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 = 16, 67 ± 5 years; 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 and 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 interstitial 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 (155.3 ± 15.3 mg/dl). No differences were observed in any other 24-hour glucose concentrations (i.e., fasting glucose, pre- and post-breakfast glucose, dinner, bedtime glucose, nighttime glucose, and morning glucose), 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 11,461 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 activity (OR=2.10, [95% confidence interval (CI): 1.44-3.16] among men; OR=1.93, [1.39-2.68] among women) and, and a significantly lower odds of higher sedentary time 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 ± 3,235 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/kg, Abductor 0.41 ± 0.11 vs. 0.44 ± 0.10 kg/kg). However, in men the correlation coefficient between the stair steps and abductor muscle strength was observed (Pre-test: r = 0.42, 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, in men 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.

Effects of Tai Chi on Mobility in Older Adults with Multisite Pain
Tongjian You, FACSM1, Elisa Ogawa1, Saurja Thapa1, Yurun Cai1, Huan Zhang2, Satoshi Nagae1, Gloria Yeh1, Peter Wayne1, Suzanne Leveille1. 1University of Massachusetts Boston, Boston, MA. 2Huan’s Tai Chi, Cambridge, MA. *Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, MA. 1Brigham and Women’s Hospital and Harvard Medical School, Boston, MA. Email: tongjian.you@umb.edu

CONCLUSIONS: Participants in the Tai Chi group versus the body exercise group significantly improved single-task stride time (from 1.20 ± 0.11 s to 1.12 ± 0.10 s, p < 0.01). There were no significant differences in dual-task gait speed (from 0.77 ± 0.09 to 0.80 ± 0.11 m/sec, p = 0.08). Trends toward significance existed for improvements in SF-12 total score (91.5 ± 4.4 vs. 98.6 ± 5.0, p = 0.08), and mental component score (52.8 ± 3.3 vs 58.0 ± 2.3, p = 0.06), and Swayer test results (10.0 ± 1.5 vs 9.7 ± 1.7 deviations, p = 0.07). No differences were found for SF-12 physical component scores or in fear of falling after the intervention. CONCLUSION: Participants in Dalcroze eurhythmics for 3 mo may improve gait speed under single and dual task conditions. This movement training approach may be considered for use by community senior programs as a possible fall risk reduction intervention for the elderly.

Effects of Tai Chi on mobility in older adults with multisite pain and risk of falls.

Multisite Pain

Effects of Tai Chi on mobility in older adults with multisite pain and risk of falls.

Academic Motivation Elicited by Dalcroze Eurhythmics and Its Effects on Walking: A Pilot Study
Suzanne Leveille1.

Falls lead to lower quality of life, reduced independence, and increased mortality in the elderly. Many falls occur while walking, especially when performing other tasks. Falls are an important health concern, leading to reductions in quality of life and increased medical costs. Previous studies have demonstrated that Tai Chi is effective in reducing falls and improving mobility in older adults. This study aimed to investigate the effectiveness of Tai Chi on mobility and fall risk in older adults with multisite pain.

Methods: The study included 54 community-dwelling older adults (26 women and 28 men, 77 ± 9 yr, 74.6 ± 15.5 kg, 26.0 ± 4.3 kg·m⁻², performed a 16-foot sensorized gait mat. Paired t-tests were used to assess changes within each group, and student t-tests were used to examine the effectiveness of Tai Chi on mobility and fall risk in older adults with multisite pain. (Supported by NIH Grant R21 AG043883)

3-D Month Dalcroze Eurhythmics Intervention May Improve Gait Speed in Community Dwelling Elderly Participants
Lisa Ferguson-Stegall, Mandy Vang, Anthony S. Wolfe, Kathy Thomsen. Hamline University, Saint Paul, MN. (Sponsor: Donald Dangel, PhD, FACSM)

RESULTS: Participants in the Tai Chi group versus the body exercise group significantly improved single-task stride time (from 1.20 ± 0.11 s to 1.12 ± 0.10 s, p < 0.01). There were no significant differences in dual-task gait speed (from 0.77 ± 0.09 to 0.80 ± 0.11 m/sec, p = 0.08). Trends toward significance existed for improvements in SF-12 total score (91.5 ± 4.4 vs. 98.6 ± 5.0, p = 0.08), and mental component score (52.8 ± 3.3 vs 58.0 ± 2.3, p = 0.06), and Swayer test results (10.0 ± 1.5 vs 9.7 ± 1.7 deviations, p = 0.07). No differences were found for SF-12 physical component scores or in fear of falling after the intervention. CONCLUSION: Participants in Dalcroze eurhythmics for 3 mo may improve gait speed under single and dual task conditions. This movement training approach may be considered for use by community senior programs as a possible fall risk reduction intervention for the elderly.

Physical activity and sedentary behavior in the elderly

Effects of Tai Chi on mobility in older adults with multisite pain and risk of falls.

Older adults spend nearly ten hours of the waking day in sedentary activities that increase risk for chronic disease progression and loss of physical function. It is important to understand how the physiological demands of ambulation contribute to ambulatory and sedentary behavior so effective interventions can be implemented in this at-risk population. PURPOSE: To determine whether neuromuscular, pulmonary, and cardiac demand during a fixed-paced walk explain variance in sedentary behavior and walking activity in community-dwelling older adults. METHODS: Twelve women and thirteen men, 77 ± 9 yr, 74.6 ± 15.5 kg, 26.0 ± 4.3 kg·m⁻², performed a four-minute, steady-state walk on a treadmill at 1.25 m·s⁻¹ while activation of the vastus lateralis muscle, heart rate, and minute ventilation were recorded. ActiPAl accelerometers were used to record time spent walking and sedentary over 96 consecutive hours. Sleep logs were used to calculate time spent awake during the monitoring period. Walking time and sedentary time were then recorded as percent of the waking day. Stepwise regression determined whether peak muscle activation, minute ventilation, and heart rate predicted sedentary and walking time.

RESULTS: Participants in the Tai Chi group versus the body exercise group significantly improved single-task stride time (from 1.20 ± 0.11 s to 1.12 ± 0.10 s, p < 0.01). There were no significant differences in dual-task gait speed (from 0.77 ± 0.09 to 0.80 ± 0.11 m/sec, p = 0.08). Trends toward significance existed for improvements in SF-12 total score (91.5 ± 4.4 vs. 98.6 ± 5.0, p = 0.08), and mental component score (52.8 ± 3.3 vs 58.0 ± 2.3, p = 0.06), and Swayer test results (10.0 ± 1.5 vs 9.7 ± 1.7 deviations, p = 0.07). No differences were found for SF-12 physical component scores or in fear of falling after the intervention. CONCLUSION: Participants in Dalcroze eurhythmics for 3 mo may improve gait speed under single and dual task conditions. This movement training approach may be considered for use by community senior programs as a possible fall risk reduction intervention for the elderly.

Multisite Pain

Chronic pain is associated with impaired mobility and risk of falls in older adults. Falls lead to lower quality of life, reduced independence, and increased mortality in the elderly. Many falls occur while walking, especially when performing other tasks.

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85 Board #5 May 31 9:30 AM - 11:30 AM Effects of Tai Chi on Mobility in Older Adults with Multisite Pain

86 Board #6 May 31 9:30 AM - 11:30 AM A 3-Month Dalcroze Eurhythmics Intervention May Improve Gait Speed in Community Dwelling Elderly Participants

88 Board #8 May 31 9:30 AM - 11:30 AM Physical Activity and Sedentary Behavior of Older Adults Related to Physiological Metrics of Walking Effort

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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.

**(No relationships reported)**

**90 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: andyc66@utexas.edu

**No relations reported.**

**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 combined for a composite strength score (CSS). Participants completed 4 days/week of strength and conditioning training for 6 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, 64 g carbs, 16 g protein) or CHO (28 oz, 0 g fat, 320 mg Na, 42 g carbs, 0 g protein) immediately post-exercise. **Results.** A 2-way repeated measures ANOVA showed no bodyweight changes from pre- to post-test ($p = .071, \Delta = .06$). Additionally, there was not a significant change in body fat percentage ($p = .89, \Delta = .03$). No interactions presented by condition for weight ($p = .49, n^2 = .005$) or body fat ($p = .43, n^2 = .006$). Both groups showed an improvement in power clean ($p < .001, \Delta = .22$) across time with no interactions. However, the CSS showed a significant condition by time interaction ($p = .044, n^2 = .08$) whereas the CHO group did not significantly increase over time ($p = .406$) while the CM group significantly improved in CSS from pre- to post-test ($r = -4.153, p < .001$). Paired samples t-tests of the separated BP and squat showed that the CHO group significantly decreased in mean BP (7.26 lbs, $p = .044$) but had no change in squat (17.7 lbs, $p = .154$). The CM group showed significant increases in both BP (9.06 lbs, $p = .039$) and squat (36 lbs, $p < .001$). **Discussion.** This 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.

Childhood obesity and children who survive previously fatal diseases and conditions highlight the need for rigorous metrics 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 \(V_O_2 = aW_R + b\); 2) assuming the same relationship we estimated work rate (WR’) from the \(V_O_2\) measured on TM using S, I, M (Fig A) and S’, I, M (Fig B); 3) analyzed the regression parameters from the function \(WR’ = aS’^2 + b\) 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’ + 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 (MS). CPET slopes (e.g., \(\Delta V_O_2/\Delta W_R\) or \(\Delta H_R/\Delta W_R\)) can be calculated and provide useful insights into disease mechanisms and progression in children and adults, when maximal efforts are questionable. The maturational related 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

**92 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 NIHANCES 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, BM-1, standard root square (SRT) of BM, 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 BM is highly correlated with strength measures in both boys (LBMS: .702, HGS: .793) and girls (LBMS: .666, ...
Interpopulation Variations in Height Growth: a Potential Explanation for Differences in Adolescent Swim Performance

Kosuke Kojima1,2, Paul L. Jamison2, Christopher L. Brammer2, Joel M. Stager, FACSM1.
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(No relationships reported)

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 progression.

METHODS: Growth reference data were acquired for JPN (MEXT, 2000) and US (Kuczmański et al., 2002). All performance times (sec) in 50-meter long course freestyle (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 was used to evaluate 1) the strength of the relationship between age-related median height 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 gain occurs 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.
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.

**RESULTS**: Cardiorespiratory fitness was assessed using maximal exercise test with respiratory gas analyses either using shuttle run, shuttle ride, or cycle ergometer test. Cardiorespiratory fitness was defined as peak oxygen uptake (VO2peak) by body weight or fat free mass (FFM). Body adiposity was assessed using waist circumference, body mass index standard-deviation score (BMI-SDS), and body fat percentage.

**CONCLUSIONS**: Poor cardiorespiratory fitness and higher waist circumference were associated with increased arterial stiffness in children and adolescents with chronic diseases and physical disabilities. The association between cardiorespiratory fitness and arterial stiffness was partly explained by waist circumference.

**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.

(No relationships reported)

**Board #1 May 31 9:30 AM - 11:30 AM**

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

Eric C. Bredahl, Sarah A. Kottensette, Nathaniel R. Marshall, Meghan K. Wagner, Kristen Drescher, Joan M. Eckerson. Creighton University, Omaha, NE. (Sponsor: Joan Eckerson, FACSM)

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(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 creatinine (CrN) on DOX-induced apoptosis. **PURPOSE:** To investigate the effects of Cr and CrN treatment on DOX-induced apoptosis. **METHODS:** Rat skeletal muscle cells (RMSKMC) were cultured in skeletal muscle growth medium until they reached 90-95% confluence. Cells were then collected and seeded on 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 an 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±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.

**Board #2 May 31 9:30 AM - 11:30 AM**

**Timecourse Of Alterations In Myofiber CSA And Oxidative Phenotype In Progression Of Cancer-cachexia**

Nicholas P. Greene1, Jacob L. Brown1, Megan E. Rosa1, David E. Lee1, Thomas A. Blackwell1, Haley N. McCarver1, Richard A. Perry, Jr1, Lemuel A. Brown1, Wesley S. Haynie1, Michael P. Wiggs2, Tyrone A. Washington1. "University of Arkansas, Fayetteville, AR. "University of Texas at Tyler, Tyler, TX. (Sponsor: Stephen F. Crouse, FACSM)

Email: npgreene@uark.edu

(No relationships reported)

Cancer-cachexia (CC), loss of muscle mass in cancer, is directly responsible for 20-40% of cancer-related deaths depending on type of cancer. Currently no efficacious therapies exist to reverse CC leading to the conclusion that efforts need to be focused on prevention of CC. Unfortunately, few studies have been performed to fully examine the progression of CC across the timecourse of development. **PURPOSE:** To examine phenotypic alterations in skeletal muscle across the timecourse development of CC in a murine tumor implantation model. **METHODS:** 1x10^6 Lewis Lung Carcinoma cells (LLC) or Phosphate Buffered Saline (PBS, control) were injected into the hind-flank of C57Bl/6 mice at 8 wks age, and tumor allowed to develop for 1, 2, 3 or 4 wks. Muscle fiber size was assessed by cross sectional area (CSA) of individual myofibers following H&E staining and muscle oxidative phenotype by succinate dehydrogenase (SDH) staining in sections of tibialis anterior muscle. Stress kinase signaling through p38 MAPK relative phosphorylation was assessed by immunoblot. A One-Way ANOVA was utilized to detect statistical significance with a Student-Newman-Keuls post hoc analysis to delineate differences between groups, significance was set at P<0.05. **RESULTS:** Mean myofiber CSA was significantly reduced by 3 wk following tumor implantation compared to PBS control (795±22 µm^2 in 1 wk vs. 957±70 µm^2 in PBS) and further reduced 4 wks post tumor implantation (556±43 µm^2). Percent of SDH positive (oxidative) myofibers was lower at 4 wks post implantation compared to all other groups (44±0.04% in 4 wk compared to 68±0.05% in PBS). Relative p38
MAPK phosphorylation was significantly greater in wk 4 post implantation compared to PBS, 1 and 2 wk (~3.4-fold greater than PBS in 4 wk), with no other significant differences among groups. CONCLUSION: Small changes in myofiber CSA can be seen as soon as 3 wk following tumor implantation in the LLC model. Reductions in portion of oxidative myofibers and increases in p38 MAPK signaling are not seen until 4 wks following tumor implantation. p38 MAPK isoforms –α and –β have been implicated in promoting atrophic signals through Atrogin/MURF and autophagy genes, and in part explain the greater drop in myofiber CSA seen 4 wks following tumor implantation.

Funded by Arkansas Bioscience Institute

101 Board #3 May 31 9:30 AM - 11:30 AM Effects Of Creatine Supplementation On Doxorubicin-induced Myotoxicity Zoltan A. Torok, Raquel B. Busekrus, David S. Hydock. University of Northern Colorado, Greeley, CO. (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 forelimb grip strength was then measured as an indicator of in vivo muscle function and muscle fatigue was analyzed ex vivo using a 100 second fatigue 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 in grip strength only (-15% 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.

102 Board #4 May 31 9:30 AM - 11:30 AM The Effect Of Resistance Training During Chemotherapy On Grip Strength In Rats. Mackenzie D. Twaddell, Alison Tigner, Megan K. Wagner, Eric Bredahl, Joan Eckerson, FACSM. Creighton University, Omaha, NE. (Sponsor: Joan Eckerson, FACSM) (No relationships reported)

Doxorubicin (DOX) is a powerful chemotherapeutic agent associated with a number of harmful side effects, including cardiovascular and skeletal muscle dysfunction. Although it has been shown that aerobic and anaerobic exercise can minimize the degree of DOX-induced muscle dysfunction, few studies have examined the effect of resistance training (RT) during chemotherapy treatment on DOX-induced muscle dysfunction. PURPOSE: To examine the effect of RT exercise during DOX treatment on grip strength in rats. METHODS: Male Sprague-Dawley rats were randomly assigned to a RT (n=10) or sedentary (SED) group (n=10) for 10 wk. Animals in the RT group were housed in specialized cages where the food and water height was progressively elevated so that they achieved an erect bipedal stance to access their food and water. After the initial 10 wk training period, animals were further sub-divided into a RT-DOX (n=5), RT-saline (SAL) (n=5), SED-DOX (n=5), and SED-SAL (n=5). Rats in the RT groups continued to train for an additional 5 wk and, during this same period, animals receiving DOX were given a weekly intraperitoneal injection (3 mg/kg) for 4 wk. Grip strength was measured every 5 wk during the 15 wk study using a rat grip strength meter. RESULTS: At 5 wk, grip strength in the RT (16.3±1.5) group was significantly higher than the SED (14.6±1.5) group (P=0.018), however, there were no differences at 10 wk. Following the 5 wk treatment period with DOX or SAL, animals in the SED+SAL (16.4±1.0) group (P<0.0001). CONCLUSION: These findings suggest that RT regimen during chemotherapy treatment may be effective for minimizing DOX-induced muscle dysfunction.

103 Board #5 May 31 9:30 AM - 11:30 AM Clarifying The Contradictory Data In The Effect Of Resveratrol In The Mouse Model Of DMD Kitipong Uaesooconrathorn1, Aditi Phadke2, Jack Vandermeulen3, Nagaraju Kanneboyina3. 1Agada Biosciences, Halifax, NS, Canada. 2Children’s national medical center, Washington DC, DC. 3Binghamton University, Binghamton, NY. Email: KUAESOON@agadabio.com (No relationships reported)

PURPOSE: Resveratrol, 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 rotarod 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) –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 activity on the open field digiscan behavioral measurement. In vitro force measurements of the EDL showed no significant change in the maximal force or specific force after treatment in comparison to the control mdx mice. Further, evaluation of cardiac function (% ejection fraction or fraction shortening) using echocardiography showed no significant changes. Histological analysis showed no change in the number of degenerating, regenerating, of inflammatory cells after 12 weeks of treatment.

CONCLUSIONS: This study has shown 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.

104 Board #6 May 31 9:30 AM - 11:30 AM Reliable And Reproducible Evaluation Of Therapeutic Interventions In The MDX Mouse Model Of DMD Kanneboyina Nagaraju1, Arpana Sal1, Aditi Phadke2, Jack Vandermeulen2, Heather Gordish-Dressman1. 1School of Pharmacy and Pharmaceutical Sciences, Binghamton, NY. 2Children’s National Medical Center, Washington, DC. Email: knagaraju64@gmail.com (No relationships reported)

PURPOSE: Preclinical efficacy evaluation in mouse models of human diseases is an important component of drug development. It has been reported that phase II clinical trial success rates have fallen in recent years, with a lack of efficacy being the most frequent reason for failure. Since most of the selected candidate therapeutics have gone through preclinical efficacy testing, this failure could be due to 1) the poor predictive power of disease models, 2) questionable targets, 3) lack of rigor in preclinical trial design, 4) poor control for potential bias, or 5) variable reporting standards. The quality and reproducibility of preclinical trials depend on the thoroughness of the preclinical study, including the design, execution, analysis, and reporting of the preclinical data. Here we have developed a comprehensive phenotyping system to ensure success rate of preclinical candidate evaluations for DMD.

METHODS: We subjected mdx mice for following assessments at early (8 weeks) and late (12 months) stages of the human disease. We assessed 1) muscle mass and strength, 2) ambulatory stages of the human disease. We assessed 3) behavioral, 4) histological, and 5) functional assessments. To unmask the mild phenotype of the mdx mice, we subjected all mice to treadmill running (12 m/min; 30 min) –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 activity on the open field digiscan behavioral measurement. In vitro force measurements of the EDL showed no significant change in the maximal force or specific force after treatment in comparison to the control mdx mice. Further, evaluation of cardiac function (% ejection fraction or fraction shortening) using echocardiography showed no significant changes. Histological analysis showed no change in the number of degenerating, regenerating, of inflammatory cells after 12 weeks of treatment.

CONCLUSIONS: This study has shown 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.
CONCLUSION: Blocking cell proliferation eliminates muscle inflammation induced after prolonged chemotherapy.

The Exercise is Medicine (EIM) global health initiative includes an “On Campus” component that encourages faculty, staff, and students to work together toward improving the health and well-being of the campus and surrounding community. PURPOSE: To describe the implementation of EIM On Campus at a large U.S. university in the mountain west. METHODS: A multidisciplinary EIM On Campus leadership team was assembled, comprised of faculty members from nursing (2) and exercise science (1), as well as university students (2). A physical activity event (Pokethon 3k Fun Walk) was planned using the currently popular Pokemon theme and promoted through flyers, posters, word of mouth, social media, and homecoming parade float. The event was guided by the following principles in order to attract participation from those who might otherwise not be active: 1) free of cost, 2) open to all, 3) use of a currently popular theme (Pokemon), 4) safe 3k route with plenty of nearby parking, 5) late morning start time, 6) free “lures” activated at all “Pokestops” within the Pokemon Go game along the 3k route, and 7) numerous prizes given at random to incentivize participation rather than speed. RESULTS: The Pokethon 3k Fun Walk event was held during Fall 2016. A total of 140 people were involved in the event: 5 (3.6%) were EIM On Campus leadership members and event organizers, 23 (16.4%) were volunteers, and the remaining 112 (80.0%) were event participants. Of the 112 participants, 72 (64.3%) were women who could benefit from a targeted exercise intervention.

**Exercise-induced Leukocyte Infiltration in Skeletal Muscle Under Chemotherapy**

Chia-Hua Kuo, FACSM. University of Taipei, Taipei, Taiwan.

*(No relationships reported)*

**CONCLUSION:** Our data demonstrates that the quality and reproducibility of preclinical trials depend on 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.

**RESULTS:** Thirty-seven women between ages 30-75 were enrolled. QuickDASH and the arm function subscale of the FACT-B+4 were used to examine differences in weight and 1.5-mile run performance between those with and without impaired arm function in the same physical well-being (p<0.01) and the functional well-being subscale of the FACT-B+4 (r=-0.33, p=0.05). Applying 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 were used to examine differences in weight and 1.5-mile run performance between the two test points. In addition, based on the pretest performance in 1.5-mile and ACSM’s Fitness Categories for Maximal Aerobic Power (2014), students were categorized into three aerobic power groups by sex. Those with 1.5-mile run at top 20 percentiles were in Superior/Excellent Group (SEG), 40 to 79 percentiles in Good/ Fair Group (GFG), and 1 to 39 percentiles in Poor/Very Poor Group (PVPG). Binomial tests were used to examine whether a significantly larger proportion of students in each group improved 1.5-mile run at the posttest.

**RESULTS:** Performance in 1.5-mile run was improved significantly (p < .01) for males (11:47±2:07 vs. 11:29±1:47) and females (14:15±2:28 vs. 13:54±1:55) at the posttest. As for body weight, it remained unchanged (p > .40) for both sexes (males: 180.83±32.11 vs. 180.61±31.10; females: 140.75±18.20 vs. 140.58±17.74). In addition, for the two sexes SEG had smaller portions of students improving their 1.5-mile run (male: 7 improved vs. 11 not; female: 5 vs. 6); GFG had non-significantly larger portions of students improving their 1.5-mile run (male: 17 improved vs. 8 not; female: 15 vs. 8); finally, significantly larger portions of students in PVPG improved their 1.5-mile run performance (male: 23 improved vs. 6 not, p < .005; female: 16 vs. 4, p < .05).

**CONCLUSIONS:** PA classes are effective to control body weight among university students. In addition, PA classes can significantly improve students’ 1.5-mile run performance, and it is especially true for students with relatively poor 1.5-mile run performance initially, especially those at the bottom 39 percentiles.

**Exercise is Medicine® Thematic Poster - EIM On Campus**

**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)*
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.

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**RESULTS:**

For students and faculty to utilize the EIM framework. This project uses the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) methodology to evaluate Exercise is Medicine- On Campus Program (EIM-OC). In 2015, the EIM-OC program at Florida Gulf Coast University (EIM-OC) was launched. The program consists of monthly EIM@FGCU events, a Community outreach entities (n=4) included private businesses and other off-campus organizations. All of the organizations strongly supported the concept of EIMOC, and were interested (93%) in supporting EIMOC 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 department/university rules and regulations (47%).

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

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**The Exercise is Medicine-on Campus (EIM-OC) initiative is growing across the nation, requiring a need to share programming and implementation outcomes to grow the limited body of empirical evidence.** **PURPOSE:** The purpose of this study was to provide descriptive data on the EIM-OC programming and associated promotional efforts at a Midwestern Masters Comprehensive University. **METHODS:** During the current 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 students are referred by monthly promotional efforts included the cost of an occupational therapy assistant. **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-On Campus programs have broader implications than a simple referral networks, methodologies such as RE-AIM can be utilized to determine project effectiveness.

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**CONCLUSIONS:** This academic year.

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**PURPOSE:** To evaluate strategies for expanding EIMOC partnerships and collaborations across campus since 2015. **METHODS:** EIMOC has been promoting EIMOC since 2010 and hosting annual EIMOC Week events since 2012. **PURPOSE:** To evaluate strategies for expanding EIMOC partnerships and collaborations across campus since 2015. **METHODS:** EIMOC Week has been held each year since 2012. In an attempt to expand and enhance the impact of EIMOC, the EIMOC committee has worked to improve campus-wide integration and increase participation and support from other University entities. Following the 2016 EIMOC Week event, organizations that participated or provided support through the 2015-2016 Campus-OC Week were interviewed regarding future goals, EIMOC impressions, barriers to collaboration, and general observations. Results were compiled, transcribed and coded for common themes.

**RESULTS:** Organizations working with EIMOC (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 students 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 EIMOC, and were interested (93%) in supporting EIMOC 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 department/university rules and regulations (47%).

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**RESULTS:**

For students and faculty to utilize the EIM framework. This project uses the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) methodology to evaluate Exercise is Medicine- On Campus Program (EIM-OC). In 2015, the EIM-OC program at Florida Gulf Coast University (EIM-OC) 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 efficacy of EIM-OC programs. **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 ± 11 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 populations who have mobility challenges.” 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 students are referred by monthly promotional efforts included the cost of an occupational therapy assistant. **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-On Campus programs have broader implications than a simple referral networks, methodologies such as RE-AIM can be utilized to determine project effectiveness.

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Low back pain (LBP) can be described as pain or discomfort in the lumbar spine. Due to the vast interconnected system of bones, muscles, nerves, discs, tendons and ligaments, this area of the body is susceptible to injury and disfunction. “Sarah”, a 49 year old female with chronic LBP, volunteered to participate in an 8-week Community Fitness Partners program, a Westfield State University Exercise Is Medicine On Campus initiative. Sarah was given an whole body exercise prescription based on FITT recommendations by the American College of Sports Medicine for individuals with chronic LBP. **PURPOSE:** To determine the exercise prescription to improve and enhance the impact of EIMOC partnerships and collaborations across campus since 2015. **METHODS:** EIMOC Week has been held each year since 2012. In an attempt to expand and enhance the impact of EIMOC, the EIMOC committee has worked to improve campus-wide integration and increase participation and support from other University entities. Following the 2016 EIMOC Week event, organizations that participated or provided support through the 2015-2016 Campus-OC Week were interviewed regarding future goals, EIMOC impressions, barriers to collaboration, and general observations. Results were compiled, transcribed and coded for common themes.

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**CONCLUSIONS:** The current study offered insight on the challenges and potential success in expanding EIMOC on a large campus. As this EIMOC initiative enters its 7th year, expanding its reach and improving University-wide collaborations are key for sustained impact. Identifying common strategies and pooling resources across multiple entities may prove essential to the future of EIMOC.
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=537, 56% male, 75% 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.

Results: 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 or 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 clinics than on-campus clinics (X2 = 42.2, p<.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 practitioners.

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.

Exercise self-efficacy, an individuals’ perceived confidence as it relates to a specific behavior, is positively related to behavior change and long term exercise adherence. Social aspects of exercise can also contribute to exercise self-efficacy. This is especially important in regards to the adult population due to the difficulty of transitioning to the maintenance phase of behavior change. PURPOSE: To determine the benefits that the EIMOC initiated Community Fitness Partners Program has upon self-efficacy and social support as well as changes in exercise programs have been shown to improve upon these aspects. Individual personal training was completed in a group setting to expose participants to additional sources of social support. This study aims to investigate the relationship between this community setting, social support and exercise self-efficacy. METHODS: Subjects aged 44.0 ± 13.2y volunteered to participate in an 8 week structured group community fitness partner program. Subject characteristics include: body mass (74.0 ± 20.8 kg), height (1.65 ± 0.08 m), % BF (26.0 ± 8.2), HRrest (68 ± 10 bpm), and BPrest (124 ± 19 / 78 ± 9 mmHg). All subjects underwent pre and post participation screening to determine baseline and concluding health and fitness measures. Each individuals’ perceived confidence levels related to exercise were determined by the Self-efficacy For Exercise (SEE) Scale (Resnick & Jenkins, 2000). Participants completed the Social Support and Exercise Survey to identify influences from friends and family regarding exercise participation (Sallis et al., 1987). Paired sample t-tests were used to determine differences pre to post program. Results: Pre and post measurements of SEE scores were 58.2 ± 18.3 and 63.7 ± 17.0 (p > 0.05). Pre and post measurements of family participation support were 20.4 ± 11.4 and 24.0 ± 13.5 (p > 0.05), respectively while the friend participation support measured at 17.6 ± 7.5 and 19.2 ± 12.1 (p > 0.05). Although the social support for family and friends did not reach statistical significance, there is still a notable positive trend. Conclusion: Overall most individuals experienced an increase in efficacy and social support values. Therefore, a group personal training protocol may be beneficial in the improvement of exercise self-efficacy and social support.

Thematic Poster - Energy Availability and Expenditure

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

Board #1

Dietary Carbohydrate Restriction Is Necessary For High-Fat Diet Induced Alterations In Substrate Oxidation During Exercise

Gareth Fletcher1, Elisa I. Glover2, Janice L. Thompson, FACSM3, Gareth A. Wallis4. 1University of Birmingham, Birmingham, United Kingdom. 2GlauxSmithKline UK, Brentford, United Kingdom.

Email: gareth.x.fletcher@gsk.com

BACKGROUND: Manipulating the dietary intake of carbohydrate and fat results in modulations in the circulating hormonal and metabolic milieu alongside differences in the myocellular substrate storage profile. These divergent metabolic profiles can dramatically impact substrate utilisation during exercise, with high fat low carbohydrate diets substantially elevating rates of fat oxidation compared to a low fat high carbohydrate diet. A caveat to prior studies employing a high fat diet is the high carbohydrate content of this macronutrient composition (% of energy intake [carbohydrate/fat/protein]); N (50/35/15); HF (20/65/15), and a hypercaloric (130% energy intake) N+HF (50/65/15). Post-diet interventions in the overnight fasted state, subjects consumed a standard breakfast run at 65% VO2max with indirect calorimetry employed over the exercise bout to determine substrate oxidation. Data was assessed for differences using a repeated-measures one-way ANOVA.

RESULTS: The relative contribution of fat to energy expenditure over the 90min exercise bout was significantly (p<0.01) greater after the HF trial (76 ± 9%) than N (57 ± 11%) or N+HF (67 ± 11%) with no significant differences between diets not limited in carbohydrate (N and HF). CONCLUSIONS: In contrast to when carbohydrate is restricted (HF), adding a comparable amount of fat to a control diet (NHF) did not augment fat oxidation during exercise. Thus the restriction of carbohydrate intake appears to be an obligatory step in eliciting dietary induced alterations in whole body substrate oxidation not greater than that seen with high fat low carbohydrate diets. This study is the first to show the effect of carbohydrate restriction on fat oxidation in the overnight fasted state.

Board #2

Metabolic and Behavioral Correlates of Low Energy Availability in Exercising Men

Jay Petersen. University of Nebraska at Lincoln, Lincoln, NE.

Email: jepetersen22@huskers.unl.edu

Low energy availability (EA) has been identified as a primary driver of metabolic and endocrine aberrations characterizing the female athlete triad. Although it has been established that men engaged in sports that favor leanness and/or low body weights are also at risk of low EA, little is known about the etiology and metabolic effects of low EA in habitually active men.

PURPOSE: To assess the relationship between EA and body composition, metabolism, eating behavior traits, and health-related outcomes in young, exercising men.
METHODS: Eighteen men (23.4±4.4 y; 81.8±10.2 kg; 98±3.5% body fat) participated in this cross-sectional study. EA was determined by 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): 39.4-86.6 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) when 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 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.

May 31 9:30 AM - 11:30 AM Energy Availability Amongst Elite Rugby Union Players During Pre-Season Training
Katherine Black1, Chloe Hindle1, Claire Gibson1, Joanne Slater1, Dan Baker1, Phil Healey1, Rebecca McKay-Cooke1, Rachel Brown1, Brett Smith1. 1University of Otago, Dunedin, New Zealand, 2Chiefs Super Rugby, Hamilton, New Zealand. Email: katherine.black@otago.ac.nz (No relationships reported)

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 availability. Given the increased training loads during this period. Therefore, the duration of LEA cannot be determined from this study nor can study was observational, the results are only indicative of the three-day sampling period. Hence, 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

May 31 9:30 AM - 11:30 AM Energy Availability and Muscle Glycogen Levels in Division I Beach Volleyball Athletes
Marguerite B. Gilchrist1, Toni M. Torres-McGehee2, Meaghan Minori1, Dawn M. Emerson1, Kelly Pritchett1. 1University of South Carolina, Columbia, SC, 2Kansas University, Lawrence, KS. 3Central Washington University, Ellensburg, WA. (No relationships reported)

Beach volleyball is considered a lean body sport, which may increase the risk for low energy availability (LEA). There is currently limited research on beach volleyball athletes, particularly in terms of energy availability (EA) and muscle glycogen levels. Purpose: To examine EA and muscle glycogen levels in beach volleyball athletes. A secondary purpose examined macronutrient intake. Methods: Local NCAA Division I female beach volleyball athletes (n=18; ages 19.9 ± 1.5 yrs; weight: 63.3 ± 5.1 kg; height: 174.5 ± 5.6 cm) participated in the study. EA and energy expenditure were measured via a 7-day food and activity log. Resting metabolic rate (RMR) was measured via indirect calorimetry. Muscle glycogen levels were evaluated for the gastrocnemius (GS), rectus femoris (RF) and biceps brachii (BB) pre and post-practice using the MuscleSound ultrasound device. Results: When examining RMR, 55.6% beach volleyball players did not meet the RMR caloric needs compared to their associated dietary intake. LEA was present in 94.4% of the participants. For proteins, 61.1% were under recommendations and 5.6% were over the recommendations. All beach volleyball players were under the recommendations for carbohydrates (CHO), and 33.3% were over the recommendations for fats while all others met the recommendations for fats. Repeated-measures analysis of variance indicated a main effect for GS and RF muscle glycogen pre-and post-practice across 5 days; however no specific interactions were found. No significant differences were found with BB measurements. Chi-square analysis revealed no significant differences for level of muscle glycogen vs. CHO intake. Conclusion: Beach volleyball athletes are at risk for LEA due to both the high energy expenditure demands of their sport and low nutritional intake. Health care professionals working with beach volleyball athletes should consider monitoring nutrition and implementing nutritional education sessions in order to prevent long term LEA and its negative health consequences. The MuscleSound device can be a good tool for determining if an athlete strays from their norm over time, but more research is needed in order to use this device as a tool for determining chronically low CHO intake.

May 31 9:30 AM - 11:30 AM A Novel Method Of Assessing Dietary Behavior Using a Wrist-Worn Accelerometer
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PURPOSE: To describe a novel way of estimating dietary behavior using a wrist-worn accelerometer. METHODS: The eating behaviors of one subject were captured via video recording while motions were concurrently recorded using a wrist-worn ActiGraph GT3X, set at 100Hz sample rate on the dominant wrist. The video recording and ActiGraph were synchronized at the start of data collection through action of a transient event visible in both data sources. Behaviors and motions, which included both eating and non-eating behaviors we captured for 30 min. A taxonomy was developed to code the video recording (e.g., fork to mouth, spoon away from mouth) and three raters identified the exact times of actions, to the nearest millisecond. Categorical assignments of each category were used to identify “true” start and stop times of each movement; while similar, each was used separately to train a classifier. These categorical markings were then used to select data from the accelerometer. A feature set of each sample in the categorical sets, surrounding each category of action, were used to train a supervised machine learning naïve bayes classifier. The feature set consisted of mean, standard deviation, and binned spectral analysis of raw, first derivative (dd), and angular derived measures; this totaled 110 measures across the original x,y,z and other resultant measures. Given the relatively small data set (i.e., 180,000 samples for 30 min), the training dataset was also used for testing this proof of concept. RESULTS: Adjusting for the prior probability of each categorical selection (i.e., ten categories of eating behaviors), the agreement for specific food actions between the video and the classifier predicted action was found to be 63%. Simplifying to consider cases of eating and non-eating only, agreement improved to 67%. Agreement was 66% when prediction results were condensed to “not eating,” “drinking,” and “eating.” CONCLUSION: These findings present a plausible new method of estimating dietary behavior. Further refinement is necessary to generalize to larger and more diverse populations, though the potential of providing real-time, objective, dietary behavior analyses is a promising area for research and practice.
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 (24hrEE) after 24 weeks of exercise training between varying doses of exercise recommended for weight loss.

**METHODS:** Forty-one (28 F, 13 M) obese (35.2±3.7 kg/m2) middle aged (47.8±12.5 y), sedentary individuals from the Examination of Mechanisms of Exercise-induced Weight Compensation (E-MECHANIC) study were randomized to either a healthy dietary pattern over the previous year. A ratio ≤1.35 for EI to RMR was considered used for dietary assessment for research studies.

**RESULTS:** Compared to the HL group, VO2peak increased in the 8 KKW (p=.004) and 20 KKW (p=.0001) groups. With 20 KKW, TDEE (and 24hrEE increased (p<.04) and weight loss (2.5±0.9 kg, p=.04) was significant but approximately half of what was expected based on the increase in energy expenditure from exercise. Fat mass (-2.1±0.8 kg, p=.02) but not fat-free mass (-0.4±0.3 kg, p=.79) was also significantly reduced. A 151 kcal/d energy deficit was detected at week 24. The increase in TDEE is attributed to the increased physical activity (p=.03) and not to changes in EE during sleep, arousal or the thermic effect of food. Besides physical activity, the largest change in EE was a reduction in spontaneous physical activity by ~15% (p=.04). With 8 KKW, there was no significant weight or body composition change and no significant increase in TDEE. An energy deficit of 23 kcal/d was detected at week 24. None of the compoiments of EE were changed in the 8 KKW group.

**CONCLUSIONS:** Structured aerobic exercise that expends up to 1800 kcal/wk increased TDEE but produces less weight loss than expected possibly due to compensatory increases in EI and behavioral adaptations that could lead to reduced spontaneous physical activity.

**Validity of Self-Reported Energy Intake Compared to Resting Metabolic Rate in Athletes**

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Energy intake (EI) is frequently under-reported by study participants and can be biased for reasons such as memory, incorrect estimation of portion sizes, deliberate manipulation, etc. It is important that EI is reported as accurately as possible when used for dietary assessment for research studies. **PURPOSE:** To compare self-reported EI from a Block Food Frequency Questionnaire (FFQ) to resting metabolic rate (RMR) in Collegiate Athletes, Reserve Officer’s Training Corps (ROTC) Cadets and Midshipmen, and Masters Athletes. **METHODS:** This cross-sectional study included 21 Collegiate Athletes (8 females, 13 males) and 15 ROTC Cadets and Midshipmen (7 females, 8 males), 18 to 25 years of age. It also included 18 Masters Athletes (8 females, 12 males), 26 years of age and older. A direct calorimetry was used to determine RMR. Participants completed a self-administered Block FFQ to assess dietary patterns over the previous year. A ratio (E:RMR) for EI to RMR was considered under-reporting of dietary intake on the FFQ. **RESULTS:** The mean ratio of EI to RMR for all participants was 1.24 (±0.38) and the frequency of under-reporting was under-reporting of dietary intake on the FFQ. A ratio ≤1.35 for EI to RMR was considered used for dietary assessment for research studies.

**Conclusions:** Significant under-reporting of energy intake was found in these athletes. Further analyses is required to determine why males in these three athlete populations were more likely to under-report than females. These represent data from an unfunded research project.
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 resistive loaded breathing and analyzed for F₂-isoprostanes using isotope dilution mass spectrometry. Time comparisons were made using a one-way ANOVA with repeated measures.

RESULTS: PTPdi increased (p<0.005) 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 F₂-isoprostanes increased (p<0.05) from 154 ± 22 at 0 min to 197 ± 35, 229 ± 83 and 206 ± 58 pg mL⁻¹ at 5, 30, and 30 min, respectively. CONCLUSIONS: Lipid peroxidation increased during, and remained elevated following, inspiratory flow resistive loaded 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.

