized (men=2.75; women=3.00) treatment groups. Training responsiveness was also similar (p=0.05) across age for both treatment groups. CONCLUSION: Our findings demonstrate that personalized exercise training maximizes comprehensive training responsiveness. These preliminary results are promising for exercise physiologists and other health professionals who prescribe exercise for populations at-risk for cardiovascular disease and other chronic conditions.

With the increased popularity of foam rolling (FR) as a recovery tool, it is important to establish the exact manner in which the practice is useful. PURPOSE: The purpose of this study was to examine the impact of FR on recovery from exercise-induced muscle damage. METHODS: In a between-group design, 37 males performed 40x15m sprints, inducing muscle damage. Immediately following sprinting and in the four days following, perceived muscle soreness, hip ROM, vertical jump, and agility measures were recorded. 18 subjects (mean±sd; age 22.4±2.0 yrs; BMI 26.9±4.2 kg/m²) foam rolled prior to testing each day (FR), while 19 (mean±sd; age 23.2±3.2 yrs; BMI 26.3±4.0 kg/m²) served as a non-foam rolling control (CON). Measured recordings during the five days of recovery from the repeated sprint protocol were compared to those obtained during three baseline days of familiarization the prior week. The area under the curve (AUC) was calculated by summing all five scores and these data were compared by condition using a two-tailed Mann-Whitney U test (alpha level = 0.05).

RESULTS: Perceived soreness, hip ROM, and vertical jump were not significantly different between groups (p=0.05). Agility, specifically the difference in time from baseline to complete the agility T test, was significantly lower in the foam rolling condition (0.05). AUC was higher in CON (2.88 vs=2.45) than FR (0.33 ±0.16). Mean values for agility changes from baseline in CON were 0.52 ±0.82 s, 0.78 ±0.45 s, and 0.32 s on the day muscle damage was induced, and then the four days following, respectively. Mean values for agility changes from baseline in FR those days were 0.11 ±0.17 s, 0.06 ±0.12 s, and -0.13 s. CONCLUSIONS: FR expedites recovery of agility following exercise-induced muscle damage instigated by a repeated sprint protocol. FR may be useful for athletes requiring adequate agility who need to recover quickly from intensive bouts of exercise. Supported by: Performance Health (Hygienic Corporation, Akron, Ohio) supported this project with donations of foam rollers.

In football matches, cold-water immersion (CWI) is often practiced during halftime to recover from fatigue and maintain performance in the second-half. PURPOSE: To develop and validate a 90-min long simulated football match using a football simulated protocol (FSP) and to observe performance changes in the second-half responding to an application of a 5-min CWI during halftime. METHODS: Twenty male elite footballers (athletic career: 9 ± 1 years) visited a regular outside natural-grass football pitch three separate days. On the first day, baseline values of two-legged maximal vertical jump, 20-m sprint, arrowhead agility test, and accuracy scores of short-pass and long-kick were assessed. On the second and the third days, participants performed nine repetitions of a 5-min long FSP, consisted of football related activities (walking, jogging, sprinting, cutting, jumping, side stepping, and kicking) to complete the first- and second-half. On the second and third days, calorie expenditure and heartbeat rate (HR) were also recorded. During halftime, participants were received one of conditions (CWI: bare feet immersed up to 8 cm below from the tibial tuberosity at 7.5 °C or control: sitting on a bench: in a counterbalanced order) for 5-min. To test condition effects over time, time points were divided as T1 (first 15-min of the first-half) through T6 (last 15-min of the second-half), thus 2 × 6 mixed model ANCOVAs (covariate: baseline values) and Tukey-Kramer post hoc tests were performed (p<0.05). RESULTS: A total value of calorie expenditure (1.245 Cal) and an average value of HR at a point time (163 bpm) in our study were similar to typical football matches. Participants spent less calories during T1 (186 Cal) and T4 (191 Cal) than to T2 (213 Cal) or T3 (224 Cal), and T4 (212 Cal) or T5 (219 Cal), respectively. An application of CWI during halftime did not change any performance in the second-half (maximal vertical jump: F5,209=0.44, p=0.82; 20-m sprint: F5,209=0.6, p=0.7; arrowhead agility test: F5,209=0.26, p=0.93; short-pass: F5,209=1.75, p=0.12; long-kick: F5,209=1.19, p=0.31). CONCLUSIONS: Our football simulated match can be used as experimental or practical purposes. Half-time CWI does not affect performance in the second-half.

External Counter Pulsation (ECP) therapy is a non-invasive treatment that enhances blood flow and delivers oxygenated blood to the extremities through the sequential compression of the lower limbs during diastole. While ECP has been used to treat patients with chronic angina pectoris/congestive heart failure, there has been little research on the impact of ECP on healthy individuals.

RESULTS: Average cycling time significantly decreased from visit 1 to visit 3 for the ECP group compared with the control group (1,524 to 1,432 vs. 1,499 to 1,479 sec; p<0.05). Although balance for both groups improved, the ECP group significantly improved their balance as compared to the control group from POST visit 1 to PRE visit 2 (74.8 to 67.9 vs. 75.2 to 73.6; p<0.05). Jump explosiveness was maintained from POST visit 1 to PRE visit 2 for the ECP group, while performance on this test decreased significantly for the control group over the same period (.403 to .404 vs. .363 to .393; p=0.05). CONCLUSION: ECP therapy after strenuous exercise improved cycling time trial performance, improved balance, and maintained jump explosiveness. Mechanisms through which ECP impacts performance are possibly enhanced recovery by means of vasodilation and increased blood flow.
Sports medicine professionals often prescribe foam rolling as an intervention to treat myofascial restrictions. Of particular interest, is the effect foam rolling has on the ipsilateral antagonist muscle and contralateral muscles. Recent research has observed ROM changes in these muscles after a foam rolling intervention. To date, no studies have examined how foam rolling effects the pressure pain threshold (PPT) levels of the ipsilateral antagonist and contralateral muscles. PURPOSE: To examine the acute effects of a foam rolling intervention on ipsilateral antagonist and contralateral muscle group PPT levels. METHODS: Twenty-one healthy participants (mean age 27.52±8.9 years) (M=13, F=8) were recruited for this study and signed an IRB consent. Participants underwent pretest and immediate posttest PPT measures after a 2-minute video-guided foam roll intervention to the left quadriceps. PPTs were measured using a digital algometer to the ipsilateral left hamstrings and right quadriceps. Pretest and posttest measures were calculated using the paired t-test. Statistical significance was considered p< 0.05 using a two-tailed test. RESULTS: A significant difference was found between pretest to posttest measures for the ipsilateral hamstrings (t (20) = 2.6, p<0.001) and contralateral quadriceps (t (20) = 9.1, p<0.001) suggesting an increase in PPT. CONCLUSIONS: These finding suggest that foam rolling of the quadriceps muscle/tissue may have an acute effect on the PPT of the ipsilateral hamstrings and contralateral quadriceps muscles. Individual may feel less discomfort due to a higher PPT the ipsilateral decrease in hamstring PPT may have occurred through reciprocal contralateral quadriceps muscles. These finding suggest that foam rolling of the quadriceps muscle/tissue may have an acute effect on the PPT of the ipsilateral hamstrings and contralateral quadriceps muscles. Individual may feel less discomfort due to a higher PPT the ipsilateral decrease in hamstring PPT may have occurred through reciprocal contralateral quadriceps muscles. These finding suggest that foam rolling of the quadriceps muscles/tissue may have an acute effect on the PPT of the ipsilateral hamstrings and contralateral quadriceps muscles. Individual may feel less discomfort due to a higher PPT the ipsilateral decrease in hamstring PPT may have occurred through reciprocal contralateral quadriceps muscles. These finding suggest that foam rolling of the quadriceps muscles/tissue may have an acute effect on the PPT of the ipsilateral hamstrings and contralateral quadriceps muscles. Individual may feel less discomfort due to a higher PPT the ipsilateral decrease in hamstring PPT may have occurred through reciprocal contralateral quadriceps muscles.

Purpose: Downhill running (DHR) causes muscle soreness that may affect running performance. Foam rolling (FR) is a potential recovery tool for reducing soreness and attenuating performance decrements. Running economy (RE), which quantifies the efficiency of running, is a key factor in distance running ability. It is unclear whether DHR affects RE in trained runners and whether FR is an effective recovery method for DHR-induced soreness. Furthermore, RE may be assessed in several ways, including O2 cost (VO2), energy cost (EC, kcal/kg*min-1). These measures may be more accurate with allometric scaling of body weight (allVO2, and allEC, body weight in kg0.70). Thus, our purpose was to evaluate changes in RE with DHR and FR or placebo using 4 definitions of RE.

METHODS: Subjects did submaximal running to assess RE 2-4 days before (SUBMAX1) and 48 hours after (SUBMAX2) DHR. Immediately after DHR, they performed FR or placebo (sham compression tights) [7]. In a randomized crossover design, subjects repeated these tests 2-4 weeks later. RE during SUBMAX was calculated as VO2, allVO2, EC, and allEC. Muscle soreness was measured on a 0-10 verbal scale before DHR and SUBMAX2.

RESULTS: Eight trained runners completed the study (VO2max 57.7 ±16.9 ml*kg−1*min−1, age 36.4 ± 8.9 years, 4 females). Soreness measures for the ipsilateral hamstrings (t (20) = 2.0, p<0.05) and contralateral quadriceps (t (20) = 1.5, p<0.05). Subjects had a significant main effect for both the vertical jump (p = .04) and the 40 yd sprint (p = .03). There were no significant differences in perceived pain between the two massage interventions (t (49) = 1.60, p < .05). CONCLUSION: The use of SMR prior to exercise may be beneficial in improving vertical power in recreational athletes, and was not perceived to be more painful than IASTM. However, neither SMR nor IASTM improved horizontal power.

The vertical jump (VJ) test is commonly utilized to determine how high a person can jump and what their resulting power will be. Thus, it is important that the VJ test is administered correctly for a person to jump as high as possible. The standard time between subsequent jumps is usually 30 seconds (secs) with a completion of 3-6 jumps. But, if an individual is not fully recovered before their next jump, it is possible that jump may be lower vs. the first or earlier jumps. If a longer recovery period is granted between each jump, the individual may potentially jump as high or even higher than their previous attempts. However, to the best of the researchers’ knowledge, the impact of a 30 vs. 60 second passive recovery period on VJ performance has not been assessed. PURPOSE: To investigate the potential differences between a 30 vs. 60 seconds passive recovery period on VJ performance in no less than averagely fit college-age males. METHODS: After having descriptive data (ie. HT, WT, BF%, age) recorded, 31 averagely fit college-age males had their reach height measured and then participated in an 8 min dynamic warm-up. Subjects were then given a 4 minute passive recovery period after the warm up and then completed 4 familiarization jumps (for trials) using a VJ measurement device. After a 4 min PR period, subjects completed 2 series of jumps (ie. 4 trials apiece) in a counterbalanced order with either 30 (THIR) or 60 (SIXT) secs of PR between each jump. The THIR and SIXT jump series were separated by 4 min of PR. Excluding the first jump/trial for each series, the highest jump for THIR vs SIXT were compared using Paired-Samples t-Tests with significant differences occurring at p<0.05. RESULTS: No significant differences (p = 0.44) occurred between SIXT (70.01 ± 10.36 cm) and THIR (69.97 ± 9.86 cm). CONCLUSION: The current results suggest that 30 or 60 secs of passive recovery between jumps is optimal recovery for peak performance to occur during the vertical jump test using averagely fit college-age males. However, further research may...
be necessary to assess the impact of 30 vs. 60 sec passive recovery on vertical jump performance using averagely fit college-age females. Also, future studies may need to examine the effects of a shorter recovery period vs 30 or 60 seconds on vertical jump performance in male and female athletes.

**POtUSe:** The aims of this study were to determine if inter-structural release for posterior shoulder tightness on the position of the humeral head with respect to the center of the glenoid cavity. **METHODS:** Twenty-four healthy adult males participated in this IRB-approved study. Inclusion criteria were: age between 18 and 50 years old, and Japanese males. Exclusion criteria were; a history of surgery on the glenohumeral joint, and current pain in the glenohumeral joint. The subjects were allocated randomly to (1) stretch (S) group who performed the sleeper and cross body stretch, (2) combined stretch and manual release (R) group who performed the same stretch and received manual release to the posterior deltoid, or (3) control (C) group. An intervention period was set at four weeks. The manual release technique was intended to release loose connective tissue between the structures, e.g. the posterior deltoid and infraspinatus, was performed to achieve complete superior gliding of the posterior deltoid. We expect that normal alignment of the humeral head relative to the glenoid and normal end feel in maximal glenohumeral internal rotation at 90 degrees abduction can be achieved. The main outcome measures included range of motion in flexion, horizontal abduction, internal and external rotation at 90 degrees abduction. Secondary outcome was the alignment of the humeral head relative to the glenoid cavity and the distance between the acromion and humeral head. Statistical analyses included two-way analysis of variance and Bonferroni method as a post hoc test. The level of significance was set at alpha=0.05.

**RESULTS:** The R group showed significant improvements in flexion by 17.2±9.5 (P=0.043) and in total arc by 16.4±9.5 (P=0.038). The R group (10.1±3.7) showed significant improvements than the C group (0.1±1.5) in horizontal flexion (P=0.041). No significant differences were observed between the S and R groups. **CONCLUSION:** Limitations of this study were small sample size and reproducibility of the manual technique. To conclude, the shoulder range of motion and the humeral head position had no correlations.

**Board #166**

**June 3 9:30 AM - 11:00 AM**

**Effects Of Manual Inter-structural Release For Posterior Shoulder Tightness On The Humeral Head Position**

Koki Hamada¹, Masashi Sadakaiyó¹, Kazuyoshi Gamada².
1Sadamatsu Hospital, omura, Japan. 2Hiroshima International University, Higashihiroshima, Japan.

(No relationships reported)

**Board #167**

**June 3 9:30 AM - 11:00 AM**

**The Effect Of Between Innings Cooling Or Compression On Baseball Pitching During Competitive Game**

Kristin J. Heumann, PhD, CSCS, c-EP, Michael Reeder, DO, Nathaniel Snyder, Shelby Kasch, Jeremy Hawkins, PhD, ATC, Colorado Mesa University, Grand Junction, CO.

Email: kheumann@coloradomesa.edu

(No relationships reported)

In baseball, pitching effectiveness is critical for team success. Previous research has identified that short-duration cooling in between simulated innings was effective for maintaining velocity and improved perceptions of recovery. This combination is thought to improve overall pitching effectiveness. **PURPOSE:** A pilot study to assess the effect of short-term, between innings, cryotherapy and/or compression on perceived exertion and recovery of pitchers during a live college baseball game. **METHODS:** NCAA Division II baseball pitchers were studied during Fall season scrimmages. Participants filled out a scoring of Perceived Exertion (RPE) and Perceived Recovery Scale (PRS) prior to game play. Participants dressed in a specially designed cabin in which liquid nitrogen lowers the temperature of the air (-110 to -140°C) for a short period of time, usually 3 min. **RESULTS:** Our purpose was to determine which recovery, A, P, or WBC, was most effective at reducing BLA in Brazilian Jiu-Jitsu athletes. **METHODS:** Five males (37.8 ±3.82 yrs) participated in this study. Baseline BLA, heart rate (HR), rate of perceived exertion (RPE) and measures of pain were recorded before, during and after the workout. A 5 min dynamic warm-up preceded the circuit: 8 power clean and press with 95 lbs x 8 reps; 10 pull-ups; box jumps for 30 seconds; renegade row for 30 sec; full squat with 95 lbs x 10 reps; inverted row, 10 reps; medicine ball slam 30 sec; treadmill run 7 mph, 15% incline, 1 min. After the circuit, subjects sat for 5 min to allow BLA to peak, then it was measured using a finger prick and results recorded. Subjects randomly performed one of three recovery methods: 1) P - sit - 15 min; 2) A - 15 min cycling 40 RIRMx; or 3) WBC - stood in Cryochamber 3 min. Blood lactate was obtained every 5 min for 15 min. Data were analyzed using SPSS 19.0. **RESULTS:** Mean values for BLA (mmol/L) at 5 min (P=16.52±2.10; A=13.22±2.09; WBC=16.78±2.72). BLA for A recovery was significantly less than P or WBC (p = 0.003). At 10 min (P=16.76±0.68; A= 11.74±2.72; WBC= 11.62±1.48) and 15 min (P=16.34±4.0; A= 11.62±1.48; WBC=8.98±2.73) BLA levels were significantly less for A and WBC than P (p = 0.003). There was no significant difference (p > 0.05) between A and WBC recovery.
CONCLUSIONS: Pre-exercise lactate levels were significantly lower while wearing compression socks, which indicated an improvement in short-term (24 hour) aerobic exercise recovery. Compression socks have a positive effect on short term recovery from maximal aerobic exercise for moderately fit college aged individuals.

Pilot Study: The Influence Of Menthol On Recovery From Exercise-induced Muscle Damage

D. Jason Gillis, Aurora Vellante, Joseph Gallo. Salem State University, Salem, MA.
Email: jason.gillis@salstate.edu

No relationships reported

PURPOSE: Menthol is a cold receptor agonist found in various products claiming to relieve muscle soreness, but menthol’s influence on recovery from exercise-induced muscle damage requires clarification. The purpose of this study was to compare serial measures of muscle soreness and performance following exercise-induced muscle damage between a Menthol (M), Placebo (P) and Control (C) condition. It was hypothesized dependent variables would not differ between conditions (null hypothesis).

METHODS: 38 males with a mean (SD) age, weight and height of 24.0 (4.0) yrs, 79.5 (16.1) kg and 1.74 (0.12) m were randomized to M (n=11), P (n=8), and C (n=19).

RESULTS: There were no significant differences in pre-exercise lactate levels when wearing compression socks for the 24 hours of recovery. The GXT recovery HR (149.0 ± 31.0) recovery was significantly (p <0.05) lower at 5 min (108.5 ± 7.7 vs 107.1 ± 10.0) of recovery.

CONCLUSIONS: Pre-exercise lactate levels were significantly lower while wearing compression socks, which indicated an improvement in short-term (24 hour) aerobic exercise recovery. Compression socks have a positive effect on short term recovery from maximal aerobic exercise for moderately fit college aged individuals.
Cupping is an alternative therapy used by athletes to purportedly improve performance or enhance recovery. Bell shaped cups are placed on the skin (above a targeted muscle) and air is withdrawn to create a vacuum against the skin surface. Blood flow is expected to improve under the cup area during the application and impact somatosensory integrity and performance. PURPOSE: To determine the effect of chronic Cupping Therapy (CUP) on unilateral hip flexibility, balance, and muscular power, 12 subjects (age 21.4 ± 1.2, ht. 167.6 ± 8.4 cm, and body mass 71.6 ± 18.2 kg, 7♀) participated. METHODS: Familiarization trials ensured reliability. Testing was conducted within 15 minutes after CUP for four consecutive days (1-4) with CUP randomly assigned to either leg on day one. Single foot balance was obtained with a sway index (SI) on the Biodex Balance System with unilateral trials for 20 seconds and 10 sec recovery repeated twice. Each test consisted of two measures of unilateral passive hip range of motion (degrees) obtained by goniometer with the subject in the prone (hip extension [HE]) and supine (straight leg raise test of hamstring [HF]) positions. Unilateral hamstring/quadriceps muscle power (MP) testing was conducted with a Biodex Isokinetic dynamometer (Watts = W) including five repetitions @ 60°/sec warm-up and 10 maximal repetitions at 120°/sec for the trial. CUP required the application of 6 plastic cups applied at -14 PSI bilaterally for 10 minutes at 30 mm lateral of the vertical midline of the posterior thigh above the hamstring muscle group.

RESULTS: Statistical analysis by ANOVA (p<.05) with repeated measures revealed no significant difference among matched variables including: SF, 39, 99, 74, & 36 and 1.07, .78, .84 & 1.011; HE(degrees): 13.4, 13.4, 13.6, & 13.3, and 12.7, 14, 13.8 & 13.6; HF(degrees): 66.6, 62, 61, & 62.4 and 61.5, 62, & 61, & 62; MP(W): 94, 53.4, 68.7, & 61.2 and 82.1, 40, 66.3, & 65.9 for CUP and No CUP treatments on days 1, 2, 3, and 4, respectively. CONCLUSION: The application of cupping therapy on four consecutive days with six treatment cups applied for ten minutes at a modest negative pressure provided no alteration in balance, flexibility or muscular power compared to no treatment over four days. The efficacy of cupping for enhancement of performance related measures is not supported by this study.

PURPOSE: To evaluate the effectiveness of foam rolling (FR) on the rehabilitation of exercise-induced muscle fatigue (EIMF). METHODS: Forty-two male college students (age: 24.5±2.5 yrs) were randomly divided into two groups: a control group (n=21) and a FR group (n=21) group. All subjects performed a bout of bottom-up squats for obtaining EIMF. All subjects were measured for peak torque (PT), peak torque/body weight (PT/BW), average peak torque (APT) and total work (TW) by using an isokinetic test system before, and 0.5h, 24h, and 48h after the squats. The only difference between two groups was that the FR group performed a 6-min FR exercise protocol before each post-EIMF protocol measurement (at 0.5h, 24h, and 48h). The data was analyzed by one-way ANOVAs with LSD post-hoc tests, and independent t-tests. Results: See table below for all results. At 0.5h after the EIMF protocol, PT, PT/BW, APT and TW significantly decreased in FR group and control group (all p<0.05), and there were no significant group differences in these variables. At 24h after the EIMF protocol, T, PT/BW, APT and TW tended to be higher in the FR group than in the control group, although there were no significant group differences. At 48h after the EIMF protocol, PT, PT/BW, APT and TW were significantly higher in the FR group than in the control group (all p<0.05), and nearly reached the pre-EIMF protocol values. Conclusion: Foam rolling resulted in a faster recovery in muscle strength and muscle work following a bout of bottom-up squats. The potential mechanism needs to be further investigated.

The Change of PT, PT/BW, APT TW Between Control Group And FR Group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Before</th>
<th>0.5h After</th>
<th>24h After</th>
<th>48h After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control PT(Nm)</td>
<td>207.38±43.36</td>
<td>156.52±42.80*</td>
<td>155.85±46.37*</td>
<td>157.60±47.44*</td>
</tr>
<tr>
<td>Control PT/BW (Nm/kg)</td>
<td>3.14±0.58</td>
<td>2.90±0.48</td>
<td>2.30±0.52</td>
<td>2.27±0.50</td>
</tr>
<tr>
<td>Control Average PT(Nm)</td>
<td>170.57±42.80</td>
<td>138.31±46.58*</td>
<td>150.97±47.50*</td>
<td>155.15±48.00*</td>
</tr>
<tr>
<td>Control Average PT/BW (Nm/kg)</td>
<td>261.39±42.80</td>
<td>261.39±42.80</td>
<td>261.39±42.80</td>
<td>261.39±42.80</td>
</tr>
</tbody>
</table>

N=21 for Control and N=21 for FR. *p<0.05, compared to Before. #p<0.05 compared to Control.

PURPOSE: The effects of varied stretching modes on athletic performance in able-bodied populations but fewer empirical studies have been conducted on athletic performance in disability populations. PURPOSE: The purpose of this research project was to examine the effect of stretching mode on sprint speed among competitive wheelchair athletes. METHOD: Wheelchair rugby players with tetraplegia (N = 32, 49.3 ± 8 yrs, 76.78±13.8 kg, 161.2±17.2 cm, 13.1±9.5 yrs post injury) were randomly assigned to one of three different stretching techniques [proprioceptive neuromuscular facilitation stretching (PNF), static stretching, (SS) or dynamic stretching (DS)] on three testing dates. Timing gates (Brocker TC Motion Start, Knoxville, TN) were used to assess sprint speed before warm-up, after warm-up (which included the assigned stretching mode, and after 75 minutes of rugby play). The best of the two sprint times was used to compare pre- and post- warm-up speeds as well as pre- and post-practice speeds.

Results: Sprint speed improved from pre- to post-warm-up across each stretch condition. PNF yielded the greatest improvement (-0.10±0.22 s). As expected, sprint scores declined from pre- to post-practice with DS yielding the least change (0.02±0.19 s).

Conclusion: Regardless of stretch mode, short term performance can be improved
by PNF, SS, or DS stretching modes. Flexibility training may also help to offset fatigue in athletes during regular practice sessions. With the concern that increased fatigue could interrupt proper mechanics, these findings are applicable to both performance and injury prevention.

**Effect Of Branched-chain Amino Acids, β-hydroxy-β-methylbutyrate, And Glutamine on Recovery From Resistance Exercise**

Sara A. Baggett1, Ludmila M. Cosio-Lima1, Phillip A. Bishop2
1The University of West Florida, Pensacola, FL. 2Liberty University, Lynchburg, VA. Email: sbaggett@uwf.edu

**RESULTS:** Treatment enhanced second-day performance for the leg extension (11 ± 1 vs. 10 ± 1; p = 0.03), latisimus pull-down (11 ± 2 vs. 10 ± 1; p = 0.02), and total repetitions (62 ± 5 vs. 59 ± 7; p = 0.03). Reduced residual pain (29 ± 19 vs 40 ± 23; p = 0.01) and pain during the leg press (37 ± 14 vs 45 ± 21; p = 0.04) and shoulder press (17 vs 47 ± 24; p = 0.04) were observed with treatment. RPE on the second day was reduced under the treatment for the leg press (55 ± 20 vs. 40 ± 23; p = 0.01) and pain during the leg press (37 ± 14 vs. 45 ± 21; p = 0.01) and pain during the shoulder press (17 vs 47 ± 24; p = 0.04). Measures of perceived recovery (RPR) were assessed 24 h after initial workouts. Treatment intervention that accelerated recovery processes.

**CONCLUSIONs:** Though exercise VO2 and EE associated with CON were greater than intervention groups, these improvements were within an acceptable limit for performance athletes.

**REFERENCES:**


4.Repeated measurements ANOVA with Bonferroni post-hoc tests to determine statistical significance.

5. Standard error of the mean (SEM).
PURPOSE: To examine the effects of post-exercise cold water immersion (CWI) on free circulating testosterone (T).

MATERIALS AND METHODS: Twenty male college physical education students (21.46±1.18 yr., height: 172.1±9.48 cm, mass: 74.37±6.34 kg) without shoulder injury volunteered for the study. They were randomly divided into two intervention groups, one CWI and the other PNF intervention, with both met 5 times a week, 15 minutes each, for two weeks. Joint mobility (flexion and stretch) was measured by F-JDC type joint measurement scale before and after the intervention. Paired t-test and effect size (ES, Cohen’s d) were calculated to determine the difference between AS and PNF.

RESULTS: There was no statistical significant difference between the groups before the intervention. There were significant improvements in both groups (P<0.01), but greater improvement was found in the post-procedure intervention group (flexion: 4.1±0.86; stretch: 1.96±0.30; P<0.001).

CONCLUSIONS: Both methods can improve the flexibility of the shoulder joints, but AS shows more effective.

Corresponding author: Jingmin Liu

Study was supported by Independent scientific research plan of Ministry of Education (20121080023)

Cryotherapy is commonly used to improve muscle recovery from exercised induced damage. Recent studies have shown that use of post exercise cryotherapy can blunt adaptations in muscle hypertrophy and strength but the mechanism as to why is unclear. PURPOSE: To examine the effects of post-exercise cold water immersion (CWI) on free circulating testosterone (T).

METHODS: Ten well-trained men (>18mo run training, ~2.3 h/day, ≥18mo run training, ~2.3 h/day, 176±14cm; mass: 83.0±13.3kg; body fat: 23±7%; ≥18mo run training, ~2.3 h/day, 176±14cm; mass: 83.0±13.3kg; body fat: 23±7%) completed two protocols during Visits 3-4. T-tests determined differences 48-h post-fatigue with COM and PLA socks (p≤0.05).

Purpose: Compression socks are a popular recovery modality in endurance sports. Purpose

RESULTS: Sensory disturbance from DOMS in Comparison to Compression Sleeve

Delayed onset muscle soreness (DOMS) is known to decrease range of motion (ROM), increase muscle swelling, and increase perception of pain in the affected muscle. Wearing compression garments during recovery from DOMS has been demonstrated to reduce both the recovery time and the peak disturbance in these variables when compared to no treatment. PURPOSE: To determine the effects of a pneumatic compression device (PCD) compared to a compression sleeve (CS) during a 5-day recovery period from DOMS of the elbow flexors. METHODS: Eight college-aged students participated in this crosstraining design study. Upper and lower arm circumference were measured to determine muscle swelling; pain during elbow flexion and elbow extension was measured using a 0 - 100mm visual analog scale to determine muscle soreness; and flexion and extension ROM were measured to determine joint mobility. The muscle-damage protocol consisted of 4 sets of 25 repetitions of isokinetic concentric elbow flexion followed by eccentric elbow extension. Immediately following the muscle-damage protocol, subjects either wore a CS continually for five days or completed daily, 20-minute PCD treatments for 5 days. Swelling, ROM, and pain were measured pre- and post-exercise, and daily during the 5-day recovery period. Subjects rested for 7 days before completing another muscle-damage protocol and the remaining treatment. Repeated measures ANOVA was used to determine differences between treatments. RESULTS: PCD significantly reduced increases in upper arm circumference (1.7 vs. 2.0cm), flexion pain (24.4 vs. 34.3mm), extension pain (30.8 vs. 41.4mm), and minimized reductions in flexion ROM (15.9 vs. 25 degrees) and extension ROM (2.5 vs. 4.1 degrees). There were no differences in lower arm circumference. Non-significant interaction effects between time and treatment suggest that the time course of DOMS recovery was similar between trials. However, because the PCD disturbances from baseline were lower, measurements returned to baseline earlier in the PCD trial. CONCLUSIONS: These findings suggest that daily treatments using a PCD further reduce peak disturbance and recovery time from DOMS of the elbow flexors when compared to a continuously-worn CS.

Abstracts were prepared by the authors and printed as submitted.
Acute Effects of Two Different Foam Rollers on Range of Motion
Isaac D. Henry, Jacilyn Olson, Melissa Powers, Jill Robinson, Ed Cunliff. University of Central Oklahoma, Edmond, OK.

Effect of Cooling on Postmatch Recovery in Elite Volleyball Players in Warm Conditions
Niehl Ghouli, Montassar Tabbene, Karim Chamari, Claire Tourney. Faculty of Sport Sciences, Labaratoire MOVE (EA 6413), Poitiers, France. ASPREV, ASPETAR, Orthopedic and Sports Medicine Hospital, Doha, Qatar. Athlete Health and Performance Research Center ASPETAR, Orthopedic and Sports Medicine Hospital, Doha, Qatar. Faculty of Sport Sciences, CETIPS EA 3812, Rouen, France.

Combined Effects of Cold Water Immersion and Compression Garment after Exercise on Muscle Damage Markers
Maruyama Tatsuhiro, Sahiro Mizuno, Kazushige Goto. Ritsumeikan University, Kusatsu, Japan. (Sponsor: Robbert Kramers, FACSMB)

Decrease muscle soreness by medical tape is supported by the literature. Subjects: Twenty normal subjects ranging in age from 18 to 55 with no history of previous skin allergy and do not have any upper body injuries participated.

METHODS: Subjects will perform the lowering phase of a bicep curl exercise using a dumbbell consisting of 3 sets 25 repetition, followed 90 seconds rest between each set. A grid shaped adhesive, a little larger than a stamp, called a cross tape will be applied in the bicep of the dominant hand and the other hand as control for one week. The range of motion and pain for both arms will be measured before and after applied the tape.

RESULTS: The study findings show that there were statically significant difference between the ROM and the pain (pre, post) when the procedure is carried out over a period of two consecutive weeks (1 day per week) with large effect size (0.2) and strong power (0.96). However, there were no significant differences between the two groups (right, left arms) with medium effect size (0.1) and weak power (0.33).

Conclusions: Therefore, this study suggest that cross tapes may reduce delayed onset muscle soreness, however more research is needed. Future studies should include a larger number of subjects, more diverse cohort, an exercise that applies a greater intensity, and expands the time of research. CT is an advisable method to decrease DOMS and improved functional performance.
Compression garments are popular mechanical ergogenic aids that are hypothesized to shorten the time needed to recover from exercise. PURPOSE: The purpose of this study was to evaluate the effects of full-length compression tights and knee-high stockings on recovery from plyometric exercise. METHODS: This study used a randomized pretest-posttest design. Thirty healthy males aged 18-25 were recruited for participation (height 1.81 ± 0.078 m; body mass 79.28 ± 12.59 kg; age 21.40 ± 2.28 years). Subjects were randomized into three groups: full-length tights (n=11), knee-high stockings (n=10), and a control group (n=9). Subjects completed perceived muscle soreness ratings using a visual analog scale (VAS), isokinetic strength of the knee extensors (KE), time to peak torque (TTPT), and vertical jump height (VJ) measures at baseline, and repeated these at 24, 48, and 72 hours post-plyometric exercise. Plyometric exercise took place the on the second visit with subjects completing 10 sets of 10 plyometric box drop jumps. Compression garments were worn by the full-length and knee-high compression groups immediately following plyometric exercise and for the following 12 hours. All data were analyzed in SPSS (v23). Multiple repeated measures ANOVAs with Bonferroni adjustments were used to analyze the differences in KE, TTPT, VJ, and perceived muscle soreness. RESULTS: There were no differences between groups for any dependent measures. The time effect showed statistical significance for the VAS of the calves and quadriceps VJ, KE, and TTPT (p<0.05). Pairwise comparisons showed significant differences in VJ, KE, and TTPT (p<0.05). Pairwise comparisons of the VAS revealed the plantar flexors and the knee extensors demonstrated significant differences in perceived muscle soreness (p<0.05). CONCLUSION: These results suggest that while muscle damage occurred, and differences in VJ, KE, and TTPT were seen, no significant differences were observed between groups relative to compression garments. With this finding, we can conclude that full-length or knee-high compression stockings do not aid in recovery from plyometric exercise.