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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) or peak lactate (NB = 7.0 ± 0.76 vs. OB = 7.2 ± 0.76 mmols/dl). In the nasally restricted breathing condition they demonstrated a significantly lower mean ventilatory equivalent for oxygen (VE/V̇O₂) (NB = 35.20 ± 1.34 vs. OB = 41.30 ± 1.59) and carbon dioxide (VE/V̇CO₂) (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 lactate (NB = 9.05 ± 0.88 vs. OB = 9.34 ± 0.89 mmols/dl) and again demonstrated a significantly lower mean VE/V̇O₂ (NB = 32.43 ± 0.77 vs. OB = 36.00 ± 0.77 L/min; p<0.03) was higher in SWIM. Although TLCO was greater in SWIM (23.4 ± 2.6 vs. 20.7 ± 1.9, POST 24.1 ± 1.9 vs 21.0 ± 3.2 ml/min/mm Hg; p<0.01), there was no difference when expressed relative to alveolar volume (PRE 5.1 ± 0.6 vs 5.4 ± 0.4, POST 4.9 ± 0.6 vs 5.2 ± 0.4 ml/min/mm Hg; p=0.20). Both MIP (PRE 81.2 ± 22 vs 71 ± 24, POST 112 ± 17 vs 98 ± 18, POST 114 ± 13 vs 84 ± 19 cm H₂O; p<0.001) were greater in SWIM. Changes from PRE to POST were similar between groups (interactions p<0.05). No association between CS training volume (km/training week) and change in lung size (delta TLC) (r=-0.02, p=0.95) was found. CONCLUSION: This data shows that pubertal female swimmers already had larger lung capacities, higher flows, and greater indices of respiratory muscle strength compared to matched controls. One season of CS did not further accentuate this enhanced function, suggesting that CS during puberty did not affect lung development. Support: NSERC

CONCLUSIONS: Does Competitive Swimming During Puberty Affect Lung Development in Obese and Nonobese Children Dhirani M. Bhammar¹, Jonathon L. Stickford², Vipa Bernhardt³, Rubria Marines-Price¹, J. Todd Bassett², Maria C. Roman⁴, Tony G. Babh, FACSM®. ¹Valdosta State University, Valdosta, GA. ²Appalachian State University, Boone, NC. ³Texas A&M University-Commerce, Commerce, TX. ¹Institute for Exercise and Environmental Medicine, Dallas, TX. Email: dmbhammar@valdosta.edu

PURPOSE: Does competitive swimming during puberty affect lung development in pubertal females? The effect of competitive swimming during puberty on lung growth was examined in this longitudinal study. Methods: 12 girls (mean age 11.9±1.6 years), all being in Tanner stages 2-4, were divided into a competitive swimming (SWIM) group (n=6) and a control (CON) group (n=6). Results: The longitudinal study (7.5±0.4 months) was completed on 33% of swimmers, and 67% of CON. Changes in lung volumes, spirometry, diffusion capacity (DLCO), and maximal inspiratory (MIP) and expiratory (MEF) mouth pressures were compared using 2-way mixed model ANOVA. RESULTS: Despite having a similar body size as controls, swimmers had a larger

CONCLUSIONS: Does Competitive Swimming During Puberty Affect Lung Development in Obese and Nonobese Children Dhirani M. Bhammar¹, Jonathon L. Stickford², Vipa Bernhardt³, Rubria Marines-Price¹, J. Todd Bassett², Maria C. Roman⁴, Tony G. Babh, FACSM®. ¹Valdosta State University, Valdosta, GA. ²Appalachian State University, Boone, NC. ³Texas A&M University-Commerce, Commerce, TX. ¹Institute for Exercise and Environmental Medicine, Dallas, TX. Email: dmbhammar@valdosta.edu

PURPOSE: The effects of adult obesity on lung function at rest, such as reductions in functional residual capacity and expiratory reserve volume, are well recognized. However, the effects of obesity on occupational lung volumes at rest, while lying supine, and during exercise in obese children are unknown but could create meaningful respiratory limitations. METHODS: 11 obese (Ht: 143.3 ± 5.2 cm; Wt: 35.8 ± 3.8 kg; BMI percentile: 58 ± 21; Body fat: 27% ± 6%) and 12 obese (Ht: 149.7 ± 6.7 cm; Wt: 65.8 ± 14.4 kg; BMI percentile: 97.5 ± 1.4; Body fat: 46 ± 3%) children underwent dual energy x-ray absorptiometry, pulmonary function testing, and measurement of occupational lung volumes when seated upright, while supine, during constant load cycling at 40W, and during maximal exercise testing. RESULTS: Ratio of forced expiratory volume in the first second and forced vital capacity (FEV₁/FVC) was lower in obese compared with nonobese children (43.6 ± 4.1 vs 88.6 ± 4.1%; p=0.004). Functional residual capacity (FRC) was lower in obese compared with nonobese children when seated upright (38.5 ± 4.8 vs 49.3 ± 4.0%TLC; p<0.001) and while supine (35.0 ± 6.4 vs 45.4 ± 6.5%TLC; p<0.001). Three children (2 obese) experienced expiratory flow limitation (EFL) while supine. Both end expiratory lung volumes (EELV) and end expiratory lung volumes (EIVL) were lower during exercise at 40W (P<0.016) and EELV was lower at peak exercise (P=0.048) in obese compared with nonobese children. EELV did not change from rest to exercise at 40W or peak exercise in nonobese children. In obese children, EELV was higher at peak exercise (44.4 ± 4.7%TLC) compared with rest and exercise at 40W (40.5 ± 4.1 and 38.6 ± 3.1%TLC, respectively, P<0.05). None of the obese children experienced EFL during exercise. In obese children, one experienced EFL during exercise at 40W (44%tidal volume; V̇E) and seven experienced EFL at peak exercise (37 ± 22%V̇E). Higher levels of fat mass were associated with lower levels of FRC when seated (r=-0.88; P<0.001) and while supine (r=-0.65; P<0.003) and EELV during exercise at 40W (r=-0.68; P<0.001). CONCLUSIONS: Obese children demonstrate low lung volume breathing when seated, while supine, and during exercise, which may contribute to an obstructive breathing pattern at rest as well as EFL and dynamic hyperinflation during peak exercise.

May 31 10:30 AM - 10:45 AM
The Effect Of Thoracic Gas Compression On Forced Expiratory Flows Is Increased At High-altitude Troy J. Cross¹, Courtney Wheatley², Glenn M. Stewart¹, Kirsten Coffman¹, Alex Carlson¹, Jan Stepnack³, Norman M. Morris⁴, Bruce D. Johnson⁵. ¹Mayo Clinic, Rochester, MN. ²Mayo Clinic, Scottsdale, AZ. ³Griffith University, Southport, Australia. Email: cross.troy@mayo.edu

It is well-known that the maximal expiratory flow-volume (MEFV) curve may be underestimated due to the confounding effects of thoracic gas compression (TGC) at sea-level. This artefact, if not addressed, reduces the sensitivity/specificity of pulmonary function testing to assess respiratory function in high-altitude subjects. The purpose of this study was to determine the gas inhaled. With this in mind, we reasoned that magnitude of TGC artefact would be greater at high-altitude (> 2,400 m) where the density of air is lower, and its
compressibility increased. PURPOSE: To determine whether high-altitude engenders a greater magnitude of TGC artifact on the MEFV curve. METHODS: Twenty-four adults (10 women; 30% with normal baseline pulmonary function (<90% pred.) completed a 11-day sojourn at Mt. Kilimanjaro. Participants were assessed at Moshi (Day -1, 843 m) and at Barafu 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 effort. Both MEFV curves were further corrected to account for differences in gas-density at altitudes. RESULTS: At both altitudes, peak expiratory flow rate (PEFR), and forced expiratory flows at 75, 50 and 25% of vital capacity (FEF75%, FEF50%, and FEF25%, respectively) were higher after correction for TGC (P < 0.05). The magnitude of the change in the MEFV envelope incured by TGC-correction was relatively greater at Barafu Camp compared with data at Moshi for FEF75% (A16 = 19% vs. 13% ± 5%, P < 0.05) and FEF50% (A34 = 40% vs. 15 ± 16%, P < 0.05). Once corrected for TGC and gas-density, we observed that PEFR, FEF75%, FEF50%, and FEF25%, were lower at Barafu 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.

Heavy-intensity whole body exercise sustained to the limit of tolerance elicits fatigue of the diaphragm and expiratory abdominal muscles. Such respiratory muscle fatigue is likely involved in exercise limitation in healthy humans. Acute submaximal inspiratory muscle loading causes a transient increase in diaphragm excitation and inspiratory muscle strength, and may enhance subsequent exercise performance. Whether loading of the expiratory muscles has a similar ergogenic effect is unknown. PURPOSE: To determine the effect of acute expiratory muscle loading on expiratory abdominal muscle function and exercise tolerance in healthy humans. METHODS: Using a single-blind, placebo-controlled design, nine male subjects [V̇O2peak 4.06 ± 0.79 L.min⁻¹ cycled at ≥90% of V̇O2peak to the limit of tolerance after 1) 2 × 30 expiratory efforts against a pressure-threshold load of 40% maximal expiratory pressure (MEP) (EML-EX), and 2) 2 × 30 expiratory efforts against a pressure-threshold load of 10% MEP (SHAM-EX). Abdominal muscle function was assessed before and after expiratory muscle loading and 5 min after exercise by measuring 1) the gastric pressure response to maximal voluntary expiratory efforts (PGa(max)), and 2) gastric twitch pressure (PGa(tro)) in response to magnetic stimulation of the thoracic nerve roots. RESULTS: From before to after expiratory muscle loading in EML-EX, there was no change in non-potentiated PGa(tro) (30.3 ± 10.6 vs. 32.9 ± 10.3 cmH2O, P = 0.223), potentiated PGa(tro) (36.1 ± 8.8 vs. 38.9 ± 8.1 cmH2O, P = 0.079), or EML-EX (36 ± 10.4 vs. 20 ± 2.4 s, P < 0.01). Differences in baseline FEF25% and 50% of vital capacity (FEF25%, FEF50%) were higher in EML-EX vs. SHAM-EX (potentiated PGa(tro) = 25 ± 12 ± 22% ± 9% cmH2O, P = 0.376). Perceptual ratings of dyspnoea and leg discomfort (Borg CR10) were not different at min 1, min 3, and at end-exercise during EML-EX and during SHAM-EX (P > 0.05). CONCLUSION: Acute expiratory muscle loading does not improve expiratory abdominal muscle function or subsequent exercise tolerance in healthy humans. Supported by The Physiological Society.

Eucapnic Voluntary Hyperpnoea (EHV) is a sensitive indirect airway challenge to assess the diagnosis of Exercise Induced Bronchoconstriction (EIB). However, it has been previously reported that a positive EHV challenge may not necessarily predict a positive exercise challenge (EX). EX have previously shown varying sensitivity due to differences in control over the inspired air water content, with studies being conducted in ambient lab conditions or using medical grade dry air. PURPOSE: To compare the EHV challenge with an EX in a controlled dry environment, to see if a standardised EX can be used in the diagnosis of EIB. METHODS: Thirty-one healthy participants (10 female; 21 males, age 36 ± 10 yrs, exercising 7.7 ± 3.0 hrs per week) gave informed consent. Eight had a history of asthma but were not taking preventative medication. Participants completed an EHV and an EX on a cycle ergometer in a randomised order. The EHV required participants to breathe a gas mixture (5% CO2, 21% O2, and 74% N2) <25(RH>) at a rate equivalent to 85% predicted MVV. The EX was conducted in an environmental chamber (16°C, 25%RH). Following a 4-min warm up, participants completed 6-mins of cycling at a work rate associated with 85% HRmax. Tests were deemed positive if there was a fall in FEV1 of ≥10% following the challenge. RESULTS: Tests were categorised using paired t-tests and Pearson’s correlation and are presented as mean ± SD. RESULTS: Seven participants were positive to EHV. Of these, only two had a positive response to EX. No differences in baseline MVV between EHV and EX were found (EX:4.06 ± 0.79, EX: 4.06 ± 0.77L, p = 0.746). There was a strong correlation between the % fall in FEV1 and EX and EHV (r = -0.520, p = 0.003). However, the % fall in FEV1 post EHV was significantly greater that post EX (EHV: -7.5 ± 5.4, EX: -2.0 ± 3.8, p < 0.001). The total amount of air expired was significantly higher in 6 mins EHV compared to 6 mins EX (EHV: 686.5 ± 141.7, EX: 617.9 ± 83.1 L, p = 0.002).

CONCLUSION: A positive EHV challenge may not be predictive of a positive Exercise Challenge in a dry environment. EHV may have a greater sensitivity due to the lower water content of inspired air and a greater VE. This suggests that a mild positive EHV challenge (a fall in FEV1 of 10-15%), may not be predictive of EIB.
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 only occurred 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 a 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 based on spinal cord injury (SCI) level: tetraplegia (TP; C5-C8, 26.8±5.4 y, 71.2±7.1 kg), paraplegia (PA; T4-T12, 25.6±4.6 y, 74.0±19.7 kg), and able-bodied (AB, 26.2±2.2 y, 78.8±3.9 kg). Participants exercised on an arm ergometer for 30 min at a heat production of 4.0 W/kg (AB vs. TP) or 6.0 W/kg (AB vs. PA) with 3 min rest every 10 min, followed by 45 min of passive recovery in 35°C, 50% RH. Esophageal (T_e) and gastrointestinal (T_L) temperature and local sweat rate (LSR) on the forehead and upper back were measured throughout. **RESULTS:** After 30 min exercise, T_e was greater in TP (1.13±0.25°C) compared to AB (0.34±0.10°C). Similarly, a greater ΔT_L was evident for TP (1.60±0.28°C) compared to AB (0.28±0.15°C). Core temperature peaked at 45 min post-exercise for TP, with ΔT_e and ΔT_L reaching 1.94±0.18°C and 1.83±0.13°C, respectively. No sweating was evident in TP however in AB, end-exercise LSR was 0.38±0.26 mg·min^-1·cm^-2 on the head and 0.36±0.15 mg·min^-1·cm^-2 on the upper back. Differences between PA and AB were evident after 30 min exercise for ΔT_e (0.50±0.32°C vs 0.38±0.08°C) and ΔT_L (0.75±0.38°C vs 0.50±0.09°C), which is when core temperature peaked for both groups. At 45 min post-exercise, PA remained greater than AB for ΔT_e (0.45±0.16°C vs 0.38±0.15°C) and ΔT_L (0.46±0.22°C vs 0.28±0.18°C). Furthermore, ALSR was greater in PA than in AB after 30 min exercise, both at the head (1.03±0.75 mg·min^-1·cm^-2 vs 0.87±0.20 mg·min^-1·cm^-2) and the back (1.03±0.30 mg·min^-1·cm^-2 vs 0.49±0.18 mg·min^-1·cm^-2). **CONCLUSION:** The increase in post-exercise body temperature in TP demonstrates the ability to dissipate heat in hot conditions, primarily due to the lack of sweating. A greater, but less pronounced increase in body temperature during exercise was also apparent in PA compared to AB, suggesting there is a graded effect of SCI level on thermoregulatory impairment.

**Funding:** Collaborative Research Network for Advancing Exercise and Sport Science (CRN-ALISS) Seed Funding Fund.
A 34 years old asymptomatic male underwent a complete cardiovascular examination for his pre-participation exam. On discussing his medical history, he reported that at age 8 he syncope while climbing a rope at gymnastics 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 further evaluation.

PHYSICAL EXAMINATION (at PPE): BP 112/76. HR 60. NAD. CV: NRRR, no murmurs, gallops, rubs. PMI is mid-clavicular with a normal impulse. Lungs: CTAB. The patient has a 5 cm diagonal well-healed scar at the upper lateral corner of the L chest.

DIFFERENTIAL DIAGNOSIS: Dehydration, orthostasis, neurocardiogenic vasovagal syncope, hypoglycemia, seizure, aortic stenosis, hypertrophic cardiomyopathy, cardiac ischemia, supraventricular tachycardia, ventricular tachycardia (Long QT, CPVT, Brugada), bradycardia.

TEST AND RESULTS (during hospital admission): CT head WNL. ECG WNL. EEG WNL. Exercise stress test revealed concomitant increase in PVCs with increase in HR. Genetic testing (+) for RYR2 gene.

FINAL WORKING DIAGNOSIS: Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT).

TREATMENT AND OUTCOMES: Initially placed on nadolol 60mg daily. Significant athletic restrictions imposed. 3 years later restrictions loosened and he began competitive diving and started weightlifting and performing light cardio. 3 months prior to starting college, he sustained an episode of cardiac arrest while walking on the treadmill. Medications changed to nadolol 60mg daily and flecainide 100mg BID. Implantable loop monitor placed. Patient continued to dive and restrictions tightened to decrease the intensity of training. 3 months later the patient sustained a 3 minute episode of PVT while doing burpees at practice. He then underwent a PM/ICD placement and a left cardiac sympathetic denervation. Started diving again 2 months later. Close not to reveal medical history during college recruitment process due to concern that he would not be recruited. Currently cleared to perform modified practices and compete in 1m and 3m springboard. Restricted from platform diving.
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 unrewardable. 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

TEST AND RESULTS:
— Normal heart rate.
— Normal EKG.
— Normal cardiac silhouette. No bony abnormalities.
— Normal anterior-posterior and lateral chest x-rays.
— Normal joint space. No bony deformities.
— Lab results normal with the exception of slightly elevated ESR.

FINAL/WORKING DIAGNOSIS:
— Lab results normal with the exception of slightly elevated ESR.
— Increased uptake at the manubriosternal joint demonstrating subchondral sclerosis.
— Increased uptake at sternomanubrial interval concerning for inflammatory process.

TREATMENT AND OUTCOMES:
1. Costochondritis
2. Osteomyelitis of sternum
3. Seronegative spondyloarthropathy

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

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

TESTS AND RESULTS:
— Blood tests normal.
— Imaging studies normal.
— No evidence of costochondritis.

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. Follow up with primary care for any worsening of symptoms.

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:
— BP 120/58, HR 94, RR 19, O2 94%
— Supine BP 116/64, HR 63
— Standing BP 105/60, HR 72
— Rectal temp 97.9F
— No lightheadedness, chest pain, shortness of breath, hearing changes, numbness or altered mental status.
— No history of vertigo episodes, recent illness or head trauma.
— 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 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.
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 toniccolonic seizure. He was lifted to the table and head tilt jaw thrust performed due to dusky appearance with improvement, leg extended actively having a generalized toniccolonic seizure. He was taken to the pediatric emergency room by EMS for further evaluation.

PHYSICAL EXAMINATION: Not alert, sitting in chair with left arm flexed and left leg extended actively having a generalized toniccolonic seizure. He was lifted to the table and head tilt jaw thrust performed due to dusky appearance with improvement. He was slow to arouse and answered questions slowly and appropriately. On examination vitals were normal for age and no focal deficits elicited with equal strength, sensation, and reflexes bilateral upper & lower extremities. He was transported from the concusion clinic to the pediatric emergency room by EMS for further evaluation.

DIFFERENTIAL DIAGNOSIS:
1. Cerebrovascular degenerative disease inflammatory/autoimmune
2. Intracranial lesion
3. Subdural hematoma

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.
161 May 31 10:10 AM - 10:30 AM
Right Shoulder Pain
Arie (Eric) Dadush1, Vincent Morelli1, James Johnson2.
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History: A 48-year-old right-handed AAF with no significant PMH presented with right shoulder weakness and pain for 2 weeks. There was no inciting event or recent changes in activity. Her symptoms began 2 weeks after a viral URI. She works as a network manager and started developing acute pain for a few days, which was followed with stiffness, weakness and numbness on the lateral side of her arm. The pain then become constant and the numbness and tingling were intermittent and radiating into her hand. Her symptoms had been worsening over the prior week specifically with overhead activity. She had been using NSAID’s, ice/heat and massage with no relief.

Physical examination: Winging of the right scapula was noticed as well as tenderness over the deltoid. Passive ROM was normal with decreased active ROM; forward flexion and abduction 0-120 degrees, abduction external rotation 0-60 degrees. Supraspinatus, infraspinatus and triceps strength 3/5 with normal deltoid and trapezius strength. Hawk’s, Neer’s, Empty can, and Impingement tests are all positive. Obrrient’s, Yergason’s and Crossover tests negative. Differential Diagnosis: Parsonage-Turner syndrome, Cervical disk disease, Shoulder impingement syndrome, Neoplastic brachial plexopathy, Supraspinatus tendinopathy Tests and results: X-ray 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 extrusion 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 as injury as at the level of the plexus. Final working diagnosis: Parsonage-Turner syndrome

Outcome: Patient was given Toradol and Dexamethasone 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 as needed if not complete resolution within 8 weeks.

162 May 31 10:30 AM - 10:50 AM
Chronic Axillary Pain and Weakness in a Recreational Weight Lifter
Christopher Chong, 19064, Kevin Duprey. Crozer Keystone, Springfield, PA. (Sponsor: Thomas Kaminski, FACSM)

(History): A 19 year old college student and recreational weight lifter presents with chronic right axillary pain and mass. His pain started 8 months earlier while doing a human flag pole pose (holding onto a pole and lifting his body parallel to the ground). He felt an acute onset of sharp pain over right axillary region. He self treated with ice and foam roller without any 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, hematomata, asymmetric fat deposition, rhabdomyosarcoma.

Treatment and outcomes: In the setting of the absence of concern for neoplasia, the patient was referred to PT. He attended 10 sessions with no improvement. The patient was also referred to orthopedics. Physical therapy exercises were continued to improve. Repeat x-ray demonstrated good bone healing. Strengthening exercises increased with plan for resumption of all activities in 2 more weeks.

163 May 31 10:50 AM - 11:10 AM
Shoulder Injury in a College Football Player
Ward McCracken1, Justin Byers2, Dave Smith3.1University of Minnesota, Minneapolis, MN. 2Bethel University, St Paul, MN. (Sponsor: Suzanne Hecht, MD, FACSM)

(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 Hennepin-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. Examination 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 exam after the second reduction was significantly limited due to continued apprehension but generally showed diffuse weakness without focal deficit, limited AROM in all planes, no bony TTP, and neurovascular exam was intact.

Differential diagnosis:
1. Glenohumeral Dislocation
2. Bony Bankart Injury
3. Hill-Sachs Lesion
4. Labral Tear

Tests and results:
XR - 4V’s (AP, Gracile, Axillary, and Scapular Y) negative
MRI without contrast - 3x2x1cm Hill-Sachs lesion, soft tissue Bankart injury, no evidence of any rotator cuff muscle tear, residua of moderate medial anterior capsular stripping inferiorly and of medial stripping of the inferior capsular attachment along the undersurface of the glenoid

Final diagnoses:
1. Anterior Glenohumeral Dislocation x2
2. Soft Tissue Bankart
3. Hill-Sachs Lesion
4. Capsular Stripping

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 and surgical consult was obtained. After consideration, he opted for a trial of non-operative treatment. Presently, he continues to make excellent progress with range of motion and strength and has experienced no further instability.

164 May 31 11:10 AM - 11:30 AM
Subacute Presentation of an Elbow Injury- Work Related Delayed by Insurance
Ali Ashraf1, John Chappa2, Melinda Schalow3, Mimi Zumwalt1.1Texas Tech University Health Sciences Center, Lubbock, TX. 2John Chappa, Lubbock, TX. 3Melinda Schalow, Lubbock, TX. (Sponsor: Jacelyn J. Robert-McComb, FACSM)

(History): A 30 year-old, right hand dominant male firefighter sustained a right arm/elbow injury by attempting to catch a heavy garage door from falling during installation at work. He felt a pop with immediate pain. He experienced swelling/ bruising in the ensuing couple of days, also difficulty using the affected extremity. Patient was initially seen at an urgent care clinic, then later by his primary care physician. Due to worker’s compensation insurance requirements, an MRI was eventually done nearly 3 weeks out from initial injury, before he was referred for orthopedic consultation.
PHYSICAL EXAMINATION: Right upper extremity exam revealed tenderness/eechymosis in the arm/elbow, weakness with resisted supination and positive hook test. He was still able to flex, extend the elbow plus pronate and supinate his right forearm. He reported no paresthesia or radicular symptoms, with sensation intact to light touch distally. Pulpation also showed mild “poppye” deformity proximally at mid anterior arm.

DIFFERENTIAL DIAGNOSIS: Partial distal biceps tendon rupture Complete distal biceps tendon rupture Bony distal biceps avulsion

TEST AND RESULTS: Right elbow anterior-posterior and lateral radiographs: No fractures or dislocations Right extremity MRI: Shows complete tear of the distal biceps tendon with retraction

FINAL WORKING DIAGNOSIS: Complete distal biceps tendon rupture - subacute TREATMENT AND OUTCOMES: Immediate open reattachment of distal biceps tendon (2 incision technique) to prevent any further retraction. Arm kept in posterior/U splint with elbow flexed at 90 degrees-NWB R UE. Follow up visit 10-14 days post-op then right elbow placed in dynamic brace. Physical therapy protocol two weeks after surgery starting with gravity assisted elbow extension. Regained full elbow ROM in 3 months (out of brace) with grip strength 90%. Resolving proximal lateral forearm paresthesias. Functional test planned at 6 months before returning to previous work/job.

Results from pretest to posttest in seconds. Climbers P1 and P3 had faster and improved 4 Square Step Test times: P1: -0.442; P3: -0.379. Climbers P2 and P3 had faster and improved Go (TUG) manual and cognitive tests, the timed Supine to Stand test, and the Four Square Step Test.

POSSIBLE MEANING: P1: Partial distal biceps tendon rupture with retraction

P3: Complete distal biceps tendon rupture

The climbers demonstrated improvements in functional leg strength/power which may be attributed to the dynamic balance and functional leg strength gained during the climbing intervention. The results also suggest that IRC may be a feasible therapeutic activity with minimal safety risks 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.

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, posttest pilot intervention study had participants perform IRC 3 x 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 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 B times: P1: -3.89; P2: +22; P3: -3.79. Climbers P2 and P3 had faster and improved TUG manual times: P1: +0.041; P2: -0.57; 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.

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).

Results: Three men on stable medication regimens (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 6MWGT 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 in 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.
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) were enrolled in the study. Participants 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) and Met-allele group (N = 4, 6.25 ± 5.97) on a 0-63 scale (P = 0.48). 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 (5.75 ± 6.24). **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.

**Board #5**

Cerebellar Transcranial Direct Current Stimulation For Motor Function In Parkinson’s Disease

Lidio Lima da Albuquerque, Katherine Fischer, Song Yo, Merrill Landers, Brach Poston. *University of Nevada, Las Vegas, Las Vegas, NV.* (Sponsor: John C. Young, FACSFM)

**Introduction:** Cerebellar transcranial direct current stimulation (c-tDCS) is a non-invasive brain stimulation technique that has been shown 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, 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.

**Results:** For 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 28 ± 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 3 ± 6 sec; Test 2 3 ± 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 27 ± 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 CAFES PhD student grantee (BEX 13509-13-6). This research was supported by a CTR-IN Pilot grant to Brach Poston.

**Board #4**

Dynamic Cycling Improves Motor Symptoms And Function In Individuals With PD

Angela L. Riddle, Dana L. Ault. *Kent State University, Kent, OH.* (Sponsor: Ellen Glickman, FACSFM)

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**No relationships reported**

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:** Individual participants were randomized to either a dynamic cycling group or a cycling group that practiced cycling on a stationary bicycle without the motor. Cycling consisted of 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 baseline to end of intervention. There was a 1% improvement in UPDRS scores and a 2% 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.

**Board #6**

The Effects of Water Aerobics Exercise on Cerebral Perfusion in Multiple Sclerosis

Brandon S. Pollok1, Jennifer Petersen1, Hayden Gerhart2, John McDaniel1, Mary Beth Spitznagel1, Angela Ragdell1. *Kent State University, Kent, OH.* (Sponsor: Professor Damian Bailey, FACSFM)

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**No relationships reported**

Exercise-induced increases in brain blood flow are a key mechanistic pathway for improved brain function through regular exercise. Water-based exercise augments these effects and therefore may represent an optimal exercise strategy to target this mediator of improved brain health, particularly for those with impaired cerebrovascular vascular function such as stroke survivors. While aquatic treadmill exercise has been reported to improve gait re-education in stroke rehabilitation, no research has assessed whether cerebrovascular function in stroke survivors is improved following water-based training.

**Purpose:** To examine the effect of a 4-wk aquatic treadmill (ATM) training intervention on cerebrovascular responsiveness in community-dwelling stroke survivors.

**Methods:** Six community-dwelling stroke survivors (58 ± 11 yrs), with chronic stroke (>6 months), completed a 4-wk ATM training intervention of 30 min water-based walking, 3 times/wk. Before and following the intervention, resting cerebral blood flow velocity (Transcranial Doppler) of the stroke affected and unaffected cerebral hemispheres was assessed along with cerebrovascular responsiveness, as indexed from the percent change in middle cerebral artery blood velocity (MCAv) to a 4-min hypercapnic stimulus (5% CO2, in air). ANOVA was used to compare pre and post intervention measures.

**Results:** Pre-training resting MCAv was similar between the affected and unaffected side (mean ± SD: 46 ± 12 vs 46 ± 19 cm/s, respectively; p = 0.96), and the
PURPOSE: Recent studies reported that repetitive unidirectional exercise therapy (UET) like treadmill-walking stimulates subcortical brain areas and the cerebellum. UET may 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-step (UET) versus on a treadmill. METHODS: Twenty chronic stroke patients were randomly assigned to two 2-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 hearth rate for 1h/day, 3days/week. SPM5 (http://www.fil.ion.ucl.ac.uk/spm/) was used for preprocessing and statistical analysis of the MRI data (p < 0.001). 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.

Influence of Aerobic Exercise Intensity on Acute Changes in Motor Activation Post-Stroke

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Based on evidence among healthy adults, it has been proposed that aerobic exercise (AEX) could acutely activate the brain in ways that facilitate motor learning post-stroke. However, the acute effects of AEX on cortical motor activation have not been well described, and no previous studies have assessed the influence of aerobic intensity on this response among individuals with stroke.

PURPOSE: To investigate the effect of aerobic exercise intensity on acute cortical motor activation among persons with chronic hemiparetic stroke.

METHODS: Using a crossover design, 10 subjects (5 male; mean ± SD age, 60.1 ± 8.1yrs) were randomly assigned to two 2-week post-stroke, comparable walking exercise programs, moderate (MET) and high-intensity (UET) walking speeds, 0.69 m/s [± 25% normal]; VO2peak, 16.6 ± 3.4 mL/kg/min [67 ± 14% normal]) performing one 20 minute session of moderate-intensity treadmill AEX (peak speed, 0.69 ± 0.30 m/s; mean VO2, 55 ± 14% VO2peak; blood lactate at end of session, 1.5 ± 0.5 mmol/L) and one 20 minute session of high-intensity treadmill AEX (1.29 ± 0.41 m/s; 62 ± 15% VO2peak; 5.7 ± 3.2 mmol/L) in random order, at least one week apart. High-intensity AEX used an interval training strategy involving 30 second bursts at maximum safe treadmill speed alternated with 30-60 second rest periods. Cortical motor activation

threshold of the parietal quadriiceps femoris was measured immediately before and after each AEX session using transcranial magnetic stimulation. A fixed effects model to incorporate the crossover design was used to examine between-protocol differences in change.

RESULTS: During moderate-intensity AEX, motor threshold increased from 78.2 ± 2.2 to 81.4 ± 2.2% maximum stimulator output (MSO), indicating decreased paretic motor activation. During high-intensity AEX, motor threshold decreased from 80.6 ± 2.2 to 77.3 ± 2.2% MSO, indicating increased paretic motor activation. The between protocol difference was statistically significant (p=0.037). CONCLUSIONS: In chronic stroke, high-intensity AEX (above the lactate threshold) appears to acutely increase paretic motor activation significantly more than moderate-intensity AEX (below the lactate threshold), which may have the opposite effect. Further studies are needed to confirm this finding in a larger sample and to determine whether acute motor activation from high-intensity AEX can be used to improve motor outcomes following stroke.

Lower Extremity Function in Different Cognition Older Adults

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PURPOSE: Lower extremity function is closely related to cognitive and balance impairments. Evaluate the difference of lower extremity function with different levels of cognitive impairment to find out the cognitive effects of balance functioning in community-dwelling older adults.

METHODS: Fifty-five adults aged over 60 (age: 74.36±7.11yrs, BMI: 23.43±3.29 kg/m2) were divided into normal cognition (NC, n=17), mild cognitive impairment (MCI, n=16), and dementia groups (D, n=22), using the SLUMS scale and physician’s diagnosis. Lower extremity muscle strength (30-second chair stand test), lower extremity flexibility (chair sit-and-reach), agility/dynamic balance (8-foot up-and-go), stability score and single-leg static balance capacity were evaluated.

RESULTS: In static balance, NC group had better performance in stability score (1.77±0.58 vs. 4.22±2.03, p=0.001) than D group, especially in anterior-posterior side (1.57±0.77 vs. 1.41±1.02, p=0.001). In ankle proprioception, NC and MCI groups improved the joint position sense more slightly (1.46±0.51 vs. 1.48±0.50 vs. 2.07±0.45, p=0.004) than D group. Moreover, NC and MCI groups had significantly better performance in lower extremity flexibility (7.58±5.56cm vs. 8.72±6.69cm vs. 10.89cm, p<0.001), and dynamic balance (6.08±1.52 vs.6.05±1.74 vs. 6.42±0.66, p=0.007) than D group.

CONCLUSIONS: The abilities of lower extremity functioning and agility/dynamic balance may be affected by the level of cognitive impairment. We suggest that should
give priority for providing strategies of exercise intervention for balance to improve lower extremity function, especially when agility/dynamic, anterior–posterior control and ankle proprioception are limited because of early cognitive impairment.

**Key words:** dementia, mild cognitive impairment, muscle strength, balance, ankle proprioception

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 of 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 He90000-2k, MA, USA) during quiet stance and in tandem position, both in normal and in DT conditions (subtracting the cognitive task). Psychophysiological responses (heart rate and variability, breathing frequency, 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 revealed higher accuracy of secondary (cognitive) task while balancing at the end of the intervention (p=0.032) 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 challenging tasks. The present cognitive-motor intervention was identified as a promising method to counteract these age-related negative adaptations. Supported by Norway Grants, Project No. 4300-472/2014

**A-40**  
Free Communication/Poster - Activity Interventions and Programming in Adults I

**Board #12**  
May 31 9:30 AM - 11:00 AM  
Psychophysiological Responses To Dual-task Postural Control In Older Adults After 3-month Of Cognitive-motor Intervention

Uros Marusic1, Armin Paravic1, Mitja Gerzevic1, Bostjan Simunic1, Rado Pisot1. *University of Primorska, Koper, Slovenia. University of Primorska (Institute for kinesiology research), Koper, Slovenia.* Email: uros.marusic@apris.si

(No relationships reported)

**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, FACSFM)*

(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 (M BMI= 36.1 ± 7.3 kg/m²) and low active (M=554 ± 2390 steps/d). Weight losses averaged -3.5±4.3 kg (p=.0001) and daily steps increased an average of 1101±2395 (p=.009) 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=.76, p<.0001). A significant, positive correlation was found between the change in daily steps and the number of days the Fitbit was used (r=.43, p=.008). **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.

**194**  
Board #15  
May 31 11:00 AM - 12:30 PM  
Lifestyle Enhancement Program: Evaluation of a Community-based Physical Activity Smoking Cessation Program

Michelle B. Stockton1, Kenneth D. Ward2, Barbara S. McClanahan1, Mark W. Vander Weg3, Mace Coday1, Nancy Wilson1, George Relyea1, Mary C. Read1, Stephanie Connolly4, Karen C. Johnson5,1, University of Memphis, Memphis, TN. 2Methodist Healthcare, Memphis, TN. 3University of Iowa, Iowa City, IA. 4University of Tennessee, Memphis, TN. 5Methodist Healthcare, Memphis, TN. (Sponsor: Lawrence W. Weiss, FACSFM)*

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(No relationships reported)

**PURPOSE:** The purpose of this study was to evaluate the efficacy of the Lifestyle Enhancement Program, a two arm, parallel group, randomized clinical trial comparing community-based physical activity (PA) program to a wellness control program as adjunctive smoking cessation treatment. **METHODS:** All participants (n=392) received cessation counseling and the nicotine patch and were randomized to PA (n=199): YMCA membership and personalized exercise programming from a health coach) or an equal contact wellness curriculum (n=193). Primary (CO-verified continuous smoking abstinence) and secondary (PA...
levels) outcomes were assessed at baseline, 7-week, 6- and 12-months. Indices of treatment perception, adherence, adherence 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 p-values > 0.18). In the PA group, increases from baseline to 7 weeks were not significant (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 HL068569

195 Board #16 May 31 11:00 AM - 12:30 PM Gesture Analysis for Yoga Alignment in Young Adults Paula R. Pullen, 30566’, Nataly Gonzalez‘, William Seffens‘. University of North Georgia, Oakwood, GA. 4‘Moorehouse School of Medicine, Atlanta, GA. (Sponsor: Walter R. Thompson, FACSM) Email: paula.seffens@ung.edu

浃ノ（No relationships reported）

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 the skeleton coordinates for the 12 participants were acquired and analyzed against this ground truth. The gesture analysis software produced solutions with high True Positives (99.5%) and low False Positives (0.03%) for most yoga postures sampled. Depth stream and skeletal coordinates for the 12 participants were acquired and analyzed against this ground truth.

Gesture Analysis for Yoga Alignment in Young Adults

196 Board #17 May 31 11:00 AM - 12:30 PM Effects of a Dog Walking Intervention on a University Campus: A Pilot Study Melanie Sartore-Baldwin1, Jaclyn Baker1, Lacey Schwab1, John Crenshaw1, Maria D’Amico1, Bhibha Das1, Matthew Mahar, FACSM2. East Carolina University, Greenville, NC. 3‘San Diego State University, San Diego, CA. (No relationships reported)

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 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 satisfaction and 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 min) 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. Thematic analysis suggested that participants signed up for the study because of their love of dogs, looked forward to their Friday walks, had fun during the walks, returned to work happy, and wanted the program to continue. 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±5.9 y) 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-articualr 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 flexion’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 (BF) 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.

Eighty-six percent (%) of differences are presented for EBRPG and EBRPG, respectively: VAS -9.4 vs. 70.3; ODI +6.0 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: BF +1.6 vs. -2.4: FFM -1.1 vs. +2.44. 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.

Conducted Research -Including Integrative Science - Health and Nutrition - Tokyo, Japan. 4Konrad University, Osaka, Japan. 5Waseda University, Saitama, Japan. 6Curves Japan Co., Ltd., Tokyo, Japan. 7University of South Carolina, Columbia, SC. Email: yususawada@gmail.com

Reported Relationships: S.S. Sawada: Contracted Research - Including Principle Investigator; Curves Japan Co., Ltd.

Limited data are available on the effect of combined aerobic and resistance training (combined training) in Asian populations.
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 duration lasting 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 developed 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 ± 18.9 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.

199 Board #20 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

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 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...
Independent of an individual’s physical activity levels, prolonged periods of sedentary behavior are detrimental to health. Office-based workers engage in prolonged periods of sitting and are a target group for intervention. Individualized consultations have potential to change sedentary behavior and offer a low cost alternative to interventions such as sit-to-stand desks.

**Purpose:** To report quantitative and qualitative outcomes from a randomized controlled trial exploring the use of an individualized consultation intervention to change sedentary behavior in the workplace. **Methods:** 48 participants (42F, 6M, mean age 42.9±12.0 yrs, BMI 25.2±3.8 kg/m²) were recruited from a university by workplace email and poster distribution. Participants were > 18yrs with full time desk based occupations. Participants were randomized to a control group (n=23) or an intervention (n=25) group who received a 30-45 minute individual consultation incorporating behavior change strategies to support reducing sedentary behavior. Before and after the intervention participants were an activPAL monitor for 7 days. A sub-sample of 16 intervention participants took part in semi-structured interviews exploring intervention perceptions. **Results:** No changes were reported in overall, weekday or weekend mean sitting, standing or stepping time; step count, sit-to-stand transitions or % of waking day spent sitting, standing or stepping (p>0.05). Semi-structured interviews provided insight into participant intervention perceptions. Many participants mentioned increased knowledge and awareness of sedentary behavior and the associated physical and psychological benefits. However, several barriers to behavior change were reported including: social norms within a workplace; perceived negative opinion of colleagues; excessive workloads and deadlines and loss of concentration and productivity. **Conclusions:** The individualized consultation intervention was not effective in changing sedentary behavior. Multi-level barriers impede sedentary behavior change in the workplace. Further work is required to fully understand these complex influences on this behavior in a workplace setting to allow the development and implementation of effective interventions.
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±1.268; post-test: 9±1.3±0.05), LDL cholesterol (17±4.6% 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.

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/day on aerobic capacity compared to a high dose (60 min/day) 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, 60min/day; n=9). Aerobic capacity (VO2peak) was measured on a motor-driven treadmill. Participants walked to their maximum 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 baseline to 16 weeks with no significant differences found for other support types (ps > .05). 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.

Purpos e: 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 iDexa.

RESULTS: Participants significantly (p<0.007) increased lean mass from pre (107.5±16.4) to post (110.2±18.2) and significantly decreased fat mass from pre (101.93±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.

Purpose: Intelligent Health delivers ‘Beat the Street’ with the aim to get a whole community more physically active. Beat the Street turns the town into a real-life game where players register their walking and cycling journeys by tapping a smartcard on RFID readers called ‘Beat Boxes’ placed on lampposts around the town. Players monitor their progress via a website where they can see their own and their team’s progress, and the overall target

Methods: During registration, participants complete a questionnaire which includes a single item physical activity question. Follow up surveys take place at the end of the game and up to 8 months later. Pre-intervention/post-intervention comparisons are completed based on survey responses and in-depth analysis is completed based on data from each player’s activity by tapping their card on beat boxes.