Cardiorespiratory fitness (maximum aerobic capacity), and more recently muscle strength, have been found to be associated with lower levels of cardiovascular and metabolic risk factors in longitudinal studies from adolescence to early adulthood. Higher levels of total daily energy expenditure (TDEE) are associated with improved cardiometabolic fitness, however less is known about the mechanism related with anaerobic metabolism-related fitness. PURPOSE: To analyze the association between TDEE, physical activity and anaerobic performance in youth. METHODS: A database of 136 measurements of TDEE in 84 individuals aged 6-19 years was analyzed (37 females and 47 males, age=13.3±3.2y, BMI=20.5±3.8kg/m², TDEE=2390.9±531.9kcal). TDEE was determined over 15 days by the doubly labelled water technique. Physical activity (PA, min/day and steps/ day) was measured by accelerometry. PA energy expenditure (PAEE/kg) was calculated by subtracting resting energy expenditure (REE) and thermic effect of food, and ratios of kcal by kg of body weight (PAEEkg) were calculated. Fat free mass (FFM) was calculated by deuterium dilution technique. Anaerobic performance was tested by vertical jumps (CMI, CMJ, handjump, lower limbs isometric strength (LLS) and, 15m- and 30m-sprint. A stepwise regression analysis was used to explore the relationship between anaerobic performance (dependent variable), TDEE and PA. All correlations were adjusted to FFM, gender and age. RESULTS: TDEE was associated with all anaerobic performance tests (r=0.190 for CMJ, r=0.216 for CMJA, r=0.289 for handjump, r=0.493 for LLS and, r=0.371 for 15m-sprint, all p<0.05). However, after adjusting for confounders, only PAEEkg and vigorous PA were significantly associated with sprint performance (30m: r-tatio=2.0, r=0.214, p<0.05; 15m: r-tatio=2.36, r=0.286, p<0.05) and LLS (r-tatio=2.0, r=0.214, p<0.05) respectively. CONCLUSION: Our results highlighted the importance PAEE more than total PA for an improved performance of high-intensity displacement activities, which has been recently associated with health outcomes independently of cardiometabolic fitness. However our results will be cross-validated in other school communities. Funded by Spanish Ministry of Economy and Competitiveness (Grant: DEP2011-30565).
scale of 5 (best) to 1 (worst). Results: Twenty eight female soccer players (14.3-17.9 years) and 23 female basketball players (12.6-16.0 years) were included. Average VO2peak was 48 and 47.9 ml/kg/min, respectively. Forward soccer players had a better VO2peak comparing to other positions (goalkeepers = 42.2, defenders = 48.4, midfield = 47.3, forwards = 54.7 ml/kg/min). Soccer coach playing ability (average = 4.21) and fitness estimation (average = 3.96) did not correlate with VO2peak results (Correlation Coefficient = 0.292, p = 0.13 and 0.257, p = 0.18 respectively). Center basketball players and guards the highest average VO2peak (centers = 34.2, forwards = 44.6, guards = 50.5 and point guard = 53.1 ml/kg/min). Basketball coach playing ability (average = 3.14) and fitness estimation (average = 2.86) correlate with VO2peak results (Correlation Coefficient = 0.464, p < 0.003 and 0.547, p < 0.008 respectively). Conclusions: Adolescent female soccer and basketball players at different playing positions exhibited different VO2peak values as reported in the literature. Basketball coaches’ estimation of aerobic fitness and general playing ability were associated with VO2peak results whereas soccer coaches’ estimation did not. VO2peak may be considered as a parameter for team selection of ball game players game players, however in light of the inconsistency results, further research is required.

CONCLUSIONS: Genu valgus does not interfere in different levels of physical activity, adjusted to chronological age in Brazilian males adolescent.

PURPOSE: Genu valgus interferes negatively in physical activities of moderate and moderate to vigorous intensity among Brazilian females adolescent students, which may be a negative factor for an active lifestyle. Objective: To analyze the association between genu valgus and physical activity level (PAL), categorized in: total, light, moderate, vigorous and moderate to vigorous intensity, adjusted to chronological age in male adolescent students.

METHODS: Sample comprised 270 male students, 30 boys in each age group, aged 10-18 years (14.0 ± 2.6), and living in the city of Ilhabela, Brazil. Genu valgus was measured using a goniometer, measuring the intermalleolar distance (cm). Physical activity behavior in different intensities (minutes per week) was assessed by the International Physical Activity Questionnaire (IPAQ). Statistical analysis has used multiple linear regression adjusted to chronological age.

RESULTS: There was no association (p > 0.05) between intermalleolar distance and total (β = 0.475), light (β = 0.484), moderate (β = 0.2012), vigorous (β = 0.412) and moderate to vigorous (β = 0.2432) physical activity level.

CONCLUSIONS: Genu valgus does not interfere in different levels of physical activity (total, light, moderate, vigorous and moderate to vigorous) among male adolescent students.

Association Between Waist-to-Height Ratio And Fitnessgram® BMI Classification In Sixth-grade Children

John L. Walker, FACSM, Tinker D. Murray, FACSM, James Eldridge, FACSM, William G. Squires, Jr., FACSM, ‘Texas State University, San Marcos, TX. ‘University of Texas of the Permian Basin, Odessa, TX. ‘Texas Lutheran University, Seguin, TX. Email: jw18@txstate.edu

FITNESSGRAM has established criterion standards for body composition and body mass index (BMI) according to gender and age in children. Standards for aerobic capacity (AC) have also been established to assess cardiorespiratory function. Waist-to-Height ratio (WHtR) has been shown to be a strong indicator of metabolic syndrome in youth. PURPOSE: The purpose of this study was to determine the association between WHtR and FITNESSGRAM BMI classification in sixth-grade children. METHODS: Subjects were 528 sixth-grade boys and girls, ages 11-13, who completed each of the FITNESSGRAM components as a part of their yearly assessment. In addition to height and weight, subjects were also measured for waist circumference. AC was determined from one-mile run/walk times, age, gender and BMI. The percent of these students classified within the Healthy Fitness Zone (HFZ) were 46% for BMI, and 52% for AC. The percent of these students classified as High Risk were 43% for BMI, and 31% for AC. RESULTS: The correlation between WHtR and BMI was 0.92, and the correlation between BMI and AC was -0.75. The correlation between WHtR and AC was 0.1. Receiver Operating Characteristic (ROC) analysis indicated that a WHtR of 0.451 represents the best cut-off score for classifying girls within the HFZ for BMI with 91% classified correctly, and AUC = 0.96. Also, a WHtR of 0.475 represents the best cut-off score for classifying boys within the HFZ for BMI, with 90% classified correctly, and AUC = 0.95. For determining High Risk classification for BMI, a WHtR of 0.476 represents the best cut-off score for classifying girls as High Risk for BMI with 90% classified correctly, and AUC = 0.96. Also, a WHtR of 0.484 represents the best cut-off score for classifying boys as High Risk for BMI, with 94% classified correctly, and AUC = 0.97. CONCLUSIONS: WHtR is strongly associated with classification according to FITNESSGRAM BMI standards in sixth-grade children. These data suggest that a WHtR of 0.451 for girls and 0.475 for boys are the best criteria for HFZ classification for FITNESSGRAM BMI. Also, a WHtR of 0.476 for girls and 0.484 for boys are the best criteria for High Risk classification for FITNESSGRAM BMI. Reduction of WHtR may provide important benefits since children in the High Risk category are most likely to develop problems related to metabolic syndrome as adults.

Correlation Between Varying Back Squat Depths On Speed And Vertical Jump Performance In North American High School Football Players

Nicholas Farrell1, Kent J. Adams, FACSM2, Joseph Berning, FACSM3, Mark DeBeliso, FACSM4. ‘Southern Utah University, Cedar City, UT ‘California State University Monterey Bay, Seaside, CA ‘New Mexico State University, Las Cruces, NM. (Sponsor: Mark DeBeliso, FACSM) Email: nicholasfarrell@usu.edu

PURPOSE: This study attempted to determine which of two back squat depths (90 degree knee flexion or 45 degree knee flexion) would correlate with superior sprint times and VJ performance. METHODS: Participants were high school aged males on a North American football team (age: 15.1±0.9 yrs, mass: 77.0±13.2 kgs). Twenty three athletes performed the 36.6 meter (36.6M) sprint and VJ tests along with performing a 3RM back squat at 90 and 45 degrees of knee flexion on randomized separate waves. Pearson Correlation Coefficient (r) test was used to compare the squat scores with sprint times and VJ performance. RESULTS: Variable measures were 36.6M: 5.23 ± 0.26 sec, VJ: 59.6 ± 6.6 cm, 90° 3RM squat: 116 ± 21.0 kgs, and 45° 3RM squat: 132 ± 22.2 kgs. Low correlations were found at both knee flexion angles: 90° 3RM squat (r = 0.36, r < 0.05, p > 0.05). However, moderate correlations were revealed when comparing the 3RM back squat/body mass ratio with the participant’s 36.6M sprint times (r = 0.46, 45° r = 0.46, p < 0.05). CONCLUSIONS: Within the parameters of this study, low to moderate correlations were determined between back squat depth and sprint speed as well as VJ at both 90 and 45 degrees of knee flexion.
and a 12.8 m rope (4.1 kg) was used for all trials. Comparisons between exercises were made using one-way ANOVA with repeated measures. **RESULTS:** Peak values for VO2 and HR during the treadmill test were 47.4 ± 8.8 ml/kg/min and 195.1 ± 6.6 bpm, respectively. Mean HR and VO2 values for both sets of exercise during the BR protocol were 52.7% to 84.1% and 21.5% to 60.1% of HRpeak and VO2peak, respectively. During the BR protocol, there were progressive increases in VO2 and HR from EX1 to EX5. Results of pairwise comparisons of VO2 and HR among five BR exercises are below (mean ± SD):

<table>
<thead>
<tr>
<th></th>
<th>EX1</th>
<th>EX2</th>
<th>EX3</th>
<th>EX4</th>
<th>EX5</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR</td>
<td>103.3 ± 1 124.1 ± 15</td>
<td>148 ± 16</td>
<td>147 ± 14</td>
<td>164 ± 11</td>
<td>2,3,4</td>
</tr>
<tr>
<td>VO2</td>
<td>10.2 ± 2</td>
<td>12.7 ± 3</td>
<td>18.1 ± 3,2</td>
<td>23.1 ± 3,2,3</td>
<td>28.5 ± 3,2,3,4</td>
</tr>
</tbody>
</table>

*p<0.05 vs EX1; 1 vs EX2; 2 vs EX3; 3 vs EX4*

**CONCLUSION:** These data indicate that BR exercise can pose a moderate to vigorous metabolic and cardiovascular stimulus in children with the mean effects augmented with the use of exercises requiring greater muscle mass.

### Board #198
**Changes in VO2max are Not Associated with Ventricular Morphology or Function in Female Youth Athletes**

Carol Coutinho, Andrew Watson, Stacey Brickson. University of Wisconsin-Madison, Madison, WI.

While the relationship between fitness changes and ventricular morphology and function has been studied in adults and in cross-sectional studies with children, we are aware of no prior research which has evaluated this relationship in female youth athletes longitudinally.

**PURPOSE:** To determine if changes in maximal aerobic capacity are associated with changes in ventricular morphology or systolic function in female youth athletes.

**METHODS:** 26 female soccer athletes (ages 13-18) underwent resting 2-D echocardiography and maximal aerobic testing at two time points 7 months apart to determine, maximal aerobic capacity (VO2peak), left ventricular (LV) end-diastolic diameter (LVEDD), right ventricular (RV) end-diastolic diameter (RVEDD), LV mass (LVM), RV area in diastole (RVA), RV area in systole (RVAS), LV shortening fraction (LVSF), RV fractional area change (RVFAC), interventricular septal wall thickness (IVWT), and LV posterior wall thickness (LVPWT). Echocardiographic and fitness variables were compared at the two time points using paired Wilcoxon tests and Cohen’s d. Linear regression models were used to predict changes in VO2peak using changes in echocardiographic variables as predictors.

**RESULTS:** During the study period, no significant change in VO2peak was identified (2.61 ± 32% vs 2.62 ± 32%, p = 0.75, d=0.05). A significant decrease was identified in RVFAC (44% ± 10% vs 36 ± 5%, p = 0.02, d=0.61). No significant differences were identified in any other echocardiographic or fitness variables (p>0.05 for all). None of the changes in echocardiographic variables were significant predictors of change in VO2peak during the study period. While this suggests that changes in aerobic capacity may not be related to changes in ventricular size or function, it is also possible that the changes in these variables during the study period were not large enough to demonstrate meaningful relationships between them.

### Board #200
**Maximal Oxygen Uptake Equations To Discriminate The Cardiometabolic Risk In Colombian Children And Adolescents: The Fuprecol Study**

Jorge E. Correa-Bautista1, Andres Vivas2, Jorge Mota2, Antonio Garcia-Hernmoso3, Daniel H. Prieto-Benavidez4, Robinson Ramirez-Velez2. 1Centro de Estudios para la Medicion de la Actividad Fisica «CEMA». Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogota D.C, Co, Bogota, Colombia. 2Grupo de Investigacion en Ejercicio Fisico y Deporte. Vicerrectoría de Investigación, Universidad Manuela Beltrán, Bogota, D.C, Colombia.. 3Laboratorio de Ciencias de la Actividad Fisica, el Deporte y la Salud. Universidad de Santiago de Chile, Santiago, Chile. 4Laboratorio de Ciencias de la Actividad Fisica, el Deporte y la Salud. Universidad de Santiago de Chile, Santiago, Chile. Email: robin640@hotmail.com

**PURPOSE:** Associations between maximal rate of oxygen uptake (V O2peak) and cardiometabolic risk have not been adequately studied in Colombian children and adolescents. The aim of the present study was two-fold: (i) to determine the ability of eight different V O2peak equations to discriminate between low and high cardiometabolic risk; and (ii) to determine cardiorespiratory fitness (CRF) thresholds associated with a more favourable cardiovascular health profile in Colombian children and adolescents.

**METHODS:** CRF was estimated by the 20 m shuttle run test on 2,870 schoolchildren (54.5% girls) from Bogota (Colombia). We computed a metabolic syndrome score (MetScore) as the sum of the age-sex standardized scores of waist circumference, triglycerides, HDL-c, glucose, systolic and diastolic blood pressure. ROC analysis showed a significant discriminatory accuracy of MS in identifying the low/high metabolic risk in children and adolescents and both gender.

**RESULTS:** ROC analyses showed a significant discriminatory accuracy for the identifying the low/high CMRI in both gender and age group (AUC=0.83 (95%CI: 0.71-0.95), p< 0.001; boys AUC= 0.84 (95%CI: 0.74-0.94), p= 0.001; adolescents girls AUC=0.79 (95% CI: 0.70-0.89), p< 0.001; boys AUC= 0.88 (95%CI: 0.68-0.92), p<0.001. In children (9 to 12 years old), handgrip strength (kg)/body mass (kg) values at these points were 0.359 and 0.376 in girls and boys, respectively. In adolescents (13.0 to 17.9 years old), these points were 0.440 and 0.447 in girls and boys, respectively.

**CONCLUSIONS:** In conclusion, the results suggest a hypothetical MS level relative to weight for having a low metabolic risk, which could be used to identify youths at risk.

### Board #199
**Muscle Strength Thresholds For The Detection Of Cardiometabolic Risk Among Colombian Children And Adolescents: The Fuprecol Study**

Jhonatan Camilo Peña-Ibagón1, Felipe Lobeo2, Antonio García-Hernmoso1, Daniel H. Prieto-Benavidez3, Jorge E. Correa-Bautista4. 1Centro de Estudios para la Medición de la Actividad Física «CEMA». Escuela de Medicina y Ciencias de la Salud, Universidad del Rosario, Bogotá D.C, Co, Bogotá, Colombia. 2Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA. 3Laboratorio de Ciencias de la Actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile. 4Laboratorio de Ciencias de la Actividad Física, el Deporte y la Salud, Universidad de Santiago de Chile, Santiago, Chile. Email: robin640@hotmail.com

**PURPOSE:** To determine if similar relationship between maturational timing and adolescent swim performance could be used to identify youths at risk.

**METHODS:** CRF was estimated by the 20 m shuttle run test on 2,870 schoolchildren (54.5% girls) from Bogota (Colombia). We computed a metabolic syndrome score (MetScore) as the sum of the age-sex standardized scores of waist circumference, triglycerides, HDL-c, glucose, systolic and diastolic blood pressure. ROC analysis showed a significant discriminatory accuracy of MS in identifying the low/high metabolic risk in both sexes and age group (9-12 and 13-17 years old). Therefore, we are proposing to use MetScore as a quantitative marker of healthier cardiovascular profile Colombian in children and adolescents.

**CONCLUSIONS:** The CRF cutoffs can be used as a quantitative marker of healthier cardiovascular profile Colombian in children and adolescents.

### Board #201
**Maturational Timing and Adolescent Swim Performance**

Sierra L. Wagner, Andrew Cornett1, Alan Duski2, Brian Wright1, Joel Stager, FACSM3. 1Eastern Michigan University, Ypsilanti, MI. 2DePaul University, Greencastle, IN. 3Indiana University, Bloomington, IN. (Sponsor: Joel Stager, FACSM) Email: swagne11@emich.edu

**PURPOSE:** Associations between maximal rate of oxygen uptake (V O2peak) and cardiometabolic risk have not been adequately studied in Colombian children and adolescents. The aim of the present study was two-fold: (i) to determine the ability of eight different V O2peak equations to discriminate between low and high cardiometabolic risk; and (ii) to determine cardiorespiratory fitness (CRF) thresholds associated with a more favourable cardiovascular health profile in Colombian children and adolescents.

**METHODS:** CRF was estimated by the 20 m shuttle run test on 2,870 schoolchildren (54.5% girls) from Bogota (Colombia). We computed a metabolic syndrome score (MetScore) as the sum of the age-sex standardized scores of waist circumference, triglycerides, HDL-c, glucose, systolic and diastolic blood pressure. ROC analysis showed a significant discriminatory accuracy for the identifying the low/high cardiometabolic risk in both sexes and age group (9-12 and 13-17 years old). Therefore, we are proposing to use MetScore as a quantitative marker of healthier cardiovascular profile Colombian in children and adolescents.

**CONCLUSIONS:** The CRF cutoffs can be used as a quantitative marker of healthier cardiovascular profile Colombian in children and adolescents.
Medicine & Science in Sports & Exercise®

But by middle adolescence, the late maturers have a performance advantage that is have a performance advantage over late-maturing swimmers during early adolescence. In contrast, swim performance improved whereas mean PPS during middle adolescence was 664.4, 683.1, and 721.3. Thus, the late maturers improved more (62.6%) from early to middle adolescence than the average (47.0%) and early (45.2%) maturers. In contrast, swim performance improved to a similar extent for the three groups from middle to late adolescence. Conclusion: Our results extend Beunen et al.’s findings by showing that early-maturing swimmers have a performance advantage over late-maturing swimmers during early adolescence. But by middle adolescence, the late maturers have a performance advantage that is maintained into late adolescence.

3755 Board #202 June 3 8:00 AM - 9:30 AM
Which One Is The Decisive Factor To Cognition Performance In Preschool Children Aged 3.5 To 4.5 Years Old, Aerobic Fitness Or Agility? A Cross-sectional Study In Shanghai, China
Rui Wang, female1, Pengchung Xu, male2, Guoyuan Huang, male3, Tang Zhou, female4, Minhui Quan, male5, Hui Fang, female6, Xueqiang Wang, male7, Weihua Xiao, male8, Jian Liu, male9, Jieyi Zhang, female10, Hanbin Zhang, male11, Guanggao Zhao12, Ying Zhang, female13, Liping Lu, female14, Zhenbo Zhao1, Ying Zhang, female1, Liping Lu, female1, Zhenbo Zhao, female1, Xueqiang Wang, male1, Weihua Xiao, male1, Jian Liu, male1, Jieyi Zhang, female1, Hanbin Zhang, male1, Guanggao Zhao1, Ying Zhang, female1, Liping Lu, female1, Zhenbo Zhao, female1
1Shanghai University of Sport, Shanghai, China. 2Indiana University, Bloomington, IN. 3University of Southern Indiana, Evansville, IN.
Email: wangru0612@163.com

Purpose: This cross-sectional study was to compare the associations of aerobic fitness and agility with cognition performance in preschool children. Methods: A total of 346 preschool children (age 3.5-5.5 yr old) with 201 boys and 145 girls were recruited from eight preschools in Yangzhou, Shanghai, China. After enrolled in this study (Trial Registration: clinicaltrials.gov NCT00674544), the young children were asked to perform a comprehensive package of tests including physical fitness, and cognitive function. Children’s scores on the tests of 10-m Shuttle Run (timetests can be used to determine speed and agility performance, and elite players will use less time than the subelite participants) and 20-m Shuttle Run (laps/chest test can be used to determine aerobic fitness performance, and elite players will have more laps than the subelite participants), Verbal Intelligence Quotient (VIQ), Performance Intelligence Quotient (PIQ), and Full Intelligence Quotient (FIQ) were assessed. Correlation coefficients were determined by conducting Pearson product-moment and Spearman’s rho analyses. Linear regression analyses were used to examine the associations of cognitive performance with aerobic fitness and agility in a sequential manner. Descriptive data were reported as mean/SD. Statistical significance was set at a p-value < 0.05. Results: After adjustment for age, gender, BMI, physical activity, nutrition status, sleep habits, and education, a negative relationship (P < 0.001 ) was found between the change in the 10-m Shuttle Run Test (times) and the change in PIQ, VIQ and PIQ, whereas a positive association (P < 0.01) was observed between the change in the 20-m Shuttle Run Test and the change in PIQ, VIQ and FIQ. However, after the 10m and 20m Shuttle Run Tests were mutually adjusted with covariates to control the confound variables, only the negative association still remained in the changes between the 10m Shuttle Run Test and PIQ, VIQ and FIQ (P < 0.001), respectively. Conclusions: Compared with aerobic fitness, a high level of the agility fitness may be associated more with a high cognition performance (performance of the PIQ, VIQ, and FIQ). Further research is needed to examine the effect of the aerobic and agility fitness related interactions on the cognitive parameters in this population.

3756 Board #203 June 3 8:00 AM - 9:30 AM
Effects of Self-Regulation at Ventilatory Breakpoint on Children's Running Fitness during Physical Education Pedagogical Strategies
Peggy Boey1, Govindasamy Balasekaran, FACSFM,2 Dianna Thor1, Venchasuth Vichaidoswasamy2, Wey Choo Ng3, Jolene Lim1, Nanyang Technological University, Singapore, Singapore. 2Concordia University Chicago, Chicago, IL.
Email: peggy.boey@hotmail.com

Introduction: Exercising at ventilatory breakpoint (Vrp) with the use of Rate of Perceived Exertion (RPE) scale has been used widely in children but its effect on running fitness during Games Concept Approach (GCA) or Skill-based Approach (SA) pedagogical strategies during physical education lesson is unknown. Purpose: To investigate the effects of running fitness of exercising within the range of Vrp (RPE 4-6) via self-regulation by children during GCA and SA pedagogical strategies. Methods: 18 healthy children, 9 boys (age: 10-years old, height: 138 ± 5.94cm, weight: 34.56 ± 7.3kg) and 9 girls (age: 10 ± 0.5 Years old, height: 135 ± 8cm, weight: 33 ± 10.45kg) were recruited. The intervention was conducted in a school for 12 sessions over a period of 6 weeks. Students were split into GCA or SA group. Two sessions were held in a week and each lasted for 45 minutes (5 minutes warm up, 15 minutes GCA or SA activities, 5 minutes break, 15 minutes GCA or SA activities and 5 minutes cool down). RPE and Heart Rate (HR) were recorded during the sessions. Physical activity was kept similar throughout the intervention period. The students ran a 1 km before and after the intervention. Results: Paired-t test showed significant difference between pre and post 1.6km run test for GCA (pre: 693.67 ± 98.03 seconds, post: 614.89 ± 74.18 seconds, p < 0.001) and SA (pre: 817.11 ± 92.98 seconds, post: 712 ± 68.51 seconds, p < 0.0005). Independent-t test showed significant difference between GCA and SA in the 1 km post run (p = 0.011) and HR (p = 0.011). Maximum HR (HRmax) was 129.9 ± 17.23, p < 0.001 but not in RPE (GCA: 4.30 ± 1.16, SA: 3.73 ± 1.72, p = 0.426). Conclusion: Faster timings in the 1.6km post run test results showed improvement in cardiovascular fitness for both pedagogical approaches, which may have been attained with sustained exercise intensity within 60-75% of HRmax and RPE 4-6. A higher improvement from the GCA group suggests GCA is a better pedagogical approach as it is fun for children. Self-regulation of exercise intensity using the OMNI RPE scale during both GCA and SA improved fitness and may be a safe way to exercise as the students are not exercising at high RPE (8-10) which may induce injuries.

3757 Board #204 June 3 8:00 AM - 9:30 AM
Nine-year Longitudinal Study Of Obesity In Japanese Young Children
Kazuo Oguri1, Kosho Kasuga2, Takahiro Nakano2, Tomoko Saka1,1Gifu shokotsu Gakuen University, Gifu, Japan. 2Gifu University, Gifu, Japan. 3Nagoya Gakuin University, Aichi, Japan. (Sponsor: Kiyoji Tanaka, FACSFM)
Email: oguri@gifu.shotoku.ac.jp

PURPOSE: Childhood obesity is increasing worldwide. Tracking, or the tendency for an individual to maintain his/her disease risk factor rank level relative to his/ her peers through time, leading to adolescence and adult obesity is observed even in early childhood. Childhood obesity is associated with increased risk of mortality due to cardiovascular diseases in adulthood, independent of adult weight. Therefore, intervention, and prevention of obesity in young children is important in reducing the risks of obesity and cardiovascular disease in adulthood. However, little is known about the process and tracking of obesity during the years of young childhood because of a lack of longitudinal studies. Consequently, prevention and treatment of obesity in the young childhood has made little progress. The purpose of this study is to investigate the trends in degree and tracking of obesity in young children over nine years.

METHODS: The subjects were 58 young children (22 boys and 36 girls). They were followed up for height, weight, and obesity index from 3 to 11 years old. Obesity index (actual weight - standard weight) / standard weight×100 was calculated using the standard weight for Japanese children, which was determined according to the formula: Male: y = 1.83 × 10x - 2.077 × x + 74.3 Female: y = 2.44 × 10x - 0.157 × x + 77.1 (y: standard weight, x: height). Obesity was defined as having an obesity index of more than +15%. Pearson’s correlation coefficients and χ2 test were used to estimate the effects of age on frequency trend and tracking of obesity. Statistical significance was p<0.05. RESULTS: The prevalence of obesity was 17.2% (n=10) in 3-year-old children and 20.7% (n=12) in the same children at 11-years-old. There were no age-related differences in frequency of obesity. The obesity index at 3-years-old was significantly correlated with that at 4-years-old (r=0.861), 5-years-old (r=0.774), 8-years-old (r=0.626).
CONCLUSIONS: The status of many obese young children is likely to track, but the chance of a decrease in obesity over nine years is not small in young childhood.

Young children’s acquisition of the habit of engaging in physical activity (PA) and having a positive attitude to PA are very important to improve children’s physical fitness. The acquisition of the habit of engaging in PA translates into an increase in the amount of PA. It is also expected that the improvement of physical fitness supports the development of a positive attitude to PA. However, the amount of PA changed according to influence of daily lifestyle and guardians’ consciousness of children’s PA.

**PURPOSE:** The purpose of this study was to examine the relationships between young children’s PA and guardians’ consciousness regarding the same. This study specifically focused on the change in the longitudinal relationships.

**METHODS:** The subjects of this study were 77 young children. Data included their PA, daily lifestyle, and guardians’ consciousness of children’s PA. The amount of PA was measured on all days of a week. The data on 18 items related to daily lifestyle and guardians’ consciousness of children’s PA were collected using a questionnaire. These data were collected when the children were aged 3 and 5 years, using the same protocol. The subjects were divided into 2 groups, the improvement group and maintain or no-improvement group, based on the change in guardians’ consciousness of children’s PA.

The difference in the amount of PA between these groups was examined using an independent t-test. **RESULTS:** The amount of PA increased on weekdays and decreased on weekends from 3 years old to 5 years old. The amount of PA increased significantly in the improvement group based on the consciousness that “playing outside, exercise, and sports are very important” and “the guardian sometimes takes a walk with the child”. Regarding daily lifestyle items, “the frequency of playing using the whole body” was the only item that showed a significant difference in PA. Although statistical significance was not confirmed, PA increased in the improvement group specifically focused on the change in the longitudinal relationships. **CONCLUSIONS:** It was suggested that guardians’ consciousness regarding playing outdoors, and engaging in exercise and sports is very important for children’s PA. Further, it is necessary to control the duration of watching TV/videos and of playing video games in order to increase children’s PA.

***Board #206 June 3 8:00 AM - 9:30 AM***

**Vertical Jump Performance Predicts Selection Of Young Talented Volleyball Players For the Junior National Team**


Email: atsoukos@phed.uoa.gr

(No relationships reported)

**PURPOSE:** To determine whether anthropometric measurements and fitness test results can discriminate between selected and non-selected junior volleyball players.

**METHODS:** Forty three male junior volleyball players (age: 15.0±0.7 yrs) took part in training camp and underwent a selection procedure by coaches of the junior national team. Anthropometric data (body height, body mass and body height with extended arm) and fitness tests scores (countermovement jump (CMJ), block jump, spike jump, 10m sprint and 505 agility test) were obtained. Four expert volleyball coaches of the national team evaluated and graded the players in a scale from 0 to 100 during their participation in a volleyball tournament. The coaches selected the best 23 players on the basis of their score (selected players; n=23, height: 186±5 cm, body mass: 72±10 kg) (non-selected; n=20, height: 188±3 cm, body mass: 69.5±7.5 kg). A linear discriminant function was conducted on the selected and non-selected groups to determine if the anthropometric and fitness test data could predict the coaches’ selection. Anthropometric and fitness test data of the two groups were compared using independent samples t-tests. Statistical significance was set at p<0.05. **RESULTS:** Selected players had higher coaches’ scores compared to the non-selected (83.9±7.2 vs. 65.3±7.5, p<0.05). There were significant differences between selected and non-selected in only in vertical jumps (CMJ: 40.5±6.6 vs. 34.4±3.6, block jump: 43.6±6.9 vs. 36.9±3.5 cm, spike jump: 72±10 vs. 63.4±3.8 cm, all p<0.05), but not in any other anthropometric or fitness test parameter. The multivariate analysis yielded a discriminant function (Wilk’s lambda= 0.69, χ²= 15.12, p=0.001, n=0.62). CMJ was the main test result that highly loaded the discriminant function (r=0.85). Cross validation results showed that selection was correctly predicted in 31 out of the 43 selected athletes (predictive accuracy: 72.1%).

**CONCLUSIONS:** Vertical jumping ability may be used as an important parameter that largely determines success, since it may discriminate between selected and non-selected junior volleyball players.

**Board #207 June 3 8:00 AM - 9:30 AM**

**Comparison Of Cardiorespiratory Fitness Testing Measures In Young Children**

Michael C. Taylor, Jr, Shannon E. Vinci, Justin M. Thomas, Cassandra M. Blase, Rosie K. LaCoe, Jody L. Clasey, FACSM. University of Kentucky, Lexington, KY. (Sponsor: Jody L. Clasey, FACSM)

Email: yewcheo@gmail.com

(No relationships reported)

Laboratory and field methods of assessing cardiorespiratory fitness in young children provides valuable information to assess the effectiveness of intervention strategies designed to improve overall health outcomes. **PURPOSE:** To compare peak oxygen uptake (VO2peak; ml kg⁻¹·min⁻¹) and maximal heart rate (MHR; beats min⁻¹), from the FitnessGram Progressive Aerobic Cardiovascular Endurance Run (PACER) test to a maximal graded exercise test (GXT; treadmill) in 17 (9 boys) young (10-11 yr) old children. In addition, VO2peak from the PACER test was compared (mean ± SD) to the estimated VO2peak using the Youth Sports Sports Test Score Calculator (Topend) equation.

**METHODS:** Subjects completed the PACER and GXT in a randomized order 1 week apart while wearing a heart rate monitor and a portable oxygen analyzer.

**RESULTS:** The PACER test VO2peak (30.4 ± 4.6) was not significantly different from the GXT VO2peak (32.1 ± 5.5) however, MHR GXT (194 ± 8.9) and MHR PACER (173 ± 20.9) were significantly (p< 0.05) different. Treadmill VO2peak (23.8 ± 2.9) was significantly (p< 0.05) lower than the PACER VO2peak. Both the GXT and the Topend VO2peak were significantly (p<0.05) correlated with the PACER (r=0.75 and 0.62, respectively). There was no significant correlation between the PACER and GXT MHR (r=0.40). **CONCLUSIONS:** The PACER elicits a similar VO2peak response, however, the Topend estimation equation should be used with great caution to estimate the cardiorespiratory fitness of young children.

Supported by the University of Kentucky Pediatric Exercise Physiology Laboratory Endowment

**Board #208 June 3 8:00 AM - 9:30 AM**

**Comparison of Health Related Fitness Variables between Male and Female Youths in Singapore**

Yew Cheo Ng1, Govindasamy Balasekaran, FACSM1, Stanely Sai-Chuen Hui, FACSM, 2Vishvasureth V. Govindaswamy,4 Dianna Thor1, Jolene Lim1, Peggy Boey1, Nanyang Technological University, Singapore, Singapore; 2The Chinese University of Hong Kong, Shatin, Hong Kong, 4Concordia University Chicago, Chicago, IL.

Email: yewcheo@gmail.com

(No relationships reported)

Physical fitness encompasses health-related fitness (HRF) variables such as cardiovascular fitness (CF), lumbar and lower limb flexibility (LLLIF), muscular strength (MS) and body fat percentage (BF%). To date, no large study has been conducted on HRF variables among Singaporean youths.

**PURPOSE:** To compare HRF variables between male and female Singaporean youths.

**METHODS:** One thousand four hundred and fifty-six youths (762 males: age: 13.63 ± 1.35 years, height: 158.36 ± 8.75 cm, weight: 53.82 ± 14.39 kg, BF%: 17.64 ± 10.73 %; and 694 females: age: 13.34 ± 1.21 years, height: 160.73 ± 8.68 cm, weight: 48.82 ± 10.9 kg, BF%: 25.74 ± 7.87 %, p<0.005; SRT: Males: 52.97 ± 10.04 cm, Females: 55.53 ± 10.03 cm, p<0.005; HS: Males: 28.35 ± 7.98 kg, Females: 20.77 ± 7.44 kg, p<0.001) from Singapore schools participated in this study. Body Mass Index (BMI) was calculated using standard methods and BF% was measured with a Tanita BC-581 FiiFit Plus Innerscan Scale and Body Composition Monitor. CF, LLLF, and MS were tested using the 15m youth Progressive Aerobic Cardiovascular Endurance Run test (PACER), one-legged sit-and-reach test (SRT), handgrip strength test (HS), and 1-minute sit-up test (SUT) respectively.

**RESULTS:** 76.65% of the males (77.82%, females: 82.56%) were in the healthy BMI range according to the Health Promotion Board of Singapore. Significant differences were found between males and females for all variables (BF %: Males: 17.64 ± 10.73 %, Females: 25.74 ± 7.87 %, p<0.005; SRT: Males: 52.97 ± 10.04 cm, Females: 55.53 ± 10.03 cm, p<0.005; HS: Males: 28.35 ± 7.98 kg, Females: 20.77 ± 7.44 kg, p<0.001; SUT: Males: 43.26 ± 11.29, Females: 33.24 ± 9.16, p<0.005; PACER: Males: 48.79 ± 24.93 stages, Females: 29.41 ± 12.89 stages, p<0.005). Males were significantly stronger than females, whereas females were significantly more flexible than males.

**CONCLUSIONS:** Generally, youths in Singapore are aerobically fit, with a healthy BF% indicating low obesity rates. If these results of HRF variables are maintained throughout their lifetime, there may be low risk of cardiovascular diseases in Singapore in the future.
Injuries caused by falls account for 25% to 40% in morbidity and mortality of children worldwide. Therefore, it is important to identify effective interventions to prevent falls.

**Purpose:** To investigate the effects of backward walking on balance and fall risk in children.

**Methods:** Twenty eight healthy boys (6.2± 0.5 yrs) were randomly assigned into a control group (n=14) and an intervention group (n=14). Boys in the control group participated in a conventional physical activity program, and those in the intervention group received conventional physical activity plus balance training with backward walking. The programs were provided 30 min/day,3 days/week for 12 weeks. Balance at baseline and post-intervention was evaluated by using a dynamic training system BTA-200DP which includes anterior/posterior balance index (API), medial/lateral balance index (MLI), and overall balance index (OBI), as well as kinematic parameters in lower extremities. Independent t-tests were performed for group comparisons.

**Results:** There were no significant differences between the control group and the intervention group in each of the parameters before treatment. After 12 weeks of training, however, compared with the control group, the intervention group had significantly higher support phase time (0.83±0.07 s vs. 0.75±0.06 s, P<0.01), swing time (53.58±11.01 sec vs. 73.77±62.46 sec, P<0.01), step length (53.58±11.01 cm vs. 73.77±62.46 cm, P<0.01), step speed (6.19±1.26 m/s vs. 5.75±1.74 m/s, P<0.01).