Summary of Results: In 2015, Intelligent Health delivered 11 Beat the Street projects, engaging 170,000 participants and collected baseline survey data from 45,136 adults. In 2016 prior to September, Intelligent Health delivered 15 Beat the Street projects, and reached the milestone of 500,000 people engaged and collected baseline survey data from 53,234 players. In 2015, across all Beat the Street projects the proportion of people reporting 0 or 1 days of physical activity decreased from 14% before Beat the Street to 8% after. The proportion meeting WHO guidelines increased from 43% to 48%, and the proportion of people walking for 15+ minutes on 5-7 days per week increased from 54% to 63%. In 2016, across all Beat the Street projects the proportion of people reporting 0 or 1 days of physical activity decreased from 8% before Beat the Street to 5% after Beat the Street.

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 intervention identified as the most helpful for their weight loss efforts. Social support is defined as the most helpful type of support versus those who lost < 5% of their initial 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 (ps > .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.

Board #31
May 31 11:00 AM - 12:30 PM
The Effect Of A Hiit And Resistance Exercise Program On Body Composition In Obese Females
Ashley Peart, Mynor Rodriguez-Hernandez, Shelby Foote, James McDonald, David Pasco, FACSM, Danielle Wadsworth. Auburn University, Auburn, AL. (Sponsor: Dr. David Pasco, FACSM)
Email: azh0078@auburn.edu
(No relationships reported)

PURPOSE: The aim of this study was to evaluate the effect of the American College of Sports Medicine's recommended exercise training program for obese females with nonalcoholic fatty liver disease. Obese individuals with nonalcoholic fatty liver disease (NAFLD) were randomized to 16 weeks of verified exercise training (HIIT, 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 iDexa.

RESULTS: Participants significantly (p<0.007) increased lean mass from pre (107.5±16.4) to post (110.2±18.2) and significantly decreased fat mass from pre (101.93±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.

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)
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(No relationships reported)

Purpose: Intelligent Health delivers ‘Beat the Street’ with the aim to get a whole community more physically active. Beat the Street turns the town into a real-life game where players register their walking and cycling journeys by tapping a smartcard on RFID readers called ‘Beat Boxes’ placed on lampposts around the town. Players monitor their progress via a website where they can see their own and their team’s progress, and the overall target

Methods: During registration, participants complete a questionnaire which includes a single item physical activity question. Follow up surveys take place at the end of the game and up to 8 months later. Pre-intervention/post-intervention comparisons are completed based on survey responses and in-depth analysis is completed based on data from each player’s activity by tapping their card on beat boxes.

Summary of Results: In 2015, Intelligent Health delivered 11 Beat the Street projects, engaging 170,000 participants and collected baseline survey data from 45,136 adults. In 2016 prior to September, Intelligent Health delivered 15 Beat the Street projects, and reached the milestone of 500,000 people engaged and collected baseline survey data from 53,234 players. In 2015, across all Beat the Street projects the proportion of people reporting 0 or 1 days of physical activity decreased from 14% before Beat the Street to 8% after. The proportion meeting WHO guidelines increased from 43% to 48%, and the proportion of people walking for 15+ minutes on 5-7 days per week increased from 54% to 63%. In 2016, across all Beat the Street projects the proportion of people reporting 0 or 1 days of physical activity decreased from 8% before Beat the Street to 5% after Beat the Street.
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.

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**Board #33**

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

**A Randomized Trial of Chinese Traditional Health-Promoting Exercises for Ankylosing Spondylitis**

Huiru Wang1, Liye Zou1, Ting Li1, Minhua Lu1, Zhe Liu1. Shanghai JiaoTong University, Shanghai, China. 2Springfield College, West Springfield, MA. 3Renji Hospital, Shanghai, China. 4Shanghai JiaoTong University, Renji Hospital, Shanghai, China.

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(No relationships reported)

**PURPOSE:** 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 Qigong 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 swinging hands in the closure. 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 < 0.001), whereas the control group only showed an improvement in Finger-to-floor test (p = 0.012). For the intergroup comparison, significant differences were only observed in MSF (p < 0.001) and CE (p = 0.041), but FF (p = 0.483). 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.

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**Board #34**

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

**Moderate Versus High Intensity Interval Exercise Training Reduce the Clinical Components of Metabolic Syndrome in Prevalently Physically Inactive Adults: A Randomized Clinical Trial**

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(No relationships reported)

**PURPOSE:** Metabolic syndrome (MetSyn) increases the risk for morbidity and mortality from cardiovascular disease and exercise training is a fundamental factor in the treatment and prevention the clinical components of MetSyn. We conducted this study to investigate how an exercise program affects the risk components of MetSyn and exercise capacity 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% peak HRmax until expenditure of 300 kcal until the end of training. A MetSyn z-score was calculated for each subject from triglycerides, HDL-C, fasting glucose, waist circumference, and arterial blood pressure (MAP). Blood lipids and glucose, waist circumference, MAP and exercise capacity were measured at baseline and 12-weeks thereafter.

**RESULTS:** Z-score MetSyn changes were 1.546 (1.575) in the MCT group, −1.249 (1.629) in the HIT group (difference between groups −2.795 [95% CI, 1.276 to 4.311] (P = 0.001)). Average cardiometabolic risk factors decreased in the MCT group (p = 0.040) and 0.18 in the HIT group. There was a significant decrease in glucose fasting from 0 to 12 weeks in MCT group (P = 0.039) compared to 12 weeks for the HIT group (P = 0.001). Waist circumference was significantly reduced at 12 weeks compared to 0 weeks in HIT (P = 0.010). Percentage body fat did not change in the MCT group (0.8) and decreased in HIT group −1.1 (difference between groups 1.2 [95% CI, 0.1 to 2.4 P = 0.04]). Muscle mass significantly increased throughout the 12 weeks of training in high intensity with significant differences between groups 0.8 kg [95% CI, 0.3 to 1.3 P = 0.027]. MAP was significantly reduced from 0 weeks at 12 weeks in HIT group (P = 0.019).

**CONCLUSIONS:** In inactive adults, this study showed that a 12-week HIT program can improve the clinical risk factor profile for MetSyn.
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 pharmacological 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-times 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; F=6.95, P=0.012 and MMSE score (1.23 points; F=4.84, P=0.03) with moderate and high effect size (ES=1.28-0.01). There were significant within-group changes (improvement) in ADAS-Cog (t=2.34, P=0.03), MMSE (t=2.65, P=0.06), MoCA (t=3.85, P=0.01), TMT-A/B (t=2.80, 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 self-observed 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 was recommended HbA1c treatment in 4.3% of patients. The change in HbA1c was found after the intervention (from 7.7 to 7.1%) and was thus unchanged in the last 3 months (7.0%). VO2max increased by 19% in both training groups in the intervention (from 25.1 to 28.8 ml-1·kg-1·min-1, p<0.01), but was unchanged in the last 3 months after intervention (28.0 ml-1·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-1·kg-1·min-1 and 6.9, 6.8, 6.6% respectively). The difference between HAIT and MCT after the 12 week intervention was statistical significant for both VO2max and HbA1c (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.

PURPOSE: Excess gestational weight gain (GWG) increases the risk for adverse maternal and fetal outcomes. Recent reports link sleep deficiency to excess GWG; however, evidence in non-pregnant women suggests that physical activity improves sleep duration and sleep efficiency. Our objective is to report preliminary findings from a randomized aerobic exercise intervention throughout pregnancy, on the association between sleep quality, GWG, and the modifying effects of physical activity. METHODS: Thirteen mothers provided objective physical activity duration, total sleep time, and sleep efficiency via the SenseWear Armband (BodyMedia Inc.) for sleep duration and 31% of the variance in sleep quality, with no significant effects between two groups (TG = gardeners and NG = non-gardeners). At both T1 and T2, there was no significant difference in GWG between the two groups (TG = gardeners and NG = non-gardeners) for 5 consecutive days during the 1st, 2nd, and 3rd trimester. Physical activity level (PAL) was expressed as total energy expenditure divided by resting energy expenditure. GWG was calculated as pre-pregnancy weight (measured at 8-13wks) subtracted from weight at delivery. Appropriate versus excess GWG were categorized using 2009 IOM guidelines. RESULTS: Sleep duration significantly decreased from the 1st trimester to the 2nd trimester (Mean ± SEM= 436 ± 34.7 vs. 381.1 ± 30.0min, p=0.03) and plateaued in the 3rd trimester (381.1 ± 30.0 vs. 306.6 ± 29.0min, p=0.05). There was no difference in sleep efficiency throughout pregnancy. Compared with mothers with appropriate GWG, mothers with excess GWG achieved less sleep (389.6 ± 21.7 vs. 292.1 ± 36.1min, p=0.035) and slept less efficiently (81.0 ± 3.8 vs. 61.6 ± 6.4%, p=0.029). Mothers randomized into the exercise intervention had higher sleep duration (412.8 ± 19.7 vs. 301.8 ± 23.8min, p=0.002) and better sleep efficiency (82.5 ± 6.4 vs. 4.7%, p=0.007) compared with controls. Multiple linear regression models assessing the independent effects of GWG and exercise intervention on sleep quality demonstrate that aerobic physical activity explains 39% of the variance in sleep duration and 31% of the variance in sleep quality, with no significant effects from GWG. CONCLUSION: Our findings suggest that physical activity may be a potentially effective way of improving sleep quality in pregnant women with or without excess gestational weight gain.

PURPOSE: Caloric excess induces endothelial dysfunction. Exercise can improve endothelial function or mitigate the negative effects of excess caloric intake. We hypothesized that exercise training would prevent deterioration in endothelial function associated with 4 weeks of fat-sugar snacking. METHODS: 27 overweight/obese (BMI = 30.0±3.7 kg/m²) males (age = 29±7 y) underwent 4 weeks of added fat-sugar snacking (14.5±9.4 kcal/day), in the form of donuts (6 days/week) added to their regular diet. Participants were randomized to one of three conditions: 0 kcal/day supervised moderate-intensity (MCT; n=8) exercise (50% peak VO2), 1,000 kcal/day supervised high-intensity interval (HIIT; n=10) exercise (90-95% peak heart rate), or no-exercise control (CON; n=9). All participants were tested in the morning following a ~10 h overnight fast at baseline and 4 weeks. Endothelial function was assessed by brachial artery flow-mediated dilation (FMD) and was further normalized for shear rate (FMD/shear rate). Two-way repeated measures ANOVA was used to detect time, condition, or time x condition interaction effects. RESULTS: FMD was unchanged in all groups (Control: Pre FMD = 4.6 ± 1.2%, Post FMD = 3.7 ± 2.1%, p=0.28; HIIT Pre FMD = 6.0 ± 2.7%, Post FMD = 5.5 ± 2.3%, p=0.56; MCT Pre FMD = 6.2 ± 2.4%, Post FMD = 5.5 ± 2.4%, p=0.43). With all groups combined there was a trend towards a reduction in FMD (p=0.16) and FMD/shear rate (p=0.09). Baseline diameter, peak diameter, blood flow velocity and shear rate were unchanged within all groups (p > 0.05). CONCLUSIONS: The addition of ~14,500 kcal of fat-sugar snacking in the form of donuts to the regular diets of overweight/obese men over a 4-week period was insufficient to induce deleterious changes in endothelial function. The consumption of additional energy predominantly as fat and sugar may have prevented improvements in FMD expected with HIIT and MCT.
12 participants (mean age, 44.09 ± 16.26 years) wore the activPAL accelerometers for a 6-day period (including 2 weekend days). Each day, time spent in sedentary time, standing, walking times, and EE were measured. The number of steps were measured, and energy expenditure (EE) in metabolic equivalent-hour was estimated. The data were analyzed using MatLab and SAS.

**RESULTS**: At T1, no significant differences (p > .05) for overall (weekday and weekend) sedentary, standing, walking, and EE were detected between TG and NG. Unexpectedly, the TG had lower step counts (1.25 ± 0.35 vs. 2.05 ± 0.47 hrs, p<.05) compared to the NG at the <120 steps/min cadence at T1. From T1 to T2 data, the NG significantly increased time spent sedentary (1.90 ± 0.65 hrs, p<.05), significantly decreased time spent standing on weekdays (-0.98 ± 0.33 hrs, p<.01), and marginally significantly decreased overall time spent standing (-0.36 ± 0.45 hrs, p = .09). No significant changes were found between T1 and TG in TH, nor did any other variables in either TG or NG change. The increased sedentary time and the decreased standing time in the NG but not TG indicated that gardening may protect against sedentary time and maintain PA. One gardener dropped out at T1 and two NGers started late at T2 (we have to submit the abstract before getting their data). All other participants wore the accelerometers for all six days (24 hrs/day), which indicates a good compliance.

**CONCLUSIONS**: The accelerometers successfully tracked subjects’ PA and SB for sedentary, standing and walking indicating that activPAL accelerometry is a feasible approach for assessing PA and SB. Although the results should be interpreted cautiously due to the small sample size, which precluded adequate statistical power, the study demonstrated feasibility of testing methods for a large scale gardening study.

In recent years, more emphasis has been put on the importance of the role of exercise and proper diet in successful weight management. Weight loss due to an exercise induced energy deficit without changes in dietary intake is generally less than expected.

**PURPOSE**: The purpose of this study was to compare 24 hour changes in appetite/satiety and daily physical activity following bouts of either 200 or 400 kcal of aerobic exercise (walking) in sedentary overweight/obese (BMI ≥ 25) college age females.

**METHODS**: Overweight/obese college age girls (n=19) were recruited and scheduled for six trials. The exercise trials consisted of walking at 70% of their heart rate reserve on a treadmill until they expended either 200 or 400 kcal. Energy expenditure was verified by indirect calorimetry. The third trial was a non-exercise control. The order of the trials was randomized. Changes in physical activity (sit/lie time, sleep time, and standing time) were measured using the ActivPal accelerometer during the 24 hours post exercise. Changes in appetite/satiety were measured via Visual Analog Scales immediately before and after the exercise session and at 60, 120, and 180 minutes following each trial.

**RESULTS**: There were no significant changes in sit/lie time between the 200K (575.7 ± 144.6 minutes), 400K (613.7 ± 90.1 minutes), and control trials (554.0 ± 113.3 minutes). There were no significant changes in sleep time between the 200K (532.6 ± 105.6 minutes), 400K (529.7 ± 91.9 minutes), and control trials (570.9 ± 91.8 minutes). There were no significant changes in stand time between the 200K (223.1 ± 110.1 minutes), 400K (187.5 ± 85.0 minutes), and control trials (216.6 ± 95.0 minutes). There was no difference in the appetite between the 200K (27.4 ± 12.2 minutes), 400K (25.4 ± 12.2 minutes), and control trials (20.1 ± 12.9 minutes). There was no significant changes in satiety between the 200K (30.5 ± 17.5 minutes), 400K (33.1 ± 15.0 minutes), and the control trials (33.3 ± 14.6 minutes).

**CONCLUSION**: In overweight/obese, college age females an exercise bout of either 200 or 400 kcal does not result in changes in daily physical activity or appetite/satiety in the 24-hour period immediately following the exercise session.

**Time spent in sedentary behavior (i.e., < 1.5 METs while reclining), is linked to poor health outcomes. Persons who spend considerable periods of time daily in unbroken sitting are at higher risk of cardiometabolic disease. As sedentary time emerges as an independent health risk factor, the workplace has come under greater scrutiny due to its high percentage of computer-based, sedentary jobs. University employees were recently shown to spend 75% of their workday seated (Fournette et al. 2014). However, apart from this study, little is known about sedentary behavior among employees at academic institutions.**

**PURPOSE**: We subjectively assessed occupational sitting and physical activity of employees at a 4-year, private college. **METHODS**: At the start of the 2016 fall semester, all members (N = 697) of the college community received an online version of the Occupational Sitting and Physical Activity Questionnaire (OSPAQ; Chau et al., 2012). The OSPAQ measures perceived time spent in sitting and physical activity. 343 employees (49%) provided complete responses to the survey. Employees reported working 8.3±1.8 hours per day.

**RESULTS**: Data were expressed as raw and percent time spent sitting, standing, walking and heavy lifting. Administrators reported spending more hours (46.2±10.0 hr/week) and days (5.5±0.8 d/week) at work than faculty (45.0±13.1 hr/week and 5±1.0±0.9 d/week) and staff (40.0±8.6 hr/week and 5.2±0.8 d/week).

One-way ANOVAs were computed to examine differences among employee categories (staff, administrator, faculty). For time spent walking (68.4±53.4 min/day; 13.9±10.3% time) or heavy lifting (11.3±28.3 min/day; 2.3±5.6% time) no significant differences existed among employment categories. Administrators sat (372.2±112.8 min/day; 73.2±17.7%) significantly more than faculty (314.5±138.8 min/day; 58.5±19.6%) and staff (315.1±115.8 min/day; 68.5±24.2%). Faculty stood (136.4±89.2 min/day; 25.8±14.8%) significantly more than administrators (62.1±49.6 mins/day; 12.4±9.7%) and staff (67.8±80.9 mins/day; 14.1±16.5%). **CONCLUSIONS** Based upon our findings, targeted behavioral interventions are needed to help reduce the time that administrators spend sitting during their working day.

**Purpose**: Worksite sponsored physical activity programs are prevalent at universities in an effort to improve health indicators, including risk factors for cardiovascular disease. The purpose of this project was to compare cardiovascular risk factors of university employees participating in a worksite sponsored walking program versus those who did not participate. **METHODS**: The research was a matched pairs design, with two groups. The study group (n=31) participated in the “Walkoff Challenge” for six weeks, while the control group (n=11) did not participate. All cardiovascular risk factors, as defined by ACSM Guidelines, were assessed two weeks prior to the start of the walking program and then repeated during the last week. Risk factors assessed included family history, age, smoking status, physical activity amount, blood pressure, body composition (waist circumference and BMI), dyslipidemia (total cholesterol, HDL, LDL), and fasting glucose. To assess differences in these variables, dependent t-tests were performed.

**RESULTS**: Walking program participants significantly improved their physical activity amount (p<.05), body mass index (p=.003), waist circumference (p=.03), diastolic blood pressure (p=.005) and fasting glucose (p=.001) from baseline to end of program. There were no significant improvements for participants in systolic blood pressure or cholesterol (total and HDL). Despite a trend, there was no significant decrease in total number of risk factors following the walking program. The control group had no significant changes. **CONCLUSIONS**: The participants in the walking program had many health indicators improve following the six week walking program. Therefore, short-term worksite walking programs may be effective in improving cardiovascular risk factors. Future research should focus on programming’s effect on long-term adherence to physical activity and improvement of health indicators.
in the lessons and 96 (70%) who were active, practiced twice weekly in various activities: Pilates, yoga, running, cycling, and Zumba. RESULTS: The physical activity group was found to have a higher workplace satisfaction level (p < 0.01), a decrease in burnout (p < 0.01), better health perceptions (p < 0.01), lower weight (p < 0.05), a reduction in chronic morbidity and drug consumption (p < 0.05), less smoking and liquor consumption (p < 0.01), healthier eating and sleeping habits (p < 0.001) and more physical activity outside of working hours (p < 0.01). Among the main barriers to participate in the activity lessons at work for the non-active group were: unsuitable lesson schedule (62%) lack of desire for sport (61%), lack of time (53%), fatigue (44%), prior family commitments (39%), non-payment of activity time (35%), and unawareness of the physical activity programs (27%). CONCLUSIONS: Physical activity programs at medical centers promote employees health thereby neutralizing negative aspects such as worker burnout, mental and physical fatigue and increases employee satisfaction at the workplace. The 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 everyday use so far. 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 16SN1012D.

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. While the initiative targeted the entire campus community, our study population included 57 employees (6.3% of all employees) and only 60 students (1.1% of all students). Attrition was greater than expected with 94% of tested participants reporting their activity in week 1, and progressively decreasing to a point where only 47% reported their activity in week 5. CONCLUSION: This study was extremely feasible and cost-effective. However, greater care must be taken in marketing the program to students and weekly incentives may need to be offered to improve activity reporting throughout.

Health is not only without disease or weakness, but also a good condition in psychology, physiology and society. Civil servant is a special group, its health status has been aroused serious concern. PURPOSE: To understand the health status and exercise habits of civil servants in Chengdu and to make formulation of the intervention to health status. METHODS: Using stratified cluster facilitation sampling method, 500 civil servants were randomly selected from Wuhou, Jinjiang, and a mid-sized public university recruited via employee email to participate. Employees (N = 500 were sent out, 459 recycled, missing up to 2% were delete, 418 were valid. The health status of civil servants in Chengdu is not good, and their sitting time is a little long. PURPOSE: To test differences between participants that used both II (enrolled in physical activity lessons at work) and those that just used a pedometer. METHODS: The intervention 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. While the initiative targeted the entire campus community, our study population included 57 employees (6.3% of all employees) and only 60 students (1.1% of all students). Attrition was greater than expected with 94% of tested participants reporting their activity in week 1, and progressively decreasing to a point where only 47% reported their activity in week 5. CONCLUSION: This study was extremely feasible and cost-effective. However, greater care must be taken in marketing the program to students and weekly incentives may need to be offered to improve activity reporting throughout.

PEDOMETER-BASED INTERVENTION

Pedometer-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 = 500) were recruited via employee 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)
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 two II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Pedometers were reassigned 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 < .0004) 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 ± 1009.2). 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 - .854). 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.

233 Board #54 May 31 11:00 AM - 12:30 PM Lifestyle and Health Habits Among Canadian University Community
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Purpose: To determine the knowledge of fitness and the fitness habits of medical students at the University of Missouri School of Medicine (UMSOM). There is currently limited research on the association of a Patient-Based Learning (PBL) curriculum with students’ fitness as well as their implementation of patient exercise programs.

Methods: Anonymous surveys were distributed to 394 medical students. Data were entered into the REDCap electronic survey tool and tabulated with REDCap and Microsoft Excel. In the survey, respondents were asked to state the Centers for Disease Control (CDC) recommendations for physical activity in adults. The survey 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<1.10x) 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 agreed 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.

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. (Sponsor: Barbara Ainsworth, FACSM) Email: rodney.joseph@asu.edu

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
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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...
was performed 90 minutes per time, 3 times per week, for 8 weeks, including core myodynamics training, static standing, muscle strength and endurance training of lower extremities. Static balance and dynamic balance tests were performed, and the strength of core myodynamics was measured using a BIODEX balance test system. The SPSS19.0 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: When 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±5.44s vs. 20.74±10.62s) and 8 degree abdominal bridge test (24.5±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 (7.55±1.78s, 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±4.98s 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 myodynamics were improved; and this may reduce the risk for falls.

The Centers for Disease Control report that 79% of Americans are not meeting weekly physical activity requirements, increasing the risk of many lifestyle related disease. Due to the many benefits of regular physical activity, university worksites are increasingly offering physical activity programming to encourage employees to be more active throughout the workday. PURPOSE: The purpose of this study was to evaluate the effects of a university sponsored walking program on physical activity amount and sedentary behavior in employees who participated versus those who did not participate. Methods: The research was a matched pair design. The study group (n=33) participated in the Workplace Walkoff Challenge (WWC), a six week walking competition held at a small, California university. The control group (n=17) did not participate in the WWC. The International Physical Activity Questionnaire (IPAQ) was utilized to collect vigorous, moderate, and walking MET-Mins’ per week, and sitting hours during weekdays. Participants also wore an Omron® brand pedometer and reported weekly steps. To assess these variables, dependent t-tests were performed.

RESULTS: For the participant group, there were significant increases in vigorous (p<0.05), moderate (p<0.05), and walking (p<0.02) MET-Mins’ per week. There were significant increases in steps from baseline to the last week of the competition (p<0.04). There were no significant changes in sitting hours per day (p<0.39) for WWC participants. For the control group, There were no significant differences in vigorous (p>0.18), moderate (p>0.35), walking (p>0.46) MET-Mins’ per week for non-participants. There were also no significant increases in steps from baseline to end of competition (p>0.24). There were no significant changes in sitting hours per week (p>0.50) for non-participants.

Conclusion: A six week worksite walking program may be effective in increasing physical activity amount among employees, despite no change in sit time while at the worksite.

The existence of public parks for the practice of physical exercise is common in several places of the world and the explanation could be linked to a health promotion strategy, which seeks to make free leisure activities accessible to citizens. Since this is a public policy to promote health in the population, it is important to evaluate strategies that provide feedback on investments already carried out, on which we can base the best application of resources. The effectiveness evaluation is necessary as a form of accountability for citizens, allowing re-planning actions, if necessary.

PURPOSE: The objective of this study was to identify the reasons to join an exercise program offered by an outdoor gym located in the university campus, in the city of Rio de Janeiro, Brazil. METHODS: This survey relied on the participation of all users of the program “Rio Ar Livre” (RAL) (“Rio Outdoor”), UERJ unit, totaling 44 individuals (8 men and 36 women), with an average age of 64 years, varying from 23 to 87 years. The data were collected through a questionnaire with both closed and semi-open questions, developed exclusively for this investigation. This study was carried out between August and September 2015.

RESULTS: The main reason users frequented this physical activity program was “Due to the decision to improve health” (W: 60%; M: 62.5%); “For reasons of personal health” (W: 55%; M: 46.7%); “A better body” (W: 57%; M: 37.5%). The most cited positive points were: the “Participation of the teacher and trainer” (W: 88.6%; M: 75%); “Location of UERJ in relation to the participant’s residence” (W: 60%; M: 62.5%) and the “attendance” (W: 62.8%; M: 75%). On the question of negative points: “Cleanliness” received the most votes (W: 57%; M: 37.5%).

CONCLUSION: It was concluded that the gym’s structure is one of its negative points. However, aspects such as location, gym access and, especially, the competence of personnel working in the gym (RAL-UERJ) are probably the factors leading the user to join the program and remain enrolled in it. Supported by FAPERJ (E-26/210.231/2014).

239 Board #60 May 31 11:00 AM - 12:30 PM Effect of an Educational Program Promoting Regular Physical Exercises in Subjects With Knee Osteoarthritis José M. Rodrigues da Silva¹, Marcia U. de Resende², Tânia C. Spada³, Júlia M. D’ Andréa Greve⁴, Lucila S. Francisco⁵, Emmanuel G. Ciocâl⁶, ¹ São Paulo State University (UNESP), School of Sciences, Exercise and Chronic Disease Research Laboratory., Bauru, Brazil. ²University of São Paulo (USP), School of Medicine, Institute of Orthopedics and Traumatology., São Paulo, Brazil. ³University of São Paulo (USP), School of Medicine, Institute of Orthopedics and Traumatology., São Paulo, Brazil. ⁴University of São Paulo (USP), School of Medicine, Institute of Orthopedics and Traumatology., São Paulo, Brazil. ⁵Universidade Guarulhos (UNG), Guarulhos, Brazil. Email: capociragrafa@hotmail.com (No relationships reported)

PURPOSE: The purpose of this study was to investigate the effects of an educational program emphasizing the regular practice of physical exercise on physical fitness, functional capacity and daily- living physical activity levels in patients with knee osteoarthritis (OA). METHODS: Two hundred and thirty-nine (239) patients in the public health system (male and female), with primary or secondary knee OA (degree I to IV in the Kellgren and Lawrence scale), and with referral for OA clinical treatment were randomly allocated to intervention (IG; n = 112) and control groups (CG; n = 127). All subjects of both groups underwent assessment for physical fitness (six-minute-walking- tests), functional capacity (seat-to-stand, Up-and-Down-stairs and Timed-Up-and-Go tests) and daily-living physical activity (IPAQ short-version), before (pre), during (6-months) and after (12- months) the follow-up. Statistical analysis was performed with ANOVA two-way (group x time) with repeated measurements, Chi-square test and the Bonferroni’s t test. RESULTS: During six months of follow-up, the IG showed significant improvements (P < 0.05) in Up-and-Down-stairs (19%), seat-to-stand (30%) and Timed-Up-and-Go (32.5%) tests, as well as a reduction of Body Mass Index (BMI) (P < 0.05), which were maintained during the 12 months. There was also an increase in the percentage of self identified “actives” and “very actives” subjects and reduction in the percentage of sedentary subjects in the IG during follow-up (P < 0.05). The CG improved only the Up-and-Down-stairs tests during the 6-months (12%, P < 0.05), but the improvement was not maintained during the 12 months follow-up. There was also an increase in the percentage of very actives subjects in GC, however, this increase was lower than that was observed in the IG. There were no significant improvements on muscular capacity, aerobic capacity and flexibility during the 12-months follow-up in both groups. CONCLUSIONS: These results suggest that an educational program promoting the regular practice of physical exercise may be an effective tool for improving functional capacity in patients with knee OA.
Using Accelerometers to Quantify Exercise Intensity of Exercise Classes in Older Adults

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No relationships reported.

Accelerometers offer detailed minute-by-minute information over extended periods pertaining to physical activity behavior. Furthermore, accelerometers are typically placed on the right hip. However, accelerometers placed on the hip may not determine exercise intensity during an entire workout in older adults.

PURPOSE: The first purpose of this study was to use accelerometers to determine the duration of time spent in certain intensities during exercise classes for older adults. The second purpose of the study was to examine the intensity level during those exercise classes as determined by accelerometers placed on the hip and wrist.

METHODS: A total of sixty seven older adults (age: 73.8 ± 14.5 yrs, weight: 71.0 ± 12.9 kg) were recruited. Twenty-five of them wore an accelerometer placed on the right hip (H) and an accelerometer placed on the right wrist (W). All individuals participated in exercise classes that included periods of cardiovascular, strength, and balance exercises. In order to quantity exercise intensity, cut points (cpm) of sedentary (≤ 100 cpm), light (101-799 cpm), and moderate (800-5722 cpm) intensity were used. A two-tailed independent t test was used to examine differences between H and W in the amount of time spent in sedentary, light, and moderate exercise intensity. Statistical significance was set at p < 0.05.

RESULTS: Overall, the participants engaged in 17.1 ± 5.8 minutes of light and 12.3 ± 8.8 minutes of moderate intensity activities. Furthermore, the majority of the participants (91%) perceived the intensity as moderate. The average time spent in light exercise intensity was 19.1 ± 4.5 and 7.4 ± 2.1 minutes for the H and W accelerometers, respectively. The average time spent in moderate intensity activity was 11.4 ± 6.1 and 35.0 ± 4.2 minutes for the H and W accelerometers, respectively. There was a significant (p < 0.01) difference between the accelerometers for light and moderate exercise intensity.

CONCLUSIONS: The data showed that very little of the activity met the moderate intensity threshold by accelerometer data, but this was dependent on the placement of the accelerometer. Furthermore, the data suggests that in order to fully comprehend the intensity of an exercise class for older adults, accelerometers must be worn on both the hip and the wrist.

A Comparison of Upper Body Strength and Body Composition Between Elderly from Costa Rica and Kansas

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An increased lifespan and body adiposity as people age are considered risks factors for all-cause mortality. Handgrip strength is a considered a powerful predictor of cause-specific and total mortality in older disabled women and to cardiometabolic risk in aging populations. Ethnic-specific heterogeneity of risk factors calls for comparative studies to better understand component prevention and management, which might be one of the essential steps toward elimination of ethnic disparities for several diseases.

PURPOSE: To compare the upper body strength and body composition in elderly from Costa Rica (CR) and Kansas (KS).

METHODS: Older adults from CR (men = 26, women = 32, mean age = 68.91 ± 4.79 yr.) and KS (men = 35, women = 65, mean age = 72.84 ± 5.59 yr.) underwent handgrip strength and body composition measurements (dual-energy X-ray absorptiometry). RESULTS: Men (31.24 ± 7.02 %) had lower %BF than women (41.28 ± 5.87 %; p < 0.001). Women (15.0 ± 1.7 kg/m²) had lower lean tissue mass index than men (18.0 ± 1.7 kg/m²; p < 0.001). Women (6.2 ± 0.5 kg/m²) had lower appendicular lean soft tissue index than men (8.1 ± 1.0 kg/m²; p < 0.001). KS participants (1.16 ± 0.11 g/cm²) had higher total bone mineral density than CR participants (1.08 ± 0.11 g/cm²; p < 0.001), and men (1.21 ± 0.11 g/cm²) had higher total bone mineral density than women (1.08 ± 0.09 g/cm²; p < 0.001). Significant correlations (p < 0.003 for all) were obtained between handgrip strength and body height (r = 0.72), body weight (r = 0.56), arms bone mineral density (r = 0.67), total bone mineral density (r = 0.56), lean arms mass (r = 0.78), total lean mass (r = 0.81), body fat % (r = 0.80), body fat mass index (r = 0.22), lean tissue mass index (r = 0.59), and appendicular lean soft tissue index (r = 0.69).

CONCLUSIONS: Differences in body composition and handgrip strength were found in older adults from CR and KS. Ethnic-specific heterogeneity on biologic factors and physical-related performance allows for culturally diverse prevention programs for the elderly.

Association Of Agility With Muscle Strength, Balance, Mobility And Physical Activity Status Of Older Women

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It has been reported that body-weight supported stepping training increases the walking speed of healthy older women. This suggests that stepping with body weight unloading improves the walking ability. We hypothesized that stepping in a sitting position is associated with the physical fitness, walking ability and the physical activity status of older people.

PURPOSE: The purpose of this study was to examine the association between the stepping rate (agility) and the muscle strength, balance, mobility and the physical activity status of older women.

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; Yamagi), was used as an index of agility. The participants were instructed to perform alternating steps with each leg as quickly as possible for 10 seconds, while in a sitting position. The total number of step for both legs was used as the participant’s score. The physical activity status was measured for two weeks using a uniaxial accelerometer. A multiple regression analysis was used to evaluate the association between the stepping rate and each of the other variables.

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 the 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.

An inter-rater and test-retest reliability of the Y-balance test in healthy women 50-80 years old

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No relationships reported.

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 fall risk in healthy older adults. A test which may be appropriate for healthy older adults is the Lower Quarter-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: Exercise six potential participants were screened and data collection included 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 achieved 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 reach in each direction and the composite scores.

RESULTS: The LQ-YBT demonstrated excellent
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 0.97 to 0.99 for the various reaches and 0.96 and 0.99 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
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(Please note that the full text of the research is not available due to the limitation of text extraction.)

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 xanthine oxidase (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=56) 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: 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. One can expect that in older adults, muscular strength has been shown to decline by up to 1-2% per year, and muscular power declines at an even higher rate. Plyometric training has shown benefits for increasing muscle force, power, and agility in adolescents and recreational adults; however, data on older adults is lacking. The AlterG treadmill allows for improved mobility, strength, and safety while improving functional capacity related to endurance, strength, and power. 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 participants 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. A 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 (22.1 ± 8.48%, p < 0.001), timed stair climb (14.68 ± 6.28%, p = 0.002), and stair climb power (16.59 ± 9.07%, p < 0.001). PG and SG significantly increased their estimated 1RM in the LE and LL (p < 0.05). SG was significantly more powerful at all 3 velocities in both flexion and extension except at 60°/sec extension, ranging from 24.5 ± 19.94% to 85.74 ± 62.23% (p < 0.001). PG increased muscular strength similarly or better than SG without performing resistance training. CONCLUSIONS: 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. Results suggest that plyometrics, if modified and performed in a safe environment, can increase muscular strength and power and improve functional abilities in older adults.
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 = 10, age = 64.70 ± 6.91 yrs.) or control group (CG; n = 11, age = 65.56 ± 11.56 yrs.) group. The TG performed 3 sessions per week of unilateral isokinetic RT for 4 weeks. RT sessions consisted of maximal concentric knee extensions at 45°·s⁻¹ for 4 sets of 10 repetitions. Subjects were instructed to “kick out as hard and fast as possible” during each RT session. Maximal concentric isokinetic testing of the knee extensions for the trained (TL) and untrained (UL) leg at 500°·s⁻¹ (ISOK500) was performed before (PRE) and after (POST) week 2 and 4 (POST) of RT. There was no resistance during ISOK500, with the exception of the lever arm mass, as the velocity was above all subjects’ maximum velocity. The highest velocity attained (PV; deg·s⁻²) 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: When compared by walking speed, all postural parameters (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.
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
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(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+59(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 the difference of functional fitness among various 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<0.05). Furthermore, significant differences were observed in lower limbs muscle endurance, NOR is higher than 1st and 2nd (8.71%,1.46%)(p<0.05). In lower body flexibility, NOR is better than 2nd (8.85%) (p<0.005). However, in upper body flexibility, NOR and PRE were better than 1st and 2nd (0.87%, 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
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(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: 30 elderly 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 (6MWT)], 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 = 6.84±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 = 34.42±11.76; post = 41.07±14.53 kg; leg curl 25.33%; pre = 36.00±8.92; post = 45.12±8.32 kg]. The 6MW test increased significantly 15.76% [pre = 564.20±90.83; post = 653.10±50.78 m, (p<0.05)]; and the vascular reactivity index [measured by fingertip digital thermal monitoring] also increased significantly 13.36% [pre = 2.17±0.44 vs. post = 2.46±0.36, (p<0.05)].

CONCLUSIONS: Clearly, these findings demonstrate that whole-body RT is capable of increasing physical exercise capacity and microvascular function among elderly women. This study underlies the importance of whole-body resistance exercise training as part of a healthy and active lifestyle in elderly women.

254  Board #75  May 31 9:30 AM - 11:00 AM  Fitness Correlates Of Golf Performance, Exercise Enjoyment, And Mood In Senior Women Golfers
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(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: 31 female senior golfers completed golf histories, 17 golf-specific fitness screening tests (TPI-fit; Tiestile 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 (6MWT).

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”; 6MWT (ft) = 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 more 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 (r = -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 6MWT 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.

255  Board #76  May 31 9:30 AM - 11:00 AM  Relationships Among and Differences between Muscle Quality and Functional Performance in Younger and Older Women
Mitchel A. Magnini, Ryan J. Colquhoun, Alejandra Barrera-Curiel, Ryan M. Thier, Tyler W. McD, Jason M. DeFreitas, Doug B. Smith, Nathan D.M. Jenkins. Oklahoma State University, Stillwater, OK.
(No relationships reported)

The quality of skeletal muscle has been identified as an important factor that is used to describe intramuscular changes associated with muscle function in aging. Traditionally, muscle quality (MQ) has been calculated as maximal muscle strength expressed per unit of muscle mass. More recently, however, the echo intensity (EI) of skeletal muscle ultrasound images has been used as a surrogate measure of muscle quality. PURPOSE: The purpose of this study was to examine the relationships among and differences between commonly-used measures of MQ and functional performance in younger (YW) and older women (OW). METHODS: 15 YW (mean ± SD: 22 ± 2 yrs) and 15 OW (74 ± 5 yrs) completed this study. Muscle cross section area (mCSA) and EI of the rectus femoris were measured from ultrasound scans at the midpoint of the thigh. Each participant completed two maximal voluntary isometric knee extension contractions (MVICs) to determine MQ strength. Each participant also completed three maximum velocity sit-to-stand movements, during which power and movement velocity were measured. MQ was calculated as MVIC strength ÷ mCSA. Independent samples t-tests were used to analyze differences between YW and OW and Pearson’s correlation coefficients were also used to analyze the relationships among the dependent variables in the YW and OW. RESULTS: MQ strength (166 ± 37 vs 105 ± 28 Nm), mean velocity (0.6 ± 0.1 vs 0.4 ± 0.1 m/s), peak velocity (0.9 ± 0.2 vs 0.7 ± 0.1 m/s), mean power (435 ± 81 vs 299 ± 57 W), peak power (1070 ± 265 vs 597 ± 127 W) were greater and EI (39 ± 8 vs 52 ± 10 au) was lower in the YW than OW, respectively. There was no difference in muscle quality (p = 0.96). EI and MQ were not significantly related (r = 0.12) in the YW, but were significantly related in the OW (r = 0.54). EI was inversely related to mCSA in the YW (r = -0.53) and OW (r = -0.54). In addition, MQ was significantly related to mCSA (r = 0.75) in the OW, and was not significantly related to EI or MQ in either the YW or OW. CONCLUSION: There were age-related differences in muscle strength, muscle size, echo intensity, and functional performance, but no age-related difference in traditionally measured MQ. EI was related to MQ in the OW, but not the YW. Although EI has been used as a surrogate for MQ, these data suggest that MQ and EI may reflect different qualities of skeletal muscle in aging.
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.

**METHODS:** To compare the acute effects of LI-BFR (80% of absolute vascular occlusion pressure) with HI-BFR on muscle torque, activation and neuromuscular fatigue. **METHODS:** Ten men (23.8 ± 5.4 years) 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-flows 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-HI and LI BFR (-9.5 and -7.8%, respectively; p<0.05), but not after LI without BFR. The RF muscle 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 RF muscle (-10.7%, p<0.05) was greater than HI-BFR (-6.3%, p<0.05) in contrast, while RF muscles reduced by 19.0% post-HI (p<0.05), this was not seen after HI with or without BFR. 

**CONCLUSION:** LI-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.

**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 function and performance variables in college-aged triathletes. 

**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 190 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 (VO2max), one leg knee extensor strength, and thigh muscle cross sectional area (CSA). Two-way repeated ANOVAs were used to compare BFR-CON vs BFR-CP vs BFR-IP and Pre vs Post with significance accepted at p<0.05. 

**RESULTS:** VO2max significantly increased after the training (main effect of time) and significant group-by-time interactions were detected (1398 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.
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±8.7; 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.