**Conclusions:** Backward walking training improved dynamic balance and motion control ability in children.

Supported by the Sports Medicine key laboratory of General Administration of Sport of China/Sports Medicine key laboratory of Sichuan province Foundation .

---

**Introduction:** Limited data exist on the reliability and sensitivity of the 40-yard dash (40-yd) and vertical jump (VJ) tests in youth athletes, which are popular combine assessment tests. **Purpose:** To examine the test-retest reliability for the 40-yd and VJ in youth athletes. **Methods:** Seventy-seven 5-15 year-old athletes (mean height ± SD = 153.0 cm ± 14.9; weight = 45.8 kg ± 16.3) volunteered for the performance measurements. **Results:** Four tests were separated by 24-72 hours. Athletes were divided into three age groups (5 - 9, 10 - 11, and 12 - 15 years old). The 40-yd was assessed in seconds (s) with a digital timing gate, and the VJ was assessed in centimeters (cm) with a vertec, both performed on indoor field turf. Intra-class correlation coefficients (ICC) with corresponding 95% confidence intervals, standard errors of measurement (SEM), coefficients of variation (CV), and minimum detectable changes (MDC) were calculated from the repeated measures analysis of variance (ANOVA) from test 1 to test 2 for all assessments. **Results:** There were systematic decreases in 40-yd times between 2009-2013 in the US and UK. Thirteen REC (mean age: 10.7 ± 3.3 yrs) and EC groups intervened by the sensory integration training, which was based on balance and flexibility and coordination. The intervention lasted for 6 months. Adopting BOLD-fMRI technology. Regional homogeneity was observed. Based on VBM measurement technology, Cerebral gray matter concentration was measured. The dynamic change of regional homogeneity and gray matter concentration of the whole brain for both A and B group has been observed before and after exercise intervene. **Conclusions:** 1.Compared with group A, the abnormality of regional homogeneity occurred in many encephalic regions for group B. After intervene, group B’s regional homogeneity signal changed obviously in SG (P<0.05:P<0.01) and cerebellum(P<0.05:P<0.01).M1(P<0.05:P<0.05),PMA(P<0.05:P<0.05), IPL(P<0.05:P<0.05). 2.3.The gray matter of group B occurred in such encephalic regions as precentral gyrus(BA4), inferior parietal lobule (BA 40), cuneus (BA 18),precuneus (BA7), cingulate gyrus(BA 24, 32) encephalic regions improved.4.Sit and reach (flexibility, P<0.01), walking balance beam (balance ability, P<0.01), cross jump (coordination ability, P<0.05), two feet continuous jump (jump ability, P<0.01) significantly increased for group B 5). The 40-yd was the main encephalic region which resulted in FC children motor function injuries So it was the main intervene target. 2 MI,PI,MA,SM and IPL were the critical regions for FC children to accomplish reorganization and compensation of the brain function in the resting-state. They were the important focus for exercise intervene. 3. The abnormal alternation of ray matter concentration was the main difference among group A and B children’ brain structure. It became the material basis of the abnormality of brain function.4. Sensory integration training and exercise intervene based on the development of balance and coordination ability had the significant effect on improving FC children’s physical ability .

**In the search to find activities youth enjoy and to which they will adhere, rock climbing has become increasingly popular; youth climbing teams/programs exist all over the United States (US) and United Kingdom (UK). The US has over 800 climbing gyms, with almost 400 in the UK. From a health-related fitness perspective, climbing appears to be a good option for decreasing sedentary behavior and keeping youth active.**

**Purpose:** 1) To determine if recreational (REC) and elite/competitive (EC) youth climbers meet US DHSS guidelines for duration of cardiorespiratory activity, but intensity did not consistently meet moderate levels. REC and EC youth climbers differ in estimated energy expenditure (EE), fitness, and body composition. **Methods:** Data were collected between 2009-2013 in the US and UK. Thirteen REC (mean age: 10.7 ± 3.3 yrs) and 18 EC (13.8 ± 2.3 yrs) female climbers were assessed; 17 REC (10.6 ± 1.7 yrs) and 22 EC (15.9 ± 1.9 yrs) males were assessed. Heart rate (HR) monitors were used to collect time of activity (mins), average heart rate (AHR), and peak heart rate (PHR) in beats per minute (bpm) during climbing. Energy expended (kcal) during climbing was estimated from the HR data. Health-related fitness was measured via sit and reach (flexibility), pushups (muscular endurance), and right and left grip strength (muscular strength). Body composition (%fat) was calculated from skinfolds using standardized differences. Differences between groups were tested using ANCOVAs, controlling for age. **Results:** In the RECs and ECs groups, climbers spent between 73 and 85 mins being active during climbing sessions; the groups did not significantly differ. However, female and male EC climbers, respectively, had higher estimated EE (5.4 ± 1.3 and 6.7 ± 1.7 kcals/min) than female and male REC climbers (3.5 ± 1.4 and 4.3 ± 1.4 kcals/min; P<0.05). Female EC climbers were also stronger than female REC climbers in both right and left grip strength (P<0.01). Once adjusted for age, few other differences existed between REC and EC. **Conclusion:** For all groups, AHR ranged between 120-158 bpm, and the exercise intensity approached moderate levels. REC and EC climbers did not differ on most physical or fitness parameters. Additionally, climbers meet US DHSS recommendations for duration of cardiorespiratory activity, but intensity did not consistently meet moderate levels.
CONCLUSIONS: Our study suggests that there are distinctive characteristics pertaining to every factor in the improvements observed in physical fitness in childhood.

Cortisol can negatively affect athletic performance, potentially causing fatigue and inflammation, while high levels of this hormone have been associated with impaired performance in elite athletes. Monitoring hormones in saliva has distinct advantages over doing it in other biological fluids. However, little is known about the salivary cortisol responses in adolescent athletes, particularly after a tennis match. PURPOSE: The purpose of this study was to examine the salivary cortisol responses in elite (finalists of national competition playoffs) adolescent tennis players after a tennis match. METHODS: Thirty-two tennis athletes (20 females: age 14±0.5 yrs, height 165±7 cm, mass 52.2±7.6 kg, BMI 19.0±1.6, and 12 males: 14±0.5 yrs, height 173±10 cm, mass 60.8±8.2 kg, BMI 19.9±1.2) participated in the study. Mean match duration for all participants was 77.5±13.6 min. Unstimulated mixed saliva samples were collected in salivette swabs 15 minutes prior to and 15 minutes after the end of the tennis match. Specifically, the swab was placed in the mouth for one minute, then it was transferred into plastic tubes, centrifuged and the resulted saliva sample was analyzed. Saliva samples were assayed in duplicate using a commercially available ELISA kit for cortisol. Differences between the cortisol levels before and after the match were analyzed using student’s t-test. RESULTS: Salivary cortisol levels were significantly higher after the completion of the tennis match compared to the baseline levels (4479.9±993.8 pg/ml vs. 976.1±143.13 pg/ml; p<0.001). No significant differences were found between the mean cortisol response in males and females (p>0.05). CONCLUSION: The findings of the present study suggest that monitoring cortisol in saliva can be a useful, non-invasive and sensitive method to assess this hormonal response in adolescent athletes after a tennis match. Moreover, in contrast to findings of previous studies in adult tennis players, the increased cortisol levels in the adolescent athletes of this study found to be independent of their gender. The possible negative effects of these cortisol responses on the adolescent elite athlete’s performance needs to be further investigated.

CONCLUSIONS: The participants were 66 three-year-old children (38 boys and 28 girls) attending daycare centers in 2012. For all participants, we made longitudinal observations of physical fitness and physical activity every year in March and November. We evaluated participants’ performance with the standing long jump, upright standing time, sitting trunk flexion, 25 m dash, ball throwing, side-step, and hand grip, calculating changes through the year. Additionally, participants were given an accelerometer for one week, and we evaluated the number of steps on weekdays and weekends. RESULTS: On weekdays, the number of steps by five-year-old boys was significantly higher than for boys of other ages (three-year-old: 12848±2330 steps, four-year-old: 12820±2905 steps, five-year-old: 14274±2871 steps, p<0.05), but for the girls, there were no significant differences among all ages. In all test items except the side-step and the sitting trunk flexion, we found significant improvements in physical fitness scores every year. There were significant improvements in the side-step only in the span of three and four years of age (6.3 ± 0.3, 9.2 ± 0.3 and 9.7 ± 0.3 times/5 sec, p<0.05). No significant changes were observed in sitting trunk flexion. The amount of change between three and four years of age for the 25 m dash and side-step was significantly greater than that between four and five years of age. On the other hand, changes in upright hand standing time, ball throwing, and hand grip were significantly greater between four and five years of age than between three and four years of age. For the amount of change in physical fitness between three and four years of age and between four and five years of age, a negative correlation was observed both for boys in sitting trunk flexion (r = -0.42), ball throwing (r = -0.41), and side-step (r = 0.65), and for girls in sitting trunk flexion (r = -0.73), ball throwing (r = -0.58), and hand grip (r = -0.48).

P URPOSE: To investigate the effects of physical exercise program on sport performance of children speed skaters. METHODS: A total of 52 children speed skaters (aged=9.09±0.27; 69.2% girls) from Ecuador participated in the study. The ALPHIA-Fitness battery was used to analyze the body composition and physical fitness (muscular strength and stamina, speed-agility (4×10-m shuttle run test), and cardiovascular fitness (20-m shuttle run test). Sport performance was measured by the time-marks of the different modalities of the speed skating (combined test, time trial, sprint, and hare test). All participants were evaluated before and after 10-weeks of intervention based on a physical exercise program (90-min/ session, 4-days/week). A mixed factorial ANOVA was used to analyze effects and interactions of the study factors age (<10-yr and >10-yr), sex (boys and girls), and measure moments (baseline and post-intervention) on body composition, physical fitness, and sport performance. RESULTS: Post-intervention compared with baseline, weight was lower in girls <10-yr (MD=0.6±0.30 Kg, p=0.033), fat mass was lower in girls <10-yr and >10-yr (MD=7.37±1.21 Kg, p<0.001; MD=7.71±1.71 Kg, p<0.001), muscle mass was lower in boys >10-yr (MD=0.13±0.06 Kg, p=0.035) and bone mass was higher in girls <10-yr DM=28.0±0.09, p=0.03). The muscular fitness of upper limbs was higher post-intervention compared with baseline in boys <10-yr (DM=1.55±0.57, p=0.010) and girls <10-yr (MD=1.58±0.35, p=0.010). For lower limbs, muscular fitness post-intervention was higher in girls <10-yr (MD=5.20±2.28, p<0.02). The cardiovascular fitness was higher post-intervention in girls <10-yr (MD=0.65±0.20, p<0.002) compared with baseline. The time marks of the combined test post-intervention was lower in boys >10-yr (MD=6.0±2.00, p=0.004, in time
trial the time-mark was lower in boys <10-yr (MD=0.71±1.99, p<0.001), girls <10-yr
(MD=0.52±0.12, p<0.001) and in girls <10-yr (MD=0.38±0.17, p=0.027) compared
with baseline. The time-mark in sprint was lower for girls <10-yr (MD=2.39±1.02, p=0.023) post-intervention. CONCLUSION: A 10-weeks physical exercise intervention improves sport performance in children speed skaters, what are directly related with sex and age.

3770 Board #217 June 3 8:00 AM - 9:30 AM
Reliability of the Neuromuscular Fatigue Threshold Measurement across Maturity Status in Boys
Jeffrey R. Stout, FACSM, Kyle Beyer, David Fukuda, Michael Redd, Kayla Baker, Jay Hoffman, FACSM. University of Central Florida, Orlando, FL.
Email: jeffrey.stout@ucf.edu
(No relationships reported)

Several studies in adult men and women have demonstrated excellent reliability and sensitivity when measuring neuromuscular fatigue threshold (NFT) during an incremental cycle ergometer test. Recently, the ability to estimate NFT in young boys (11±1.1 yrs) was demonstrated, which may provide a new noninvasive method to examine training interventions as well as the effect of maturation on changes in motor unit recruitment strategies. However, to date, no one has examined the reliability of estimating NFT in boys. PURPOSE: To determine the reliability of estimating the onset of neuromuscular fatigue in boys across maturity status. METHODS: Twenty-four boys (age 11 to 17yr) and 12 girls (age 12 to 17yr) participated in two graded exercise test (GXT) on a cycle volunteered separated by at least 48 hours. The NFT was estimated during the GXT by way of the maximal distance method using electromyographic amplitude values from the right vastus lateralis vs power output (W). All participants were separated according to their number of years from peak height velocity (PHV), an estimation of somatic maturity status, into PRE- (<1yr), PERI- (between 1- to 1yr) and POST- (>1yr) PHV groups. Test-retest reliability was calculated for PRE-, PERI-, POST-PHV as well as the combined group. Intraclass correlation coefficient (ICC), standard error of the measurement (SEM) and minimum detectable change (MDC) were calculated using a custom written Excel spreadsheet. RESULTS: Table 1 summarizes the results. Every group independently and combined demonstrated excellent reliability (ICC>0.75) CONCLUSIONS: The current results described in Table 1 are similar to other studies that have reported ICC (0.85 to 0.95), SEM (6W to 14.6W) and MDC (17W to 34W) in adult men. The estimation of NFT, therefore, is reliable in boys regardless of maturity status. Table 1. Summary of the reliability data

<table>
<thead>
<tr>
<th>Group</th>
<th>NFT-Trial 1 (w)</th>
<th>NFT-Trial 2 (w)</th>
<th>ICC</th>
<th>SEM (w)</th>
<th>MDC (w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All (n=24)</td>
<td>161.7±38.0</td>
<td>163.1±39.0</td>
<td>0.96</td>
<td>10.4</td>
<td>23.3</td>
</tr>
<tr>
<td>PRE (11.6±0.7yrs; n=6)</td>
<td>123.7±46.0</td>
<td>122.0±48.2</td>
<td>0.99</td>
<td>6.1</td>
<td>14.5</td>
</tr>
<tr>
<td>PERI (14.2±1.0yrs; n=7)</td>
<td>157.7±18.4</td>
<td>157.1±12.7</td>
<td>0.80</td>
<td>10.0</td>
<td>23.3</td>
</tr>
<tr>
<td>POST (17.0±0.8yrs; n=11)</td>
<td>185.1±24.2</td>
<td>189.4±21.1</td>
<td>0.85</td>
<td>12.5</td>
<td>29.2</td>
</tr>
</tbody>
</table>

3771 Board #218 June 3 8:00 AM - 9:30 AM
Effect Of a Trampoline Training Program In The Power Of Lower Limbs In Children's Gymnasts
Vinicio Sandoval1, Yaira Barranco-Ruiz2, Emilio Villa-González1, Luis Jiménez-Ruiz1, Susana Paz-Viteri1. 1National University of Chimborazo, Riobamba, Ecuador; 2Technical University of Ambato, Ambato, Ecuador.
Email: fsandoval@unach.edu.ec
(No relationships reported)

PURPOSE: The recreational and competitive practice of acrobatic sports, that is, trampoline, is growing rapidly around the world. The trampoline is a gymnastic implement used for learning acrobatic skills in children's gymnastics. However, few studies investigating its application for the development of the power of lower limbs. Thus, the aim of this study was to analyze the effect of an intervention program based on trampoline training on lower limbs in children's gymnasts.

METHODS: A total of 20 gymnasts children (age: 8.00±1.71 years) participated in the study. The power of lower limbs was evaluated before and after an intervention of 8 weeks (3 days/week, 1 h/session) based on training trampoline. Leg power was assessed by Bosco test with the battery Squat Jump (SJ) and Countermovement jump (CJM) by jumping platform (Axon Jump, software 4.0). The jump time, jump height and speed takeoff were evaluated for both batteries jump. The technical implementation of vertical jump in trampoline was evaluated by scoring code of the International Federation of Trampoline (range of score from 0 to 10). The weight, height and the attendance during the intervention were also analyzed. Paired-samples Student t-test was used for comparing the means of the normal variable studies pre and post intervention. Wilcoxon test was used for non-normal variables. Statistical analysis was performed using SPSS (v.22, IBM, USA). The value of significance was p <0.05. RESULTS: Post-intervention, SI significantly increased the flight time (MD=39.2±17.19 ms; p<0.001) and the height jump (MD=4.22±1.88 cm, p<0.001). However, there were no significant differences post-intervention in the variable speed off in SJ. In the CMJ, the time of flight and jump height significantly increased (MD=41.8±5.97 ms; p<0.001; MD=4.88±3.13 cm; p<0.001, respectively). Moreover, the takeoff speed decreased significantly (MD=-0.73±0.93 ms, p<0.01). There were no significant differences in the technical implementation of vertical jump in trampoline. CONCLUSIONS: An 8-weeks of trampoline training improved the power of the lower limbs in gymnasts children increasing the time of flight, height of jump in SJ, and all the variables studied in CMJ.

3772 Board #219 June 3 8:00 AM - 9:30 AM
A Comparison Of Aerobic And Anaerobic Power In High School Individual Sports Athletes
Na-Yun Ahn1, Seoung-Ki Kang2, Kyoo-Jeong Choi1, Chae-Ouk Jang4, Chae-Ouk Jang3, Hyun-Sung An1, Jung-Min Lee3. 1University of Nebraska at Omaha, Omaha, NE; 2Yong-In University, Yong-In, Korea, Republic of; 3Korea Institute of Sport Science, Seoul, Korea, Republic of; 4Incheon National University, Incheon, Korea, Republic of.
Email: cagonooyold@gmail.com
(No relationships reported)

The maximal oxygen consumption (VO2max) and Wingate test are two of the most popular assessments for aerobic and anaerobic power, strongly associated with overall performance in athletes. PURPOSE: To assess differences by sport in VO2max and Wingate peak power weight (WPPW) in middle and high school athletes of five team sports in South Korea. METHODS: The maximal oxygen consumption (ml·kg-1·min-1) and the anaerobic PW (watts·kg) were evaluated in 163 players of swimming, track & field, shooting, golf, and wrestling (Age = 16.9 ± 1.2 years, BMI = 21.7 ± 1.9 kg·m²; mean ±SD). All participants performed a treadmill maximal test using the Bruce protocol and the 30 second Wingate test using Inbar Wingate test protocol. Differences in VO2max and WPPW among the sports were tested through one-way ANOVAs. Post-hoc multiple comparisons were made using Bonferroni tests. Linear associations of VO2max and WPPW with age were also assessed by computing Pearson correlation coefficients. Statistical significance was determined at p<0.05. RESULTS: ANOVA showed statistically significant differences among the sports for WPPW and VO2max, (respectively: F(4, 158) = 3.25, p=0.013; F(4, 158) = 14.91, p < 0.001). In WPPW, multiple comparisons among the means showed three homogeneous subsets; 1) Swimming (13.7 watts kg) and Shooting (13.9 watts kg), 2) Golf (14.7 watts kg) and Track & Field (14.5 watts kg), and 3) Wrestling (16.7 watts kg). In VO2max multiple comparisons among the means also exposed three homogeneous subsets; 1) Track & Field (56.1 ml·kg-1·min-1) and Wrestling (56.9 ml·kg-1·min-1), 2) Golfer (44.6 ml·kg-1·min-1) and Shooting (46.7 ml·kg-1·min-1), and 3) Swimming (51.6 ml·kg-1·min-1), No correlations were found between Age and VO2max and between Age and WPPW (respectively: 0.083, p=0.293; 0.52, p=0.513). CONCLUSIONS: The comparisons between sports that reached statistical significance evidenced differences was observed in several groups on VO2max, 1) Wrestling and Golf (p<0.001), 2) Wrestling and Shooting (p<0.005), 3) Swimming and Golf (p<0.001), 4) Shooting & Track & field (p<0.001), 5) Track & field and Golf (p<0.001). A similar tendency was observed in WPPW, except for the comparison between swimming and Wrestling. Age was poorly correlated to VO2max and WPPW.

3773 Board #220 June 3 8:00 AM - 9:30 AM
Effect of Modified Tai Chi Exercise on Lower Extremity Muscle Strength and Proprioception among Chinese High School Students
Nan Ye1, Wei Sun1, Lulu Gao2. 1Beijing Sports University, Beijing, China; 2Shandong Institute of Sport Science and Technology, Shandong, China. 3Capital University of Physical Education and Sports, Beijing, China. (Sponsor: Yong Tai Wang, FACSM)
Email: okok_ok@qq.com
(No relationships reported)

PURPOSE: The effect of Tai Chi exercise on muscle strength and proprioception among high school students has been well documented. The purpose of this study was to investigate the effect of a modified Tai Chi intervention on lower extremity muscle strength and proprioception among high school students. METHODS: Six male and sixty female healthy high school students aged 16-18 years participated in the Tai Chi intervention. The participants were randomly assigned to four groups with 30 per group: male experimental group (MIG); female experimental group (FEG); male control group (MCG) and female control group (FCG). The experimental groups received the Tai Chi intervention for 20 weeks, 5
days a week and 40 minutes/day. The control groups did not do any exercises. Lower extremity muscle strength (LEMS) of squat, proprioception of ankle inversion (PAI), proprioception of ankle eversion (PAE), proprioception of knee flexion (PKF) and proprioception of knee extension (PKE) were measured at the beginning, at the end of 10th week and at the end of 20th week. The proprioception reflected the sensitivity of joint angle change. One-way ANOVA was used to determine the differences (p<0.05) between four groups, and repeated ANOVA was employed to examine the differences within the groups over the course of the intervention (p<0.05).

**RESULTS:** The results indicated that at the end of 20th week, the MEG had a significantly more increment than MCG did in LEMS (62.12±5.11 vs. 53.15±5.78 kg, p<0.05), and the similar trend was found between the FEG and FCG on LEMS; the MEG had a significantly better proprioception (PAI & PKE) than the MCG did (PAI: 2.93±0.52 vs. 5.81±0.99 deg, p<0.05; PAE: 2.98±0.4 vs 5.79±1.01 deg, p<0.05), and the similar trend was observed between FEG and FCG on PAI and PAE; the MEG also showed a significantly better proprioception (PKF & PKE) than the MEG did (PKF: 0.99±0.49 vs 2.69±0.51 deg, p<0.01; PKE: 0.75±0.51 vs 2.05±0.51 deg, p<0.05), and the similar trend was discovered between the FEG and FCG on PKF and PKE.

**CONCLUSIONS:** The modified Tai Chi exercises may improve high school students’ lower extremity muscle strength and proprioception at the ankle and knee joints. This modified Tai Chi exercise may be used as an optional exercise for high school students in China. Supported by Chinese General Administration of Sport 2013B034
Striated Activator of Rho Signaling (STARS) has recently been proposed as a link to the context and regulation of STARS. This actin-binding protein is localized in the sarcomere and has been previously shown to be upregulated in response to physiological stimuli. The purpose of these studies was to assess whether similar responses are observed in humans that vary in age and obesity status, and specifically with respect to maximal AT production rate (MAPR).

**Methods**

Twelve healthy subjects (gender: 7M/5F; age, 19-50 years; BMI, 19-40 kg/m², body fat, 12-42%) had muscle biopsies performed before and 3 hours after 45 min of cycling at 65% VO₂max. SS and IMF MITO were isolated using standard procedures. MAPR in the isolated mitochondria was measured by firefly-luciferase assay, and using the following substrates: Malate+Pyruvate+Glutamate (MPG), complex I activity, Succinate (complex II activity), malate+palmitoyl carnitine (M+PC; fat substrate). Insulin sensitivity of the subjects was evaluated from an oral glucose tolerance test (i.e., Matsuda index), and body composition was determined by bioelectrical impedance analysis.

**Results**

Insulin sensitivity index ranged from 2.7 to 29.0, and did not correlate with either SS or IMF MAPR (P > 0.05). MAPR increased after exercise in both SS MITO (MPG substrate: 322 ± 38 vs 449 ± 40; nmol ATP/min/mg protein) and IMF MITO (MPG substrate: 259 ± 44 vs 427 ± 61; nmol ATP/min/mg protein) (for both P < 0.05), and the exercise-induced delta change in MAPR was not different between SS MITO and IMF MITO (P > 0.05). Similar results were obtained with the other two substrates. The change in MAPR did not correlate with age, percent body fat, or insulin sensitivity in either SS or IMF MAPR (P > 0.05). However, this change in MAPR with exercise was inversely correlated with the basal MAPR in the SS MITO for both the MPG (Pearson’s r = 0.60, P < 0.05) and Succinate (Pearson’s r = 0.76, P < 0.01) substrates, but not in the M+PC substrate. No such correlations were observed in the IMF MAPR (P > 0.05).

**Conclusions**

Acute aerobic exercise stimulates both SS and IMF MITO MAPR in humans. The improvement in mitochondria function is not lower in relation to older age or obesity status. However, the magnitude of the stimulation of MAPR by exercise is lower in SS MITO exhibiting the greatest MAPR prior to the exercise stimulus.
INTRODUCTION: Obesity among children is highly prevalent and can lead to risk factors for chronic disease in adulthood. The Institute of Medicine and Centers for Disease Control and Prevention have called on schools to play a larger role by increasing children’s physical activity (PA) and nutrition by adopting an overall culture of health.

PURPOSE: This study examined the impact of a socioecological theory driven school-wide nutrition and PA intervention on 5th graders’ central adiposity as a primary predictor of health.

METHODS: Four treatment and two control schools, including 628 (377 treatment, 251 control) 5th grade children participated in the study. Over eight months, children in the treatment schools participated in a comprehensive healthy school transformation program consisting of six components: 1) principal messaging and engagement, 2) classroom nutrition and physical activity lessons, 3) active recess, 4) quality physical education, 5) student leadership teams, and 6) after-school healthy kids clubs. Trained research assistants privately measured height, body weight, and waist circumference. Waist-to-Height Ratio (WHtR) was calculated and used as the measure of obesity. Missingness of data ranged from 0.40% to 15.40%. To reduce parameter estimate bias, as well as improve generalizability and power (Enders, 2010) the full pre-post dataset was imputed (n = 100) at the item level.

RESULTS: An ANCOVA controlled for differences between the treatment and control groups at time one. While controlling for age, gender, and race, the ANCOVA revealed a significant difference in WHtR among treatment and control groups at time two (T2 F2,260,63,083 = 4.59, p < 0.01, R2change = 0.01). There were no significant differences in T2 WHtR based on age F1,260,63,083 = 0.44, p > 0.05, gender F1,260,63,083 = 0.001, p > 0.05, and race F1,260,63,083 = 0.02, p > 0.05. A total of 64% of T2 WHtR variance was accounted for by this model.

CONCLUSIONS: The healthy school intervention led to significant differences in central adiposity (obesity) levels, regardless of age, gender, or race, across the 8-month program between 5th grade children in treatment and non-treatment schools. This supports the ability of school-wide programs to significantly and positively impact student health and chronic disease prevention.

INTRODUCTION:

Methods:

Four treatment and two control schools, including 628 (377 treatment, 251 control) 5th grade children participated in the study. Over eight months, children in the treatment schools participated in a comprehensive school-wide nutrition and PA intervention on 5th graders’ central adiposity as a primary predictor of health. This study examined the impact of a socioecological theory driven school-wide nutrition and PA intervention on 5th graders’ central adiposity as a primary predictor of health.

Methods:

Four treatment and two control schools, including 628 (377 treatment, 251 control) 5th grade children participated in the study. Over eight months, children in the treatment schools participated in a comprehensive healthy school transformation program consisting of six components: 1) principal messaging and engagement, 2) classroom nutrition and physical activity lessons, 3) active recess, 4) quality physical education, 5) student leadership teams, and 6) after-school healthy kids clubs. Trained research assistants privately measured height, body weight, and waist circumference. Waist-to-Height Ratio (WHtR) was calculated and used as the measure of obesity. Missingness of data ranged from 0.40% to 15.40%. To reduce parameter estimate bias, as well as improve generalizability and power (Enders, 2010) the full pre-post dataset was imputed (n = 100) at the item level.

Results:

An ANCOVA controlled for differences between the treatment and control groups at time one. While controlling for age, gender, and race, the ANCOVA revealed a significant difference in WHtR among treatment and control groups at time two (T2 F2,260,63,083 = 4.59, p < 0.01, R2 change = 0.01). There were no significant differences in T2 WHtR based on age F1,260,63,083 = 0.44, p > 0.05, gender F1,260,63,083 = 0.001, p > 0.05, and race F1,260,63,083 = 0.02, p > 0.05. A total of 64% of T2 WHtR variance was accounted for by this model.

Conclusions:

The healthy school intervention led to significant differences in central adiposity (obesity) levels, regardless of age, gender, or race, across the 8-month program between 5th grade children in treatment and non-treatment schools. This supports the ability of school-wide programs to significantly and positively impact student health and chronic disease prevention.
Biomedical Research Centre in Physiopathology of Obesity and Nutrition (CIBERObn)-AgriFood Institute of Aragon (IA2)-Faculty of Health and Sport Sciences (FCSd). Zaragoza, Spain.

No relationships reported.

There is an association between agility and some neuromuscular functions such as perception capability and decision making. The maintenance of agility across the longevity process will increase the functional independence in old people over 65 years.

**PURPOSE:** To test the evolution of agility across the aging process in seniors aged over 65 years. **METHODS:** In this longitudinal study 152 participants (32 men and 120 women; 70.9 ± 4.5 years) were evaluated in Aragon (Spain) within the framework of the elderly EXERNET multi-center study. Agility was measured in all participants using the 8-foot up-and-go test (Senior Fitness Test Battery). The time (seconds) required to get up from a seated position, walk 2.45 m, turn and return to a seated position was recorded. The test was performed twice, with at least one minute of rest between repetitions. The best result was recorded. The measurements were registered in 2008-2009 and eight years later, in 2016-2017. A 2-way repeated measures ANOVA test was used to evaluate the changes in this parameter. The sample was divided into three groups (group 1: ≤74 years old; group 2: 75-84 years old; group 3: ≥ 85 years old) to observe if there were differences between ages. As no sex-by-time interactions were found, analyses were performed including men and women as a whole group.

**RESULTS:** Significant decreases in agility between both measures (5.1±1.9 s vs. 6.4±0.9 s; p<0.001) were found. The average percentage of change during the follow-up was 24%. However, the oldest group showed a larger increase in agility in the 8-year follow-up than the younger groups (12%, 23%, 50%, groups 1, 2 and 3, respectively; p<0.001 between youngest and oldest group).

**CONCLUSION:** Agility constantly decreases across the aging process, being this decrease more pronounced after the age of 85. Physical fitness interventions for elderly people should include aspects of agility training in order to increase functional independence and quality of life.

 Supported by Ministerio de Trabajo y Asuntos Sociales (104/07), University of Zaragoza (UZ 2008-BIO-01), Centro Universitario de la Defensa (UZCUD2016-BIO-01), Ministerio de Economía and Competitiveness (DEP 2016-73089-R) and FEDER founds.

**S816** Vol. 49 No. 5 Supplement

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®

**Purpose:** To examine the relationship between systemic leptin concentration and unique measures of body composition distribution in exercising women with FHA and elderly menstrual cycles.

**Methods:** Leptin and body composition were assessed in exercising women with ovulatory cycles (OV, n=22) and with FHA (AMEN, n=17). Leptin was measured by immunoassay and trunk, leg, android, and gynoid percent fat were measured by DXA with the ratios of trunk/leg (T/Lr%) and android/gynoid (A/G) fat % calculated. Student’s t-tests were used to compare demographics. Pearson and Spearman correlations were used to determine associations between leptin and unique body composition variables.

**Results:** There were no differences between the groups with respect to age, height, weight, BMI, or body fat % (p>0.05). Log leptin was significantly correlated with leg (OV: r=-0.794, p=0.001; AMEN: r=-0.647, p=0.005), trunk (OV: r=0.679, p=0.001; AMEN: r=0.779, p=0.001), and gynoid (OV: r=-0.822, p=0.001; AMEN: r=0.617, p=0.008) fat % in both groups. AMEN log leptin was significantly correlated with T/Lr% (r=-0.490, p=0.046) and A/G% fat (r=-0.735, p=0.001). The regions of strongest association differed between OV and AMEN with a stronger relationship in OV between log leptin and leg and gynoid % fat, whereas in AMEN log leptin was more strongly related to trunk and android % fat.

**Conclusion:** Ratios of T/Lr% and A/G% were significantly related to leptin concentration in AMEN and body fat distribution measures were related in both groups. Regions of body composition reflecting subcutaneous fat have a greater influence on systemic leptin concentration than regions reflecting visceral fat. This indicates that the site distribution of adiposity may be more important for systemic leptin than traditional measures of total fat mass and the association may reflect menstrual status.

3787  Board #234 June 3 9:30 AM - 11:00 AM Dietary Nitrate and Muscle Power with Aging

Andrew R. Coggan, FACSM1, Joshua L. Leibowitz2, Deana Mikhailkova2, Dakkota Thies2, Seth R. Broadstreet1, Suzanne Waaler1, Linda R. Peterson2,1 Indiana University Purdue University Indianapolis, Indianapolis, IN. 2 Washington University School of Medicine, St. Louis, MO.

(No relationships reported)

Reductions in muscle speed and power are highly predictive of disability, institutionalization, and mortality in the elderly. We have recently demonstrated that ingestion of dietary nitrate (NO3-), a source of nitric oxide (NO), increases maximal muscle speed and hence power in healthy younger individuals, in athletes, and especially in patients with heart failure (HF). **PURPOSE** The purpose of the present study was to determine whether dietary NO3- improves muscle contractile function in older people, another population (like HF patients) in whom NO production is reduced. **METHODS** Six healthy older subjects (5 men, 1 woman; age 73±3 y; height 1.74±0.10 m, mass 82.4±12.1 kg) were studied using a randomized, double-blind, placebo-controlled, crossover design. On one occasion, subjects were tested 2 h after ingesting a concentrated beetroot juice (BRJ) supplement containing 11.2 mmol NO3-.

On another, they were tested 2 h after ingesting BRJ depleted of NO3- (placebo). Breath NO was measured periodically, and maximal knee extensor force (torque), speed, and power were assessed using a Biodex 4 isokinetic dynamometer. **RESULTS** Dietary NO3- ingestion increased breath NO levels, a marker of whole-body NO bioavailability, from 27±10 to 51±26 ppb (P<0.05). On average, this resulted in an increase in the maximal velocity of knee extension of 10% (i.e., from 9.81±1.38 to 10.75±2.42 rad/s), but this difference only approached statistical significance (i.e., P<0.13). On the other hand, maximal knee extensor power did not differ between the NO3- and placebo trials (i.e., 4.16±1.18 vs. 4.08±1.22 W/kg; P=0.47). This lack of difference, however, seemed to be due to an inadequate dose of NO3- in some subjects, as the relative increase in maximal power was correlated (i.e., r=0.78; P=0.05) with the amount of NO3- ingested per kilogram of body mass. In keeping with this conclusion, maximal power increased (P<0.05) by 6.4±3.9% in the four subjects who ingested ≥125 mmol/kg of NO3-, but did not improve in the two subjects who ingested less.

**CONCLUSION** Acute dietary NO3- supplementation appears to improve muscle contractile function in healthy elderly individuals, but only when provided at a dose of ≥125 mmol/kg of NO3-.

The optimal dose of dietary NO3- for improving muscle speed and power in older (or younger) persons remains to be determined.