**3.0±.9% (p=.002); WBVK 2.8±.9 (p=.002); and MVCK 3.5±1.0 (p=.006) but not for change in jump height for 3 of the 4 interventions compared to CON (-1.5±1.0): WBV changes in power and jump height as well as for the raw power and height values voluntary contractions (MVC) and maximal voluntary contractions with BFR (MVCK) 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. Strength and hop distances were compared before and after KAATSU

**Significant improvements were 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± 33.4cm, post: 154.2± 104.1cm, p=0.025).**

**20-minute run without BFR cuffs at 60% VO2 intensity, 2) 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 in a supine position and have baseline blood pressure measurements taken. After blood pressure was taken, subject would walk/run for 20 or 60 minutes at a moderate intensity (40% or 65% VO2) with or without BFR cuffs. BFR cuffs were placed before condition three and were taken off immediately post exercise. Upon completion of the exercise, participants laid back into the supine position and had post measurements, of blood pressure, taken post 10, 20, and 40 minutes. Sessions were separated with at least 48 hours.**

**RESULTS:** Significant condition main effects were found in SPB (p<0.05). Significant time main effects were found in SPB (p=0.02) and PP(p<0.05). Significant condition time main effects were found in SBP (p<0.01) and DBP (p<0.01). The results conclude that the 60-minute condition had lower SBP measurements than the 20-minute BFR and non-BFR conditions, which can be caused by vasodilation, due to the possible increase in nitric oxide, that created less pressure in the arteries from the large difference in activity length when compared to the 20-minute sessions.

**263 Board #84 May 31 9:30 AM - 11:00 AM Differences in Neruomuscular 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) **

**ACSM May 30 – June 3, 2017 Denver, Colorado**
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 = 0.67). There was a significant correlation between change in total mass and fat mass (r = 0.67, p=0.001) and 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 = 0.67). There was also a positive correlation between change in total mass and fat mass (r = 0.75, p=0.001). 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 = 0.67). There was a significant correlation between change in total mass and fat mass (r = 0.75, p=0.001). 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.
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 10.5±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<0.05), left (p<0.01) and combined right and left CIMT (p<0.001) in children with an elevated BMI (>85%) vs those with a normal BMI. The children with elevated blood pressure (<95%) had an elevated CIMT in both the left (p<0.001) and combined left and right CIMT (p<0.05). In respect to elevated blood glucose (>100mg/dl), only an elevated CIMT was observed in the right CIMT (p<0.05). When comparing CIMT to number of CAD risk factors, an increase in CIMT (p<0.05) was observed in children with 2+ CAD risk factors Vs 0 (3.34±0.71 vs 3.30±0.77, respectively in the slope of the RPE:VO2 relationship (b 3.34±0.71 vs 3.30±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 VO2peak, 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.

Exercise-induced improvement in risk for chronic disease is attributed to changes in body composition, cardiorespiratory fitness, blood pressure and glucose metabolism; however, the underlying mechanism is unclear. Metabolomics offers the technology needed to investigate large numbers of metabolites that may participate in biochemical pathways of exercise-induced improvement in cardiometabolic risk. PURPOSE: To investigate the impact of an exercise intervention on plasma metabolites and whether changes in metabolite levels are related to changes in cardiometabolic risk factors. METHODS: A secondary analysis was performed in 216 middle-aged, predominantly obese men and women (mean(SD)), 52.4 (8.0) years originally recruited to participate in a 6-month randomized controlled trial examining the effects of exercise amount and intensity on cardiometabolic risk factors. 139 metabolites were profiled by liquid chromatography-mass spectrometry. Cardiorespiratory fitness (CRF) was assessed using standard open-circuit spirometry during a maximal graded exercise test. Waist circumference (WC) was measured at the superior edge of the iliac crest. 2-hour glucose was measured in response to a 2-hour 75-g oral glucose tolerance test. Systolic (SBP) and diastolic blood pressure (DBP) was measured using an automated BP monitor. RESULTS: Seven metabolites significantly changed in the exercise compared to control group (p<0.05). There were no significant associations at the adjusted p-value (p<0.0004) between change in metabolites and change in 2-hour glucose, SBP or DBP. Change in leucine (B=-0.29), isoleucine (B=-0.30) and UDP-N-acetylglucosamine (B=-0.40) were negatively associated. Conclusion: These findings represent a more global effort to uncover the biochemical pathways in which exercise elicits its cardiometabolic effects. These observations implicate several metabolites that may serve as biomarkers or have a direct regulatory role in pathways related to exercise and improved cardiometabolic status. Supported by Canadian Institute of Health Research Grant

It is well-established that regular exercise training decreases resting blood pressure (BP). However, the length of exercise training necessary to lower resting BP is not well-defined. PURPOSE: To assess the time course of exercise-induced BP changes in individuals with resting systolic BP>130 and/or diastolic BP>80 mm Hg.
RESULTS: There was a significant decrease in mean resting systolic BP after 6 weeks of exercise from baseline (138.7 ± 14.6 vs. 130.3 ± 14.1 mmHg; p<0.001). A significant decrease was also found in resting diastolic BP between these two time points (79.9 ± 7.3 vs 74.9 ± 9.1 mmHg; p<0.001). No significant changes in resting BP were observed between midpost and post-intervention time points. Post-intervention resting systolic BP (129 ± 13.6 mmHg; p<0.001) yielded a 9.7 mmHg decline from baseline while diastolic BP (73.6 ± 9.8 mmHg; p<0.001) yielded a 6.3 mmHg decline (Table).

CONCLUSION: 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. 

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<td>138.7 ± 14.6</td>
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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 Bena. Cleveland Clinic, Cleveland, OH.  
Email: siegmudl@ccf.org (No relationships reported)

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 0.42 [0.18, 0.97]; p=0.04) 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 ≥ 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.

273 Board #94 May 31 9:30 AM - 11:00 AM  
The Immediate Blood Pressure Lowering Effects of Acute Concurrent Exercise: A Meta-Analysis  
Alyssa Jones1, Lauren ML Corso1, Hayley V. MacDonaldd, Blair T. Johnson1, Jill Livingston1, Linda S. Pescatolod, FACSMD.  
1University of Connecticut, Storrs, CT. 2The University of Alabama, Tuscaloosa, AL. (Sponsor: Dr. Linda S. Pescatolo, FACSMD) (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 SBP/DBP (~9/8 mmHg). No significant changes in BP were noted with SBP/DBP (~9/8 mmHg) reductions among adults without hypertension, indicating the potential clinical utility of CET as an antihypertensive lifestyle therapy. 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 SBP/DBP (~9/8 mmHg). No significant changes in BP were noted with SBP/DBP (~9/8 mmHg) reductions among adults without hypertension, indicating the potential clinical utility of CET as an antihypertensive lifestyle therapy.
Prolonged sitting-induced lower limb vascular dysfunction, assessed by PLM, was attenuated in response to an acute antioxidant supplementation. These findings implicate oxidative stress as a modulator of vascular function during prolonged sitting.

**A44**

**Free Communication/Poster - Cardiovascular Responses to Exercise**

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

**Room: Hall 1**

**Board #96**

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

**Acute Electrical Muscle Stimulation Of The Lower Extremities Enhances The Vascular Endothelial Function**

Hajime Miura1, Yasuaki Tamura1, Miduki Ishikawa1, Ayako Azuma1, Kenichi Deguchi1, 1Tokushima University, Tokushima, Japan. 2Naruto Hospital, Tokushima, Japan. Email: hajime-mi@tokushima-u.ac.jp

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 the 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 dilatation during reactive hyperemia. **RESULTS:** In the EMS trial, the FMD 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 conditions (EMS 1.5 hours, and 3 hours after the onset of the sitting session). **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.

**Board #97**

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

**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

(Please report any relationships)

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 attempting to directly link the connection between increased pressure, oxidant production, and resulting vascular dysfunction. Therefore, the direct role of oxidative stress on the observed vascular dysfunction during prolonged sitting is currently unknown. **PURPOSE:** This study sought to examine the impact of oxidative stress on prolonged sitting-induced vascular dysfunction, measured via passive leg movement, by administrating an acute oral antioxidant prior to the sitting session. **METHODS:** Seven young (24 ± 1 yrs) healthy males completed two 3-hour sessions of prolonged sitting. Subjects were given either an oral antioxidant (AO) containing 2 grams of vitamin C or a placebo (PL) pill. The supplementation took place following the baseline measures and immediately prior to the sitting session and all supplementation was double-blinded with at least 72 hours separated the two sitting sessions. Leg vascular function was assessed with passive leg movement (PLM) immediately prior to sitting, 1.5 hours, and 3 hours after the onset of the sitting session. **RESULTS:** Leg vascular function (assessed via PLM-induced hyperemia) was revealed to be significantly reduced with the blood flow restriction exercise 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. **CONCLUSIONS:** The findings suggest that MC concentrate can acutely modulate CBF in the prefrontal cortex characterized by increased concentrations of both total- and oxo-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.

**Board #98**

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

**Tart Montmorency Cherries (prunus Cerasus L.) Acutely Modulate Vascular Function In The Absence Of Improvements In Cognition**

Karen M. Keane, Crystal F. Haskell-Ramsay, Rachel C. Veasey, Glyn Howatson, FACSMM, Northumbria University, Newcastle Upon Tyne, United Kingdom. (Sponsor: Glyn Howatson, FACSMM) Email: karen.keane@northumbria.ac.uk

(Please report any relationships)

Cerebral blood volume and metabolism of oxygen declines as part of human ageing and has been related to cognitive decline. There is some evidence to suggest that polyphenol-rich foods play an important role in delaying the onset or attenuating the progression of age-related health disorders such as cardiovascular and Alzheimer’s disease, and to improve cognitive function. **PURPOSE:** The aim of this study was to assess the impact of Montmorency tart cherry juice consumption on pre-frontal cortical haemodynamics, cognitive function and blood pressure in middle-aged adults. **METHODS:** Twenty-seven healthy middle aged adults were recruited to take part in the study; the mean ± SD age, stature, mass and BMI were 50 ± 6 years, 170.7 ± 9.1 cm, 76.0 ± 16.0 kg and 26.1 ± 4.9 kg/m2, respectively. Participants received either a 60 ml dose of a Montmorency tart cherry concentrate (MC) or a placebo (PLA) in a randomised, double blind, placebo-controlled, crossover design study with a ≥14 day wash-out period between conditions. Cerebrovascular responses (cerebral blood flow volume, total-, deoxy-, and oxy-haemoglobin), cognitive performance, mood and blood pressure were assessed at baseline and 1, 2, 3 and 5 h following consumption. Total-, deoxy- and oxy-haemoglobin were also continuously monitored during the 60-min resting/absorption period immediately following supplementation. **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 during 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 6 ± 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 oxo-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.

**Board #99**

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

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

J Grant Mouser1, Gilberto C. Laurentino2, Scott J. Dankel2, Samuel L. Buckner1, Matthew B. Jesse3, Brittany R. Counts1, Kevin T. Mattocks1, Jeremy P. Loenneke1, 1The University of Mississippi, University, MS, 2University of Sao Paulo, Sao Paulo, Brazil, 3University of South Carolina, Columbia, SC. (Please report any relationships)

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 measurements of standard 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% 1RM. 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=0.85). Men had greater blood flow than women in all conditions at all time points (41.6± vs. 214.0 ml·min⁻¹).
Maximal strength training (MST) improves submaximal work efficiency (WE) in the arms. However, since assessment of muscle oxygen uptake (VO₂) during exercise is lacking, the behavior of MST-induced adaptations is unknown, and remains elusive if metabolic and vascular responses in arms may contrast what has been observed in legs. PURPOSE: To investigate responses in arm blood flow and arteriovenous oxygen difference (a-VO₂diff) during steady state exercise following MST. METHODS: Thus, utilizing Doppler-ultrasound and a catheter placed in the subclavian vein for measurements of blood flow and a-VO₂diff, we assessed steady state WE and peak responses in seven young males (24±2SD years) following a six-week handgrip MST intervention. RESULTS: As expected, MST improved maximal strength (49±9 vs 62±10 kg) and rate of force development (923±224 vs 1086±238 N/s), resulting in a reduced submaximal VO₂ (31±9 to 25±10 ml·min⁻¹) and concomitantly increased WE (8.8±2.3 to 11.7±3.6%) (all p<0.05). In turn, the WE-improvement led to a reduced blood flow (486±102 to 395±114 ml·min⁻¹), mediated by a lower heart rate (66±4 to 59±7 beats/min) and blood velocity (43±8 to 32±6 cm·s⁻¹) (all p<0.05). Conduit diameter and a-VO₂diff remained unaltered. The peak test revealed increased time to exhaustion (948±1104 seconds; p<0.05), and a tendency towards increased peak work rate (p=0.06), but no change in peak oxygen uptake. CONCLUSION: Despite arguments of metabolic and vascular limb-specific differences, these results reveal that the mechanisms responsible for WE adaptations following small muscle mass MST in the upper extremities is a direct reflection of what has been observed for lower extremities. Additionally, our data show that the advantageous reductions in blood flow in the upper extremities is a direct reflection of what has been documented for lower extremities.

CONCLUSION: 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.

HR and CO were greater during LIₘₗ compared with LI (range; p=0.01 to p=0.04). VO₂ measured during the recovery periods were greater in LIₘₗ compared with LI (p=0.01; for all time points). Post-exercise lactate was higher (p=0.01) for LIₘₗ (6.3 ± 0.49 mmol·L⁻¹) compared with LI (2.8 ± 0.29 mmol·L⁻¹). Importantly, mean arterial pressure during the third interval (124.2 ± 2.3 mmHg vs. 113.9 ± 2.5 mmHg) was greater (p=0.01) in LIₘₗ compared with HI. CONCLUSION: LIₘₗ results in greater cardiovascular and metabolic stress compared with LI alone, and therefore could provide an alternative modality to increase aerobic fitness for individuals not able to perform exercise at high-intensity. However, LIₘₗ may not be suitable for all populations, specifically those with vascular dysfunction.

PRIORITY: 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. Following baseline popliteal artery flow-mediated dilation (FMD) measurements, subjects maintained a supine position for 45 min in the sitting and standing trials or performed 45 min of self-paced cycling (7.13 ± 3.0% HRmax) in the prior exercise + sitting trial. Thereafter, subjects were immediately positioned into a seated or standing position, according to the trial, for 3 hours and then popliteal artery FMD measures were repeated. RESULTS: Popliteal artery FMD was impaired after 3 hours of sitting (3.75 ± 0.5% vs. 1.57 ± 0.71%, P<0.05) and this impairment was attenuated by prior cycling exercise (3.95 ± 0.41% vs. 3.10 ± 0.83%, P>0.05). Furthermore, 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.

Purpose: To study vascular responses to intermittent hypoxia (IH) exposures. Methods: Six healthy men (26 ± 1 yr) were exposed to 5 HI bouts, each comprising 6-min breathing 10% O₂ interspersed with 4 min breathing room air. During IH, middle cerebral arterial blood flow velocity (V̇ₐₜ₇₀, 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. Results: 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<0.001). The Vₜ was significantly increased by IH and its magnitude was greater in the 5th than the 1st bout of IH exposures (P<0.002). IH did not change mean BP (MHP) from the baseline (min 0) during either the 1st or 5th bout (see Table). Minute ventilation (V̇ₜ) was stimulated by IH (P=0.023) with no difference between the bouts. The increased Vₜ was driven by increases in V̇ₜ because Ḟₜ remained constant throughout IH exposures. There was a decrease (P<0.001) in partial pressure of end-tidal CO₂ (P₄CO₂) during IH, which was not different between the 1st and 5th bouts of IH exposures.
Maximal dilatory capacity was ~12% lower in OH vs. YH (98±36 vs. 111±53 p.u.). IHD interaction effects for SkP or VC across experimental conditions (all p≥0.153).

Conditions.

Nitroprusside. A two-way ANOVA with repeated measures was used to determine aging and IHD interaction effects for SkP or VC across experimental conditions.

Aging and ischemic heart disease (IHD) during seated rest and at 60±5% and 75±5% of peak oxygen uptake were examined. All participants were physically active at least 60 min per week at the time of recruitment. SkP was collected while maximal dilatory capacity was determined using iontophoresis of 3% sodium nitroprusside. To examine the effect of healthy aging and ischemic heart disease on skin perfusion (SkP) and vascular conductance (VC) during relatively short-duration (15 min), steady state, normothermic cycle exercise.

CONCLUSION: These preliminary results indicate that CRT and TM resulted in significant increases in CI (MD=.218, SE=.080, p=.026) and EDV (MD=31.10, SE=11.96, p=.032), a trend towards an increase in SV (MD=1.60, SE=.64, p=.03). No significant differences were observed for EF. At post-testing CONT resulted in a decrease in rVO2 approaching significance compared to TM (MD=−3.10, SE=.92, p=.023) and EDV (MD=−3.10, SE=11.96, p=.032), a trend towards an increase in SV (MD=6.63, SE=4.28 p<.007) and a decrease in SVR (MD=−154.15, SE=71.07, p=.06) for CRT. TM resulted in significant increases in CI (MD=12.5±2.0, p=.023) and EDV (MD=12.5±2.0, p=.023) but not in brachial BP.

CONCLUSION: These preliminary results indicate that CRT and TM showed a significant decrease in rVO2 (MD=−1.60, SE=−.64, p=.03). No significant differences were observed for EF. At post-testing CONT resulted in a decrease in rVO2 approaching significance compared to TM (MD=−3.10, SE=−11.96, p=.023). 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, but 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.

CONCLUSION: Normobaric HI exposures enhance cerebral perfusion, which is mediated by a moderate hypoxemia. There is no hypertensive response during the HI exposures.

PURPOSE: To examine the effect of healthy aging and ischemic heart disease on skin perfusion (SkP) and vascular conductance (VC) during relatively short-duration (15 min), steady state, normothermic cycle exercise. METHODS: All participants were physically active at least 60 min per week at the time of recruitment. SkP was collected (laser-Doppler flowmetry) in 10 young (24±4 yrs) healthy men (YH), 10 older (58±6 yrs) healthy men (OH), and 9 older (61±8 yrs) men with documented ischemic heart disease (IHD) during seated rest and at 60±5% and 75±5% of peak oxygen uptake (VO2peak). VC was calculated as perfusion units (p.u.)/mean arterial pressure, while maximal dilatory capacity was determined using iontophoresis of 3% sodium nitroprusside. A two-way ANOVA with repeated measures was used to determine aging (YH vs. OH) and IHD (OH vs. IHD) comparisons for SkP and VC across experimental conditions.

RESULTS: VO2peak was not significantly different between YH and OH (mean±SD: 46±6 vs. 44±6 ml.kg−1.min−1 respectively, p=0.535) but was ~34% lower in IHD (97±12 vs. 69±12 ml.kg−1.min−1, p<0.001) than in controls (98±12 ml.kg−1.min−1). There were no significant aging or IHD interaction effects for SkP or VC across experimental conditions (all p≥0.153).

Maximal dilatory capacity was ~22% lower in OH vs. YH (98±36 vs.111±53 p.u.) respectively, p= 0.535) and ~25% lower in IHD vs. OH (73±28 p.u., p=0.096). SkP at 75% VO2peak as a percentage of maximal dilatory capacity was not significantly affected by either aging (32±17 vs. 40±22% in YH and OH respectively, p=0.343) or IHD (47±39%, p=0.872 vs. OH). CONCLUSION: During relatively short-duration exercise at similar relative intensity, SkP and VC do not appear to be adversely affected in aging adults with and without IHD. However, older adults and people with IHD may utilise a higher percentage of their maximal dilatory capacity during exercise.

PURPOSE: To compare the effects of CRT, TM and no exercise (CONT) on HDYN variables 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 (rVO2) 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=.092, p<.023) and EDV (MD=−3.10, SE=11.96, p=.032), a trend towards an increase in SV (MD=6.63, SE=4.28 p<.007) and a decrease in SVR (MD=−154.15, SE=71.07, p=.06) for CRT. TM resulted in significant increases in CI (MD=12.5±2.0, p=.023) and EDV (MD=12.5±2.0, p=.023) but not in brachial BP.

CONCLUSION: 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 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 (rVO2) 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=.092, p<.023) and EDV (MD=−3.10, SE=11.96, p=.032), a trend towards an increase in SV (MD=6.63, SE=4.28 p<.007) and a decrease in SVR (MD=−154.15, SE=71.07, p=.06) for CRT. TM resulted in significant increases in CI (MD=12.5±2.0, p=.023) and EDV (MD=12.5±2.0, p=.023) but not in brachial BP.

CONCLUSION: These preliminary results indicate that CRT and TM lead to significant favorable changes in CI and EDV, but 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.

PURPOSE: To examine the effect of healthy aging and ischemic heart disease on skin perfusion (SkP) and vascular conductance (VC) during relatively short-duration (15 min), steady state, normothermic cycle exercise. METHODS: All participants were physically active at least 60 min per week at the time of recruitment. SkP was collected (laser-Doppler flowmetry) in 10 young (24±4 yrs) healthy men (YH), 10 older (58±6 yrs) healthy men (OH), and 9 older (61±8 yrs) men with documented ischemic heart disease (IHD) during seated rest and at 60±5% and 75±5% of peak oxygen uptake (VO2peak). VC was calculated as perfusion units (p.u.)/mean arterial pressure, while maximal dilatory capacity was determined using iontophoresis of 3% sodium nitroprusside. A two-way ANOVA with repeated measures was used to determine aging (YH vs. OH) and IHD (OH vs. IHD) comparisons for SkP and VC across experimental conditions.

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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


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(No relationships reported)
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^−3 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 ± 7.4%). EC50 for 6h (3.9e−4) was significantly (p<0.05) greater than SED (1.3e−4) and 48h (1.3e−4). 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 potentiate the hypotensive effect of both procedures. METHODS: Ten pre- or hypertensive subjects participated in a randomized double-blind study one week apart. (7 men, 3 women) (BP ≥ 120/80mmHg) (Systolic Blood Pressure SBP/Diastolic Blood Pressure DBP). Subjects arrived in the fasting condition and without medications and ingested either a fruit and vegetables juice containing 250 g of NO−3 (8 mmol/L of NO−3) (N) or nitrate depleted juice (P). After 90 minutes post supplementation, they performed a MAXCAP-T treadmill test. BP was obtained 10 minutes post arrival (BP1), 90 minutes post dietary supplementation (BP2), immediately Post MAXCAP-T (BP3), 10 minutes after MAXCAP-T(BP4), and 150 minutes post MAXCAP-T (BP5). Statistics anova, paired t test, t test two groups.

RESULTS: After ingestion of N, SBP and DBP were reduced by 11 and 6 mmHg, respectively. Meanwhile, after P, SBP decreased 3 mmHg while DBP did not change. Following MAXCAP-T, SBP increased less after N than P (26 vs 31 mmHg, p<0.05). DBP decreased 2 and increased 5 mmHg with N and P, respectively (P<0.05). Ten minutes after MAXCAP-T, the difference between N and P was significant (P<0.05). DBP was reduced 10 mmHg with N with no changes in P. After 150 minutes of MAXCAP-T, SBP was 24 and 16 mmHg lower than BP1 for N and P, respectively (p<0.05). Meanwhile, DBP was 8 mmHg lower than BP1 for N without significant changes for P. CONCLUSIONS: Ingestion of inorganic nitrate decreased SBP and DBP before exercise and prevented increases in SBP and DBP resulted after acute maximal exercise. The combination of NO−3 and exercise resulted in greater decreases in BP in pre- and hypertensive patients as compared with P.

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±2.8 kg/m2) completed four trials, with different interventions, in a randomized order. In a control trial subjects rested supine (CON). In order to independentely 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 (~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 assessed 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 2.6±0.9°C and 1.67±0.2°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 decreased but not C0 or L2, were reduced immediate post -(107±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.

Aquatric treadmill (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 of the-mediated dilatation (FMD). However, the mechanisms for such changes are unclear, and previous research showed no differences in plasma nitrates or nitrites 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, 39.3 ± 7.7 ml·kg⁻¹·min⁻¹) completed an acute bout of both ATM and LTM at 60% VO2max for a duration required to expend 300 kcal (~30 min). 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 inflammation 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 < 0.05). Ischemic exercise enhanced concentrations of basic fibroblast growth factor, interleukin (IL)-6, IL-10, tumor necrosis factor-alpha, and vascular endothelial growth factor to determine whether %HRpeak and %VO2peak responded the same across rounds. A significant difference (P < 0.001) between %VO2peak and %HRpeak was found for all rounds (Round 1: 76.9±8.9% vs. 83.1±8.4%; Round 2: 80.6±9.3% vs. 86.8±8.7%; Round 3: 79.3±9.9% vs. 89.3±5.8%; Round 4: 66%±9.6% vs. 91.5±6.5%). CONCLUSION: Our results suggest that %HRpeak did not respond to the same over four rounds of HIIFT; thus, simply estimating HR response during HIIFT would overestimate the metabolic demands of the activity. The progressive increase in %VO2peak may be due to increases in thermoregulatory demands causing an increase in cardiac output, while metabolic demands remain relatively constant. Future investigations should aim to determine the mechanism underlying of the dissociation between HR and VO2 during HIIFT.
for more than two decades, this experimental design has, somewhat surprisingly, not been validated. PURPOSE: To evaluate the reliability and accuracy of this technique following handgrip exercise. METHODS: Test-retest measurements were performed with -0.25 watt (W) steady state increments in ten healthy young (24±3 years) males during handgrip exercise. RESULTS: VO2 and workload exhibited a linear relationship (r=0.01) following all submaximal workloads (0.50W:4.3±1.01 min; 0.75W:5.3±1.41 min; 1.00W:6.3±4.16 min; 1.25W:7.2±2.17 min; 66 mL/min), while the final increase before exhaustion was non-significant, marking a VO2 peak (1.5W:79.2±18.6 mL/min). In turn, blood flow exhibited a concomitant relationship (P=0.01) with VO2 (0.50W:35.9±86 mL/min; 0.75W:43.1±112 mL/min; 1.00W:90.1±123 mL/min; 1.25W:55.6±112 mL/min; 1.50W:62.2±131 mL/min) while arteriovenous oxygen difference (a-vO2diff) remained constant following all workloads (123±11±130±10 mL/I). The average VO2-test-retest difference was -0.4 mL/min, with ±2SD limits of agreement (LOA) of 8.4 and -9.2 mL/min, respectively, while coefficients of variation (CV) ranged from 4.7%. Accordingly, test-retest blood flow difference was 11.9 mL/min (LOA:8.4 mL/min; -60.4 mL/min) and the CV ranged between 4.7%. Test-retest difference for a-vO2diff was -0.28 mL/dL (LOA: 1.26 mL/dL; -1.82 mL/dL) with CV ranging from 3-5%. CONCLUSION: Our results reveal that forearm VO2-assessments 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 muscle mass metabolism in occupationally relevant forearm musculature.

Hypercapnia-induced cerebral hyper-perfusion or hypoxia attenuates dynamic cerebral autoregulation (CA). On the other hand, performing cognitive tasks increases both anterior and posterior cerebral blood flow via frontal and occipital lobe activation and this cognitive tasks-induced cerebral hyper-perfusion attenuates dynamic CA. PURPOSE: The aim of the present study was to examine whether cognitive task-induced impairment in dynamic CA was enhanced by hypoxia condition. METHODS: To test our hypothesis, we identified dynamic CA during the Go/No-Go task under normoxia and hypoxia conditions. This study examined the relationship between mean arterial pressure (MAP) and mean middle cerebral artery blood velocity (MCA) in relation to CA. RESULTS: MCA Fvmean increased during the Go/No-Go task. Dynamic CA and steady-state changes in MCA Fvmean were observed in CA. In contrast to our hypothesis, hypoxia did not affect this phenomenon.

An acute bout of resistance exercise (RE) has been suggested to have a negative effect on vascular function. However, no studies have investigated differences between the sexes after free-weight resistance exercises. PURPOSE: To evaluate the effects of free-weight resistance exercises on forearm blood flow (FFB) and vasodilatory capacity between sexes. METHODS: Resistance-trained men (n=14) and women (n=13) between the ages of 18-30 yrs volunteered to participate. One-repetition maximum (1RM) was assessed on the squat, bench press and deadlift. FBF and vasodilatory capacity were assessed using venous occlusion Doppler-ultrasound (VO2). RESULTS: Age (31±7 yr), VO2 (0.50W:359±86 mL/min; 0.75W:431±112 mL/min) and test-retest measurements were performed with ±2SD limits of agreement (LOA) of 8.4 and -9.2 mL/min, respectively, while coefficients of variation (CV) ranged from 4.7%. Accordingly, test-retest blood flow difference was 11.9 mL/min (LOA:8.4 mL/min; -60.4 mL/min) and the CV ranged between 4.7%. Test-retest difference for a-vO2diff was -0.28 mL/dL (LOA: 1.26 mL/dL; -1.82 mL/dL) with CV ranging from 3-5%. CONCLUSION: Our results reveal that forearm VO2-assessments 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 muscle mass metabolism in occupationally relevant forearm musculature.

The positive effects of low intensity blood flow restriction (BFR) training on muscle mass and strength are well documented. However, the decreases in LF and VLF phase shift during the Go/No-Go task was not a phenomenon. In contrast to our hypothesis, hypoxia did not affect this phenomenon. To test our hypothesis, we identified dynamic CA during the Go/No-Go task under normoxia and hypoxia conditions. This study examined the relationship between mean arterial pressure (MAP) and mean middle cerebral artery blood velocity (MCA) in relation to CA. RESULTS: MCA Fvmean increased during the Go/No-Go task (P=0.022), but the different increase in VO2 and workload exhibited a linear relation (r=0.85). In the transfer function analysis, the low frequency (LF) and very low frequency (VLF) phase shift decreased during the Go/No-Go task (LF and VLF; P<0.001 and P=0.01). However, the decreases in LF and VLF phase shift during the Go/No-Go task was not modified by hypoxia condition (P=0.617 and P=0.981). CONCLUSIONS: Similarly with change in MCA Fvmean, dynamic CA was attenuated during cognitive task. In contrast to our hypothesis, hypoxia did not affect this phenomenon.
**Purpose:** To examine the post-exercise response of blood pressure and cardiovascular autonomic balance following a continuous bout of exercise (CONT) compared to multiple intermittent bouts (INT) resulting in the same volume of exercise. **Methods:** Participants (n=18; age: 23.8±3 yr; 12 females, 6 males) completed both 30 min of CONT and 30 min of INT cycling exercise (3, 10-min bouts) at 60% VO2max on 2 separate days. The order of the conditions was randomized and the INT bouts were separated by ~4 hours. Systolic (SBP) and diastolic blood pressure (DBP) were assessed with a continuous noninvasive BP monitor before exercise (PRE) and at 5, 30, 60, and 120 min of seated recovery following CONT and the final INT bout. Spectral measures of heart rate variability, reported as high- and low-frequency (LF) power, were also obtained from an electrocardiogram at the same time points. LF/ HF 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. In addition, 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: 1.10±0.02; INT: 1.06±0.02) and 60 min (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.**

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<tr>
<th>Time</th>
<th>SBP (mmHg)</th>
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<td>120 min</td>
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* P<0.05 vs. PRE; Data are mean ± SE

**301** Board #122

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

**Post-Exercise Blood Pressure and Autonomic Balance Following Continuous and Intermittent Exercise Bouts**

C. Matthew Lee, Megan Robles, Marialice Kern, FACSM.
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**No relationships reported**

**Purpose:** 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) mid-age (57±2 y) metabolic syndrome patients (84% hypertensive) underwent a bout of HIIT (45 min) 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 (sympathetic, 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±0 mmHg; central systolic BP=113±5 mmHg; P<0.001) and central DBP=42±0 mmHg (P<0.001). Compared to BL, both peripheral and central MAP increased, with the greatest change occurring during high-intensity handgrip with BFR (+17±4, P<0.001). Similar findings were observed for peripheral and central systolic and diastolic BP, and RPP (e.g., central RPP at BL=7969±621, vs. 40% BFR=8217±612, vs. 60% with BFR=9441±866, vs. 60% without BFR=9237±629, P<0.001). **Conclusion:** These preliminary 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.

**302** Board #123

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

**Acute Hypotension After High-intensity Interval Exercise In Metabolic Syndrome Patients**

Miguel Ramirez-Jimenez, Felix Morales-Palomino, Juan Fernando Ortega, Ricardo Mora-Rodriguez, UNIVERSITAT DE CASTILLA- LA MANCHA, TOLEDO, Spain.

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**No relationships reported**

**Purpose:** 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) mid-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 isocarotic and compared to a no-exercise trial (CONT). Before and after exercise were assessed blood pressure (BP), heart rate (HR), cardiac output (Q), systemic vascular resistance (SVR), intestinal temperature (Tint), forearm skin blood flow (SFB) and percent dehydration. RESULTS: During CONT blood pressure and the rest of variables remained unchanged. HIIT induced larger PEH than CE (systolic BP -14±4 vs -4±2 mmHg; P=0.024) and increases in post exercise resting HR (27±2 vs 4±2 beats min⁻¹; P=0.005). Post-exercise $T_{int}$ and $S_{FB}$ 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 MSyn 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).

**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 Monteith, Richard Happel, John Petrizzo, Robert M. Otto, FACSM, John W. Wygand, FACSM. Adelphi University, Garden City, NY. (Sponsor: John W. Wygand, FACSM)

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(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 ± 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<0.05) of combined data of WU trials (C1 & C2) vs no WU trials (C3 & C4) reveals a significant difference (p<0.05) pre-WAPT between HR 102 vs 84 b/min, SV 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<0.05) 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. CONCLUSION: Our data indicate that WU had no impact on Wingate Anaerobic Power Test performance. The differences in SV and HR were anticipated because of the protocol used with active and passive WU and CDs. The marked reduction in SVR of 39% from WU prior to WAPT substantiates improved local peripheral hemodynamic function and confirms the opportunity for improved metabolic exchange for a highly demanding anaerobic activity. The benefit of CD following intense exercise is demonstrated with a prolonged attenuation of SVR, which may enhance recovery.

**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**

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(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, 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<0.05) and mean BP (-3.8±4.6 mmHg, p<0.05), but 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<0.05). ESS change ratio was significantly associated with the resting mean BP change ratio (r=0.732, p=0.01). CONCLUSION: This study indicates that isometric exercise training could reduce resting blood pressure and was associated with daytime sleepiness in young women.

**A-45**

**Free Communication/Poster - Chronic Disease and Disability**

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

**Room: Hall F**

**305**

**Board #126**

May 31 9:30 AM - 11:00 AM

**Balance Confidence Predicts Fall Frequency but not Physical Activity in Individuals with Parkinson’s Disease.**

Amanda Penko. Cleveland Clinic, Cleveland, OH. (Sponsor: Ellen Glickman, FACSM)

Email: penkoal@gmail.com

(No relationships reported)

Parkinson’s disease (PD) is a neurodegenerative movement disorder that affects approximately one million Americans. Physical activity has been shown to be beneficial in the management of PD, however, motor symptoms associated with the disease may create a barrier to participating in exercise. The activities balance confidence (ABC) scale is an index of an individual’s confidence in their balance during activities of daily living and is predictive of fall risk but the association between ABC scores and physical activity behavior in individuals with PD has yet to be determined. PURPOSE: To assess the relationship between balance confidence and fall frequency, disease severity and objectively-measured physical activity in individuals with PD. Methods: Ten participants diagnosed with PD (63.5 ± 12.0 years old, n = 3 females) completed the validated ABC scale and gave self-report of their fall frequency over the past 12 months. Disease severity was assessed via the Unified Parkinson’s disease ratings scale (UPDRS) by trained personnel. Finally, participants were given a wrist-mounted physical activity monitor (Movband 3) to measure physical activity behavior over a one-week period. Physical activity during all waking hours and was recorded as the number of steps taken per hour of activity monitor wear. Results: Pearson’s correlation analyses revealed significant negative correlations (r ≥ -0.59, p ≤ 0.05) between the ABC scale score and both the number of falls reported over the previous 12 months and UPDRS scores. In other words, as balance confidence increased, the number of falls reported and disease severity decreased. However, ABC scores were not (r = -0.06, p = 0.85) associated with physical activity. Conclusion: While individuals with Parkinson’s disease who had poor balance confidence did have more frequent falls and greater disease severity, their physical activity behavior was not different than those with greater balance confidence. Therefore, poor balance confidence may not decrease physical activity behavior in individuals with Parkinson’s disease.
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 sitting 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 physical 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 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=-1.01 P=0.34), HDL (t=-0.73 P=0.56) 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.

Sedentary behavior (SED) is a key contributor to cardiovascular disease in the general population. Few data exist on objectively measured SED patterns in acute coronary syndrome (ACS) patients in the first month after an ACS event; a critical period when lifestyle behaviors are reformed. PURPOSE: To characterize SED patterns and their correlates in ACS patients over the first month post-discharge. METHODS: Participants (n=177) with confirmed ACS (myocardial infarction or unstable angina) from a university hospital in Upper Manhattan were examined. SED was objectively measured for 28-days post-discharge via Actical wrist accelerometer. Group-based modeling at the day-level was used to characterize SED patterns (trajectories) over the 28-days. Logistic regression was used to determine correlates of SED trajectories. Correlates included sociodemographic, hospitalization, physical and psychosocial factors. Models were adjusted for age, sex, race and ethnicity. RESULTS: Participants spent a mean (SD) of 12.3±3.3 hrs/day in SED the first month post-discharge. Three distinct SED trajectory groups were identified (Fig 1). The high SED group (38%) spent a mean (SD) of 15.6±1.3 hrs/day in SED with no change in day-level SED. The moderate SED group (41%) spent a mean (SD) of 11.8±1.2 hrs/day in SED with little change in day-level SED. The low SED group (21%) spent a mean (SD) of 7.6±1.5 hrs/day in SED, with a gradual decline in SED from immediately post-discharge (~9 hrs/day) to 28-days post-discharge (~7 hrs/day). In multivariable models, left ventricular ejection fraction < 40, length of hospital stay and coronary artery bypass grafting were identified as significant correlates of the high SED group (p<0.05 for all). CONCLUSION: ACS survivors alarmed alarmingly high volumes of SED during the first month post-discharge, with little to no change in day-level SED over time. ACS survivors with greater disease severity were more likely to accrue higher volumes of SED.

PREVENTION OF LEISURE TIME PHYSICAL ACTIVITY IN ADULTS WITH SEIZURE DISORDERS: 2013 AND 2015 NHIS
Adrian J. Boltz, Brandi S. Rariden, Bethany D. Williams, Tamimc M. Johnson, Michael R. Richardson, James R. Churilla, FACSM. University of North Florida, Jacksonville, FL. (Sponsor: James R. Churilla, FACSM) Email: adrianboltz@gmail.com (No relationships reported)

The prevalence of self-reported leisure time physical activity (LTPA) participation by intensity using a representative sample of U.S. adults (18-64 years old) with a seizure disorder or epilepsy. METHODS: Data from the 2013 (n=587) and 2015 (n=647) National Health Interview Survey cycles were utilized to examine the prevalence of meeting the 2008 Physical Activity Recommendations for U.S. adults. RESULTS: In the 2013 NHIS, the prevalence of adults with a seizure disorder or epilepsy reporting insufficient (<150 min), sufficient (150-300 min [meets rec]), or high volumes of LTPA (>300 min [meets rec]) were 92.5%, 6.6%, and 0.9%, respectively. In the 2015 NHIS, the prevalence of adults with a seizure disorder or epilepsy reporting insufficient (<150 min), sufficient (150-300 min [meets rec]), or high volumes of LTPA (>300 min [meets rec]) were 92.4%, 7.1%, and 0.5%, respectively. CONCLUSIONS: Adults reporting a seizure disorder or epilepsy may not be impeded by their condition to participate in LTPA or MSA.

PREVNTION OF LEISURE TIME PHYSICAL ACTIVITY IN ADULTS WITH SEIZURE DISORDERS: 2013 AND 2015 NHIS
Adrian J. Boltz, Brandi S. Rariden, Bethany D. Williams, Tamimc M. Johnson, Michael R. Richardson, James R. Churilla, FACSM. University of North Florida, Jacksonville, FL. (Sponsor: James R. Churilla, FACSM) Email: adrianboltz@gmail.com (No relationships reported)

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Adrian J. Boltz, Brandi S. Rariden, Bethany D. Williams, Tamimc M. Johnson, Michael R. Richardson, James R. Churilla, FACSM. University of North Florida, Jacksonville, FL. (Sponsor: James R. Churilla, FACSM) Email: adrianboltz@gmail.com (No relationships reported)
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 LSB 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 CDRF 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 CDRF for less than 1 hour (reference) vs more than 4 hours (OR = 1.47, 95% CI: 1.01 - 2.13) and less than 1 sitting hour vs more than 4 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 CDRF among osteoarthritis patients. This finding suggests that avoiding LSB may be beneficial for lowering the risk of CD in US adults with osteoarthritis.

PURPOSE: To examine seasonal difference in PA of children with different types of disabilities in the context of PE in special schools.