3788  Board #235 June 3 9:30 AM - 11:00 AM Effect Of Dietary Nitrate Supplementation On The Development Of Neuromuscular Fatigue During Whole Body Exercise

Taylor S. Thurston, Thomas J. Hureau, Joshua C. Weavil, Jayson R. Gifford, Hsuan-Yu Wan, David T. La Salle, Russell S. Richardson, Markus Amann. University of Utah, Salt Lake City, UT.

(No relationships reported)

**Purpose:** To investigate the effect of dietary nitrate supplementation on the development of neuromuscular fatigue during whole body exercise. **METHODS:** Women with functional hypothalamic amenorrhea (FHA) present with suppressed systemic leptin, a signal of nutritional status. Unique measures of regional body composition that reflect subcutaneous (leg and gynoid) versus visceral (trunk and android) fat have varying impacts on leptin. The relationship between leptin and these unique measures has not yet been explored in exercising women with varying menstrual status.

ACSM May 30 – June 3, 2017

S816 Vol. 49 No. 5 Supplement

**Board #232** June 3 9:30 AM - 11:00 AM Physical Activity among Navajo Cancer Survivors: A Qualitative Study

Luis Valdez1, Hendrik de Heer1, Anna Schwartz2, Brian Kinslow2, Etta Yazzie1, Mark C. Lee1, Pearl Nez1, Shelby Delgai3, Jennifer W. Bea1, 1University of Arizona, Tucson, AZ. 2Northern Arizona University, Flagstaff, AZ.

(No relationships reported)

**Purpose:** Physical activity (PA) may improve quality of life and survival among cancer survivors, however, little is known about Navajo cancer survivor PA. We sought to understand Navajo cancer survivor PA habits, perceptions, barriers, and preferences. **Methods:** Focus groups (N=5 groups, 19 individuals) and individual interviews (N=13) were conducted by a bilingual facilitator using a standardized guide. Discussions were recorded, transcribed and translated. NVivo software was used to summarize major themes. **Results:** Participants were male (N=13) and female (N=19) Navajo cancer survivors (31% breast, 31% colorectal, or other). Treatment side effects reduced PA during and after treatment. However, most reported at least one mode of current PA (N=24; 71% walking). Work and homestead used to summarize major themes.

Supported by Ministerio de Trabajo y Asuntos Sociales (104/07), University of Zaragoza (UZ 2008-BIO-01), Centro Universitario de la Defensa (UZCUD2016-BIO-01), Ministerio de Economía and Competitiveness (DEP 2016-73089-R) and FEDER founds.

3786  Board #233 June 3 9:30 AM - 11:00 AM The Association Of Leptin With Unique Measures Of Body Composition Distribution In Exercising Women

Kristen J. Koltun, Heather C.M. Allaway, Nancy I. Williams, FACSM, Mary Jane De Souza, FACSM. Penn State University, State College, PA.

(No relationships reported)

Women with functional hypothalamic amenorrhea (FHA) present with suppressed systemic leptin, a signal of nutritional status. Unique measures of regional body composition that reflect subcutaneous (leg and gynoid) versus visceral (trunk and android) fat have varying impacts on leptin. The relationship between leptin and these unique measures has not yet been explored in exercising women with varying menstrual status.
Exercise-induced hyperthermia, dehydration, and fatigue independently impair anaerobic power production, but any synergistic effect on anaerobic power is less known. Further, the efficacy of a personalized hydration plan in maintaining anaerobic power after exercise-heat stress is unclear. 

**Purpose:** To evaluate the effect of exercise-induced hyperthermia, dehydration, and fatigue on anaerobic power during a 20-second repeated countermovement jump performance in maintaining anaerobic power during CMJ after exercise-heat stress. 

**Methods:** Five males (age: 25.4±5.7 y; height: 175.4±8.2 cm; weight: 78.7±16.8 kg; VO2peak: 40.1±6.1 mL·kg⁻¹·min⁻¹) completed 50-90 min of exercise in warm conditions (wet bulb globe temperature: 27.0±2.2°C with (EXP) and without (CON) fluid replacement equal to ~3% of body mass lost). Tgastrointestinal was significantly lower in DNS compared to PLA (-35±2 vs -41±7°C). 

**Conclusion:** Dietary nitrate supplementation attenuates the development of peripheral fatigue during whole body exercise. As the treatment did not alter the cardipulmonary response and bulk locomotor muscle blood flow during cycling exercise, this ergogenic effect is likely determined by intramuscular and/or intracellular mechanisms. Finally, the observed attenuation of peripheral fatigue during endurance exercise might contribute to the documented performance enhancement previously reported with DNS.

**Purpose:** Physical activity is often noted as a risk factor for the development of AMS. We sought to explore the interaction between age and physical activity patterns on the development of AMS in a group of 27 individuals during a gradual ascent of Mt. Kilimanjaro (19,341 ft).

**Methods:** 27 adults (44±15 yrs; 24.5±3.9 BMI; n=11/27 Female) climbed over an 11-day period. Use of acetazolamide and NSAIDs were minimized but remained optional. 

**Results:** Subjects achieved 2.59±0.52% BML in CON and 0.92±0.41% in EXP (p<0.001). Post-exercise Tgastrointestinal (Tgi) and fatigued (scale of 0-10) were measured throughout exercise. Dehydration was determined by percent body mass loss (BML). Peak power (PP), mean peak power (MPP), and heart rate (HR) were measured during CMJ pre- and post-exercise using dual force plates and a HR strap. Dependent t-tests, and post hoc analyses were made using Tukey’s method.

**Conclusion:** Lean body mass and RSMI increased in all athletes. Previous work using isotopic methodologies during acute exercise showed that reacquisition into protein increased during exercise. Future studies are planned with this cohort that will utilize isotopic methodology to measure changes in protein synthesis and skeletal muscle for evaluating the impact of cold exposure on physiological resilience.
The response of plasma hypoxia-inducible factor-1alpha (HIF-1α) increases in response to hypoxia and regulates erythropoietin (EPO) and vascular endothelial growth factor (VEGF) expression. However, the response of extracellular HIF-1α (i.e., plasma HIF-1α) to acute hypobaric hypoxia (HH) exposure is unclear.

**Purpose:** To determine whether plasma HIF-1α and downstream targets such as serum EPO and plasma VEGF increase from sea level (SL) to acute HH. **Methods:** Venous blood samples from 14 SL residents (M = 10, F = 4, age = 23 ± 7 years, ht = 170 ± 10 cm, wt = 74 ± 12 kg, 46 ± 6 ml/kg/min; mean ± SD) were collected after ~20 min of seated rest at SL (~50 m, Natick, MA) and after ~19 hrs of exposure to HH (4300 m, Pikes Peak, CO). Plasma HIF-1α, serum EPO, and plasma VEGF were measured via ELISA assay. **Results:** From SL to HH, plasma HIF-1α (SL: 287 ± 108 pg/mL vs HH: 264 ± 128 pg/mL, p = 0.51) and plasma VEGF (SL: 74 ± 55 pg/mL vs HH: 100 ± 87 pg/mL, p = 0.23) did not change. From SL to HH, serum EPO increased (SL: 14 ± 15 mIU/mL vs HH: 62 ± 42 mIU/mL, p < 0.0001). **Conclusion:** During the first ~19 hrs of HH exposure plasma HIF-1α and plasma VEGF do not increase, while serum EPO does increase. While we were the first to measure plasma HIF-1α during an acute exposure to HH, our results indicate that extracellular HIF-1α may not represent intracellular HIF-1α response to HH. **Disclaimer:** Author’s views are not official U.S. Army or DoD policy.

---

**S818 Vol. 49 No. 5 Supplement**

**3792 Board #239 June 3 9:30 AM - 11:00 AM**

**The Response Of Plasma Hypoxia-inducible Factor-1 Alpha, Serum Erythropoietin And Plasma Vascular Endothelial Growth Factor During Acute Exposure To Altitude (4300 M)**

Roy Salgado, Beth Beidleman. United States Army Research Institute of Environmental Medicine, Natick, MA. (No relationships reported)

**3794 Board #241 June 3 9:30 AM - 11:00 AM**

**Encouraging Exercise In The Palmetto State: A Descriptive Analysis Of Hitt And Its’ Associated Injuries**

Brian J. Schutzbach1, William N. Gasque2, Allyson L. Hale1, Joseph A. Ewing3, Michael W. Wiederman1, Andrew W. Albano1. 1Greenville Health System, Greenville, SC. 2University of South Carolina School of Medicine-Greenville, Greenville, SC. (No relationships reported)

The Exercise Is Medicine® initiative has increased the focus on exercise and its impact on health and wellness. High intensity interval training (HIIT) is an exercise modality that is reported to be gaining popularity. Because physicians, and other medical professionals, are often tasked with encouraging exercise as part of a patient’s medical therapy, it is important to understand the risks associated with HIIT so as to provide the best guidance and care possible. **Purpose:** The aim of this study was to describe the HIIT population and their HIIT-related injuries, including incidence, location, duration, and management. **Methods:** A multi-item survey was distributed to various facilities throughout the state of South Carolina promoting and instructing HIIT. Survey results were analyzed using students t-test and Chi-squared tests. **Results:** Sixty-six people met the inclusion criterion of participation in HIIT. The majority were male (56%), in their mid-thirties (33.9±8.1), with a mean BMI of 25.6 (±4.1). Most reported participation in a beginner’s HIIT training program (71%), prior weight lifting training (64%), and some level of previous athletic experience (91%). From these 66 individuals, 70% said they do HIIT 2–3 times per week, and approximately 44% (n=29) reported at least one HIIT-related injury. Fifty-three total injuries were reported; the most common being shoulder (19%) and lower back (19%). Approximately 38% sustained their injury within 6 months of starting HIIT and 55% within the first year. Most people (62%) self-diagnosed their injury, and 52% did not seek professional treatment. The majority of those injured said they recovered from their injuries within 2 months (83%) following rest (3%) and/or a decrease in exercise intensity (41%). **Conclusions:** Despite introductory training programs and prior athletic and weight lifting experience, approximately half of HIIT participants experienced a HIIT-related injury. Individuals with HIIT-related injuries are most likely to self-diagnose, and/or self-adjust their exercise program prior to resuming HIIT.
Impact of Attention Deficit Hyperactivity Disorder on Athletes

Timothy D. Dekker. Mayo Clinic, Jacksonville, FL. (No relationships reported)

Purpose: This systematic review was done to try to uncover Attention deficit hyperactivity disorder’s (ADHD) impact on athletics, treatment effects on sports participation, basis for regulation by sports organizations, and approaches to conditions occurring with ADHD.

Methods: A systematic review was done using specific keywords, gathering articles from MEDLINE, Embase, PsycINFO, Cochrane Database of Systemic Reviews and Ovid Interface.

Results: ADHD is a common neurobehavioral disorder, reported as affecting 11% of children, with symptoms persisting into adulthood in up to 15% of individuals. ADHD has been shown to have both beneficial and detrimental effects on athletic performance. Advantages include: Impulsivity, increased aggressiveness, improved pain tolerance, and decreased fatigue. Conversely, children with ADHD were found to have lower total motor composite (t=−9.32, p<.001) with Bruininks-Oseretsky Motor Performance Test. Sports and exercise have numerous positive effects on those with ADHD, for example, an increase in Dupaul ADHD rating scores of 4.53 (p<.04) were found after a 6 week aerobics program. Stimulants combined with behavioral techniques are known to be superior to behavioral management alone. Return to play is also different in athletes with pre-existing ADHD, especially with concussions due to more persistent memory issues, decreased focus and brain fog after injury. Sport organizations regulate stimulants due to presumed advantages and side effects: Increased thermogenic effects of stimulants, MI, CVA, psychosis, seizures, and even death have been recorded.

Conclusions: Athletes with ADHD should be recognized and managed appropriately. Sports performance can be positively and negatively affected by ADHD, which individual athletes and organizations need to consider. More research is needed to determine how ADHD and medications used affect specific sports.

MINUTE POROSITY OF 3D PRINTED SPLINTS/CASTS MAY ALLOW WATER ENTRY

Diana Hall1, Frank Roquemore1, Jay Townsend2, Bill Bentley3, David Atkins4, Lex Schultheis3. ‘ActivArmor: Pueblo, CO. ‘Department of Corrections, State of Colorado, Canon City, CO. ‘Robert E. Fischell Medical Device Institute, College Park, MD. ‘Dept. of Aerospace Engineering, Clarke School of Engineering, University of Maryland, College Park, MD.

Reported Relationships: D. Hall; Intellectual Property; Patent holder for ActivArmor technology. Ownership Interest (Stocks, Bonds); Owner of ActivArmor:

Outcome: This is a systematic review of medical device regulations for 3D printed equipment for athletes. The following conclusions are drawn:

- A total of 364 surveys were completed. Males represented 58% of respondents and organizations need to consider. More research is needed to determine how ADHD and medications used affect specific sports.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.

- Exercise rises muscle serum parameters and thus their interpretation could be helpful in monitoring recovery from acute overload or from muscular trauma. Our understanding of these relationships among Special Operations students is limited.
Resistance Training Versus General Exercise In Multidisciplinary Rehabilitation Of Low Back Pain: A Randomized Trial
vegard M. Iversen, Ottar Vasseljen, Paul Jarle Mork, Oyvind Salvesen, Marius S. Finnland. Norwegian University of Science and Technology, Trondheim, Norway.

Purpose: Chronic low back pain (CLBP) is commonly managed through multidisciplinary rehabilitation (MDR). We aimed to assess if the effectiveness of MDR could be improved by replacing general exercise (GE) with progressive resistance training (PRT) with high intensity using elastic bands. METHODS: Consenting adults (n=99) with moderate to severe non-specific CLBP were randomized to an intervention (PRT) or a comparative group (GE). Both groups received 3-weeks MDR with either GE or PRT (squats, stiff-legged deadlifts, flies, unilateral rows, reversed flies, lateral shoulder raises and lateral pulldown performed 3 times per week with resistance varying from 15-20 to 8-10 repetitions). Both groups were instructed to continue their respective exercise program for 9 weeks after completing the MDR, in which time participants were offered up to three supervised booster sessions. Researchers were blinded during data collection and analyses. The difference in change between groups at 12 weeks in pain-related disability (OWSDI disability index; ODI: 0-100) was the primary outcome. Secondary outcomes were pain (numerical pain rating scale), limitations in important activities (patient-specific functioning scale; PSFS: 0-10), health related quality of life, work ability, global perceived change, fear-avoidance beliefs and back-extension strength were secondary outcomes. RESULTS: Baseline data were missing for 25 patients due to early dropouts. Thus, data from 74 participants (mean age: 45 years, 57% women, mean ODI: 30.4) were obtained at baseline and included in the analyses. Forty-six persons participated at the 12-week follow-up test. There were no differences in change in ODI score between groups at 12 weeks (mean difference 1.6, 95% CI: -3.97.0, p=0.570, in favor of GE). The improvement in PSFS was larger in the GE group than in the PRT group (mean difference 1.4, 95% CI: 0.1-2.7, p=0.003). No significant differences between the groups were observed for the other secondary outcomes (p<0.11). CONCLUSIONS: This study provided no evidence in support of replacing GE with PRT in MDR for CLBP. In fact, GE might be slightly more beneficial than PRT in reducing limitations in important activities.

Characterization And Functional Capacity (SPPB) Of Adults Over The Age Of Life Free From Mexico
Nancy Cristina Banda Sauceda, Ricardo López García, Gerardo Garza Sepúlveda, Alma Rosa Lidia Lozano González, Raymundo Ruiz Rivera, Esteban Picazzo Palencia, FACSM, Rosa María Cruz Castruita. Universidad Autónoma de Nuevo León, Monterrey, Mexico.

Purpose: To determine the features and functionality of the free-living older adults of 60 years and over in the metropolitan area of Nuevo León. METHODS: In this study, descriptive and cross-sectional study of 367 adults aged 60 years and over different club houses in the metropolitan area of Nuevo León, was applied an anamnesis, anthropometric measurements such as weight and height and the battery short of physical activity (SPPB) that consists in the realization of three tests of balance (feet together, semitandem and tandem), speed (4 meters, up and sit in a chair five times, the battery allows you to assess the risk of disability, with a total score that ranges between 0 and 12, a score below 10 can determine a high risk of disability. For the statistical analysis we used the SPSS version 21.0, using descriptive statistics mean, median and standard deviation. RESULTS: In older adults the average age is 72 ± 7.28 years of age, with an average schooling of 5 years, 98% with cognitive ability to answer your interviews, 50.8% are widowed, 55.7% is devoted to the home, 24.2% are +7.28 years of age, with an average schooling of 5 years, 98% with cognitive ability to perform the total ODI score was 30.4 ± 13.65. CONCLUSIONS: ODI scores from 74 participants (mean age: 45 years, 57% women, mean ODI: 30.4) were obtained at baseline and included in the analyses. Forty-six persons participated at the 12-week follow-up test. There were no differences in change in ODI score between groups at 12 weeks (mean difference 1.6, 95% CI: -3.97.0, p=0.570, in favor of GE). The improvement in PSFS was larger in the GE group than in the PRT group (mean difference 1.4, 95% CI: 0.1-2.7, p=0.003). No significant differences between the groups were observed for the other secondary outcomes (p<0.11). CONCLUSIONS: This study provided no evidence in support of replacing GE with PRT in MDR for CLBP. In fact, GE might be slightly more beneficial than PRT in reducing limitations in important activities.

Effect Of Stretching On Intracerebral Oxygen Dynamics And Calculation Capability
Wakako Tsuchida1, Shigeyuki Suzuki2, Shingo Matsuoi3, Sena Wakano1, Mayu Asakawa4, Taizan Fukuya5, Eiji Yamanaka6, Yuji Asai1. 1Nihon Fukushi University, Handa, Aichi, Japan. 2Nagoya University, Nagoya, Aichi, Japan.