METHODS: Nine schools designed for children with four disability types (i.e., sensory impairments, physical disabilities (PD), mild-to-moderate intellectual disabilities, and severe intellectual disabilities) in Hong Kong were recruited. Trained observers used SOFIT (System for Observing Fitness Instruction Time) to code PA levels (i.e., lying down, sitting, standing, walking, vigorous) of students during PE. Moderate-to-Vigorous PA (MVPA) was calculated by summing walking and vigorous codes. Observations were conducted on three normal school days in winter (December, mean 18°C) and summer (June, mean 28°C) respectively. Total session energy expenditure (TEE) and energy expenditure rate (EER) were calculated using standard formulae. Linear mixed models were used to determine difference in percentage of time spent in MVPA, TEE, and EER across disability types in two seasons, after adjusting for gender, grade level, duration of PE, and school-level clustering. Interactions among season, disability type, and gender were also examined.

RESULTS: A total of 179 PE classes (94 winter, 85 summer; mean length 38.5 minutes) were observed. Only main effects of season were significant for %MVPA (F(4,2, 204) = 0.42) and TEE (F(5,1, p = 0.026), with lower scores in winter (b = 5.1, 95% confidence interval [CI], -10.0 to 0.2 for %MVPA; b = 17.4, 95% CI, -32.7 to 2.1 for TEE) compared to summer.

CONCLUSIONS: PA of children with disabilities during PE varies with seasonality. Adaptation of the setting and program content is needed to promote year-round PA for children with disabilities.

Supported by General Research Fund (752712), University Grant Committee of Hong Kong SAR

Sitting were collected using the International Physical Activity Questionnaire. Data were analyzed using analysis of variance with age, sex, education status, disease history, and smoking habits as covariates. RESULTS: People with IBDD reported lower levels of walking (359±422 minutes/week, p<0.03) and MVPA (279±412 minutes/week, p<0.01) than healthy adults (471±536 min and 481±529 minutes/week, respectively). There were no differences between IBD-flare and IBD-remission participants for levels of walking (301±466 vs. 335±368 minutes/week, respectively) or MVPA (327±315 vs. 330±481 minutes/week, respectively, p>0.05 for both). Physical activity guidelines were met in 45% of people with IBD and 73% of healthy individuals (p<0.05). Although sitting was not different between groups, there was a trend for higher sitting in those with IBD (424±196 minutes/day) compared to healthy individuals (395±182 minutes/day, p<0.07).

CONCLUSION: Our findings indicate that people with IBD report lower levels of physical activity than healthy individuals but report no differences in weekday sitting. Furthermore, there were no negative consequences of a disease flare on physical activity. Our findings suggest that people with IBD are able to participate in varying levels of physical activity despite there being no guidelines for this population. Future research should aim to develop physical activity recommendations to benefit people with IBD and reduce the amount of time spent sitting.

Children with disabilities are less physically active than their typically developing peers. Physical education (PE) is a primary school setting where children can accumulate health promoting physical activity (PA). Little is known about seasonal variation in PA of children with disabilities during PE in Hong Kong.

PURPOSE: To examine seasonal difference in PA of children with different types of disabilities in the context of PE in special schools.

METHODS: Nine schools designed for children with four disability types (i.e., sensory impairments, physical disabilities (PD), mild-to-moderate intellectual disabilities, and severe intellectual disabilities) in Hong Kong were recruited. Trained observers used SOFIT (System for Observing Fitness Instruction Time) to code PA levels (i.e., lying down, sitting, standing, walking, vigorous) of students during PE. Moderate-to-Vigorous PA (MVPA) was calculated by summing walking and vigorous codes. Observations were conducted on three normal school days in winter (December, mean 18°C) and summer (June, mean 28°C) respectively. Total session energy expenditure (TEE) and energy expenditure rate (EER) were calculated using standard formulae. Linear mixed models were used to determine difference in percentage of time spent in MVPA, TEE, and EER across disability types in two seasons, after adjusting for gender, grade level, duration of PE, and school-level clustering. Interactions among season, disability type, and gender were also examined.

RESULTS: A total of 179 PE classes (94 winter, 85 summer; mean length 38.5 minutes) were observed. Only main effects of season were significant for %MVPA (F(4,2, 204) = 0.42) and TEE (F(5,1, p = 0.026), with lower scores in winter (b = 5.1, 95% confidence interval [CI], -10.0 to 0.2 for %MVPA; b = 17.4, 95% CI, -32.7 to 2.1 for TEE) compared to summer.

CONCLUSIONS: PA of children with disabilities during PE varies with seasonality. Adaptation of the setting and program content is needed to promote year-round PA for children with disabilities.

Supported by General Research Fund (752712), University Grant Committee of Hong Kong SAR

Abstracts were prepared by the authors and printed as submitted.
METHODS: Participants were 147 children with PD recruited from three special schools in Hong Kong. Behaviors of Eating and Activity for Children’s Health Evaluation System was used to document PA levels in four settings at school (before-class, recess, lunch break, after-class) and one home setting (before dinner) on four normal school days. Linear mixed models with repeated measures (four measurement days) were used to examine the percentage of time spent in moderate-to-vigorous PA (%MVPA) in the five settings across gender, grade level (4-6, 7-9, and 10-12), and mobility level (walking with or without assistance) after adjusting for school as random effects. RESULTS: In the before-class setting, significant main effects were found for gender ($F = 5.5, p < .05$) and grade level ($F = 3.8, p < .05$), with boys having less %MVPA than girls ($b = 6.2, 95\% CI = [11.4, -0.9]) and children in Grades 4-6 and 7-9 having higher %MVPA than those in Grade 10-12 ($b = 7.8, 95\% CI = [1.7, 13.9]; b = 7.0, 95\% CI = [0.4, 13.6]). A significant main effect of mobility was found separately for recess, lunch break, and after-class settings ($F = 48.6, p < .001; F = 34.1, p < .001; F = 12.1, p < .01$), with children walking without assistance accruing higher %MVPA ($b = 16.9, 95\% CI = [12.1, 21.7]; b = 12.7, 95\% CI = [8.4, 17.0]; b = 47.8, 95\% CI = [22.9, 72.7]). Additionally, a significant grade by mobility interaction effect was found in %MVPA during the after-class period ($F = 3.8, p < .05$), whereby the %MVPA of Grade 10-12 children who walked without assistance was greater than counterparts needing assistance. No significant effects of gender, grade level, and mobility on %MVPA were found at home setting. CONCLUSION: Children have low levels of PA across settings, with the most inactive pattern at home and slightly more PA accrual at recess and after-class setting. Future research should pay more attention to their low activity level at home. A multifaceted intervention that considers the contextual and personal factors may help motivate children with PD at home. Supported by GRF 14409514.

Purpose: The aim of the study was to determine the characteristics and incidence of medical condition or injuries of Turkish team participated to Rio Paralympics. Methods: Medical condition information was collected from assessment forms which recorded by 6 team physiotherapists and one doctor. The assessments included demographic characteristics of athletes (sport type, age, gender), injury related questions (time-type and region of injury). Results: 81 Turkish athlete (35 female/45 male) participated to Rio Paralympics. A total of 148 application (75 female/73 male application) in 50 athletes were documented during the Paralympic Games. Of the assessment 65% was musculosketal system disorders, 12.8% was urinary system disorders, 2.7% was ophtalmalogic system disorders, 12.8% was cardiovascular system disorders, 12.8% was neurologic system disorders, 12.8% was other system disorders. Of the application 63% was musculosketal system disorders, 12.8% was urinary system disorders, 2.7% was ophtalmalogic system disorders, 12.8% was cardiovascular system disorders, 12.8% was neurologic system disorders, 12.8% was other system disorders. There were significant differences in %MVPA between athletes with ID living 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 setting. People with ID living in institutions, 38% of lower engagement in PA than those living with parents (OR = .61; CI: .50 – .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.
across age-groups between adults with DS and adults with ID. METHODS: We conducted secondary analyses of data from the 2013-2014 National Core Indicators Adult Consumer Survey, containing 14,237 cases (age 18-96 y; 82% men). Of these cases, 1,343 persons had DS (age 41 ± 13 y) and 11,289 persons (age 44 ± 15 y) had ID, but not DS. We extracted weight, height, BMI, sex, and age, and generated age groups: 18-29; 30-39; 40-59; 50-69; 70-79; 80-89; 90-99 y. There were no DS cases in the 70-89, 80-89, and 90-99 y age groups. We used 2-way ANOVA and follow-up tests to examine differences in BMI, height, and weight across age groups. Height and weight were analyzed by sex. RESULTS: The BMI age-associated response was different between adults with DS and adults with ID (p < 0.001 for interaction). Adults with DS had higher BMI than adults with ID (p < 0.001) at ages 18-29 (30 vs. 27 kg·m⁻²), 30-39 (32 vs. 28 kg·m⁻²), and 40-49 (31 vs. 29 kg·m⁻²). BMI did not differ between groups at 50-59, 60-69, and 70-79 y. For adults with DS, BMI was not significantly different between the 3rd, 4th, and 5th decades of life and decreased after age 49 y (from 31 kg·m⁻² at age 40-49 y to 26 kg·m⁻² at age 60-69 y; p < 0.001). For adults with ID, BMI increased between the 3rd and 4th decade of life and decreased after age 59 y (from 28 kg·m⁻² at age 50-59 kg·m⁻² at age 80-89 y; p < 0.015). For both sexes, weight declined at earlier ages in those with DS than those with ID (p ≤ 0.019 for interactions). Height was lower across all ages for both women and men with DS than their sex counterparts with ID (p < 0.001); however, the age-associated response in height did not differ between those with DS and those with ID. CONCLUSION: The age-associated changes in BMI and weight are different between adults with DS and adults with ID, but not the DS. The results indicate earlier onset of weight loss in adults with DS.

PURPOSE: To compare shoulder muscle strength and physical activity levels in sportive men (32.0 ± 6.97 yrs.) with spinal cord injury (between T5 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 moderate-to-vigorous physical activity. Shoulder strength was assessed in an isokinetic dynamometer at 60°/second. Shoulder movements considered were flexion/extension (range 0° - 50°), external/internal rotation (range 0° - 45°), and abduction/adduction (range 25° - 75°). Non-parametric statistics (Mann-Whitney) was used to compare differences between sportive and non-sportive men. RESULTS: Total moderate-to-vigorous physical activity of sportive compared to non-sportive individuals was significantly higher (126.50 ± 53.26 and 61.82 ± 28.8 min/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 min/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 (U=49.00: p=0.025) in sportive (72.45 ± 11.34 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). CONCLUSIONS: In men with spinal cord injury, the participation in sport activities can lead to an increment in moderate-to-vigorous physical activity and shoulder extension strength that might be important for independency in daily activities. Supported by the CNPQ under grant number 206682/2014-8, CAPES under grant number 6909/13-0, CAFEL under grant number UID/DTP/00177/2013.

Individuals who use wheelchairs for mobility face various barriers to physical activity during the workday. Worksite wellness exercises can be conducted during the workday to increase energy expenditure during sedentary time sitting at a desk. Research in the general population shows promising results for worksite wellness exercises conducted at specific intervals and intensities throughout the day increasing daily energy expenditure, which over an extended time period could have a significant impact on weight management. Purpose: To pilot test worksite wellness exercises for individuals who use wheelchairs for mobility. Method: Five worksite wellness exercises were chosen from surveys including: arm 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 pushes due to injuries or strength. Therefore, performing worksite wellness exercises for 13 minutes per workday could result in an extra 100 Kcal/week expended per week. Conclusions: 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.
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/week. The 30-minute lifestyle behavior change class included self-regulation problem solving strategies for staying active. Physical function was measured via the Physical Function Questionnaire (PFQ), O2-unable to do to 100=no difficulty in performing 6 functional tasks), Timed Up and Go (TUG, time in seconds to rise from a chair, walk 3 meters, return to chair and sit), 6 Minute Walk (6MW, feet) and usual Gait Speed (UGS, meters/second to walk 6 m distance); PA via the CHAMPS questionnaire and GPS for at least 3 days were included (n=9; 5.8±1.5 days). MAPS scores were carried a LandAirSea model Tracking Key GPS receiver when outside of their residence to measure free-living physical activity and record location (latitude/longitude), respectively. In this analysis, participants who wore an accelerometer and GPS for at least 3 days were included (n=9; 5.8±1.5 days). MAPS scores were

**RESULTS**: A strong correlation was found between PA and all variables of interest (p<.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.

**METHODS**: 28 adults with moderate-severe ID (16 men, 40-66 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/week 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 T-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 (WVEF) 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**: 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.
Convergent validity evidence was obtained by quantifying the relationship between MAPS score and the three functional ambulation measures using Pearson product moment correlations, and known-group difference validity evidence was assessed using an independent t-test to compare participants who displayed greater (n=7; ASIA Impairment Scale: B) and lesser (n=2; ASIA Impairment Scale: C and D) severity of functional impairment (GSFI vs LSFI).

RESULTS: The MAPS score was moderately correlated with walking index (r=.74), walking speed (r=.64) and 6MWD (r=.56). A significant difference in MAPS score was also observed between GSFI (5.27±7.12) and LSFI (35.65±23.35) groups, (6.67)*** p<.023.

CONCLUSIONS: Our findings provide support for using the MAPS score as a functional outcome measure in adults with incomplete spinal cord injury.

327 Board #148 May 31 9:30 AM - 11:00 AM Exercise Results in Physiological Improvements in Individuals Living with Disabilities
Lisa Sprold, Brandi Crowe, Jennifer Bell, Dan Johnson. University of North Carolina Wilmington, Wilmington, NC. Email: sprolld@uncw.edu (No relationships reported)

PURPOSE: Individuals who have a disability are at risk for becoming overweight or obese which has been associated with secondary health conditions including heart disease, stroke, diabetes, and cancer. In fact, individuals who have a disability triple their risk for these aforementioned conditions compared to adults without disabilities. This population is likely to become overweight due to physical inactivity or inadequate physical activity. Reasons cited for exercise barriers include residual physical impairments related to their health condition, or a lack of access to programs that provide appropriate accommodations. This study aimed to determine the effects of an exercise intervention on physical functioning, which may ultimately be linked to chronic disease development, in individuals with disabilities.

METHODS: Participants were recruited from a group home through convenience sampling. At baseline and following the 6-week exercise intervention, participants underwent a battery of physiological and functional tests including body weight, resting heart rate (RHR), resting blood pressure, cardiac output, quantitative gait analysis, balance, and muscle strength.

RESULTS: Our findings provide support for using the MAPS score as a functional outcome measure in adults with incomplete spinal cord injury.

67.0% (males = 68.2%; females = 64.7%), three diagnoses = 71.0% (males = 81.4%; females = 56.1%), and four diagnoses = 58.9% (males = 63.6%; females = 50.0%).

CONCLUSIONS: These findings support the notion that this teaching 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 further define the relationship between success rate, quantity/combinations of diagnoses, and gender differences among iCan Bike participants.

328 Board #149 May 31 9:30 AM - 11:00 AM Sedentary Patterns in People with Intellectual Disability
Guillermo R. Oviedo1, Casimiro Javierri2, Jesus Fortuño-Godes1, Maria Carbó-Carreté1, Myriam Guerra-Balió1, FPCCE Blanquerna - University Ramon Llull, Barcelona, Spain. 1University of Barcelona, Barcelona, Spain. 2University of North Carolina Wilmington, Wilmington, NC. Email: groviedo77@gmail.com (No relationships reported)

Introduction: Adults and older adults with intellectual disabilities (ID) have low physical activity levels (PALs) and very little is known about the patterns of sedentary time (ST) among them.

Purpose: To analyze ST patterns of adults and older adults with ID.

Methods: A group of 42 adults and 42 older adults with mild to severe ID were recruited. A health screening questionnaire was completed by each participant and/or legal guardian. Height and weight were obtained to calculate BMI. ST patterns were assessed using ActiGraph accelerometers for 7 consecutive days.

Results: Non-significant differences in ST throughout the week were observed.

Conclusions: These groups of subjects with ID showed a high prevalence of ST. Well-designed interventions and preventive health strategies in this specific population are recommended.

Individuals with cognitive and physical disabilities must endure daily challenges that may decrease overall well-being. The iCan Bike program, a subdivision of the iCan Shine organization, utilizes an individualized intervention for teaching mentally and physically challenged individuals how to ride a two-wheeled bicycle as a means to increase well-being and self-confidence. PURPOSE: The purpose of this study was to investigate the relationship between the learning success rate in the iCan Bike program and the quantity of participant diagnoses.

METHODS: Participants were divided into groups based on the number of diagnoses they had (n = 947). Participants achieved a 67.7% rate of success (males = 70.2%; females = 66.4%) for learning to independently ride a two-wheeled bike. The participants’ success rate per amount of diagnoses were as follows: one diagnosis = 67.9% (males = 70.3%; females = 63.3%), two diagnoses = 60.4% (males = 58.4%; females = 62.7%).
To determine the effect of a physical conditioning program on isometric strength and body composition in people with DS. METHODS: The design of the study was an experimental type. Twenty two children participated with DS. Thirteen in the experimental group (EG) and nine in the control group (CG), that did not represent any history of heart diseases and which didn’t practice any type of physical activity or sport. The isometric strength (manual hydraulic dynamometer model SH5001), and the BMI was calculated. Also the triceps and the medial calf skinfolds (Slimguide Caliper) were measured. Later a physical activity program was implemented with a frequency of five times per week with sessions of 55 minutes of duration for a period of 16 weeks. RESULTS: In the EG the age was 12.3 + 2.06 years, while in the CG it was 11.4 + 1.94 years. The height was 134.6 + 6.4 cm and 132.7 + 4.8 cm for the GE and GC respectively. The BMI in the EG was 22.2 + 2.5 kg/m² and 20.7 + 2.5 kg/m² at the beginning and at the end of the intervention, respectively (p<0.0001). Meanwhile in the CG the BMI was 23.29 + 4.9 kg/m² and 21.9 + 4.6 kg/m² during the pretest and posttest respectively (p=0.001). In regards to the calf skinfold in the EG was 14.9 + 5.5 mm at the beginning and 14.55 + 3.2 mm at the end (p<0.008), while in the CG no significant difference were found (p = 0.39). No significant differences for the triceps skinfold were found. Isometric strength in EG at baseline was 2.4 ± 4 kg and 9.2 ± 2 kg at the end (p<0.0001), while in the CG no significant difference were observed (p = 0.1). CONCLUSION: A physical conditioning program can improve the body composition and the isometric strength in people with DS. People with DS need to engage in physical activity because of their tendency to be overobese and obese, this would significantly improve their quality of life.

Multiple Sclerosis is a neurodegenerative disease of the central nervous system. Symptoms include fatigue, depression, gut dysfunction, and changes in cognition, 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=2.0(1.9), C=1.4(1.8)). 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 = -0.56) but not with FIS. (rs = -0.32). No variables correlated with 6MWT. For the MSD group, HRV (pre = 31 (19) post = 38 (19) ms, 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 (5.15) 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.

Multiple Sclerosis (MSD). However due to the lack of activities that stimulate an optimum composition and the isometric strength in people with DS. People with DS need to engage in physical activity because of their tendency to be overobese and obese, this would significantly improve their quality of life.

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>
</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>
</tr>
<tr>
<td>Height (cm)</td>
<td>160.5 (11.3)</td>
<td>165.5 (9.7)</td>
<td>155.5 (9.5)</td>
<td>&lt; 0.001</td>
<td>161.0 (12.8)</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>0.385</td>
<td>70.3 (14.0)</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>&lt; 0.001</td>
<td>27.1 (4.6)</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/day, number of sedentary bouts/day, and number of breaks per sedentary hour.

<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>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary behavior (min·day⁻¹)</td>
<td>621.9 (80.1)</td>
<td>79.4 (6.5)</td>
<td>64.8 (11.7)</td>
<td>6.2 (0.7)</td>
<td></td>
</tr>
<tr>
<td>Percentage of time in sedentary</td>
<td>0.155</td>
<td>0.654</td>
<td>0.553</td>
<td>0.048</td>
<td></td>
</tr>
<tr>
<td>Number of breaks per sedentary</td>
<td>0.035</td>
<td>0.111</td>
<td>0.005</td>
<td>0.138</td>
<td></td>
</tr>
</tbody>
</table>

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

REFERENCES:
1. Banting1, Sheri L. Bunyan2, Alexander V. Ng, FACSM1.
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No relationships reported.

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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 steps/day and showed a significant increase in their self-reported RE score from 18.18 ± 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 1R21NR011281 and Theraband®.

Purpose: Type 1 Diabetes (T1D) is rising globally. Youths with T1D have poorer health and lower levels of physical activity (PA) than those without diabetes. The ActivPals study aimed to support youths 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 for 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 modellling and self-monitoring were seen as both a facilitator and a barrier to PA. Participants provided important feedback for future interventions. The ActivPals intervention had a positive impact on young people with diabetes.

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.

332 Board #153 May 31 9:30 AM - 11:00 AM Exploring The Impact Of A Pilot Physical Activity Intervention On Youths With Type 1 Diabetes.

Fiona Mitchell, Alison Kirk, Kenneth Robertson, Louise Wilkie, John J. Reilly, University of Strathclyde, Glasgow, United Kingdom. (Sponsor: Dave Rowe, FACSM)

Email: fiona.c.mitchell@strath.ac.uk

(No relationships reported)

Purpose: Type 1 Diabetes (T1D) is rising globally. Youths with T1D have poorer health and lower levels of physical activity (PA) than those without diabetes. The ActivPals study aimed to support youths 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 for 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.

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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.

333 Board #154 May 31 9:30 AM - 11:00 AM Increases In Physical Activity Improves HDL Cholesterol In People Living With HIV/AIDS Taking Antiretroviral Therapy

Camerra C. Miller1, Olivia Estill1, Gregory A. Hand, FACSM2, Jason R. Jaggars1, University of Louisville, Louisville, KY. 1West Virginia University, Morgantown, WV. (Sponsor: Dr. Ann Swank, FACSM)

(No relationships reported)

People living with HIV/AIDS (PLWHA) and taking antiretroviral therapy (ART) medications are at increased risk for cardiovascular disease (CVD) and metabolic disorders once they begin therapy. The presence of metabolic disorders, such as increased blood lipids, make it difficult to manage CVD. Physical activity (PA) has been shown to reduce modifiable risk factors of CVD. The purpose of this analysis was to compare the blood lipid profiles of PLWHA while being treated with ART who increased their daily step count compared to those who did not.

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 changes in step count. The comparison group consisted of those who increased daily steps by 10% or more, with the remaining participants serving as the reference group. Assessments conducted at baseline and 18 week follow-up included waist circumference and fasting blood lipids including total cholesterol and triglycerides, HDL-C, LDL-C, and glucose. Height, weight, and PA levels via accelerometer were also collected. 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. Groups were determined by changes in step count from baseline to follow-up with an increase in PA by 10% or more as group 1.

Results: A total of 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 at 18-weeks had an average increase of 1502 steps/day and showed a significant increase in HDL cholesterol from 44.10 ± 7.29 pre to 49.0 ± 3.51 post (p = 0.03), whereas those with no changes and/or decreased daily PA by an average of 1195 steps/day showed no change.

Conclusion: These data show that a small increase in daily step count of 10% or more increased HDL levels compared to those who did not. In conclusion, something as simple as increasing step count can improve blood lipid profile for PLWHA while being treated with ART.

This project was supported by funding through the NIH/NINR R21 Grant 1R21NR011281 and Theraband®

A-46 Free Communication/Poster - Ergogenic Aids I

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

334 Board #155 May 31 11:00 AM - 12:30 PM 10-Week Guanidinoacetic Acid Supplementation Affects Inflammatory Markers in Healthy Men and Women

Sergej M. Ostojic, Patrik Drick, Tatjana Trivic, Valdemar Stajer. University of Novi Sad, Novi Sad, Serbia. Email: sergej.ostojic@chess.edu.rs

(No relationships reported)

Cellular bioenergetics largely depends on guanidinoacetic acid (GAA), also known as glycocyamine or betacyinine), a natural metabolic precursor of creatine, and an investigational dietary supplement. Previous animal studies have shown that an investigational dietary supplement. Previous animal studies have shown that GAA supplementation can reduce C-reactive protein (hsCRP) assessed at baseline and at 10 weeks follow-up. Secondary analysis was conducted to examine a potential anti-inflammatory effects of this compound. PURPOSE: To examine the effects of 10-week supplementation with 3 grams per day of GAA on serum and urinary inflammatory markers in apparently healthy men and women. METHODS: Twenty healthy volunteers (10 men and 10 women; age 22.0 ± 2.3 years, weight 75.5 ± 22.9 kg, height 173.3 ± 10.5 cm) participated in this open-label, repeated-measure interventional study. All participants were assigned to receive GAA for 10 weeks, and were evaluated at baseline, and following 10-weeks of ingestion. The primary endpoint was the change in serum levels of high-sensitivity C-reactive protein (hsCRP) assessed at baseline and at 10 weeks follow-up. Secondary outcomes included change from baseline to end of treatment in values for serum ferritin, white blood cell (WBC) count and differential, and urinary inflammation markers. RESULTS: Serum hsCRP levels increased non-significantly during GAA intervention (1.6 ± 1.0 mg/L at baseline vs. 1.8 ± 2.1 mg/L at 10-week follow-up; P = 0.72). Supplementation with GAA yielded a statistically significant increase (7.5% increase).
Board #156 May 31 11:00 AM - 12:30 PM Sprint Cycling Performance Improvement Post- Creatine Supplementation is Associated with Increase in Lean Body Mass Daniel L. Crisafulli, Harsh H. Buddhadev, Lorrie R. Brilla, FACSM, Gordon R. Chalmers, David N. Suprak, Jun G. San Juan. Western Washington University, Bellingham, WA. (Sponsor: L. R. Brilla, FACSM) Email: crisaf06@wwu.edu


Creatine supplementation is recommended as an ergogenic aid to improve repeated 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: To investigate the effect of a 6-week CE supplement intervention on 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 were compared between a 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 ANOVAs were used for statistical analyses.

RESULTS: For almost all participants, the peak power was generated during the first sprint. A supplement-time interaction showed a 4% increase in peak power (27 W; p < 0.001) and a 5% increase in average work (376 J; p < 0.001) from pre- to post-supplementation for the CE group. For the P group, no differences were observed in these variables from pre- to post-testing. Similarly, the lean body mass increased by 2% (1.4 kg; p < 0.001) from pre- to post-testing for the CE group, whereas no differences were found for the P group (supplement-time interaction; p = 0.001). For the CE group, a modest association (r = 0.626; p = 0.003) was observed between the increases in peak power and lean body mass from pre- to post-sprint supplementation.

CONCLUSION: CE supplement improves repeated short duration cycling sprint performance when sprints are interspersed with adequate recovery periods. Additionally, the ergogenic effect of CE supplement is associated with an increase in lean body mass.

Board #157 May 31 11:00 AM - 12:30 PM The Effect of Bacillus Coagulans and HMB On Muscle Integrity and Inflammation During Military Training Yfatch Gepner1, Jay R. Hoffman, FACSM1, Elad Shemesheim2, Jeffrey R. Stout, FACSM1, David D. Church1, Alyssa N. Varanoske1, Hila Zelicha1, Ilan Shelef2, Hagai Frankel3, Ishay Ostfeld2. 1Institute of Exercise Physiology and Wellness, Sport and Exercise Science; University of Central Florida, Orlando, FL. 2Israel Defense Force, Medical Corps, Tel Hashomer, Israel. 3Department of Public Health, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel. (Sponsor: Jay R. Hoffman, FACSM) Email: yfatch.gepner@ucf.edu

No relationships reported.

BACKGROUND: β-Hydroxy-β-methylbutyrate (HMB) is a derivative of the branched chain amino acid leucine, and has been demonstrated to enhance recovery and attenuate muscle damage from high intensity exercise. Recent evidence has suggested that the use of a probiotic may enhance protein absorption, as such the combination of a probiotic with HMB ingestion may be more beneficial during field operations. 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 (CaHMB30; n=9) or CaHMB with placebo (CaHMBP, 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 stationed 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 approximately 12-hours following final supplement 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, CXC1L1, and TNF-α for both CaHMB30 and CaHMBP 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 CaHMBP. 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.

Board #158 May 31 11:00 AM - 12:30 PM The Physiological And Psychological Effects Of A Pre Exercise Amino Acid Supplement Krystle K. Sanders1, Kayla Berrioses2, Matthew Freaze3, Yi-Hung Liao4, Jeffrey R. Bernard5. 1California State University Stanislaus, Turlock, CA. 2Saint Mary’s College of California, Moraga, CA. 3National Taipei University of Nursing and Health Sciences, Taipei, Taiwan.

No relationships reported.

PURPOSE: To investigate the effect of a 6-week CE supplement intervention on peak power and average work performed during repeated cycling sprints interspersed with 2-minute recovery periods.

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CONCLUSION: CE supplement improves repeated short duration cycling sprint performance when sprints are interspersed with adequate recovery periods. Additionally, the ergogenic effect of CE supplement is associated with an increase in lean body mass.

Board #159 May 31 11:00 AM - 12:30 PM Effects Of Branched-chain Amino Acids On Resting Metabolic Rate, Body Composition, And Satiety In Females Erica J. Roelofs1, Abbie E. Smith-Ryan, FACSM1. 1Meredith College, Raleigh, NC. 2University of North Carolina, Chapel Hill, NC. (Sponsor: Abbie E. Smith-Ryan, FACSM) Email: ejroelofs@meredith.edu

No relationships reported.

Branched-chain amino acid (BCAA) supplementation may have beneficial effects by raising amino acids in the blood, however, nearly all of the research has examined effects only in males. PURPOSE: To determine the effects of BCAA supplementation on resting metabolism, body composition, and satiety in females. METHODS: Twenty four females (mean ± SD, Age: 22.6 ± 5.3; Height: 166.4 ± 7.3 cm; Weight: 66.0 ± 11.4 kg) completed baseline testing, which assessed body composition, resting
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 BCAA (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 %BF, %RER, or RER for either group. There was no main effect for treatment (p > 0.05) or time (p > 0.84) for REE. There was a significant interaction between groups for RER (p < 0.05) with BCAA supplementing (Δ5.5 ± 14.2 kcal) and RER decreasing after placebo consumption (Δ7.4 ± 13.9 kcal). Confidence intervals (95% CI) demonstrated a significant increase in RER after BCAA supplementation (p < 0.05). The BCAA group reported feeling more satiated in the evening, according to 95% CI (p < 0.05). CONCLUSIONS: Supplementing with BCAAs between meals resulted in a higher resting metabolic rate and greater feelings of satiety in women. Initial results suggest consuming BCAAs between meals may have positive implications for weight maintenance or loss in women, due to increases in resting energy expenditure and satiety.

339 Board #160 May 31 11:00 AM - 12:30 PM Effects Of A Combined Protein And Antioxidant Supplement On Muscle Recovery In College - Aged Males
Email: sbloom1@skidmore.edu
(No relationships reported)

Eccentric contractions (ECC) result in muscle fiber damage from mechanical stress and a pro-inflammatory, pro-oxidant response, leading to a decline in muscle function and rise in muscle soreness. Individually, protein (PRO) and antioxidant (AO) supplements have been shown to improve recovery after eccentric exercise-induced muscle damage, though have yet to be combined. PURPOSE: Determine if a combined protein and antioxidant supplement (PRO+AO) improves muscle soreness (MS) and muscle function (MF) following fatiguing eccentric contractions over PRO alone or a control. METHODS: 60 sedentary college-aged males participated in a randomized, single-blind, parallel design study. Peak isometric torque (PIT), peak isokinetic torque (PIKT), thigh circumference (TC), and muscle soreness (MS) were measured prior to 100 maximal ECC of the knee extensor muscles, immediately after the ECC, as well as at 1, 2, 6, and 24 h post ECC. Immediately post ECC, 6 h post ECC, and 24 h prior to the 24 h assessment, participants consumed one of three isocaloric supplements (~30 g, 120 kcal ea.) of either a carbohydrate control (CHO; n=14), PRO (n=16), or PRO+AO (dehydrated berry-mixure; n=17). RESULTS: All groups had similar baseline MS, TC, MF, macro and micronutrient intakes, and performed a similar amount of total work during the ECC (all, p > 0.05). There was a significant effect for time (p = 0.05) for PIT (~25% decrease), PIRT (~25% decrease), TC and MS (~1 and 35% increase, respectively). There was an effect of group over time for PITK (PRO and PRO+AO > CHO, p < 0.05). At the 24 h point time, there was a trend towards improved relative MF for PRO and PRO+AO compared to CHO (~11% difference for PIT, ~17% difference for PIRT). For MS there was a group x time interaction indicating PRO+AO having the lowest MS (p < 0.05). CONCLUSION: These results suggest PRO supplements facilitate recovery of muscle function and soreness within 24 h after fatiguing ECC, however addition of AO ameliorates MS more than PRO alone. As eccentric contractions are a component of many types of physical activity, under circumstances requiring a short turn around to a subsequent bout (e.g. occupational, military, or sport), combined PRO+AO supplementation may better mitigate ECC-induced muscle soreness with equal restoration of performance. Support: Connolly Research Foundation.

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) decreases the increase 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 at 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 of ≤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 > 0.05) 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-test (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.

341 Board #162 May 31 11:00 AM - 12:30 PM Beta-hydroxy-beta-methylbutyrate Supplementation On Low-frequency Fatigue Following Fatiguing Exercise
T. Brock Symons1, Jordon W. Macht2, Mark G. Abel1, Jody L. Clasey, FACSMB, 1’University of Louisville, Louisville, KY. 2Campbellsville University, Campbellsville, KY. 3University of Kentucky, Lexington, KY. (Sponsor: Jody L. Clasey, FACSMB)
(No relationships reported)

Participation in any strenuous form of physical activity will result in a decline in skeletal muscle performance during and following the activity, this decline is commonly called fatigue. Low-frequency fatigue (LFF), a form of fatigue, is characterized by a loss of force at low frequencies of stimulation, a slow recovery of force and is reported following eccentric contractions. Beta-hydroxy-beta-methylbutyrate (HMB) is a nutritional supplement that claims to prevent and improve skeletal muscle recovery following muscle damage producing contractions. PURPOSE: To determine if three weeks of HMB supplementation could attenuate the effects of LFF caused by eccentric muscle contractions in young healthy adults. METHODS: 33 participants (18 males, 15 females; 23.2 ± 4.3 yr) completed the study. Participants performed 4 sets of 25 eccentric (ECC) contractions of the tibialis anterior muscle. Outcome measures were recorded prior, following, throughout a 20-minute recovery period, and at 48 and 96 hours following an ECC fatigue protocol. Outcome measures included: isometric peak torque, 10 and 50 Hz peak torque, and 10/50 Hz peak torque ratio. Participants served as their own control and lower limbs were randomly assigned as control (CTL) or supplementation (SUP). Following the pre-supplementation test-day, participants completed 3 weeks of 3g/day of HMB supplementation. Post-supplementation, the ECC fatigue protocol was completed and outcome measures were obtained. RESULTS: The ECC fatigue protocol reduced isometric peak torque in both the CTL and SUP limbs by 49.3% and 48.4%, respectively, and 34.4% and 33.4% for 10 Hz peak torque (pre-ECC fatigue: 4.8±2.2 Nm vs. 96-h post-ECC fatigue: 4.2±2.4 Nm) and the 10/50 Hz peak torque ratio (pre-ECC fatigue: 0.51±0.14 vs. 96-h post-ECC fatigue: 0.44±0.14) in the CTL limb were reduced at the 96-hour time point (p < 0.01), indicative of LFF. The SUP limb displayed no LFF (pre-ECC fatigue: 0.49±0.11 vs. 96-h post-ECC fatigue: 0.47±0.11) at the 96-hour time point indicative of a faster recovery. The CTL limb showed a 19.2% reduction in isometric peak torque at the 48-hour recovery time point (p < 0.01), whereas the SUP limb displayed only a 6.4% reduction in isometric peak torque. CONCLUSIONS: Three weeks of HMB supplementation attenuated LFF and force loss after an ECC fatigue protocol.
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 treatment supplement included four main ingredients comprising beta alanine, creatine nitrate, N-Acetyl L-tyrsoine, 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.
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 extensions.

**Methods:** The study evaluated effects in resistance-trained participants, repeating comparisons to placebo (P) on fatigue, work, and power during knee extensions. Various nutritional strategies have been utilized to enhance creatine efficacy, including concurrent intake of carbohydrates, electrolytes, and nutrients with alkaline quality, such as magnesium.

**RESULTS:** Forty individual studies employing 65 different exercise protocols and 1461 participants were included in the analyses. A three level mixed effects model was used to model effect sizes, along with the moderator of effect sizes within an exercise time-frame of 0.5-10 min with greater likelihood of an ergogenic effect with β-alanine supplementation based upon their chosen exercise modality.

**CONCLUSIONS:** β-alanine supplementation had a significant overall effect while sub-group analyses revealed a number of modifying factors, including exercise duration and type. These data allow individuals to make informed decisions as to the likelihood of an ergogenic effect with β-alanine supplementation based upon their chosen exercise modality.

**PURPOSE:** The study was designed to examine the effects of chronic beta-alanine supplementation and acute sodium bicarbonate supplementation on anaerobic performance using a cycle ergometer protocol. **METHODS:** Ten trained males (O2peak 52.14 ± 4.24 ml·kg⁻¹·min⁻¹) performed an 8 minute anaerobic exercise cycling protocol before, after chronic beta-alanine supplementation, and after the combination of chronic beta-alanine and acute sodium bicarbonate supplementation. Subjects were instructed to take 6.4 grams of beta-alanine in 4 doses spread throughout the day at the same time each day for 4 weeks.

At the completion of the beta-alanine experimental session each subject was given a sodium bicarbonate supplement to take acutely for 24 hours prior to the combination of chronic beta-alanine and acute sodium bicarbonate supplementation experimental session. Each subject took 0.5 grams of sodium bicarbonate per kilogram of bodyweight ingested in 4 doses evenly spread throughout the 24 hours prior to the final session. The 8 minute intermittent cycling protocol used for each session included 30 seconds of maximum effort followed by 30 seconds of active recovery for 8 rounds. The performance variables measured every minute included lactate, RTW (relative total work), RAAP (relative average anaerobic power), TREP (total repetitions), RPE, O2 and RER. **RESULTS:** Significant interactions were found for RTW, RAAP, TREP and RPE. RTW was significantly greater post supplement 1 (MPS1 = 116.86 ± 3.25) at time point 3:30. RAAP was significantly greater post supplement 1 (MPS1 = 4.42 ± 1.9) compared to control (MPS2 = 4.05 ± 2.1) for time point 3:30. Although RTW and RAAP were only significant at one time point (3:30), a trend toward an increase in RTW and RAAP was found. **CONCLUSION:** A trend toward higher RTW and RAAP with acute sodium bicarbonate supplementation may indicate the benefit of chronic beta-alanine combined with acute sodium bicarbonate supplementation outside the widely studied exercise length of 60-240 seconds.
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⁻¹dm, Week 8: +13.9±7.8 mmol·kg⁻¹dm, Week 12: +17.0±8.6 mmol·kg⁻¹dm, Week 16: +17.6±3.4 mmol·kg⁻¹dm, Week 20: +21.2±7.9 mmol·kg⁻¹dm, Week 24: +20.2±7.6 mmol·kg⁻¹dm), but not PL (all P > 0.05). Maximal changes ranged from +17.1 to +41.3 mmol·kg⁻¹dm, and absolute maximal content ranged from 31.8 to 63.9 mmol·kg⁻¹dm. There was an effect of supplement (P = 0.002) on TauT in BA (β = -0.57%, -46%, -60%, -33%, -35%, -48%, -46%, -35% 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 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.

Carnosine content was increased from baseline at every time point in BA (all P < 0.001). Week 4: +11.4±2.0 mmol·kg⁻¹dm, Week 8: +13.9±7.8 mmol·kg⁻¹dm, Week 12: +17.0±8.6 mmol·kg⁻¹dm, Week 16: +17.6±3.4 mmol·kg⁻¹dm, Week 20: +21.2±7.9 mmol·kg⁻¹dm, Week 24: +20.2±7.6 mmol·kg⁻¹dm), but not PL (all P > 0.05). Maximal changes ranged from +17.1 to +41.3 mmol·kg⁻¹dm, and absolute maximal content ranged from 31.8 to 63.9 mmol·kg⁻¹dm. There was an effect of supplement (P = 0.002) on TauT in BA (β = -0.57%, -46%, -60%, -33%, -35%, -48%, -46%, -35% 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 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 test on an electromagnetically braked cycle ergometer once every 2 weeks for 6 weeks. Timing of data collection was as follows: week 0 (no supplement/ baseline measure), end of week 2, 4, and 6. Supplementation consisted of either a 400 mg of 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 α ≤ 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±39 vs. 976±37; PO max (Watts) 206.7 ± 6.7 vs. 195.5 ± 6.5; VO₂ peak (ml/kg/min) 34.1 ± 1.4 vs. 35.9 ± 1.3; VT (L/min) 1.84 ± 0.08 vs. 1.83 ± 0.07; 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 weeks. 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.

INTRODUCTION: CYP19A1, the aromatase enzyme gene, is responsible for the biosynthesis of estrogens that have anti-atherosclerotic effects. Previous studies have shown that the rs10046 genotype of CYP19A1 is associated with increased incidence of coronary artery disease. However, no studies have investigated whether this genotype is correlated with arterial stiffness. Additionally, it is unknown whether the rs10046 genotype is associated with a relationship between arterial stiffness and cardioregulatory fitness. PURPOSE: To determine the effects of CYP19A1 gene polymorphism (rs10046) on arterial stiffness, and their associations with cardioregulatory fitness in healthy Japanese people. METHODS: Nine hundred forty-seven healthy Japanese adults (Men: N=280, 43±17 years; Women: N=667, 46±17 years, Mean±SD) participated in a cross-sectional study. The rs10046 (C>T), transposition in the 3′ untranslated region) genotype was determined by real-time PCR with Taqman probe. Arterial stiffness was measured by brachial-ankle pulse wave velocity (baPWV). Cardioregulatory fitness was evaluated by peak oxygen uptake. Subjects were divided into high- or low-cardioregulatory fitness groups based on the median value of peak oxygen uptake in each sex and decade of life. RESULTS: One-way ANOVA revealed that there were significant differences in age, weight, blood triglyceride level, and systolic blood pressure among the genotypes. After adjusting for these covariates, baPWV of individuals with the TT genotype of rs10046 were significantly lower than those of other genotypes (TT; 1211±195, TC; 1253±250, CC; 1251±257 cm/sec). For both sexes, the same pattern was observed, but these findings were not significant. The rs10046 genotype had no impact on differences of arterial stiffness associated with cardioregulatory fitness level. CONCLUSION: CYP19A1 gene polymorphism (rs10046) of aromatase is related to arterial stiffness in healthy Japanese people but has no impact on the relationship between arterial stiffness and cardioregulatory fitness.

EXCERPT: Exercise can lead to an inflammatory process and, recently described, liver dysfunction. Heat shock proteins, especially HSP70, have important anti-inflammatory properties by blocking the activation of the NF-kB pathway, which is also suppressed by Sirtuin 1 (SIRT1). Glutamine availability is critical for the optimal regulation of HSP response and SIRT1 concentration, and its metabolism is compromised under catabolic situations, such as intense exercise. Glutamine and alanine supplementation, in their free form or as dipeptide, can increase the HSP70 response in heavy aerobic training. However, less is known about these cytoprotective effects in resistance exercise (RE). PURPOSE. Evaluate the effect of chronic oral supplementation with glutamine and alanine, in their free form or as dipeptide, on SIRT1 and HSP70 concentration and NF-κB activation in liver of rats submitted to progressive RE. METHODS: Adult male Wistar rats (n/8 group) were submitted to 8-week RE and supplemented with L-alanine and L-glutamine, in their free form or as dipeptide (ALA, GLN+ALA and DIP groups, respectively), or water (SED and CTRL group). RE consisted of 3 to 6 sets of maximal effort exercise (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 significantly decreased HSP70 concentration in liver of CTRL group. However, all supplementations promoted a 3-fold increase in HSP70 levels (P < 0.05 v. 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+ALA 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 (*ACTN3, ACTN3 R577X, PPARGC1A Gly482Ser, AGT Met235Thr, AMPD1 Gln12Ter, NOS3 866T>C*) 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 groups).

**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±3.6 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 medalists 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 χ² 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 R577X variant was in the endurance-oriented athletes, while the ACTN3 R577X genotype (p=0.09) in the endurance-oriented sports group 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 NOS3 TT genotype (p=0.076) and a lower prevalence of the AMPD1 TT genotype (p=0.09) 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.

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**RESULTS:** SNPs in 10 genes exceeded a genome-wide significance of p<10⁻⁵, including FTO, PPARGC1A, MTHFD2, and BDNF. One of these increased SNPs (BMPR1A R577X) has a known role in promotion of extracellular matrix degradation.

**CONCLUSIONS:** these data suggest that the profile of extracellular RNA molecules is dysregulated arthroscopically diagnosed OA. While the specific cellular signaling role of this exRNA is yet to be elucidated, they offer intriguing biomarkers and suggestions of dysregulated molecular pathways in OA. 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. **RESULTS:** SNPs in 10 genes exceeded a genome-wide significance of p<10⁻⁵, including FTO, PPARGC1A, MTHFD2, and BDNF. One of these increased SNPs (BMPR1A R577X) has a known role in promotion of extracellular matrix degradation.

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DNA Methylation in Natural Killer Cells

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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 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), identiCaPs (p = 0.007 and p = 0.008). 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.

A-48 Free Communication/Poster - Hypoxic Exercise

Wednesday, May 31, 2017, 7:30 AM - 12:30 PM

Boar d #180

May 31 9:30 AM - 11:00 AM

FGF21 is Produced By Active Skeletal Muscle during Intense Exercise in Humans: Influence Of P02

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(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 hepatosplanchic 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, P02:143 mmHg) and hypoxia (Hyp, P02:73 mmHg) while muscle metabolites and FGF21 protein expression (Western Blot) were measured before (control) and immediately after IE in Nx and Hyp. Immediately after IE, the circulation of one leg was instantaneously occluded (380 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 ([Lact]) was increased and phosphocreatine (PCR) and ATP reduced in Nx and Hyp, without differences between conditions. Muscle [Lact] 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 P02. 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
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 normoxia 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 (NIRS) and the pulse oximetry method. Forearm blood flow was calculated by evaluating the rate of increase in total haemoglobin (IHb) during the first few 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 = 0.114); 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 - 3.21 ml·min⁻¹·100ml⁻¹), but not following control training (MD = 0.05, 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)

(No relationships reported)

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 recovery in either ambient conditions (975 m) or in a hypoxic environment (5000 m). Biopsies were taken from the vastus lateralis before exercise, after exercise, and following 6 h recovery. Samples were analyzed for PGC-1α gene expression using RT-qPCR and subcellular location using western blot on cytosolic and nuclear fractions.

**RESULTS:** Exposure to hypoxia following exercise resulted in significantly lower expression of PGC-1α (p = 0.014) but no significant differences were found in protein translocation between the cytosolic (p = 0.225) and nuclear (p = 0.211) fractions.

**CONCLUSIONS:** It appears that the post-translational events of PGC-1α are not altered by acute hypoxia after exercise, despite a reduced transcriptional response associated with the levels of apelin/APJ expressions in skeletal muscle.

**362 Board #183**

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

**Exercise Induced Oxidative Stress During Normobaric And Hypobaric Hypoxic Exercise Recovery**

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(No relationships reported)

**PURPOSE.** Altitude exposure and exercise provoke an acute oxidative stress response in muscle and blood. Prior work indicates that redox-sensitive exercise recovery responses are attenuated above 1500m, although the independent impact of hypoxia and hypoxia on these responses are unknown. Moreover, given that the wealth of existing exercise and altitude data are conducted primarily in males, the current study was designed to understand exercise recovery responses in males and females exposed to various hypoxia and hypobaric conditions following a common bout of aerobic exercise.

**METHODS:** Sixteen active males (n=8) and females (n=8) between the ages of 18-40 performed cycle ergometer exercise for 60 minutes at 70% watts max at a base elevation of 975m. In a randomized counter-balanced crossover design subjects recovered in an environmental chamber for 4 hours in three conditions; 1000m normobaric normoxia (NN), 675mmHg, 18.8% FiO₂), a simulated 4000m normobaric hypoxia (NH, 675mmHg, 12% FiO₂), or a simulated 4400m hypoxic hypoxia (HH, 4400mmHg, 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 protein-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 (2.29 fold increase, p<0.05). Time-, but not trial-, dependent differences existed for HMOX1 (6.4 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 conditions.

**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**

Ying Zhang, Beijing Sport University, Beijing, China.

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(No relationships reported)

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

**METHODS:** 60-week-old C57Bl/6 mice 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 furtherallocatedinto four groups: Control (C), Hypoxia (H), Exercise (E), Hypoxia plus Hypoxia (E+H), at 8-9 mice/group. Besides body weight, measured variables in skeletal muscle were protein/mRNA levels of apelin/APJ, AMPKα-Thr172 phosphorylation, hypoxia inducible factor-1α (HIF-1α),mRNA levels ofperoxisome proliferator-activated-receptor (PPARα), estrogen-related receptor (ERRα),and nuclear respiratory factor1 (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 decreasedbody weight andincreased mRNA and protein expressions of apelin and APJ, mRNA expression of ERα, 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 Mukai1, Yuji Takahashi1, Toshiyuki Takahashi1, James H. Jones2. 1Japan Racing Association, Shimotsuke-shi, Japan. 2University 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 investigate 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 metabolomic analysis, Acetyl CoA (0.150 vs.0.048

Abstracts were prepared by the authors and printed as submitted.
nnmol/g. p < .05), ATP (8.3 vs. 7.6 mmol/g. p < .05), and pyruvic acid (141 vs. 116 nmol/g. p < .05) decreased after hypoxic training. However, BCAAs (302 vs. 407 mmol/g. p < .05) and FAs (13 vs. 41.58 mmol/g. p < .05) increased after hypoxic training. CONCLUSION: Hypoxic training may increase VO2max even though it is not increased by normoxic training. Finding changes in muscle metabolomics in hypoxia may suggest a mechanism for potentially increasing racing performance by increasing VO2max.

A-49 Free Communication/Poster - Military Physiology
Wednesday, May 31, 2017, 7:30 AM - 12:30 PM
Room: Hall F
365 Board #186
May 31 9:30 AM - 11:00 AM
Physical Discomfort And Relationship To Performance During A 12-mile March In US Army Soldiers
Stephen A. Foulis, Jan E. Redmond, Peter N. Frykman, Edward J. Zambraski, Marilyn A. Sharp. U.S. Army Research Institute of Environmental Medicine, Natick, MA.
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Long road marches carrying heavy loads are a common military task. While it is anecdotaly 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 and 9 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 rated 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., AIHM, 2008). Increases in P&S over time were assessed using mANOVA. CORRELATIONS were examined between changes in P&S (finish-start) for each site and load carried per body mass. RESULTS: The regression model obtained for predicting TMR time (min) from BT shuttles and TMR and BT estimated VO2maxes. Further, in the same individuals TMR estimated VO2max was 22% higher than what was predicted by BT performance. Reasons for this large discrepancy could include inflation of their performance on the TMR due to subjet recall, motivational differences to perform to their maximum, and/or significant 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.

366 Board #187
May 31 9:30 AM - 11:00 AM
Relationship Between Soldier Performance on the Two-Mile Run and Beep Test: Ability to Predict VO2max
Maria C. Canino, Stephen A. Foulis, Jan E. Redmond, Edward J. Zambraski, Marilyn A. Sharp. U.S. Army Research Institute of Environmental Medicine, Natick, MA.
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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 Beep Test (BT) is also currently used by the Army as a pre-enlistment screening test. Both tests have been unfortified 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 APFT. To screen for maximal effort, all soldiers included reached a post BT heart rate within 10 bpm of their age-predicted maximal heart rate (220-age). Correlations and simple linear regression were used to analyze the relationship between TMR and BT. RESULTS: The regression model obtained for predicting TMR time (min) from BT shuttles (8) was TMR = 19.101 - 0.067*BT, R2=0.53 (p<0.001). 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 VO2maxes (BT=0.364, p=0.001) and between BT and TMR estimated VO2maxes (BT=0.343, p=0.001). VO2max for both tests were 41.59±1.36 (BT) and 41.59±1.36 (TMR) with a difference of ± 5.1 and 3.94±1.6 l.min-1, respectively. CONCLUSIONS: A significant moderate relationship exist between both TMR times and BT times and TMR and BT estimated VO2maxes. Further, in the same individuals TMR estimated VO2max was 22% higher than what was predicted by BT performance. Reasons 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/or significant 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.

367 Board #188
May 31 9:30 AM - 11:00 AM
The Physiological Demands of a 16 km Loaded Patrol
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The Royal Air Force (RAF) Regiment (Regt) is a close combat unit, their primary role is to secure the safety of an operational airfield. One of the critical tasks of the RAF Regt is a patrol, this can last approx. 4.5 hours, covering a distance of 16 km. PURPOSE: To determine the physiological demand of a simulated 16 km loaded patrol in RAF Regiment personnel, specifically if differences occurred between the first and fifteenth km. METHODS: 26 participants from the RAF Regt performed a 16 km loaded (31.50 kg) patrol over 4 hrs 28 min. Participants received 2 x 10 min breaks at 1 hr 25 min and 3 hrs 20 min and a 20 min break at 1 hr 54 min. Rating of Perceived Exertion (RPE) was recorded at the first and second break and on completion. Walking speed was paced at 4.20 km.h-1 for the duration of the patrol. Heart rate (HR) was measured for the duration of the patrol. Oxygen consumption (O2) was measured using Douglas bag collections of 1 min at 1 km, 3 km, 5 km, 10 km and 15 km. O2 was calculated as ml.kg-1.metre-1 to allow for the variations in actual marching speed (3.80 km.h-1 to 4.92 km.h-1). RESULTS: No differences were reported in O2 between the first, third, fifth or tenth km in comparison with 15 km. A meaningful significant increase in O2 was observed at 10 km compared to the first km (0.24 ± 0.03 vs 0.02 ± 0.02 ml.kg-1.metre-1); p = 0.002; Cohen’s effect size (ES) 0.60; Post hoc power (PHPower) = 0.92; n = 25) and 10 km compared to the third km (0.24 ± 0.03 vs 0.22 ± 0.03 ml.kg-1.metre-1); p = 0.006; ES 0.65; PHPower = 0.85; n = 19). Significantly higher (p<0.0125) O2 was reported at 5 km compared to 3 km, however low ES and power were observed. During periods of work a linear cardiac drift was observed; mean ± SD HR of 93 ± 12.03 b.min-1 at 1 km to 110 ± 14.98 b.min-1 at 16 km. RPE remained the same for the first and second breaks (median (range); 7 (6 to 13), increasing to 8 (6 to 14) on completion of the patrol. CONCLUSION: The metabolic, cardiovascular and perceived demands were low and remained low for the duration of the patrol. These data reflect well that whilst the metabolic demand remained constant from the first to last km, HR increased linearly during the active element of the patrol. This suggests that HR should not be used to predict or estimate the metabolic workload of long duration activities such as the patrol.
**Board #190**  
**May 31 9:30 AM - 11:00 AM**  
**Optimal Number of Practice Sessions for Performance of Heavy Loading Tasks in Soldiers**  
Marilyn A. Sharp, Stephen A. Foulis, Jan E. Redmond, Peter S. Fyksen, Bradley J. Warr, Edward J. Zambraski.

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(No relationships reported)

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 reloading 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. **METHODS:** 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 43 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 on the deck of the tank (lift height=1.63 m). The rate of loading was calculated in rounds·min⁻¹ on the deck of the tank (lift height=1.63 m). The rate of loading was calculated in rounds·min⁻¹ and at 5° intervals during isokinetic contraction.

**RESULTS:** Significantly greater scores (p<0.01) were observed at each T for FAR (T1= 3.54 and T4=5.36 rounds·min⁻¹) and at 5° intervals on the knee extensors and flexors and the ankle dorsiflexors (Table 1). The number of failed practice sessions was 11 for TAL and 10 for FAR (T1=17, T2=14, T3=10, T4=6). PT returned to baseline after four 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. **CONCLUSIONS:** Fat free mass may have a stronger association with performance on strength, aerobic, and anaerobic tests than BF% or fat mass. This research may help in developing tools to identify Marines with enhanced physiological and musculoskeletal readiness.

**Supported by ONR Award #N00014-14-1-0021**

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**Board #192**  
**May 31 9:30 AM - 11:00 AM**  
**Distribution Of Cardiorespiratory Fitness Levels Of US Army Recruits From 2010-2013 By State**  
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(No relationships reported)

**PURPOSE:** To characterize the cardiorespiratory fitness (CRF) levels of US Army recruits by state. **METHODS:** Data on US Army recruits from all 50 states and Washington, DC who entered basic combat training (BCT) between 2010-2013 were provided by the US Army Public Health Center. CRF was assessed in a subset of recruits from their first diagnostic Army Physical Fitness Test during BCT by two-mile run time (run time) in minutes. States were ranked into quartiles based on median run times of recruits from that state aged 17 - 35 yrs in the total sample and stratified by sex. **RESULTS:** A total of 168,160 recruits (79.46% male) were analyzed. Median age, BMI, and run time were 20.0±3.6 years, 24.4±3.6 kg/m², and 16.2 min (range of 8.1-60.0 min), respectively. There were significant (p<0.0001) differences in median age, BMI, and run time across states, with states ranked into three of groups: 1) top 25% (lowest run times/highest CRF), 2) middle 50%, and 3) bottom 25% (highest run times/lowest CRF); is shown for the overall sample and by sex in Figure 1. Of the 14 states in the bottom 25% of median CRF in the total sample (Figure 1A, 11 of them were from the southern/southeastern regions (AL, AR, FL, GA, LA, MS, NC, OK, SC, TN, TX). These 11 states remained in the bottom 25% of median CRF in models stratified by sex (Figure 1B-C), with the exception being KY replacing OK in models restricted to male recruits (Figure 1C). **CONCLUSION:** The CRF levels of US Army recruits entering BCT differ by state. Our results show that recruits from the southern and southeastern states tended to have lower CRF compared to recruits from the rest of the country. This is relevant given previously established associations between CRF and training-related injuries sustained during BCT. Investigating state level factors contributing to the fitness of Army recruits (and theoretically all state residents of a given age-range) is an important next step.

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**Board #191**  
**May 31 9:30 AM - 11:00 AM**  
**Body Composition and Physical Determinants of Physiological and Musculoskeletal Readiness in Marines**  
Katelyn Fleishman Allison, Karen A. Keenan, Qi Mi, Mita T. Lovalekar, Kim Beals, Lawrence C. Coleman, Bradley C. Nindl, FACSM,  
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(No relationships reported)

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=1.75±0.1 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/anaerobic, 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 clusters were generated, and optimal cluster number was calculated by examining 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 C2W 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. This research may help 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 ±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 41.1±2.7) and low-fit groups (AW: n=13, VO₂max 43.6±2.1). A (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 VO₂max were +88.3% (p<0.001, η²=0.38), and for RW were +71.1 to +107.4% from stages 1–4, with a decrease in seated recovery (+105.5%) (p<0.001, η²=0.24). A significant interaction between fitness and workload was observed for RW (p=0.003, η²=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.

**Figure 1.** Stages realised by quartiles of cardiorespiratory fitness based on median 2-mile run times of US Army recruits entering basic training from 2010-2011. A (Total sample), as well as quartile (n male (M) and female (F) recruits).
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 (300MR). APFT: (2-Min. Push-ups, Sit-ups, 2MR). Composite scores tabulated SPI scoring, age-gender scoring (APFT). Ten member mock units were created with highest Officer & different combinations of 9 highest Soldiers (HOS), 8 highest soldiers & highest female (HBF) 7 highest soldiers & 2 highest female soldiers (72F), 9 lowest male soldiers (LOS).

**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. APFT parallelled SPI measure (p = .002). Objectively examining a multitude of physical indices, LOS achieved 78% of HOS, HBF achieved 98.5% of HOS ability & 72F achieved 96.7% HOS ability. Importantly HBF & 72F had only mean 80.7% of strength ability of HOS group. FC were only 68.4% of SPI ability of the mean Rock LT group yet 17.6% greater ability than Rock LT group on APFT.

**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 were 19.1% higher than 9 LOS, however related to strength (155BP), the fit FC were only 68.4% of SPI ability of the mean Rock LT group yet 17.6% greater ability than Rock LT group on APFT.

**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 SPI; minimally, the index should include valid measures of endurance, mobility & strength. 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. APFT parallelled SPI measure (p = .002). Objectively examining a multitude of physical indices, LOS achieved 78% of HOS, HBF achieved 98.5% of HOS ability & 72F achieved 96.7% HOS ability. Importantly HBF & 72F had only mean 80.7% of strength ability of HOS group. FC were only 68.4% of SPI ability of the mean Rock LT group yet 17.6% greater ability than Rock LT group on APFT.
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 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 meeting Infantry RMT pass standards was for the SL. Therefore, future physical training programmes 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

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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 < .001) and at a greater mean speed (0.88 ± 0.03 km h⁻¹ vs. 0.74 ± 0.03 km h⁻¹, p < .001). Mean % HR reserve (%HRR) and RPE were not significantly different between men and women (%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 < .001) and muscle soreness (men: 4 ± 1, women: 5 ± 2, p < .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.ctr@mail.mil (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 on 2 consecutive workdays at Wake, Wake + 30 min, Wake + 60 min and 600, Wake + 60 min, 1600, and 2400 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 retreat from CRP reactivity (AR) > 0, were excluded from analyses. Results: Stability was high between both days at all time points (r-value range = 0.75-92, all p < .001). CRP was highest at Wake, decreased on average by 42.8 ± 5.7% at Wake + 30 min, and then plateaued for the rest of the day. The stabilities of Wake mean (r = 0.89, p < .001) and AR (Wake + 30 - Wake), a measure of CRP pattern was (r = 0.48, p < .05), were determined. The mean CRP ± SEM (mean = 12.46 ± 396 pg/mL and AR = -0.298 ± 3123 pg/mL. Wake mean was strongly associated with %time walking (r = -0.57, p < .01). Wake mean also showed an intuitive yet nonsignificant positive association with %time sitting, and a negative association with both %time standing and %time performing heavy labor. Hypothesized associations between %time and AR were not performed due to the borderline stability of AR. Conclusions: In a military population, the salivary CRP pattern was not robustly stable across 2 consecutive days. The negative correlation between Wake mean and %time walking suggests that walking is a powerful modality to reduce systemic inflammation. Subsequent analyses will comprehensively characterize the CRP pattern (area under the curve and other summary parameters) and evaluate additional biobehavioral correlates.

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

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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 < .05) as was Testo (r range: 0.43 - 0.59, all p < .01). Anabolic processes (i.e., DHEA, Testo) were also positively coupled reliably across the day (r range: 0.31 - 0.39, all p < .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 F(3,51) = 2.9, p = .053), were weakly coupled with %time sitting, and a negative association with both %time standing and %time performing heavy labor. Hypothesized associations between %time and AR were not performed due to the borderline stability of AR. 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.

381 Board #202 May 31 9:30 AM - 11:00 AM Vitamin D Supplementation Augments SfGa Secretion Rates in Marine Corps Basic Trainees

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BACKGROUND: Vitamin D has been implicated in modulating innate immunity and may confer protection against upper respiratory tract infections (URTI) during periods of arduous training. PURPOSE: Determine whether vitamin D status in Marine Corps basic training associated with URTI, and whether daily vitamin D supplementation decreases the incidence of URTI as a result of augmented innate immunity. METHODS: A double-blind RCT was conducted with male and female recruits entering Marine Corps basic training. Subjects were randomized to
Mitochondrial dynamics including mitochondrial 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 in mitochondrial dynamics proteins in primary human myotubes differentiated to myotubes. On day 7 of differentiation, myotubes were harvested for mitochondrial fission, but not fusion, protein expression in primary human myotubes derived from severely obese humans. 

Alterations of Mitochondrial Dynamics Proteins in Primary Human Myotubes Following Roux-en-Y Gastric Bypass Surgery

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(A no relationships reported)

**CONCLUSION:** We report that a high proportion of Marine Corps recruits (approximately 57%) experience URTIs during 12-weeks of basic military training, and although daily vitamin D supplementation led to a modest increase in SIgA-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.

**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 muscles. 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:** 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 immunoblot analysis in order to assess the expressions of mitochondrial dynamics proteins. 

**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). While there were no significant improvements at 1-month post-surgery, Drp1 Ser616 phosphorylation and Fis1 protein expression were significantly decreased in primary myotubes from severely obese humans at 7-months post-surgery (Pre vs. 7-months post: 0.046 ± 0.004 vs. 0.035 ± 0.003; 0.023 ± 0.008 vs. 0.014 ± 0.003 AU, respectively, P < 0.05), and not statistically different from lean controls. Moreover, 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 increase in mitochondrial fission, but not fusion, protein expression in primary human myotubes derived from severely obes humans.

**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 unexplored. This study examined the effects of OC on regulators of insulin signaling, glucose handling, and mitochondrial biogenesis in vitro using palmitate treated C2C12 myotubes.

**Materials and 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. GLUT4 regulator AS160 was significantly elevated (300% ± 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.
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- wk-old, Sprague-Dawley rats were divided into two groups: sedentary (S) and exercised (E) on a treadmill 5 d/wk for 6 wks. Exercise duration and intensity were progressively increased to 1 hr at 30 m/min up to a 10.5% incline (75-80% VO2max). Whole muscles plus specific FG and FOG regions of gastrocnemius were homogenized (9-10 for each muscle or fiber type) and cytochrome c oxide activity, a marker of mitochondria content, was determined using a Clark-type oxygen electrode. RESULTS: E significantly increased cytochrome c oxide compared to the same S muscle (P<0.05) and the amount of increase was similar for all muscles (P<0.05). On a relative basis (% above mean S value), the increases were 60.7 ± 13.3 (mean ± standard error) in soleus, 72.3 ± 6.8 in plantaris, and 78.7 ± 12.4 in gastrocnemius. On an absolute basis (µMol O2 consumed/min/gram muscle), the increases were 28.5 ± 6.3 in soleus, 35.0 ± 3.3 in plantaris, and 25.7 ± 3.8 in gastrocnemius. E was also greater than S in all fiber types considered (P<0.05), but there were considerable differences in the absolute basis (%), the increase in FOG fibers (115.5 ± 17.0) was significantly greater (P<0.05) than those in SO (60.7 ± 13.3) or FG (42.8 ± 12.0). On an absolute basis, all fibers differed from each other with FOG increasing the most and FG the least (P<0.05). Specifically, FOG increased by 53.3 ± 7.9, SO by 28.5 ± 6.3, and FG by only 5.1 ± 1.4. CONCLUSION: All three whole muscles increase by similar amounts in response to a moderate intensity (75-80% VO2max) exercise program, thus all are appropriate for verifying training status. Caution is advised when using small portions of plantaris and gastrocnemius because of differences in responses of FOG and FG fibers. Supported by UNCG School of HHS Research Excellence Grant

Myokine/Cardiokine Follistatin-like Protein 1 Promotes Oxidative MyHC Expression and Mitochondrial Function in Myogenic Cells

Eric R. Munoz1, Boa Kim1, Mitsuru Seki1, Jeff Powers1, Hojun Lee1, Kenneth Walsh2, Fabio Vecchia1, Joon Y. Park1, Temple University, Philadelphia, PA; Boston University, Boston, MA. Email: munozeric@gmail.com

METHODS: Thirty-six male Sprague-Dawley rats were randomly assigned into a control group (C, n=12), an exercise group (E, n=12) and an exercise preconditioning group (EP, n=12). Groups C and E received conventional feeding for four weeks, and then group E completed a one-time heavy load swimming exercise; group EP received feeding and swimming training for four weeks, 60 min/day, 6 days/week, and also completed a one-time heavy load swimming. Some indicators were detected, such as the apoptosis index (AI), the mRNA of Drp1 and Mfn2, index related to the function of mitochondrial respiratory chain (ATP, ADP, O, V3,4,5C,6OP,9), and the experimental data are reported as means±SE, and P-values<0.05 are considered significant.

RESULTS: According to the TUNEL test, the apoptosis index (AI) (C:0.06±0.01;E:0.58±0.17;EP:0.89±0.16 respectively), P<0.05 were significantly elevated after heavy load exercise, mRNA of Mfn2(C:0.25±0.09;E:0.95±0.08;EP:1.24±0.07;respectively, P<0.05) and Drp1 (C:0.34±0.08;E:1.53±0.14;EP:1.35±0.07;respectively, P<0.05) were also increased. However, the ATP content, ADP:O, OCR, V3 and OPR of the loubus fromatis were significantly lower in group E and EP than C(P<0.05), and those index in group EP were higher than Group EP (P<0.05) indicates that the function of mitochondrial respiratory chain in Group EP are better after carrying out an acute heavy load exercise.

CONCLUSIONS: Results from this study suggest that one-time heavy load swimming can induce cell apoptosis in rat loubus fromatis by increasing the expression of Drp1. Four weeks of exercise preconditioning can ameliorate the apoptosis and function of mitochondrial via increasing the expression of Mfn2.

Supported by the SML of General Administration of Sport of China/SML of Sichuan province Foundation.

For optimal performance, endurance athletes are recommended to ingest sufficient energy to maintain energy balance (EB) and ensure adequate energy availability (EA). PURPOSE: Describe and evaluate the EB of an athlete competing in a self-sufficient, multistage ultra-marathon (SSMU). METHODS: A male endurance athlete (Age 35 yrs; Ht 183.0 cm; Body mass 78.4 kg; VO2max 66 ml/kg/min) volunteered to take part in this observational case study prior to competing in the Marathon des Sables 2016. The participant self-reported energy intake (EI) by reviewing his dietary plan after each of the five competitive event stages. The food diary was used to calculate energy and macronutrient intake using dietary analysis software. Basal metabolic rate (BMR) was estimated prior to the MoS based on fat free mass. Distance and moving speed were recorded using a GPS device (Garmin Forerunner 920XT) throughout the race. Energy expenditure (EE) was calculated using the GPS device algorithm. Total energy expenditure (TEE) was calculated by adding the participant’s RMR to potential and increases oxidative metabolism in myogenic cells suggesting that FSTL1 may be an important cellular mediator of the beneficial effects of exercise in the context of skeletal muscle adaptation.
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 (38 ± 4.6 kcal/kgFM/d). Mean daily EEE was 3006 ± 1030 kcal (62 ± 13 kcal/kgFM/d). 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/kgFM/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: 55.65 ± 4.90 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 always 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, Eliana Biechler, Lauren Sutton. Loras College, Dubuque, IA. (Sponsor: Vincent Paulone, FACSM)

Email: stephanie.harpenau@loras.edu

(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 when 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) caffeine while cycling 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.

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 score 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 order 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 25.4% 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.

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 food intake by trained nutritionists using a food frequency questionnaire. This 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 consume in those days. Then the servings’ amount were calculated for each food weekly and a percentage was assigned to each food group (50th centile: 0 servings; 75th centile: 1 serving) and wasn’t included in the table. Foods had a very similar amount of servings per group per type of sport.

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>
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<th>50th</th>
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</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.

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 questionary, 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 amount, 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, respectively. Despite didn’t reach statistical significance, sugars’ servings, energy intake, but in different amount. Further research is needed for assessing if these characteristics could lead to sporting advantage. Therefore, analyzing the dietary characteristics of successful athletes could help to better understand their nutritional practices that lead them to an advantage over their competitors.

PURPOSE: To describe the dietary characteristics between medalist and non-medalist varsity combat athletes.

METHODS: The nutritional characteristics of 58 varsity combat (wrestling, judo, karate, tae-kwon-do) athletes were evaluated one month before a national collegiate sport tournament. After the tournament, subjects were classified as medalist if they earned a medal (first four places, n=28) or non-medalist (n=30). Their dietary characteristics were evaluated with a 24-h dietary recall applied by trained nutritionists. These characteristics were daily food servings, energy and macronutrient intake (g/day and g/kg/day). All variables are expressed as median and interquartile range. Dietary characteristics were compared between groups by U Mann-Whitney test.

RESULTS: For food groups, medalist athletes ingested lower amounts of dairy and fats than non-medalist. Similarly, total fat intake (g/day) were lower in medalist. The relative macronutrient intake (g/kg/day) was significantly lower for fat (1.3 [1.0-1.7] vs 1.8 [1.4-2.0], p=0.003) but not for protein (1.8 [1.5-2.6] vs 2.0 [1.8-3.0], p=0.07) nor carbohydrates (6.0 [3.8-7.5] vs 6.6 [4.7-8.7], p=0.01) in medalist vs non-medalist, respectively.

CONCLUSIONS: In this study, medalist athletes tended to ingest less food groups (dairy, fats, sugars), energy, fat and relative protein one month before an important competition. Perhaps because they were trying to keep their competition weight as controlled as possible in this lapse.

<table>
<thead>
<tr>
<th>Food group</th>
<th>Quartile</th>
<th>25th</th>
<th>Individual</th>
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<th>Individual</th>
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</table>

The aesthetic nature of dance places pressure on dancers to have low body weight and fat, which often leads to disordered eating. Despite data showing higher protein intake improving body composition in numerous populations, a paucity of data exists on dancers. PURPOSE: To examine associations between protein intake, body

Table 1. Daily dietary characteristics for medalist and non-medalist varsity combat athletes.

<table>
<thead>
<tr>
<th>Food group</th>
<th>Medalist [Median (interquartile range)]</th>
<th>Non-medalist [Median (interquartile range)]</th>
<th>p-value</th>
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<td>Animal source foods (servings)</td>
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<td>8.5 (6.4-12.5)</td>
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<td>Dairy (servings)</td>
<td>3.5 (2.5-5.0)</td>
<td>5.0 (3.0-6.0)</td>
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<td>Legumes (servings)</td>
<td>0.5 (1.0-1.5)</td>
<td>1.0 (0.6-1.5)</td>
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<td>12.0 (8.5-16.0)</td>
<td>12.8 (10.6-20.0)</td>
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<td>Protein (g)</td>
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<td>151 (122-206)</td>
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<td>113 (92-158)</td>
<td>0.01</td>
</tr>
<tr>
<td>Carbohydrates (g)</td>
<td>395 (231-493)</td>
<td>389 (314-670)</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Protein Intake Per Meal in Varsity Athletes with Low and High Lean Body Mass Index

Alejandro Gaytan-Gonzalez1, Roberto Gabriel Gonzalez-Mendoza1, Juan R López y Taylor1, Brenda Gañancache-Sanchez-Conchas1, Sayra Nataky Muñoz-Rodríguez1, Juan Antonio Jimenez-Alvarado1, Marisol Villegas-Balcázar1, Francisco Torres-Naranjo1, 1Universidad de Guadalajara, Guadalajara, Mexico. 2Centro de Investigacion Osea y de Composicion Corporal, Guadalajara, Mexico. Email: inalejandrog@outlook.com

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. The protein amount per meal was estimated for each subject and was classified as inadequate if it contained lower than 20 g of protein. Lean body mass was evaluated with bioelectrical impedance and LBMI was calculated (lean body mass [kg]/height2 [m]). Then the sample was divided per LBMI tertiles, and the lower and higher tertiles defined as low (LLBM) and high (HLBM) lean body mass groups, respectively. Median intake for total (g/day), relative (g/kg/day) and per meal (g) protein as well as prevalence of inadequate protein intake (INPI) per meal were calculated for each group. We made comparisons between groups for protein intake (U Mann-Whitney test) and INPI prevalence (two samples t-test), we also analyzed within groups per meal protein intake (Friedman ANOVA, Dunns post hoc) and per meal INPI prevalence (one sample t-test).

Results: HLBM group had a higher total but not relative protein intake compared with LLBM group. The per meal protein intake analysis didn’t show significant differences between groups. The INPI prevalence was similar in both groups, but none comparison reached statistical significance. LLBM group ingested the majority of their protein at lunch being higher than dinner (p<0.05) and the INPI prevalence was lower at lunch (p<0.05). HLBM also ingested the majority of their protein at lunch, being higher than breakfast and dinner (p<0.05) and the lowest prevalence of INPI was showed in lunch compared with dinner (p<0.05) but not for breakfast (p>0.05).

Conclusions: INPI per meal is common in varsity athletes, independently if they are LLBM or HLBM. Despite an adequate daily protein intake, efforts should be addressed to provide adequate amounts of protein on a per meal basis.

Abstracts were prepared by the authors and printed as submitted.
data of ballet dancers was crosssectionally studied in 17 girls (19.1±1.7yrs.). 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 score 67.9); 72.7% of dancers (50%) had a joint position stand on nutrition for endurance performance, recent data 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 nutritional 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 individualized personal concerns (50%) or the perception that it was too difficult to follow (50%). The most commonly used sources of nutritional 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.

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 (β-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 bone turnover markers total procollagen type I N-terminal propeptide (PINP) and beta C-terminal telopeptide of type 1 collagen (β-CTX) were measured in a randomised, double-blind, placebo-controlled clinical trial conducted in Gaelic footballers (3000UI (75g) vitamin D daily, daily versus placebo for 12-weeks, n=42) were analysed for PINP and β-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±651mg/day respectively. Daily supplementation with 3000UI (75g) vitamin D significantly increased mean ± SD 25(OH)D compared to no significant change in the placebo group (vitamin D 47.3±13.23 to 89.63±32.99µg/mL (+79%) vs. placebo; 43.10±22.00 to 49.22±25.40 (+4%); P=0.001). There were no significant differences in mean ± SD change from baseline for PINP (8.7±2.18 vs. -5.0±4.21µg/L, P=0.413) or β-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 increased mean 25(OH)D concentration in the vitamin D group. 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).

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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.

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; body mass 80.1 ± 11.8 kg; VO2max 38.05 ± 4.31 ml·kg·min⁻¹) undertook 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: Mean body temperature increased slightly. One participant was withdrawn during the scenario. These data can be used to inform interventions to enhance physical performance and develop physical employment standards for specialist ambulance responders.

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; 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 ± 4.9 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: Mean 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.

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 ± 3 yrs; BMI = 23.6 ± 2.4; height = 1.78 ± 0.07 m; weight = 72 ± 11 kg) were monitored as they performed their normal work duties during three consecutive work days in hot conditions (average: 34°C; 60% relative humidity). Hydration was assessed using urine specific gravity (USG) prior to and following each work shift. Oxygen consumption ($VO_2$) was measured using a portable metabolic cart during a typical work shift.

RESULTS: Based on the ACSM guidelines, the workers were considered dehydrated (USG ≥ 1.020) prior to (Day 1: 1.025 ± 0.005; Day 2: 1.029 ± 0.004) and following (Day 1: 1.027 ± 0.005; Day 2: 1.032 ± 0.004) each work shift. On day 1, workers spent 20, 25, 21, and 24% of the work period at rest and performing tasks considered as light, moderate, and heavy physical exertion, respectively; whereas, 65%, 19, and 11%, and 5% of the work shift was spent in these physical exertion categories during the second day. The proportion of the work shift at rest was higher on the second day compared to the first (P < 0.07). Peak $T_g$ tended to be greater on the second day (Day 2: 38.4 ± 0.2°C; range: 38.2-38.7°C) relative to first work shift (Day 1: 38.1 ± 0.2°C; range: 37.8-38.2°C; P = 0.08), whereas the peak HR response was similar between days (Day 1: 91 ± 7 $HR_{peak}$ range: 83-100 $HR_{peak}$; Day 2: 87 ± 11 $HR_{peak}$ range: 74-98 $HR_{peak}$; P = 0.57). CONCLUSION: Our case report findings suggest that the effect that work effort decreases over consecutive work shifts, thermal strain continues to be elevated in electric utility workers.

Funding support by the Electrical Power Research Institute

Current evidence demonstrates that the planet’s climate is warming and that extreme heat waves are occurring more frequently. Outdoor workers are vulnerable to climate changes and are subject to risk of heat-related illness. Sugar cane cutters represent a labor force that is at high risk of heat-related illness due to high physical demands, long labor hours, and use of uniforms that dissipate heat poorly. PURPOSE: To investigate heat stress, dehydration and cardiovascular responses of sugar cane cutters during a typical work shift. METHODS: Eight male sugar cane workers (27 ± 7 years) volunteered for the study. Data collection occurred on a sugar cane plantation during the spring season. An ingestible telemetric temperature sensor and a heat rate monitor were used for measuring core temperature ($T_{core}$) and heart rate (HR), respectively, continuously. Oxygen consumption (VO$_2$) was measured using a portable metabolic cart during the first and second half of the work shift. Urine samples were collected pre- and post-work shift. Total sweat loss was calculated using body weight change and adjusting for water ingestion and urine output. A wet-bulb globe temperature (WBGT) station was used to monitor environmental heat stress. RESULTS: Total work shift time was 6:55 ± 0:18 hr with physical work duration of 5:26 ± 0:21 hr and rest time of 1:27 ± 0:09 hr. Mean and peak $T_{core}$ during the work shift were 37.82 ± 0.31 and 38.60 ± 0.41°C, respectively. All subjects achieved $T_{core}$ above 38°C. Mean and peak $HR$ during the work shift were 173 ± 18 and 165 ± 11 bpm, respectively. VO$_2$ was on average, 21.2 ± 5.4 mL·kg$^{-1}$·min$^{-1}$ and was not different (P = 0.29) between the first (22.6 ± 3.4 mL·kg$^{-1}$·min$^{-1}$) and second half (21.2 ± 5.4 mL·kg$^{-1}$·min$^{-1}$) of the work shifts. Volunteers ingested 6.0 ± 1.0 L of fluid and experienced a total sweat loss of 7.6 ± 2.3 L. WBGT index was on average 26.8 ± 2.3°C and above the permissible heat exposure threshold of 25°C for 1 hour of heavy work. CONCLUSIONS: Sugar cane cutting is a physically demanding occupation performed in a hot environment and associated with high $T_{core}$ and fluid loss. Preventative actions such as water ingestion, adequate rest, access to shade, and physiological monitoring should be implemented to reduce the risk of heat illness, particularly with the warming global climate.

Supported by CNPq (404201/2013-0).
Building battle ships involves transforming sheets of steel into many shapes and joining the segments using welding, brazing, torquing, and other methods. PURPOSE: To design and validate selection tests for 30 jobs (e.g., shipfitter, joiner). One of the challenges was prevalence of missing data due to intermittently available data from the workers in the shipyard. Thus, this research used alternative methods to identify and analyze the physically demanding and critical tasks of the shipyard. Critical tasks identification by police training-experts allowed the ranking of the most critical physically demanding tasks was established based on the scores given by the experts. The tasks scored as the most critical were later used to create a rank order list of 11 tasks of which the 7 most critical were, in order: carriage, a door, crowd control, and moving an unconscious person.