Purpose: We examined the effect of stretching on cognitive function using a simple calculation task. We also measured brain oxygenation kinetics using near-infrared spectroscopy (NIRS). METHODS: Participants were 16 healthy students (8 males, 8 females, average age: 20.3 ± 1.4 years). Participants sat on an isokinetic exercise machine and kept their knees joints at the maximum extension position (hamstring stretch) for 5 minutes (Primus RS, BTE). We used NIRS to analyze brain oxygenation kinetics while participants completed a simple calculation task before, during, and after stretching. We measured oxygenated hemoglobin (oxy-Hb) and deoxygenated hemoglobin (deoxy - Hb) in the bilateral prefrontal cortex, motor area, and somatosensory area, as well as the ratio of oxygenated hemoglobin contained in tissue (TOI). RESULTS: We observed a significant increase in oxy-Hb in the motor and somatosensory areas during stretching compared with measured values at rest (p<0.05). Although we found no significant differences in the rate of correct answers before vs. after stretching, participants took less time to solve the computational task after vs. before stretching (p<0.05). We found no significant differences in Δoxy-Hb, Δdeoxy-Hb, or AT0I in the prefrontal cortex, motor area, or somatosensory area before vs. after stretching. CONCLUSIONS: Stretching affects brain oxygenation dynamics. Specifically, oxy-Hb increased during stretching in the motor and somatosensory areas. The computation time was shorter after stretching, but stretching did not influence brain oxygenation dynamics during the calculation task. Future work will benefit from the use of neuroimaging methods to investigate the effects of stretching on brain function.
cognitively normal counterparts. This suggests that aerobic exercise training may be a feasible method for combating further cognitive decline in older adults. Funded by National Institutes of Health.

3804 Board #251 June 3 9:30 AM - 11:00 AM Recent Illness but Not Prior Heat Injury Affects the Rate of Cooling Following Exertional Heat Stroke Michelle A. King, Matthew Ward, Bruce Adams, Lisa Leon. United States Army Research Institute of Environmental Medicine, Natick, MA. (No relationships reported)

PURPOSE: Anecdotal evidence suggests that certain risk factors may impact the severity of exertional heat injury/stroke (EHI/S) and alter the rates of cooling during treatment.

METHODS: In order to examine this hypothesis we performed a clinical records review of heat casualty reports for 215 cases of EHI/S at Marine Corps Base Quantico, VA from 2012-2015. Documentation included information pertaining to the EHI/S episode and treatment. Treatment for EHI/S consisted of a standardized cooling protocol where individuals were continuously doused with ice water and actively rubbed with ice bags, while receiving a normal saline solution of IV fluid.

RESULTS: The majority of patients that underwent the emergent cooling protocol were male, 23 years of age, and had a body mass index (BMI) of 24.5 kg/m². Patients presented on their 28th day of training with a maximal core temperature (Tc max) of 104°F, pulse rate of 111 beats per minute, blood pressure of 122/63 mmHg, and a respiration rate of 22 breaths per minute. Rates of cooling: Individuals with a recent or concurrent illness were cooled faster than those without (P<0.016), even though this group presented with a higher core temperature (Tc) at the initiation of cooling (P<0.034). Duration of cooling (minutes) was not different between these two groups (P=0.0945). Previous EHI/S had no effect on the rate of cooling (P=0.413). Further, BMI did not affect the rate of cooling nor was it predictive of Tc max. Indicators of severity: Upon admission blood glucose and pulse rate appeared to be indicators of EHI/S severity. Higher Tc max was positively correlated with both higher blood glucose values (P=0.027, r = 0.195) and pulse rates (P<0.013, r = 0.176). In this population, restrictions on sleep, diet, or water intake did not affect Tc max. Return to duty: Tc max did not correlate with the number of rest days prescribed following injury (P=0.119). Further, those experiencing prior EHI/S or recent illness were prescribed the same amount of rest days as those without (P<0.103 and P=0.156 respectively).

CONCLUSIONS: Contrary to our hypothesis, individuals with recent illness cooled faster, while prior heat injury had no effect on the rate of cooling. Author view not official US Army or DoD policy.

G-37 Free Communication/Poster - Sports Medicine Fellow Research Abstracts

3805 Board #252 June 3 9:30 AM - 11:00 AM Do Female Gymnasts Experience Catch-up Growth During Periods of Rest Following Injury? Katherine V. Yao, Dai Sugimoto, Nathalie Slick, Cynthia Stein. Boston Children’s Hospital, Boston, MA. (No relationships reported)

PURPOSE: Several studies report delayed growth and hormonal changes during high intensity training in gymnasts, yet no studies specifically investigate the growth rate of gymnasts during periods of rest. The purpose of this investigation is to determine if an increased growth rate, or “catch-up growth”, exists in high level female gymnasts during periods of rest following injury.

METHODS: A 5-year retrospective chart review was conducted at a large pediatric hospital. A search of medical records (1/1/2010-12/31/2015) identified female gymnasts 10-16 years old, training ≥10 hours/week or Junior Olympic level ≥7 who suffered an anterior cruciate ligament (ACL) tear requiring at least 6 months (n=23) was compared to female non-gymnast athletes with ACL injury and similar competitive level (Non-gym-ACL, n=29) and high level gymnasts training with minor injuries (Minim, n=27). One-way ANOVA with post-hoc correction was used to analyze the rate of change in height, weight, and BMI of the 3 groups.

RESULTS: There were no differences in mean ages (Gym-ACL: 14.8 ± 2.8; Non-gym-ACL: 14.6 ± 2.7; Gym-min: 13.9 ± 2.0), nor significant differences in 6m changes in weight or BMI among the 3 groups. However, there was significant differences in the 6m height change among the 3 groups (p=0.024). A significantly greater height increase was observed in Gym-ACL (+1.40 ± 2.16cm) compared to Non-gym-ACL (+0.02 ± 1.72cm) groups (p=0.047), but no significant differences were found between the Gym-min (+1.32 ± 2.27cm) and Non-gym-ACL (p=0.051) groups.

CONCLUSIONS: The 6m growth rate of high level female gymnasts during periods of rest is greater than non-gymnast athletes, suggesting that catch-up growth does occur following periods of rest for highly active gymnasts. This evidence may help us better understand how growth is affected by training load and timing and help develop future training protocols and growth predictions.

3806 Board #253 June 3 9:30 AM - 11:00 AM Helmet Design And Hits To The Head: Analysis Of NFL Tackling 1951-present Kevin N. Blythe1, David Wang2, Taylor Polk1, Douglass Johnson1, Jordan Murphy1, Brian McCormick1, Alex Webb2, Andrew Horn1, David Milzman1. MedStar Georgetown University Hospital, Washington, DC, 1Georgetown University School of Medicine, Washington, DC. (No relationships reported)

PURPOSE: Many anecdotal statements attribute NFL helmet design to changing tackling styles and thus, an increase of helmet to helmet hits and subsequent concussive injury. There are no current studies reviewing changes of tackling style over time in the NFL. This study will examine whether the advent of new helmet technology has led to an increase in the number of tackles involving the helmet in the NFL.

METHODS: In this preliminary study, investigators were trained in the NFL definition of a “hit,” and 2-3 investigators independently reviewed the TV broadcast or game film of each championship game from seven different decades, (1951-2016). Hits were classified based on the involvement of the helmet of both the offensive player and defensive player. A point-system was developed and mean values were collected for each game and open access sources were used to confirm number of head, neck injuries. Additionally, players’ behavior in the aftermath of a helmet hit was determined as “concussive” as defined by a neurotrauma trained emergency physician based on delay in getting up and steadiness of gait. Results: Helmet to helmet hits occurred on just 1.28% of hits in the 50s compared to 6.97% of hits in the 1970s, a 5.44 fold increase. Such hits have increased every decade, with statistically significant (p<0.05, t-test) after the 1960s and again after the 1980s. These changes correspond with the introduction of energy absorbing plastic helmets in the 1970s and the introduction of molded polycarbonate helmets in the late 1980s. These two helmet changes represent the most significant helmet technology changes in the time period studied. Overall hits involving the helmet of at least one player have increased at a similar rate, indicating a more dangerous tackling style. Additionally, the number of players that were judged to exhibit concussive symptoms after a hit significantly (p<0.05, t-test) increased after the 1980s.

CONCLUSIONS: Helmet-helmet hits have had the greatest jumps in frequency corresponding with helmet innovation in the NFL, with the largest jump occurring in the last three decades. That newer helmets with better technology has potentially led to more dangerous hits suggests that helmets designed to withstand greater impact may actually be a detriment to player safety.
cholesterol <200, HDL <40, LDL <150, TG <150, p=0.12-0.94). Lastly, linear regression models showed no correlation between CTHRC1 and lipid concentrations (p=0.21-0.93).

Conclusion: This study demonstrates no association between CTHRC1 and lipid concentrations in a sample of relatively healthy adult humans. Further research is required to better understand the temporal variation of CTHRC1 levels in vivo and thus, better time the collection of samples from subjects. Furthermore, a broader range of body composition among future subjects will help to better generalize data to the adult population.

Purpose: Standard asthma therapies must be judiciously in adolescent athletes to minimize side effects and costs. Current diagnostic criteria for EIB, ≥10% decline in forced expiratory volume in the 1st second (FEV1) after exercise challenge, does not predict significant response to bronchodilator after challenge. This suggests some patients diagnosed with EIB may not benefit from standard treatment. We sought to determine if the ratio of forced vital capacity (FVC) to FEV1 could be used as a clinical indicator to help guide management decisions in adolescent patients presenting with EIB.

Methods: Using retrospective chart review, we examined valid EIB-protocol challenges performed by patients 13-18 years old in our Pulmonary Function Test lab between 6/1/11 and 3/30/16. We collected demographic data including age, height, weight, body mass index (BMI), gender, and ethnicity. We calculated maximal % decline in FEV1 and % decline in FEV1/FVC for all tests in which patients received albuterol (n=139). We examined % change and volume increase in FEV1 after bronchodilator. We used the standard definition of bronchodilator reversibility, ≥12% and/or 0.2L increase in FEV1, to signify a positive response. We used two-sample t-tests and logistic regression to compare patients who did and did not exhibit bronchodilator reversibility.

Results: 84/139 (60.4%) patients met current diagnostic criteria for EIB, The mean % decline in FEV1/FVC was 9.6% (SD=9.0). Within this group, 55/84 (65.5%) displayed a positive bronchodilator response. None of the demographics we looked at were required to better understand the temporal variation of CTHRC1 levels in vivo and thus, better time the collection of samples from subjects. Furthermore, a broader range of body composition among future subjects will help to better generalize data to the adult population.

PURPOSE: Several modifiable factors are linked to athletic injury including disordered eating, sleep, team climate, anxiety and life stressors. We hypothesize that characterization of psychosocial factors could help identify at-risk athletes and areas for possible intervention.

METHODS: High school student-athletes aged 14-18 participating in school sponsored athletics were provided with a 31-question survey including perception of athletic pressures, diet and weight, family and personal relationships, academics and sleep. 156 athletes were surveyed with 144 athletes participating (92% response rate). Each athlete indicated whether they had sustained a musculoskeletal injury or concussion requiring time away from sport. Athletes who reported musculoskeletal injury were more likely to identify pressure to perform well in their sport and plans to pursue collegiate athletics. Self-identified change in school grades was protective (53% vs 71%, p<0.03), with decreased injury in these students. Additionally, feeling tired upon waking (91 vs 77%, p<0.02) and occupation with weight (30 v 15%, p<0.04) correlated with increased injury. This association between injury and occupation with weight was enhanced among female athletes. None of the significant associations were seen among athletes reporting concussion.

CONCLUSIONS: In a cohort of high school athletes screened for psychosocial and behavioral determinants, a more competitive athletic environment, fatigue and preoccupation with weight were found to increase the risk of musculoskeletal injury. The significant survey responses support the hypothesis that psychosocial factors contribute to risk of injury and further studies are warranted.

Purpose: Bone stress injuries (BSIs) are a common overuse injury in running athletes. The purpose of this study is to determine whether a nutrition intervention targeting at risk athletes using the Female Athlete Triad Cumulative Risk Assessment (TRIAD R-A) would result in changes in bone health and reduce incidence of BSIs. Methods and Study Design: One hundred fifty-five (76 male, 69 female) middle and long-distance runners at two NCAA Division I programs were followed prospectively over four years. The TRIAD R-A was used to identify at risk athletes pre-season followed by nutrition interventions based on these assessments. Running-related BSIs were diagnosed by a physician and confirmed radiographically. Results: A subset of twelve returning female athletes with consecutive DXA scans were evaluated at the same program. Five females had >2% improvement in L1-L4 DXA BMD (two females with <5%). Of this same subset over the same year, the number of females identified as high to moderate risk for amenorrheoa/oligomenorrhea decreased from nine to six and number of BSIs decreased from four (three high risk) to three (one high risk).

Conclusions: This is the first prospective outcome study using the TRIAD R-A and a nutrition intervention tailored to an athlete’s risk. Based on these preliminary
results, use of the TRIAD R-A in conjunction with a nutrition intervention focused on optimizing energy availability led to improvements in bone health and reductions in risk of BSI. Further research is needed to evaluate the significance and impact of these trends. Acknowledgements: The authors would like to thank AMSSM and PAC-12 for helping fund this study.

3812  Board #259  June 3 9:30 AM - 11:00 AM
Improving Prp Production In An Outpatient Sports Medicine Office: A QI Project
William L. Patterson Jr., William Dexter, FACSM, Christina Holt, Amy Haskins. Maine Medical Center, Portland, ME. (No relationships reported)

PURPOSE: Platelet rich plasma (PRP) is a clinically current topic in sports medicine and orthopedics, and is used for various orthopedic pathologies. Prior studies show that commercial kits consistently yield platelet concentrations of approximately 1,000-10^3 platelets/µL, but are prohibitively expensive for most patients. Studies comparing these “kits” vs in-office “do-it-yourself” protocols have found that a desktop centrifuge and phlebotomy tubes can produce similar elevated platelet concentrations. Our office had been using a protocol that had not yet been internally validated. We desired to identify and assess an optimal in office, high quality, accessible protocol to make PRP.

METHODS: We compared whole blood and preparations from 3 separate “in-house” protocols to isolate PRP and quantified amount of platelets in each sample. For protocol 1 (our previous in-office standard protocol) we drew 16.2ml of blood, spun this at 1318g for 10 minutes, and manually removed the buffy coat layer for analysis. For protocol 2 we drew 16.2ml of blood, spun this at 900g for 5 minutes, and manually removed the entire supernatant layer including the buffy coat, spun this solution at 1500g’s for 15 minutes, discarded the top 2/3rd of the supernatant, resuspended the remaining sample, and sent these samples for analysis. We used T tests to compare means between each method and in comparison to whole blood.

RESULTS: 31 specimens were obtained and put through the 3 protocols above. Whole blood (WB) yielded a mean concentration of 257.1x10^3 platelets/µL (95%CI 240-274). Protocol 1 yielded a mean of 688.4x10^3 platelets/µL (95%CI 581-714) (2.5x WB concentration). Protocol 2 yielded a mean of 464.4x10^3 platelets/µL (95%CI 424-504) (1.8x WB concentration). Protocol 3 yielded a mean of 974.1x10^3 platelets/µL (95%CI 850-1097) (3.8x WB concentration). All pairwise comparisons of means were highly statistically significant (p<0.0001).

CONCLUSIONS: Highly concentrated platelet rich plasma (PRP) can be consistently obtained using common in-office centrifuges and phlebotomy tubes following protocols, comparable to concentration data previously reported from using professional kits.

3813  Board #260  June 3 9:30 AM - 11:00 AM
Utilization of Emergency Department Services: A Comparison of High Schools With and Without Athletic Trainers
Christine Bender, William W. Dexter, FACSM, Amy Haskins, Christina Holt. Maine Medical Center, Portland, ME. (Sponsor: William W. Dexter, FACSM) (No relationships reported)

Purpose: The primary aim of this study is to compare utilization of ED services in Maine between students in areas of public high schools with certified athletic trainers (AT) and those without by looking at three common athletic injuries in the high school population of teens aged 14-18.

Methods: Using 2013 Maine All Claims data, we obtained aggregated counts of ED visits categorized by zip code for three injuries (ankle sprain, concussion, and fracture) based on their respective diagnosis codes. Each zip code was attributed to a high school in Maine. Each high school was contacted directly to determine AT status, number of students, number of athletes, and types of sports. We then calculated the rates of each of the three types of ED visits in schools with and without AT. Chi-square tests were used to compare the ED utilization for each type of injury among high schools with and without ATs.

Results: The 2013 Maine All Claims Data includes injury data for 346 Maine zip codes. There were a total of 1114 fractures, 826 sprains, and 538 concussions. Preliminary results were obtained from 185 (53.5%) zip codes, representing a total of 620 (55.6%) fractures, 427 (51.7%) sprains, and 305 (56.7%) concussions. These 185 zip codes represent 31992 students, 56.2% of the estimated 56,924 public high school student population in 2013-2014. In HS w/ AT, the cumulative student population was 28270 and there were 536 fractures, 339 ankle sprains, and 266 concussions. In HS w/o AT the cumulative student population was 3722 and there were 84 fractures, 88 ankle sprains, and 39 concussions. Rates were calculated by injury type per student population for schools w/ and w/o AT and reported per 100 person-time units. Fractures had rates of 1.90 and 2.26 for HS w/ AT and HS w/o AT, respectively, with a p value of 0.1423. Sprains had rates of 1.20 and 2.37 for HS w/ AT and HS w/o AT, respectively, with a p value of <0.0001. Concussions had rates of 0.94 and 1.05 for HS w/ AT and HS w/o AT, respectively, with a p value of 0.5223.

Conclusion: Although data analysis is not yet complete, our preliminary investigation reveals a significant difference in the rates of utilization of ED services for sprains when comparing schools with and without ATs. There was no statistically significant difference found for similar comparisons of fractures and concussions.
Numbers listed next to each individual represent the presentation number associated with each author. Bold numbers represent primary author.
List of numbers next to each individual represent the presentation number associated with the presentation. Bold numbers represent primary author.

Official Journal of the American College of Sports Medicine
www.acsm.org

Author Index S843