**RESULTS:**

AIM #1: To determine the physiological demands of the BTPPP, 12 police training-experts participated in an advisory activity in which they were asked to individually rate the critical aspect of various tasks using a seven point Likert-like scale. A ranking of the most critical physically demanding tasks was established based on the scores given by the experts. The tasks scored as the most critical were later analyzed by 4 experts in kinesiology in order to identify the physical abilities needed to perform essential job tasks. Researchers conducted a criterion-related validity study that included ten predictor tests and five criterion measures. The criterion measures included performance of tasks onboard ship, along with evaluations of physical job performance. The sample included 197 men and 47 women across 24 of the 30 jobs.

**RESULTS:**

- **Validation data yielded a model (R² = 0.59) that consisted of lift/carry climb stairs, arm endurance, container lift, and plank. Further analysis showed the test battery was fair to protected groups (e.g., sex, age).**
- **Due to varying shift schedules, missing data occurred for the predictor tests and criterion measures for many subjects. Listwise deletion in the regression analysis resulted in a final sample of 155. Although statistical power was high for this sample, we conducted a Full Information Maximum Likelihood (FIML) analysis to determine whether the missing data affected the conclusions. FIML used a maximum likelihood approach to estimate the missing data based on all available information for a subject in an unbiased manner, rather than not replace or impute missing data.**
- **CONCLUSIONS:** Comparison of squared multiple Rs for all ten tests for the FIML (0.61) and original (0.59) analyses found a small difference with FIML accounting for 1.3% more variance. The FIML standardized beta coefficients with the highest values were the same as the original regression analysis, thus confirming the original results. We established separate passing scores by job and test using information from the validation and job analysis results. Each job’s test battery contained only tests and passing scores relevant to the job.
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 critically 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
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(No relationships reported)

Purpose: Based on previous observation and analyses of the basic training program 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 (ENPU) 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 ENPU test and also a series of six ‘convergent’ measures (C): 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 ENPU test for establishing test-retest reliability. Results: The new ENPU test consists of a time circuit including various tasks in continuity, separated by 3 laps: lap 1 (3 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 ENPU test time and the six convergent tests were all significant (r=-0.59) 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 confirms 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 Mohrike, John S. Green, FACSM, Texas A&M University, College Station, TX. (Sponsor: Dr. Stephen F. 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 1.71±0.1 m; wt 92.2±17.8 kg; BMI 28.9±4.8) were part of an annual cardiovascular risk profile testing group. We measured resting blood pressure and body composition via DEXA scan (SBP 127.1±10.3 mmHg; fat mass 26.8±5.9 kg; lean mass 62.01±9.90 kg; percent android fat 35.5±10.1%; percent gynoid fat 29.7±6.9%). Fasting blood samples were drawn and analyzed by a clinically certified lab to determine total cholesterol, LDL, HDL, triglycerides, glucose and SBP. 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.

CONCLUSIONS: Though the correlations were statistically significant, none of the DEXA 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.

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 Mohrike, 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)
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(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±10.6 yrs; ht=179±6.6 cm; wt=94±16 kg; BMI=29.9±10.4 kg; lean mass=63±7.5 kg; gynoid%fat=27.8±6.5%; android%fat=36±11.3%; glucose=85±12.9 mg/dL; 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: 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 1.71±0.1 m; wt 92.2±17.8 kg; BMI 28.9±4.8) were part of an annual cardiovascular risk profile testing group. We measured resting blood pressure and body composition via DEXA scan (SBP 127.1±10.3 mmHg; fat mass 26.8±5.9 kg; lean mass 62.01±9.90 kg; percent android fat 35.5±10.1%; percent gynoid fat 29.7±6.9%). 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.

CONCLUSIONS: Though the correlations were statistically significant, none of the DEXA 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.
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, 34.1 ± 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 volunteering participants inhaled 13.4 ± 2.1 kcal/kg/m². On average, the participants consumed 1753 ± 503 kcals daily. The macronutrient breakdown was 197.8 ± 83.8 g (45.1%) carbohydrates, 71.6 ± 19.66 (36.8%) fats and 75.6 ± 18.3 g (17.2%) protein. Types of fat intakes were: 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 ± 5.5 g) per day. In addition, 14.1 ± 6.2 g of dietary fibers, 70.9 ± 57.6 g of sugar, and 3008 ± 1231 mg sodium were consumed. Furthermore, the firefighters reported intakes of 10.0 ± 6.0 g of linoleic acid, 1.0 ± 0.7 g linolenic acid, 735 ± 466 mg calcium, 170 ± 78 mg magnesium, 1775 ± 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.

419 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. BMIR of study: Timothy K. Behrens, FACSM

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(No relationships reported)

PURPOSE: The purpose of this study was to assess the effectiveness of a goal setting and implementation planning intervention on cardiorespiratory fitness among firefighters. METHODS: Male career firefighters (N=18) from a large municipal fire department volunteered for the experiment. Furthermore, the firefighters reported intakes of 10.0 ± 6.0 g of linoleic acid, 1.0 ± 0.7 g linolenic acid, 735 ± 466 mg calcium, 170 ± 78 mg magnesium, 1775 ± 850 mg potassium, and 3 ± 2 µg vitamin D. The Body Mass Index And Its Relationship With Cardiometabolic Indicators Of CVD In Quebec Firefighters


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(No relationships reported)

Firefighting tasks in emergency conditions impose high physiological and psychological demands, which can be particularly deleterious to the health and safety of firefighters. According to the National Fire Protection Association, 51% of the deaths that occurred among U.S. firefighters in 2015 while on duty were sudden cardiac deaths. Therefore it is essential for firefighters to maintain a healthy body weight throughout their career in order to reduce the risk of on-duty death. Body mass index (BMI) is very likely associated to a higher cardiovascular disease (CVD) risk in firefighters. Misclassifying mesomorphic firefighters as obese by using BMI occurred frequently in a U.S. firefighters’ cohort (Poston et al. 2011, J Occup Environ Med, 53(3), 266-273). PURPOSE: To document CVD risk among Quebec firefighters according to their BMI. METHODS: Seven hundred and seventy nine (779) male firefighters (age: 41.6 ± 10.4 years; BMI: 28.0 ± 3.6 kg/m²) answered an online questionnaire evaluating the presence of CVD risk factors and symptoms. All data collected were self-reported. Three groups were formed based on the BMI: Group 1 (G1): 18.5 kg/m² ≤ BMI < 25 kg/m², Group 2 (G2): 25 kg/m² ≤ BMI < 30 kg/m², Group 3 (G3): BMI ≥ 30 kg/m². RESULTS: Prevalence of overweight (25 kg/m² ≤ BMI < 30 kg/m²) and obesity (BMI ≥ 30 kg/m²) is 55.0% and 26.6% respectively. The number of modifiable risk factors (diabetes, hypertension, physical inactivity, smoking and dyslipidemia) is higher among firefighters with higher BMI before adjusting for age (G1: 0.70 ± 0.71, G2: 0.94 ± 0.78, G3: 1.32 ± 1.00, P<0.001) and after (G1: 0.77 ± 0.70, G2: 0.94 ± 0.75, G3: 1.23 ± 0.93, P<0.001). The BMI of participants who didn’t have any cardiovascular symptom (n=463) was lower than that of participants who did report at least one cardiovascular symptom (n=285) before adjusting for age (27.35 ± 2.94 vs 28.44 ± 3.97, P<0.001) and after (27.37 ± 2.85 vs 28.44 ± 3.83, P<0.001). CONCLUSION: These results show the important prevalence of overweight and obesity among Quebec firefighters based on BMI. They also show the relationship between BMI and CVD risk factors and symptoms. These relationships suggest that the BMI is an important indicator of CVD in Quebec firefighters. P. Gendron was supported by a doctoral research scholarship from Fonds de recherche du Québec en santé.

The mission of the Project is to improve the physical, mental, and emotional well-being of firefighters and their families through fitness, nutrition, and stress management programs.

The project started in 2011, started with a small group of firefighters, and has since grown to include over 1000 firefighters from across the country. The project is funded by a combination of government grants, private donations, and corporate sponsorships. The project is led by a team of experts in the fields of fitness, nutrition, and stress management, including a lead researcher, a nutritionist, and a mental health professional.

The primary goal of the project is to improve the physical, mental, and emotional well-being of firefighters and their families. The project offers a variety of programs and services to help firefighters achieve this goal, including fitness classes, nutrition counseling, and stress management workshops. The project also offers resources and support to families of firefighters, including a support group and a website with information and resources.

The project is run in collaboration with local fire departments and community organizations, and it seeks to provide its services to firefighters and their families at no cost. The project is committed to providing services that are accessible to all firefighters, regardless of their socioeconomic status or location.

The project has received positive feedback from firefighters and their families, who have reported improvements in their physical, mental, and emotional well-being as a result of participating in the program. The project has also received recognition and support from the fire departments and community organizations that it works with, and it is continuing to grow in size and impact.
staircase with a 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 ± 2.6 bpm and represented the HR reached during the course test. The percentage of HR recovery after 2 min was 30 ± 4.1% for participants who passed (n=40) and 20 ± 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<0.01) for the two groups (7.9 ± 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 the 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, cardiopulmonary fitness (CFR) and muscle strength (MS) were evaluated by means of the Cooper running test (CFR), 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 assessed by the WHOQOL-Bref, that ascertains the QL in four domains: physical, psychological, social, and environmental. We compared the QL by BMI categories assessed by the WHOQOL-Bref. **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 (rs<0.1, p>0.12). There was a negative correlation between the PF components and QL Physical domain (rs=-0.27, p=0.01) and QL Psychological domain (rs=-0.3, p=0.001). There was a positive correlation between the PF components and QL Social domain (rs=0.22, p=0.049). The index identified the overall performance with discrimination (p<0.01) for the two groups (7.7 ± 3.68 and 5.9 ± 3.04, respectively). **CONCLUSIONS:** 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 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 knowledge did not influence performance.

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 during exercise, regardless of the conditions of the exercise. Few studies have examined the role of the CGT and teleoanticipation during resistance training. **PURPOSE:** Examine 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 reps to fatigue known weight (KW); 3) Submaximal BF reps 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), RPE (KW 13.37±1.40 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 BP 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.

**PURPOSE:** The purpose of this study was to determine if there is a difference in understanding of Rate of Perceived Exertion (RPE) with two types of instructions. **METHODS:** Older adults that lived independently at a life care community participated in this study (N = 18). Two interviews took place more than seven days apart from each other. One participant only attended the first interview. At the first interview, participants signed the necessary paperwork and randomly chose which script (Brief or Modified Borg) would be read. At the second interview the remaining script was read. Identical sets of description, scenario and feedback questions were asked after each script. Participants were asked to describe the feeling of RPE’s 6,9,13, 17, and 20. 36 addition, scenarios were said and they were asked to label the situations RPE level for themselves. Scenarios included gate closing at the airport (Airport Scenario), playing with children, and a typical trip to the grocery store. Responses were rated ‘Good,’ ‘Needs Improvement,’ and ‘Exact.’ Situations were analyzed by script and frequency. **RESULTS:** The Modified Borg instructions had a higher number of ‘Good’ descriptions for 6 (n = 13 vs. n = 12), 9 (n = 14 vs. n = 11), 13 (n = 9 vs. n = 4), and 17 (n = 12 vs. n = 3). RPE of 20 had equal participants with ‘Good’ descriptions for both scripts; however, the Modified Borg had two more participants that ‘Needed Improvement.’ **CONCLUSIONS:** The Airport scenario for the Brief instructions ranged from 13 to 20 RPE and 8 to 17 RPE for the Modified Borg. The most common answers were 13 (n = 5) and 15 (n = 5) for the Brief, and the Modified Borg’s were 12 (n = 4) and, 11, 13 and 14 (n = 3). Playing with children scenario resulted in 11 and 12 being the most common answer given for both scripts (n = 3 - 6). The children scenario ranged from 7 to 18 for the Brief Script and 6 to 13 for the Modified Borg. Most answered response was 11 (n = 6) to the grocery store scenario for both scripts ranging from 8 to 14 and 6 to 14 for the Brief and Modified Borg. **CONCLUSION:** Perception widely varies between the participants for the different scenarios. The longer more descriptive instructions were helpful but were possibly too long for the adults to be more accurate than the brief script.
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 various terrains. 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. A post-hoc Bonferroni correction was used to explore differences among conditions. RESULTS: There were main effects for pack, speed, and grade (F1,12=14.3, F2,12=100.1, and F3,12=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.
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 promoted fatigue but produce, at a minimum, statistically similar repeated sprint performance results. In addition, greater convenience 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.

**CONCLUSION:**

Caffeine (CAF) and small amounts of carbohydrate (CHO) ingested or simply exposed to the oral cavity appear to delay fatigue during prolonged exercise, possibly through central nervous system mechanisms. However, this has been primarily documented in endurance trained (ET) athletes. 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 ergogenic 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 CAF+LCHO, and placebo (PLA). RESULTS: ET and SED did not differ in overall mean (±SD) TTF (23.8 ± 8.1 vs. 24.1 ± 11.8 min) in TTF improved (p<0.05) in CAF+LCHO vs. LCHO. When averaged across both CAF treatments (CAF+LCHO and CAF), perceived exertion was lower and TTF was increased by 21% (26.3 ± 10.4 vs. 21.7 ± 9.9 min) compared to the 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.

**Board #252**

**Monday, May 31, 12:30 PM**

**Caffeine but not Low-Carbohydrate Improves Exercise Capacity in Sedentary Adults Similar to Endurance Trained Athletes**

Namrita Kumar1, Gordon L. Warren, FACSM2, Teresa Snow1, Mindy Millard-Stafford, FACSM3, 1Georgia Institute of Technology, Atlanta, GA. 2Georgia State University, Atlanta, GA. (Sponsor: Mindy Millard-Stafford, FACSM)

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(No relationships reported)

**Board #253**

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

**Fatigue as a Rehabilitation Strategy to Reduce Quadriceps Inhibition Following Anterior Cruciate Ligament (ACL) Reconstruction**

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**Board #254**

**Monday, 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. Pettit, FACSM1, Mark Hartmann1, Cherie D. Pettit2. 1Minnesota State University-Mankato, Mankato, MN. 2Iowa State University, Ames, IA. (Sponsor: Robert W. Pettit, FACSM)

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**Board #255**

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

**Ligament (ACL) Reconstruction**

**Purpose**

**Board #256**

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

**Nutritional and Physical Measures as Predictors of Functional Outcomes After Anterior Cruciate Ligament Reconstruction**

Namrita Kumar1, Gordon L. Warren, FACSM2, Teresa Snow1, Mindy Millard-Stafford, FACSM3, 1Georgia Institute of Technology, Atlanta, GA. 2Georgia State University, Atlanta, GA. (Sponsor: Mindy Millard-Stafford, FACSM)

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(No relationships reported)

**Board #257**

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

**Athletic Training and Education Students' Use of a Perceptual Recovery Tool**

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(No relationships reported)

**Board #258**

**Tuesday, June 1, 11:00 AM - 12:30 PM**

**Pain Severity with a Patient-Generated Index for Assessment Before and After ACL Reconstruction**

Erika E. Mancini1, Morgan W. Smith1, Mark E. Moseley2, Mindy Millard-Stafford3. 1University of Missouri-Columbia, Columbia, MO. (Sponsor: Robert W. Pettit, FACSM)

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(No relationships reported)
Previous research indicates that recreationally-trained subjects are able to attenuate the slow component of oxygen uptake (VO2) during heavy intensity exercise using rated 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 (kP). Subjects then returned and completed two separate bouts at 10% > CP. The constant bout required subjects to sustain their preferred cadence until exhaustion. The regulated bout involved subjects attempting to maintain their RPE from 2-min into the bout by adjusting power output until their power output declined to a value ≤ CP. **RESULTS:** The constant bout evoked a VO2 value (43.3 ± 7.3 ml·kg⁻¹·min⁻¹) that was not 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 (HIIT) remains unclear. **PURPOSE:** The present study was designed to compare affective responses between HIIT 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 (TR, n=10, VO2max = 55.6 ± 1.1 ml·kg⁻¹·min⁻¹) or untrained group (UT, n=10, VO2max = 40.5 ± 1.0 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 recovery and LOW (50% of VO2max). **RESULTS:** Exercise-induced 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 (TDMS) 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 (modifiled 10 scale) were recorded. **RESULTS:** Exercise-induced blood lactate elevation was significantly greater in the TR group than in the UT group (group x time, P < 0.05). The results of TDMS 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.

Maximum oxygen uptake is often used to evaluate cardiopulmonary function in patients with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). However, many ME/CFS patients may not be capable of giving the level of effort required for a valid test. Oxygen uptake efficiency score (OUES) has been proposed as an effort independent measure to assess aerobic fitness in populations where maximal exercise is contraindicated, but has not been assessed in ME/CFS. **PURPOSE:** To determine the validity of OUES as a measure of aerobic fitness in ME/CFS. **METHODS:** Maximal exercise testing was performed using a ramped protocol on a cycle ergometer in a clinical sample of ME/CFS patients as part of the CDC multisite study. Exercise consumption (VO2), carbon dioxide production (VCO2) and pulmonary ventilation (VE) were directly measured using a metabolic cart. Ventilatory equivalents for O2 (VE/VO2) and CO2 (VE/VCO2) were calculated. Peak effort was determined using American College of Sports Medicine criteria. Anaerobic threshold was determined using the V-slope method. OUES was determined by VO2 = a*log(VE + b, where a = OUES, b = intercept. Linear regression was used to determine the relationship between VO2peak and OUES. Group comparisons were analyzed using Independent t-tests and Mann-Whitney tests with an alpha = 0.05. **RESULTS:** A total of 180 tests were evaluated including 135 (39 male) ME/CFS patients and 45 (18 male) controls (CO). Over 80% of the sample achieved peak exercise effort. Anaerobic threshold occurred at similar percentages of peak VO2 (ME/CFS: 54%; CO: 53%, p>0.05) and peak Watts (ME/CFS: 39%; CO: 45%, p<0.05). Maximum VO2 correlated with OUES in both groups (CFS: Rho = 0.695, p<0.01; CO: Rho = 0.709, p<0.01). OUES values were significantly lower for ME/CFS patients (ME/CFS Median 1.77, interquartile range (IQR) 0.86; CO Median 2.3, IQR 1.29, p<0.05). Ventilatory equivalent measurements were significantly higher in ME/CFS at anerobic threshold compared to CO (VE/VO2: ME/CFS Median 25.8, IQR 7.8; CO Median 24.0, IQR 3.8; VE/VCO2: ME/CFS Median 30.1, IQR 9.2; CO Median 28.5, IQR 4.1, p<0.05). **CONCLUSION:** These data demonstrate the validity of OUES to predict aerobic capacity and might discriminate ME/CFS patients from healthy controls, thereby encouraging future research using submaximal effort tests.
RESULTS: Injuries were sustained by 14 of 43 players (33%). Univariable associations of binary risk classification with injury occurrence were: SFI ≤ 86 (OR=6.67), VJ peak power ≤ 0.40 (OR=0.47), and Games Played ≥ 8 (OR=2.86). 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=21.12) with Games Played ≥ 8 (Adjusted OR=6.19) yielded a strong prediction model $\hat{p} = 0.07$, $p < 0.001$. 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; 95% 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 interrelationships influence LE MSK injury risk.

LE ROM, postural control, and power generation asymmetries are related through a

Conclusions: 95% bootstrapped CI=0.003-0.007) through its effect on SLAR LSI. DF LSI was indirectly related to SLHOP LSI (coefficient: 0.005, 95%CI=0.003-0.007; p<0.05). Statistical significance of the indirect effect was assessed using a 95% bias-corrected confidence interval (CI) with 50,000 samples. A 95%CI that did not include 0.00 was considered statistically significant. Alpha level was set at 0.05. Results: 3,765 male (15.65±1.23 years, 1.77±0.09m, 74.34±16.38kg) and 1,874 female (15.51±1.17 years, 1.65±0.07m, 60.26±9.94kg) 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. A linear regression-based mediation analysis was performed 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.

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. Correlation and ROC curves analyzed the relationships. Significance was set at the 0.01 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.

CONCLUSIONS: 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 and the peak power ratio failed in sensitivity and specificity. Specificity 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.

The Comprehensive High-level Activity Mobility Predictor-Sport (CHAMP-S) 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, and upper and lower limb power, speed, and agility measures and the ICCs for $\hat{r}$=0.40. Seventy-two 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 ICCs 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 Stand, 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 linenmen and skilled position players in all planes of movement. All 20 athletes returned to play safely and have not suffered re-injury to the ipsilateral 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.

Movement tests, such as the VJ and SLJ, 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 a give a picture of lower extremity injury risk. The ability to use easy and cost-efficient 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. Correlation and ROC curves analyzed the relationships. Significance was set at the 0.01 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.

Conclusions: 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 and the peak power ratio failed in sensitivity and specificity. Specificity 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.

The 4th edition of the Pre-Participation Physical Evaluation (PPE) recommends functional testing for the musculoskeletal portion of the examination. However, limitations exist concerning the recommended functional tests 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.

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PURPOSE: To 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/f = 23/17, 16 ± 2.1 y, 1.78 ± 0.1 m, 70 ± 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.

REFERENCES


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 should be assessed using yes/no questions and other topics (e.g., mood, anxiety, stress, home safety, and substance use) be included as physician reminders for athletes to document any previous injury history. Descriptive statistics were calculated to evaluate the efficacy of 4.387 on lower extremity functional movement screening scores. Previous injury history defined as out of physical participation for > 2 weeks.

**METHODS:** All incoming freshman football student-athletes for the 2012-2015 seasons completed functional movement screening performed by FMS trained sports medicine personnel. Pearson Chi-square analyses were used to determine if MSI could predict the presence of mental health issues.

**RESULTS:** Seventy-one male college athletes without MSI history participated in this prospective cohort study. Data was collected during pre-participation examinations as part of standard protocol. Injuries were tracked for an academic year by each team’s certified athletic trainer via computer software. Pearson Chi-square analyses were used to determine if MSI could predict the presence of mental health issues.

**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 treatment of mental health issues.

**Background:** Mental health issues are common among athletes, and screening for these issues can help identify athletes at risk for future injury or performance decrements. The presence of mental health issues can affect an athlete’s ability to perform at their best, and screening can help identify athletes who may need additional support or intervention.

**Purpose:** To examine the effects of previous lower extremity injury on functional movement screening scores, specifically the lower extremity FMS tests.

**Methods:** All incoming freshman football student-athletes for the 2012-2015 seasons completed functional movement screening performed by FMS trained sports medicine personnel. Researchers assessed the participants’ mental health status using the Brief Symptom Inventory (BSI) and the Beck Depression Inventory (BDI).

**Results:** The results showed that athletes with a history of previous lower extremity injury had higher levels of depression and anxiety compared to those without a history of injury.

**Conclusion:** Athletes with a history of previous lower extremity injury may require additional support and intervention to improve their mental health and reduce the risk of future injuries.
Retired NFL football players are at an increased risk for Metabolic Syndrome (MetS) due to chronic physical activity and sedentary lifestyle. Cross-sectional studies in high school and college football players suggest an increased risk even at this level. It is not clear when MetS risk factors (RF) develop and if certain markers can be used to assess risk for early intervention. **PURPOSE:** The purpose of this pilot study was to identify MetS risk factors using the NCEP ATP III standards and measured abdominal obesity in freshman football players from a Division 1 football team and a Division 3 team. Additionally, this study sought to identify if risk differed by player position and/or by college division. **METHODS:** Fifty freshmen (Division 1, n = 18, Division 3, n = 32) football players volunteered to be tested before the start of the competitive season. Testing for MetS risk factors included fasting Triglyceride (TG), High Density Lipoprotein (HDL), Blood glucose (BG), Blood Pressure (BP), and waist circumference (WC). Additional measures included percent body fat (%BF) and subcutaneous (SCAT) and visceral fat (VAT) depth. Descriptive statistics and comparison between schools related to MetS RF were analyzed. A Pearson Correlation was used to determine the relationship between the clinical markers. **RESULTS:** Ten players (20%) met the criteria for MetS (n = 2 with 3 RF, n = 4 with 4 RF, and n = 2 with 5 RF). Division 1 had a higher percentage of players (n = 5, 27.8%, 3 offensive linemen) meeting the criteria for MetS compared to the Division 3 players (n = 5, 15.6%, 1 offensive lineman). All NCEP ATP III risk factors except BG were positively correlated with meeting the criteria for MetS, with the WC being the highest (r = 0.766, p < 0.000). Using non NCEP ATP III risk factors positive correlations were found between the %BF (r = 0.645, p = 0.000), SCAT (r = 0.352, p = 0.013), and VAT (r = 0.489, p = 0.000). Linearman meeting the criteria for MetS had a %BF > 21. **CONCLUSIONS:** This data suggests that freshman football players have a high incidence of MetS RF. Waist Circumference and %BF should be included in pre-season evaluation with follow up for early intervention as necessary.

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 determine the relationship between the clinical markers. **PURPOSE:** The purpose of this research was to examine the effects of three different RIs (2, 5, and 8-minute) on training volume (TV) (kg, sets x reps x resistance) during a high-intensity bench press exercise (> 85% of 1RM). **METHODS:** 15 resistance trained males (mean ± sd, age = 26± 5 yr, height = 161± 6 cm, body mass = 70± 6 kg, bench press 1RM ratio = 1.39 ± 0.1) completed 3 experimental sessions, during which 4 sets of the bench press were performed with 85% of a 1RM load. During experimental sessions, the bench press was performed with a 2, 5, or 8-minute RI in a randomly counterbalanced design. Data was analyzed using a one-way ANOVA with repeated measures. **RESULTS:** The greatest TV (p < 0.05) was attained when subjects used an 8-minute RI between sets (table 1). Additionally, TV completed using the 5-minute RI was significantly greater (p < 0.05) when compared to the 2-minute RI (table 1). **CONCLUSIONS:** Resistance trained males, with the goal of greater volume during strength training, would benefit from longer RIs. Specifically, using an 8-minute RI between 4 consecutive sets of a bench press allows for a greater TV.

**Table 1.** Bench press training volume (kg, sets x reps x resistance) completed over 4 sets.

<table>
<thead>
<tr>
<th>RI (min)</th>
<th>2-min</th>
<th>5-min</th>
<th>8-min</th>
<th>10-min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume(Kg)</td>
<td>1448 ± 215*</td>
<td>1793 ± 315*</td>
<td>2207 ± 372*</td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05, value significantly different from 8-min RI

# p < 0.05, value significantly different from 5-min RI

**RESULTS:** There was a significant difference by position for broad jump (p = 0.002), vertical jump (p = 0.036), and total strength (p = 0.019). Overall, there was a significant correlation between on-court performance and SC measures (r = -0.439, p < 0.001). Significant position-specific correlations (r < 0.05) are as follows: defensive specialist, total strength with digs (r = 0.798); setter, hang cleans with assists (r = 0.818) and digs (r = 0.886); and middle blockers, broad jump with digs (r = 0.694), errors (r = 0.577), block assists (r = 0.763), block solos (r = 0.691), and total game success (r = 0.594).

**CONCLUSIONS:** This data suggests that freshmen football players have a high incidence of MetS RF. Waist Circumference and %BF should be included in pre-season evaluation with follow up for early intervention as necessary.

**METHODS:** Ten players (20%) met the criteria for MetS (n = 2 with 3 RF, n = 4 with 4 RF, and n = 2 with 5 RF). Division 1 had a higher percentage of players (n = 5, 27.8%, 3 offensive linemen) meeting the criteria for MetS compared to the Division 3 players (n = 5, 15.6%, 1 offensive lineman). All NCEP ATP III risk factors except BG were positively correlated with meeting the criteria for MetS, with the WC being the highest (r = 0.766, p < 0.000). Using non NCEP ATP III risk factors positive correlations were found between the %BF (r = 0.645, p = 0.000), SCAT (r = 0.352, p = 0.013), and VAT (r = 0.489, p = 0.000). Linearman meeting the criteria for MetS had a %BF > 21. **CONCLUSIONS:** This data suggests that freshman football players have a high incidence of MetS RF. Waist Circumference and %BF should be included in pre-season evaluation with follow up for early intervention as necessary.

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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) undertook 4 weeks of a barbell-based, full-body, linear periodization program 3x/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=0.004), and 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 (-15.8%) but the total:HDL cholesterol ratio was unaltered. CONCLUSION: It appears based linear periodization training program. Changes in LBM occurred sooner than expected. Data indicates 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.

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 60% 1-RM with 2 seconds concentric and 1.5 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 (TEST), cortisol (COR) and insulin-like growth factor (IGF-1). 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=0.005) time effect for raw concentrations of TEST and COR. TEST significantly (p=0.05) decreased from IP to 15P for both conditions (SS - 2.85 ± 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 Cort to increase from Pre to IP for both conditions (SS - 166.6 ± 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). TEST % change showed a significant time effect as it increased from Pre to IP (SS - 0.95 ± 4.39%; TR - 15.39 ± 7.73%) and decreased from Pre to 15P (SS - 5.48 ± 6.70%; TR - 5.41 ± 3.79%). Cort % change was not different between the two conditions. Correcting for hemoconcentration 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.
11:00 AM

Comparison Of Peak Power In The High Bar And Low Bar Squat Across Eight Loads

Jacob R. Goodin, Caleb D. Bazyler, Jake R. Bernards, Joseph Walters, Satoshi Mizuguichi, Michael H. Stone. East Tennessee State University, Johnson City, TN.

(Purpose not reported)

**Purpose:** To examine differences in peak power output between high bar (HBS) and low bar squats (LBS).

**Methods:** Six trained males (25.0 ± 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 2×8 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 90% of HBS 1RM for the HBS.

**Conclusions:** According to this pilot study, athletes seeking to increase peak 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 squatting 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 peak 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.

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**Abstracts were prepared by the authors and printed as submitted.**
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 ± 31.3 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.
Acute Effects of the Power Snatch on Vertical Jump Performance

Email: n_diaz4@u.pacific.edu

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±11.7 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 media thickness (IMT), body composition by bioelectrical impedance analysis (BIA) and central and brachial BP were determined. Fitness testing involved measurement of maximum 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: 109.1±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 (right leg: 78.3±7.0 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, 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 compare changes in kinetic variables following high volume resistance training employing heavy and light days.

**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±2.74 years). DJ140 consisted in seven sets of 20 drop jumps also (n=9, 22.89±3.37 years). 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 60°. For vertical jump, the athletes performed 3 countermovement 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 (65.05%) vs. DJ140: 7.51 ± 2.31 mm (17.82%); p = 0.286). The decrease of isometric strength was significantly greater in DJ140 than in DJ100 (DJ100: 34.2 ± 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 DJ140 than in DJ100 (DJ100: 0.48 ± 2.85 (0.95%) 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.

**Effect of Different Types of Circuit Resistance Training on Total and Regional Muscle Mass**

Chin-chuhsu Tsai1, Nien-chih Liu2, 1National Taiwan Sport University, Taoyuan, Taiwan. 2Chien Hsin University of Science and Technology, Taoyuan, Taiwan. Email: ctsai@ntusu.edu.tw

High volume resistance training is often concomitant with reductions in strength performance. The results of the study indicate that force outputs were spared following 3-wks high volume training when employing heavy and light days. Although not significant, a reduction in RFD90 of 9.3% is practically significant for athletes. It seems that while strength variables were largely unaffected, explosiveness (i.e. RFD90) may be more sensitive to high training volumes regardless of the fatigue management strategies used.

**Differences in Power and Velocity During the Back Squat in Resistance-trained Men and Women**

Jonathan M. Nedd1, Jonathan M. Oliver2, Jason D. Stone1, John D. Mata2, Margaret T. Jones, FACSM3, 1George Mason University, Fairfax, VA. 2Texas Christian University, Fort Worth, TX. (Sponsor: Margaret T. Jones, FACSM) Email: jneddo@gmu.edu

Muscular power is vital to success across sport and competitive level. Determination of the load that optimizes power varies by exercise, gender, and training status. For example, the load that maximized peak power for the power clean in men has been proposed to occur at 80% one-repetition maximum (1RM); whereas the ideal load for the squat is equivocal. Further, one study reported differences between men and women in peak power at differing loads during ballistic exercise. However, few data exist on the differences in men and women relative to power and velocity, and no study has examined the squat, a primary exercise for lower body power development.

**RESULTS:** To determine whether differences exist between resistance-trained (RT) men and women in regard to the loads that maximize average power (AP), peak power (PP), average velocity (AV), and peak velocity (PV) in the back squat (BS). METHOD: Forty-one RT (141 men vs 27 women; 183.0 ± 7.8 cm; 82.5 ± 8.0 kg) and women (n=21; 20 ± 1; 166.5 ± 6.9 cm; 63.1 ± 7.7 kg) had their 1RM determined (m: 147.0 ± 28.0 kg; f: 89.1 ± 12.3 kg). On a second day, they performed two repetitions at BS loads corresponding to 30%, 40%, 50%, 60%, 70%, 80%, and 90% 1RM as explosively as possible for determination of AP, PV, and PP. The repetition with the highest value was used for comparison. Repeated measures analysis of variance for AP, PV, PP, and PP were run. RESULTS: Men were older (p = 0.022), taller (p<0.001), heavier (p<0.001), stronger (p<0.001), and had a greater 1RM to body weight ratio (m: 1.8 ± 0.3; w: 1.4 ± 0.1; p<0.001). Men also produced higher velocities (PV, AP and power (PP)) across all loads. The highest PP occurred at 90%1RM for both, though no difference was noted between 80%1RM and 90%1RM in either sex. The highest AP occurred at 70%1RM in men, though AP at 60% and 80%1RM were not different. The highest AP in women was observed at 80%1RM, though no difference was noted between that intensity and 90% -70%1RM. AP and PP occurred at the lowest intensity (30%1RM) in both sexes. CONCLUSION: These data suggest that load for PP, PV, and PP does not differ. However, differences existed in the load that resulted in the highest AP. Whether this would be observed across all sports is unknown. Further study is required to determine if sex differences exist in load among different sports and training status.
adults. Training effects were 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
André Santos Martorelli1, Nathália Dias2, Vitor Cletó2, Sévio da Silva2, André Fonseca2, Amilton Vieira2, Rodrigo Silva2, Carlos Ernesto2, Martim Bottaro2. 1Federal Institute of Goiás, Valparaiso de Goiás, Brazil. 2University of Brasilia, Brasilia, Brazil. 3Federal University of Ouro Preto, Ouro Preto, Brazil. 4Catholic University of Brasilia, Brasilia, Brazil. (No relationships reported)

Monitoring the intensity of resistance training (RT) is essential for the effectiveness of training periodization. Athletes have been using power, hypertrophic and strength trainings 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 6 reps on SQ and 6 sets of 8 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 (6.53 ± 1.87 and 7.89 ± 1.17, respectively) when compared to PTS (4.33 ± 1.66). In all protocols volunteers showed higher LAC at the end of the sessions (p < 0.05). Moreover, in the HTS the LAC was higher (1.15 ± 0.36 to 11.77 ± 2.07 mM) when compared to STS (1.02 ± 0.40 to 4.00 ± 2.47 mM). CONCLUSION: Our data suggest that the magnitude of physiological stress resulting from the exercise (internal load) is more dependent on the magnitude of the effort (maximum or submaximal repetitions) than the TV or load lifted (external load) in different protocols of RT. Further studies are needed to investigate the effects of other RT protocols.

473 Board #294
May 31 9:30 AM - 11:00 AM
Intra- And Inter-set Velocity Characteristics During High- And Low-load Resistance Training To Failure
Carlos A. Estrada, Ryan J. Colquhoun, Mitchel A. Magrini, Allie G. Speer, Bert H. Jacobson, FACSM, Jason M. DeFreitas. Oklahoma State University, Stillwater, OK. (Sponsor: Bert H. Jacobson, FACSM) (No relationships reported)

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: 83.7 ± 10.5 kg. Squat 1RM: 157.1 ± 25.8 kg) were recruited to participate in this study. During the initial visit participants completed a one-repetition maximum (1RM) testing session to assess lower extremity strength (PTS, performed 6 sets of 6 reps on SQ and 6 sets of 8 reps on BP at 75% of 1-RM). The squat and bench press 1-RM testing was performed following the 1RM testing session. Participants were assigned 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 20% (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: Intra- and inter-set Velocity changes were conducted to assess differences between conditions. Initial analysis displayed a significantly higher MV for the low-load condition (0.66 ± 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 < 0.05) 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.

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. Byrne1, Eric R. Helms2, Daniel M. Cooke2, Michael H. Haitscher1, Trevor K. Johnson1, Jose C. Velazquez3, Joseph P. Carozzi1, John B. Cronin1, Adam G. Storey1, Michael C. Zourdos1. 1Florida Atlantic University, Boca Raton, FL. 2Auckland University of Technology, Boca Raton, FL. 3Auckland University of Technology, Auckland, New Zealand. (Sponsor: Michael Whitehurst, FACSM) Email: rbynnes2012@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 male (25 ± 3.87 years, body mass: 77.4 ± 17.7 kg, body fat: 9.5 ± 5.3%) 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, 3 repetitions, 6, 2, and 4 repetitions being performed during weeks 6-7. Week 8 served as a final testing period of 1-RM. 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 (26.7 (±2.75) 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 26.81±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; 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 different 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.

A-56 Free Communication/Poster - Running
Wednesday, May 31, 2017, 7:30 AM - 12:30 PM
Room: Hall F

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 Espósito, 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-AFOs) have enabled 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 use impacts the unaffected limb. PURPOSE: To identify limb loading and footstrike patterns during running in PD-AFO users. METHODS: Fifteen male Service Members (29.5 ± 5 years, 180.1 ± 8.1 m, 84.3 ± 7.6 kg) who had undergone unilateral lower limb salvage and who were prescribed custom PD-AFOs (Intrepid Dynamic Exoskeletal Orthosis) were included in the study. Muscle activity was measured using surface electromyography (sEMG) placed over the hamstrings, quadriceps, gastrocnemius, and tibialis anterior. An OWIS Triax accelerometer was placed on the foot to collect ground reaction force data. Data was collected at a frequency of 1,024 Hz. RESULTS: There were no significant differences in ground reaction force (GRF) and sEMG activity between the legs when running with PD-AFOs. CONCLUSION: Running with a PD-AFO provides a more functional running gait than running without one. Further research will be conducted to assess the efficacy of PD-AFOs to promote running performance in human subjects.
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 (inclines). 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 (W) 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±9.8kg; LX: n=24, ht=1.64±0.1m, mass=64.1±6.6kg; BB: n=12, ht=1.76±0.1m, mass=72.3±31.4kg). Sagittal plane kinematics and kinetics were assessed while running on an instrumented treadmill (Treadmetrix, Park City, Utah) at a constant speed using a 5 camera motion analysis system (Qualisys, Göteborg, 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 W, W-, W at the hip, knee and ankle. Two-factor analyses of variance (ANOVA) were employed using SPSS 24.0 for W, W- and W+. 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.

Running research aims to replicate movement that occurs outside the laboratory and may represent daily life. One factor commonly manipulated and constrained within the laboratory is running velocity. Outside the laboratory, velocity is often varied within a runner’s training regimen. Though running velocity is regularly altered in both settings, little is known about how these small changes may affect the organization of movement. PURPOSE: This study aimed to determine whether small deviations from preferred velocity led to changes in coordination variability. METHODS: Nine healthy runners (age 22 ± 2 years) were recruited from the Las Vegas community. Kinematic and kinetic analyses were performed while participants ran at 85%, 90%, 95%, 100%, 105%, and 110% of their preferred velocity. Movement CV was calculated for the segment couples of thigh-shank and shank-foot during early, mid, and late stance using a modified vector coding technique. The joint couples analyzed included: thigh flexion-shank rotation, thigh flexion-shank flexion, shank rotation-foot eversion, and shank flexion-foot flexion. CV values were averaged across trials and compared between conditions using repeated measures ANOVA (α=0.05). RESULTS: No statistically significant differences in CV were found between velocity conditions for any couplings of interest during any phase of stance (Table 1). CONCLUSION: Small perturbations in running velocity from preferred do not influence CV of thigh-shank and shank-foot couplings during stance phase. It is possible that larger deviations from preferred velocity would result in changes, and this effect has been shown in previous research. However, the goal of this project was to assess how slight changes, such as what would be seen in day-to-day training or from constraints in the laboratory, would influence CV.

Running mechanics are known to change with age and years of experience, however the extent to which mechanics may change more acutely from one year to the next is uncertain. In particular, refinements of running mechanics may occur which benefit an individual’s performance or reduce injury risk. PURPOSE: To assess changes in lower extremity joint work during running across two consecutive seasons among healthy collegiate cross country runners. METHODS: Pre-season data from the 2015 and 2016 cross country seasons were reviewed for 14 NCAA Division I runners (men, 7; age: 20.1±1.1 yr; height: 1.7±0.11 m; mass: 61.6±8.8 kg). Athletes were healthy at both testing sessions. Ground reaction forces and kinematic data were recorded during treadmill running (4.47m/s). Sagittal plane positive (PW) and negative work (NW) were calculated for the hip, knee, and ankle during stance phase and averaged across gait cycles. PW and NW at each joint were then compared across seasons using paired t-tests. Training programs and injuries occurring between testing sessions were also reviewed.

RESULTS: No differences between limbs were observed (p > 0.13); analyses are reported for the right limb. At the start of the 2015 season, PW at the hip, knee, and ankle was 0.26±0.10, 0.33±0.08 and 1.31±0.21 J/kg, respectively, and NW was -0.04±0.04, -0.45±0.11, and -0.83±0.29 J/kg, respectively. At the start of the 2016 season, PW at the hip, knee, and ankle was 0.38±0.14, 0.25±0.25 and 1.30±0.23 J/kg, respectively, and NW was -0.05±0.05, -0.39±0.09, and -0.86±0.31 J/kg, respectively. Hip PW increased significantly and both knee PW and NW decreased significantly (p < 0.006) across seasons. No significant differences between seasons were observed in ankle PW or NW (p > 0.42) or in hip NW (p = 0.43). Results remained consistent when comparing those who did and did not sustain an injury between 2015 and 2016, and no changes in training programs were noted. CONCLUSIONS: Hip PW and knee PW and NW changed significantly between seasons, indicating an alteration in running mechanics that may affect performance. In the absence of injury and training-related modifications, the mechanism responsible for these changes requires further exploration.
A new running shoe design called ‘maximalists’, which claims to provide maximal cushioning with its oversized midsole and thus lower the impact loading, becomes more popular among trail runners. Downhill running is an essential component of trail races but it may lead to a greater loading than level running. However, the effects of maximalist shoes 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 maximalist shoes (MAX) during level and downhill running. **Methods:** Twelve regular shoe 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, Adidas) 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 (AVLR) and instantaneous vertical loading rates (VLIR), along with the stride length and footstrike angle, were extracted and averaged over the last minute in each condition. Results: VARL, VLIR, 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 shrunken runners.

### Table 1. Average (VARL) and instantaneous vertical loading rates (VLIR), stride length, and footstrike angle when running with maximalists (MAX) and traditional running shoes (TRS)

<table>
<thead>
<tr>
<th></th>
<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>
<th>P-value</th>
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<tr>
<td><strong>MAX (m)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
<td><strong>Mean (SD)</strong></td>
</tr>
<tr>
<td>VARL (BW/s)</td>
<td>5.7 (16.3)</td>
<td>56.3 (18.3)</td>
<td>0.07</td>
<td>0.827</td>
<td>84.5 (21.6)</td>
<td>79.4 (18.8)</td>
<td>0.25</td>
<td>0.563</td>
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<td>VLIR (BW/s)</td>
<td>71.6 (18.5)</td>
<td>69.3 (19.2)</td>
<td>0.13</td>
<td>0.684</td>
<td>102.3 (23.2)</td>
<td>95.0 (19.3)</td>
<td>0.34</td>
<td>0.372</td>
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<tr>
<td>Stride length</td>
<td>1.72 (0.14)</td>
<td>1.72 (0.14)</td>
<td>0.02</td>
<td>0.672</td>
<td>1.78 (0.13)</td>
<td>1.78 (0.13)</td>
<td>0.04</td>
<td>0.626</td>
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<td>Footstrike angle</td>
<td>7.7 (7.0)</td>
<td>7.6 (7.3)</td>
<td>0.02</td>
<td>0.949</td>
<td>14.6 (6.4)</td>
<td>14.0 (11.1)</td>
<td>0.07</td>
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</tbody>
</table>

**Board #300**

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

**Maximalist Shoes Do Not Reduce Impact Loading During Level And Downhill Running**


Email: Roy.Cheung@polyu.edu.hk

(NO relationships reported)

Running with body weight support (BWS) (e.g., running on a lower positive pressure treadmill) has been used for physical fitness enhancement. Nevertheless, kinetic mechanics of running with BWS is not fully understood. **Purpose:** To investigate influence of stride frequency (SF) manipulation on muscle activity during running at different BWS conditions. **METHODS:** Nineteen subjects (23.8±4.1 years) ran on a lower body positive pressure treadmill at their preferred running speed (PS) for different BWS conditions (i.e., 0%, 50%, and 80% of BWS conditions). The SF conditions consist of running at preferred SF (PSF), PSF±10%, and PSF±15%. Muscle activity from the rectus femoris (RF), biceps femoris (BF), tibialis anterior (TA), and gastrocnemius (GA) were measured. In addition, rating of perceived exertion (RPE) and SF were measured. Muscle activity, RPE, and SF were analyzed using a 3 (mode) x 3 (BWS) repeated measures analysis of variance (ANOVA) (α = 0.05). PS was analyzed using a one-way repeated measures ANOVA (α = 0.05).

**Results:**

- SF = 1.025 was different from all other SF perturbations (p<0.05).
- SF = 1.454 was different from PSF+10%, PSF±15%, and PSF-10% (p<0.001).
- SF = 1.362 was different from PSF+5%, PSF-10%, and PSF-15% (p=0.028).

**Conclusion:** The SF variability increased as stride frequency increased further from the preferred stride frequency. It may be that decreased variability of SF is a factor determining the preferred stride frequency during running.

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**Board #301**

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

**Is Variability Of Stride Frequency A Factor That Determines Preferred Stride Frequency During Running?**

Kendall S. Galor, Joshua Bailey, Jared Joerger, John Mercer, FACSM. *University of Nevada Las Vegas, Las Vegas, NV.* (Sponsor: Dr John Mercer, FACSM)

(NO relationships reported)

Running with body weight support (BWS) (e.g., running on a lower positive pressure treadmill) has been used for physical fitness enhancement. Nevertheless, kinetic mechanics of running with BWS is not fully understood. **Purpose:** To investigate influence of stride frequency (SF) manipulation on muscle activity during running at different BWS conditions. **METHODS:** Nineteen subjects (23.8±4.1 years) ran on a lower body positive pressure treadmill at their preferred running speed (PS) for different BWS conditions (i.e., 0%, 50%, and 80% of BWS conditions). The SF conditions consist of running at preferred SF (PSF), PSF±10%, and PSF±15%. Muscle activity from the rectus femoris (RF), biceps femoris (BF), tibialis anterior (TA), and gastrocnemius (GA) were measured. In addition, rating of perceived exertion (RPE) and SF were measured. Muscle activity, RPE, and SF were analyzed using a 3 (mode) x 3 (BWS) repeated measures analysis of variance (ANOVA) (α = 0.05). PS was analyzed using a one-way repeated measures ANOVA (α = 0.05).

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**Conclusion:** The SF variability increased as stride frequency increased further from the preferred stride frequency. It may be that decreased variability of SF is a factor determining the preferred stride frequency during running.

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**Board #302**

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

**Influence Of Stride Frequency Manipulation On Muscle Activity During Running At Reduced Body Weight**

Kenji Masumoto, Jared Joerger, John A. Mercer, FACSM. *Kyushu University, Kasuga, Japan. University of Nevada, Las Vegas, NV.*

(NO relationships reported)

Age-related changes in bone structure and mechanics may increase the risk of injury when performing exercise such as running. Joint-related injury such as osteoarthritis is a primary concern for older runners. A contributing factor to bony injury is joint loading. However, it is not known whether increased loading exists in older runners. **Purpose:** To compare anteroposterior and compressive joint reaction forces (JRFs) in the lower extremities during running in healthy young and older runners. **METHODS:** Nine healthy young runners (YA) and 10 healthy older adult runners (OA) performed fifteen over ground running trials at a fixed velocity (3.35 m/s). Running velocity was maintained (+ 5%) using an infrared timing gate. Three-dimensional joint forces, ground reaction forces, and joint reactions during running were measured using an 8-camera motion capture system (240 Hz, Qualisys, Inc.) and force platform (960 Hz, AMTI, Inc.), respectively. Visual 3D was used to calculate ankle, knee and hip JRFs (compressive and anterior/posterior) during the stance phase of the gait cycle. Independent samples t-tests were used to compare mean JRFs in both directions. **RESULTS:** YA exhibited significantly larger mean JRFs at the ankle (p<0.04; YA: -13.2±1.0 BW; OA: -12.6±0.7 BW) and knee (p<0.04; YA: -13.0±0.9 BW; OA: -12.3±0.9 BW) while no differences were observed at the hip (p=0.37; YA: 2.3±0.8 BW; OA: 2.2±1.9 BW). **CONCLUSIONS:** These data demonstrate that YA 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.

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**Board #303**

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

**Smaller Compressive and Anteroposterior Joint Reaction Forces in Older Compared to Young Runners**

D. S. Blaise Williams, III, FACSM1, Douglas W. Powell2. *Virginia Commonwealth University, Richmond, VA. University of Memphis, Memphis, TN.*

Email: dswilliams@vcu.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.

<table>
<thead>
<tr>
<th>Running Speed</th>
<th>Kinematic method</th>
<th>Offset</th>
<th>95% limit of agreement</th>
</tr>
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<tbody>
<tr>
<td>10 km/h</td>
<td>PDVP</td>
<td>5 frames (21.0 ms)</td>
<td>1 frame (4.2 ms)</td>
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<tr>
<td></td>
<td>PTA</td>
<td>5 frames (21.0 ms)</td>
<td>2 frames (8.4 ms)</td>
</tr>
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<td>11 km/h</td>
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<td></td>
<td>PTA</td>
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<td>12 km/h</td>
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<td>7 frames (29.4 ms)</td>
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<td></td>
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</tr>
<tr>
<td>13 km/h</td>
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<td>1 frame (4.2 ms)</td>
</tr>
<tr>
<td></td>
<td>PTA</td>
<td>8 frames (33.6 ms)</td>
<td>2 frames (8.4 ms)</td>
</tr>
<tr>
<td>14 km/h</td>
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<tr>
<td></td>
<td>PTA</td>
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</tr>
<tr>
<td>15 km/h</td>
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<tr>
<td></td>
<td>PTA</td>
<td>6 frames (25.2 ms)</td>
<td>3 frames (12.6 ms)</td>
</tr>
</tbody>
</table>

CONCLUSION: This study showed that a novel IMU-based method of detecting FC using PTA and PDVP showed good similarity with FC detection based on GRF at all running speeds. The different time offsets among running speeds should be considered when implementing these kinematic methods to detect FC. This opens up new possibilities for studying running mechanics outside the laboratory setting.


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 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 120Hz. Kinematic and kinetic differences were analyzed via two-way repeated measures ANOVAs. RESULTS: The differences in gait between the BF and SHOD conditions were consistent with previous research with subjects exhibiting decreased stride length (BF: 2.07±0.24m, SHOD: 1.89±0.25m, p<0.001) and changing from rear footstrike when SHOD to fore/midfootstrike when BF (BF: -5.5±1.1, 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<0.01; impact peak BF: 1.65±0.22 BW, SHOD: 1.89±0.25 BW, p<0.01). Despite anesthetizing the plantar surface, there was no difference between the BF and ANEST BF conditions in terms of stride length (BF: 2.07±0.24, ANEST BF: 2.01±0.27m, p>0.05), footstrike (BF: -5.5±1.1, ANEST BF: -3.8±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.
It is known that sagittal plane kinematics are able to predict loading in runners. 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 (Qualisys, Gothenburg, Sweden) running on an instrumented treadmill (Treadmetrix, 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, peak power absorption and peak knee extension moment 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 Tandem treadmill. GRF data were further analyzed to calculate sample entropy for both 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 20%M, SampEn 20%M, SampEn 20%M) and entire stance phase (SampEn 10%M, SampEn 10%M, SampEn 10%M). Post hoc Tukey test was applied as needed. RESULTS: A significant shoe effect was observed on the association among dependent variables listed above (P<0.05). Cushioned shoes displayed a higher SampEn 20%M (.1162 ± .01558) than regular shoes (.1094 ± .0258) and a greater SampEn 20%M (.1556 ± .01556) than minimalist shoes (.1546 ± .0932). Minimalist shoe exhibited greater SampEn 10%M (.0614 ± .01310) and SampEn 10%M (.0636 ± .0688) than cushioned shoes (.0577 ± .1002, .0448 ± .0305) 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.

Purpose: The purpose of this study was to determine if muscle activity is affected by different stride frequencies (SF) at preferred running velocity while running outdoors. METHODS: Participants (n=10, 26±4.8 y, 72.6±18.3 kg, 170.8±7 cm) were given a self-selected warm-up after signing an informed consent. Wireless electromyography sensors (sample rate = 1926 Hz) were attached to four muscles on the right side: the rectus femoris (RF), biceps femoris (BF), tibialis anterior (TA), and gastrocnemius (GA). Maximum voluntary contractions were performed for five seconds prior to moving outside for data collection. Preferred running velocity and preferred stride frequency (PSF) were determined outdoors. Participants performed seven randomized conditions, each at their preferred running velocity, consisting of a specific SF. The conditions were 115%, 110%, 105%, 100%, 95%, 90%, and 85% of their PSF. SF was controlled by having participants match a metronome. Absolute value of EMG were averaged across a 5-second window for each SF for each muscle. A repeated measures analysis of variance was used to compare muscle activity between SF conditions. RESULTS: There was no significant difference in BF between SF conditions (p=0.352). There was no significant difference in RF between SF conditions (p=0.229). There was no significant difference in TA between SF conditions (p=0.342). There was no significant difference in GA between SF conditions (p=0.758). Discussion: Despite large changes in average muscle activity was not different for any of the muscles tested when running a set speed outdoors. It does not seem that average muscle activity is a factor determining preferred stride frequency. This project was made possible by a grant from the National Institute of General Medical Sciences (P20GM103440) from the National Institutes of Health. This project’s contents are solely the responsibility of the authors and do not necessarily represent the official views of NIH.
490 Board #311 May 31 9:30 AM - 11:00 AM
Relationship of Footstrike Pattern and Landing Impacts During a Marathon Race
Matthew Ruder, Steve T. Jamison, Adam Tenforde, Marian Hannan, Irene Davis, FACSM, ’Spaulding National Running Center, Cambridge, MA. ’Institute for Aging Research, Hebrew SeniorLife, Boston, MA. (Sponsor: Irene Davis, FACSM) (No relationships reported)

Landing impacts during running are influenced by footstrike pattern (FSP) in rearfoot strikers (RFS) in laboratory studies. These impacts have been linked with running injuries. Landing impacts are highest in RFS, lower in midfoot strikers (MFS) and lowest in forefoot strikers (FFS). In RFS, impacts are positively correlated with speed. However, these relationships have only been examined in a laboratory setting, limiting the ecologic validity of the data.

PURPOSE: 1. To compare landing impacts between FSP during a marathon. 2. To assess the interaction effect of FSP and speed on landing impacts during a marathon.

METHODS: 226 runners (118 M, 108 F; 4.43±1.1 yrs) running a marathon were recruited for this study. Subjects were initially filmed running on a treadmill to determine their habitual FSP (169 RFS, 32 MFS, 23 FFS). During the marathon, an accelerometer, secured to the distal medial tibia, recorded continuous data. Average peak tibial shock (TS) was calculated for the first 10km of the marathon. An ANOVA (p<0.05) was used to determine FSP differences. The interaction effect of FSP and speed on TS was determined using an ANCOVA (p<0.05).

RESULTS: Peak TS was significantly higher in the RFS compared with the FFS runners. TS in the MFS group was 20% higher than in FFS group. While not significant, this difference (p>0.05) was used to determine FSP differences. The interaction effect of FSP and speed on TS was determined using an ANCOVA (p<0.05).

CONCLUSIONS: When running in their natural environment, FFS runners have the lowest impacts of all FSPs. In addition, unlike the RFS and MFS groups, FFS runners appear to have the ability to maintain lower impacts at faster speeds. Supported by Vibram USA.

Table 1: Means and Standard Deviations for subject groups and intra-group comparisons

<table>
<thead>
<tr>
<th>Group</th>
<th>ABDH (cm)</th>
<th>Qin (cm)</th>
<th>FDB (cm)</th>
<th>FHB (cm)</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 ± .57</td>
<td>1.62 ± .27</td>
<td>1.38 ± .17</td>
<td>4.34 ± 1.37</td>
<td>4.28 ± 2.05</td>
</tr>
</tbody>
</table>

P-value .321 .061 .043* .006* .012* .969

Effect Size 2.80 3.82 3.81 2.10 0.10 2.20

Pooled Standard Deviation 0.52 0.53 0.30 23 32 169

Mean Peak Tibial Shock (g) 10.03 12.13 12.23

Standard Deviation 2.47 3.01 3.95

Number of Subjects 23 32 169

Standard Error 0.52 0.53 0.30

Absolute Value of Average Difference 2.10 0.10 2.20

Pooled Standard Deviation 2.50 3.82 1.81

Effect Size 0.75 0.03 0.58

P-Value 0.095 0.99 0.021

493 Board #314 May 31 9:30 AM - 11:00 AM
The Influence of Footwear on Running Mechanics, Impact, and Plantar Loading in Habitual Rearfoot Strikers
Camden S. Marshall, William J. McDermott, James Walker. The Orthopedic Specialty Hospital, Murray, UT. (No relationships reported)

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 shoes (MN), and neoprene socks (BF) on running mechanics, impact, and plantar pressure.

The majority of running studies are conducted in controlled laboratory settings. The advent of mobile technology has allowed the study of running impacts outside in a more natural environment enhancing the ecologic validity of these investigations. A marathon provides an excellent opportunity to examine the effect of a variety of naturally occurring, race-related factors on running impacts which have been related to injury.

PURPOSE: To determine the association between course incline, speed, and race progression (an indication of fatigue) on running impacts (tibial shock) during a marathon.

METHODS: 226 individuals (118 males, 108 females; 44.3±11.1 yrs) running the same marathon (42.2km) were included. They each wore a triaxial accelerometer, recording at 1.000Hz, secured on their distal, medial tibia throughout the race. Peak resultant acceleration, tibial shock (TS), for each step was determined. Run times for each 5km, and the last 2.2 km, were provided by the race organizers. TS and course incline were averaged over matching race intervals. A linear mixed effects model was used to determine the relationship between tibial shock and the independent variables of course incline, speed, and race progression.

RESULTS: Mean resultant tibial shock was 15.2±1.1g. Course incline, speed, and race progression were all positively correlated with increases in TS. Speed and distance were both positive.

CONCLUSIONS: Our results suggest that higher resultant tibial shock is associated with increases in TS, increases in speed, and race progression (increased fatigue). Supported by Vibram USA.

Figure Caption: Population average resultant tibial shock [in units of gravity, g] relative to each independent variable (speed, incline, and distance). Grey numbers represent the total distance traveled after each race interval used [in km].
Methods: 35 habitual rearfoot strike runners, ages 19-42 yrs, running 5-15 mi/wk, with a CAD of <170 steps/min were randomized to a FFS group (n=16, 5M) or increased CAD group (n=19, 5M). All subjects performed 4 weeks of strengthening exercises. This was followed by 8 sessions of gait retraining (GR) over 3 wks using auditory feedback specific to each group. Run time was increased from 10-30 min over the 8 sessions, and feedback time was faded over the last 4 sessions. An instrumented treadmill assessment was done at baseline, at 1wk post GR, and at 1mo follow-up. Variables of interest were vertical average and instantaneous load rates (VALR, VILR) measured in bodyweights (BW)/s.

Results: Groups were similar in all variables at baseline (Figure 1). FFS group reduced VALR by 58% and VILR by 44%. CAD group reduced VILR by 26% and VILR by 44%. At 1mo, load rates for both groups were significantly lower than baseline, but FFS maintained reductions to a greater extent. A 5.6% increase in cadence occurred in both groups following GR. At 1 mo follow-up cadence remained higher in both groups, but to a greater extent in FFS group.

Conclusion: These data suggest that transitioning to a FFS results in greater reduction of vertical load rates and greater persistence of these changes over time.
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±F = 7, F = 3) ran on a treadmill at PSF-15%, PSF-10%, PSF-5%, 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 representative of a 30 minute run. During preferred running condition, PSF was calculated by visually identifying the time to complete 20 strides. Target SFs 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 30s 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 (α = 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 BF (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 PSF, 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%, 103.42±42.59%, 109.45±36.24%, 90.89±19.40%, 106.68±20.33% for PSF -15%, -10%, -5%, 0%, +5%, +10%, +15% respectively. CONCLUSION: Muscle activity was not minimized while running at PSF compared across all conditions.

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Preliminary Analysis: Variability Between Healthy and Injured Individuals during Running

Amanda Estep1, Steven Morrison2, Shane Caswell1, Jatin Ambedgaonkar1, Nelson Cortes1.1 George Mason University, Manassas, VA. 1Old Dominion University, Norfolk, VA.

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(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.

PURPOSE: To compare lower extremity kinematic variability between healthy (HE) and individuals currently experiencing LEI (knee, hip, pelvis, and thigh) during a running task.

METHODS: A single 25-second trial was collected. Variables of interest included knee flexion/extension angle, knee abduction/adduction angle, hip flexion/extension angle, and thigh) during a running task.

RESULTS: Significant differences between groups were found between the 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.
Medical 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 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 to evaluate which variables were best predictors of group membership. RESULTS: After two seasons 8 of the 24 athletes developed MTSS. There were no differences in activity levels, injury rates, or shoe type 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 (g² = 18.1, p < .001) revealed every 1% stance increase in duration of rearfoot eversion increased odds of being in the INJ group by 1.26 (p = .02, ES = 1.1), higher peak rearfoot eversion (22.6 ± 6.3 vs. 18.3 ± 4.2 % stance, p = .001, ES = 2.5) during stance phase. The logistic regression revealed every 1% stance increase in duration of rearfoot eversion increased odds of being in the INJ group by 1.26 (p = .02, ES = 1.1). The large hip adduction group (12.4 ± 2.6(Nm/Bw*ht)*100-1) had less hip abductor eccentric strength (11.9 ±1.7(Nm/Bw*ht)*100-1)) than the small hip adduction group (12.4 ±1.7(Nm/Bw*ht)*100-1) and NMC tests (MDD = 5 taps). However, group differences did not exceed MDD for hip abductor eccentric strength (MDD = 2.7°, indicating a true difference (17.0° ±8.9° and 12.6° ±5.1°, ES = 3.7). The large hip adduction group had slightly less hip abductor eccentric strength (11.1 ± 1.7(Nm/Bw*ht)*100-1) than the small hip adduction group (12.4 ±2.6(Nm/Bw*ht)*100-1) and the mean running mileage was 606 ± 103 km, height, body mass, BMI, percent body fat, bone mineral density (BMD), t-score of BMD, and lean soft tissue mass were 172.0 ±5.2 cm, 57.3 ± 4.4 kg, 19.1 ± 0.3 % body fat, 1.175 ± 0.057 g/cm², 0.524 ± 0.067 and 1.15 ± 0.4 kg, respectively. The mean running mileage was not significantly correlated with any of those variables (p>0.05). The mean running mileage of each category (A, B, C, & D) was 709, 600, 606, and 475 km/month, respectively (p>0.01). Percent body fat were lowest in A (5.7%) and highest in D (14.8%) whereas z-score of BMD was −0.447 and −0.660, respectively. ANOVA showed no significant differences in those variables among the categories. Fischer’s exact tests of questionnaire survey revealed significant differences in between categories in percentages of runners attempting weight reduction practices (8.3, 13.3, 53.8, and 38.5%, respectively, p<0.05) and those complained of frequent fatigue (25.0, 53.3, 53.8, and 69.2%, respectively, p<0.05). CONCLUSIONS: The runners with the lowest performance level and the least training volume likely attempted weight reduction practice and complained of fatigue. It was concerning that they might pursue the lower level of percent body fat by restricting energy intake.

Large peak hip adduction angles in women are prospectively linked to patellofemoral pain and iliotibial band syndrome. 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 (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 and experience trail runners (age = 22.4 ± 6.3 yr, ht = 173.4 ± 8.4 cm, body mass = 64.2 ± 7.4 kg, VO2 max = 56.5 ± 7.1 mL·kg−1·min−1) participated in this study. Blood lactate measurements were obtained at mile 9.7 and at the marathon finish. Probabilistic magnitude-based inferences were determined to assess the likelihood that the true value of the effect represents substantial change. RESULTS: Relative to the shan treatment, IPC produced likely beneficial effects for marathon run time (mean ± 90% confidence limits (CL) 1.7 ± 1.5%). Mean marathon times for IPC and sham treatment groups were 57.44 and 57.36 hours, respectively. Blood lactate values were significantly lower (p<0.05) in the IPC vs. sham group at 9.7 miles (2.4 ± 1.7 vs. 3.3 ± 1.3 mmol·L−1) and (2.2 ± 0.6 vs. 3.8 ± 1.6 mmol·L−1).
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. Nade body weight was recorded each morning. RESULTS: Daily, the subject completed 39.98±2.61 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/mi pace (range 15.17-18.45 min/mi). Subject consumed 4398±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; 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 in their mean OD (6.4%) versus LD (+0.5%) (P<0.01). Mean anaerobic contributions to reach SS were greater in the LD than in the MD (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 end of season 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.

It has been suggested there are two separate breakpoints in the oxygen pulse (Opulse = 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 Opulse 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 Opulse and exercise intensity to determine if Opulse thresholds could be detected during treadmill running, and, if detected, to compare these Opulse 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 oxygen consumption, ventilation, and heart rate, 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 VCO2 relationships, respectively. The Opulse 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 < 0.05. RESULTS: The mean (± SD) VO2 peak was 3.475 ± 0.959 L·min⁻¹ (48.33 ± 7.30 ml·kg⁻¹·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 Opulse versus VO2 relationship was best explained by a linear fit (r² = 0.976 - 1.000) for 9 and a quadratic fit (r² = 0.985 - 0.996) for 3 of the 12 subjects. Only 1 of the 3 subjects with a quadratic fit for the Opulse versus VO2 relationship displayed a response consistent with a plateau in the Opulse. CONCLUSIONS: The highly linear relationship between Opulse and VO2 for 75% of the subjects indicated that Opulse thresholds could not be detected during treadmill running using the Opulse versus VO2 relationship. These findings do not support the use of the Opulse as a non-invasive measure of fatigue thresholds.

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. 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 each. 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.
Analysis of critical speed derived from “all-out” shuttle and continuous running
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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 CSi (D*). Results were calculated using: (speed of 150 s * CSi) * 150 s Results: There was a moderate effect size difference (Cohen d = 0.72) between true CS (3.78 ± 0.61) and CSi (3.40 ± 0.60) (t = 6.44, p < 0.01). Although the two parameters were positively correlated (r = 0.92, p < 0.01), where true CS (m/s) could be predicted from y = (-3.21 + 0.91 * CSi) (r = 0.96, p < 0.01). Poor correlations were observed between true CS and CSi versus D* (44 ± 46 m) (r = -0.43 p = 0.07 and r = -0.32, p = 0.18, respectively). CONCLUSION: Shuttle running evokes a consistent, predictable decline in CS. The CS method relies on the same physiological variables mediating true CS, and the D* measure appears as a distinct metric.

514 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
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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. METHOD: 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. 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 CSi (D*). Results were calculated using: (speed of 150 s * CSi) * 150 s Results: There was a moderate effect size difference (Cohen d = 0.72) between true CS (3.78 ± 0.61) and CSi (3.40 ± 0.60) (t = 6.44, p < 0.01). Although the two parameters were positively correlated (r = 0.92, p < 0.01), where true CS (m/s) could be predicted from y = (-3.21 + 0.91 * CSi) (r = 0.96, p < 0.01). Poor correlations were observed between true CS and CSi versus D* (44 ± 46 m) (r = -0.43 p = 0.07 and r = -0.32, p = 0.18, respectively). CONCLUSION: Shuttle running evokes a consistent, predictable decline in CS. The CS method relies on the same physiological variables mediating true CS, and the D* measure appears as a distinct metric.

515 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
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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, with no sex difference in response to endurance training, and that changes in all variables will be significantly correlated with each other. PURPOSE: To assess sex 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: Subjects in a marathon training class (n=147, 111 females; 21.0 ± 1.7 years) completed the following 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 Ultima 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<0.001), 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, BF and 2TT: r=-0.311, VO2max and BM: r=-0.279, 2TT and BF: r=0.341, 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 program, both men and women improve 2TT and VO2max and decrease BF with no change in BM.

516 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
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Alpha-actinins form a crosslink between actin filaments and adjacent sarcomeres, and play a role in signaling and energy metabolism. Alpha-actinin-3, 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: n=12, age: 21.2 ± 3.2 years, BMI: 21.5 ± 2.8 kg·m²) of the 577R allele, reported 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 beneficial effect of XX genotype (±20 s; ± 40 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 endurance capabilities in elite female athletes.
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 completion of the series from the series website. Descriptive analyses and a comparison 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±467 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±86.2 min, p=0.006).

CONCLUSIONS: Even though the day one finish times were close to six hours on average, the toll of seven 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
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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 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 cardiopulmonary fitness (CRF). PURPOSE: Compare standardized MET and resting VO2, with respect to these two applications and explore the association between CRF and resting VO2.

METHODS: Twenty men (18-30 y) with normal CRF (n=15, VO2max<80 mL·kg-1·min-1) and overweight CRF (n=5, VO2max≥80 mL·kg-1·min-1) visited the laboratory twice (1 week apart) and participated in two studies. First, 100 men [lower CRF: n=48, VO2max<50 mL·kg-1·min-1; higher CRF: n=52, VO2max≥50 mL·kg-1·min-1] visited the laboratory twice to explore the association between body composition and resting VO2. Second, 14 men performed a 30-min bout of running at 8.0 km·h-1 (3.3 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 VO2rest was strongly positively correlated with resting VO2 (R=0.88, P<0.001). The mean observed resting VO2 value of 3.28 (s=0.10) and 3.07 (s=0.14) 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).

CONCLUSIONS: The standardized MET value considerably underestimated 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.

518 Board #339 May 31 11:00 AM - 12:30 PM
A Mile Trail Run Can Predict Performance for a 5K Trail Race
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PURPOSE: The purpose of this study was to determine if a 1-mile trail run could predict performance for a 5K trail race. Also, based on these data, 5K trail running velocity is approximately 15% less than during a 1-mile trail run bout.

RESULTS: Thirteen participants [Female: 3, Male: 10, Age: 23±5 y, Height: 175±9 cm] participated in a 5K trail race. It was hypothesized that a significant correlation would be present between the standardized MET and resting VO2. A significant correlation was observed between 1-mile time and 5K performance (r=0.987, **P=0.0001, R2=0.974**). The equation to predict 5K time from the 1-mile run time was: 5K time (min) = 6.49 + 0.88 (1-mile time). The 1-mile run time was compared to laboratory tested VO2max, pace at VO2max (V̇O2maxpace), and lactate threshold pace (LTpace).

CONCLUSIONS: Our results show that a 1-mile trail run time trial can be used to predict performance for a 5K trail race. Also, based on these data, 5K trail running velocity is approximately 15% less than during a 1-mile trail run bout.

520 Board #341 May 31 11:00 AM - 12:30 PM
An Evaluation of Time-Trial Based Predictions of VO2max and Recommended Training Paces For Collegiate and Recreational Runners
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PURPOSE: The purpose of this study was to determine if a 1-mile trail run time trial can be used to predict the performance of VO2max, and recommendations of interval and threshold training paces (pIN & pTH) in samples of NCAA Division 1 track athletes (ATH, n=11) and recreational runners (REC, n=9). METHODS: Predicted variable data were obtained using results from indoor 5km time-trials. Data from the VO2culator was compared to laboratory tested VO2max, pace at VO2max (V̇O2maxpace), and lactate threshold pace (LTpace).

CONCLUSIONS: Practically, pIN can be confidently used for threshold training regardless of ability level. pIN also appeared to be accurate for AT in both ATH and REC populations.

Abstracts were prepared by the authors and printed as submitted.
The influence of foot strike pattern on running performance has produced inconsistent results (Kasner et al., Int. J. Sports Physiol. Perform. 29:286-292, 2013. Larson et al., J Sports Sci 29:1665-73, 2011) as has the effect of footwear and foot strike pattern on running economy (Perl et al., Med. Sci. Sports Exerc. 44:1335-1343, 2012). PURPOSE: To examine the effects of varying footwear on running economy and preferred foot strike pattern in collegiate distance runners. 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 (VO$_2$), heart rate (HR), rating of perceived exertion (RPE), and preferred foot strike (PFS) 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 for VO$_2$ (41.4±2.5, 40.7±1.9, 41.6±2.2 ml/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). The Friedman test showed a significant difference (p<0.05) across BF and TS but not MS conditions for the PFS. The Friedman test showed a significant difference (p<0.05) in PFS patterns across footwear treatments. Subsequently, the Wilcoxon test indicated the PFS pattern for BF was forefoot and, in contrast, for both MS and TS conditions the PFS was rearfoot. CONCLUSION: There is no metabolic advantage to BF, MS and TS for VO$_2$, HR and RPE. The influence of foot strike pattern on running performance has produced inconsistent results.

In addition to overall volume, an essential variable in an optimal endurance training program is the distribution of exercise intensity. Training intensity distribution (TID), which is the percentage of time an athlete spends training in low, moderate, and high intensity efforts, has been used to prescribe training programs and monitor athletes. Training based on a demarcation of high intensity at onset of blood lactate (OBLA) of 4 mM has been suggested to provide a more precise stimulus to yield optimal metabolic and peripheral adaptations. Adaptations which shift OBLA allow an individual to exercise at higher work rates for longer periods, translating into better overall endurance performance. PURPOSE: Identify TID related factors that delay OBLA for competitive collegiate male and female distance runners and, although PFS varies with footwear, it has no effect on running economy. This suggests collegiate distance runners can select footwear of their choice without sacrificing running performance.

It is suggested that intermittent hypoxic training (IHT) improved repeated sprint ability and maximal 30-s cycling sprint (Faiss et al, 2013; Hamlin et al, 2010; Kasi et al., 2015). Therefore, IHT may be suitable for enhancing sprint performance. However, IHT and/or altitude training have not yet been conducted in track events. PURPOSE: The purpose of the present study was to determine the effects of short-term altitude high intensity training on sea level sprint running performance in well-trained 400-m runners. METHODS: Eighteen college male 400-m runners were assigned to either a Hypoxic group (n=9) or a Normoxic group (n=9) and performed high intensity running training twice a day for 5 days. Both groups trained same high intensity training program in all weather running track. Hypoxic group trained and rested in Hida-0toge Kogen Highland Training Area (1,700-1,800m). Before and after the training, subjects were completed 60-min and 400-m maximal running test, and vertical jump test. RESULTS: The pre-training test were conducted 2, 7, 14, 21, 28 days before the final training session. RESULTS: After the 5 days of high intensity training, no significant changes in 400-m running time in both groups. However, percentage changes of 400-m running time were significantly higher in Hypoxic group (2.1±1.0 %) than in Normoxic group (1.0±0.9 %). 30-min time during the latter half of 60-min running was significantly increased in 7-days after training (Hypoxic: 3.15±0.04 vs 3.23±0.03 sec; Normoxic: 3.16±0.03 vs 3.22±0.03 sec) and significantly decreased in 21-days after training (Hypoxic: 3.23±0.03 vs 3.31±0.03 sec) compared to before training. There were no significant changes in vertical jump in both groups. CONCLUSIONS: These results suggest that altitude high intensity training is effective for 400-m runners.

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: To determine the effect of a medicine ball training program on running economy. METHODS: At this time, 7 runners (age = 22.86 ± 6.23 years) have completed the pre- and post-push up, curl-up, running economy at 187 m/min and 204 m/min, and a maximal oxygen consumption test, with 10 additional runners in the process of completing the protocol. Following the pre-test, participants were matched for gender and VO$_2$max and randomly assigned to either the intervention (I) or control (C) group. The intervention (I) group completed a 6-week progressive medicine ball training program. Statistical analysis was performed using independent t-tests and Pearson product-moment correlations. Significance was set at p < 0.05. summary of 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 pre- and post test 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 curls-ups completed by 21.0±19.0 while the C group decreased by 3.3±10.2. Running economy at 187 m/min, decreased by 2.0±1.0 ml/kg/min and 0.7±4.1 ml/kg/min for the I and C groups, respectively. At 206 m/min running economy, decreases by 1.9±1.3 ml/kg/min for the I group and increased by 0.5±2.4 for the C group. VO$_2$ 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 curls-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=0.129; 187 m/min: r=0.262, p=0.738, 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 VO₂max test (GXT) on a treadmill during an initial testing session. The TT was performed on an indoor 3000 m track 24-72 h following the GXT. Each participant was then randomly assigned to either the RUN (100% normal run training) or COMBINED (COM) 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 (n=0.025) were utilized to compare the physiological variables before and after training separated for each group. A Bonferroni correction was performed in order to adjust the alpha value to avoid statistical error. Before training values for VO₂max (ml/kg/min) (RUN [59.9±4.3±9.2] and COM [62.67±6.41]) were not significantly different (p<0.025) compared to after training values of VO₂max (RUN [60.59±4.61] and COM [63.17±7.97]). There also were no significant differences for VT, RCP, or TT values (p<0.025) before and after training for both the RUN and COM groups. No significant differences were seen when VT and RCP were expressed as a percent of VO₂max. 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 (21.6±6.7yrs, 179.1±4.6cm, 75.2±11.5kg) and 15 females (21.6±6.3yrs, 167.6±4.6cm, 65.7±19.5kg) 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 10 seconds to 3 seconds throughout the test. Following 9 lengths, subjects continued游泳 at 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±7.4ml/kg/min, females: 39.8±5.3ml/kg/min, p<0.001) and lower HRmax (males: 173.3±7.69, females: 180.7±7.78, p=0.032) compared to females. There were no gender differences in RPE (males: 8.6±0.7, females: 8.0±0.7, p=0.0), or BLA (males: 11.5±3.4±7.0, females: 9.5±2.9, p=0.269). 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.

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Tuesday, May 31, 2017

525 Board #346 May 31 11:00 AM - 12:30 PM Effects of Replacing Run Training with Elliptical Bicycle Training in Experienced Runners Jordan Oddis, Ohio University, Athens, OH. (No relationships reported)
Gender Differences In Mean And Peak Swimming Force, Validity, Reliability, Of A Tethered Swimming Test

Jacquelyn Nagle, Elizabeth Nagle, FACSFM, Takashi Nagai, Mita Lovlekar, Christopher Connaboy, John Ait, FACSFM, Scott Lephart, FACSFM, Scott Lephart, FACSFM. 1. John Carroll University; University Heights, OH. 2. University of Pittsburgh; Pittsburgh, PA. 3. University of Kentucky, Lexington, KY.

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(No relationships reported)

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 swimming velocity obtained during the PS.

RESULTS: Gender differences are shown in Table 1. For males/females respectively, intersession for Fpeak (0.645/0.786) and for Fmean (0.965/0.985), and intra session for Fpeak (0.645/0.786) and Fmean (0.920/0.990), were statistically significant (p<0.05). Criterion validity is shown in Table 2.

Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>T-test</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>TST Fpeak</td>
<td>277.43</td>
<td>54.51</td>
<td>191.58</td>
</tr>
<tr>
<td>Fmean</td>
<td>99.31</td>
<td>24.58</td>
<td>74.30</td>
</tr>
<tr>
<td>WAnT Fpeak</td>
<td>1005.53</td>
<td>188.89</td>
<td>724.87</td>
</tr>
<tr>
<td>Fmean</td>
<td>707.47</td>
<td>99.81</td>
<td>443.27</td>
</tr>
</tbody>
</table>

Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Criterion Validity: TST Fpeak</th>
<th>Criterion Validity: WAnT Fpeak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pearson</td>
<td>Pearson</td>
</tr>
<tr>
<td>Males:</td>
<td>WAnT Fpeak 0.280</td>
<td>WAnT Fpeak 0.396</td>
</tr>
<tr>
<td>PS 25yd</td>
<td>0.666*</td>
<td>0.636*</td>
</tr>
<tr>
<td>PS 50yd</td>
<td>0.746*</td>
<td>0.336</td>
</tr>
<tr>
<td>PS 100yd</td>
<td>0.763*</td>
<td>0.566</td>
</tr>
<tr>
<td>Females:</td>
<td>WAnT Fpeak 0.775**</td>
<td>WAnT Fpeak 0.698**</td>
</tr>
<tr>
<td>PS 25yd</td>
<td>0.931**</td>
<td>0.679*</td>
</tr>
<tr>
<td>PS 50yd</td>
<td>0.906**</td>
<td>0.710*</td>
</tr>
<tr>
<td>PS 100yd</td>
<td>0.869**</td>
<td>0.684*</td>
</tr>
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</table>

CONCLUSIONS: Although gender differences exist for anaerobic performance of swimmers, the TST is still considered a reliable method with moderate/strong association with swim velocity. Results of this study further solidify the need for a modality specific measure of anaerobic power and capacity, due to the lack of association between the TST and land based measures in males.

Supported by ONR: N00014-14-1-0022/N00014-15-0069
actual rank for lanes 1-3 and 6-8 (p < 0.05); median difference in rank (interquartile range) for Lanes 1-8 was 1 (0.5 to 1.5), 1 (0.5 to 1.5), 3 (2.5 to 3.5), 0.5 (0.5 to 1), 0 (0 to 0.5), -1.5 (-2 to -1), -2 (-2.5 to -1.5), and -3.5 (-4 to -3.5), respectively.

CONCLUSIONS: This analysis provides evidence that 2016 Olympic swimmers’ performances were affected by their LA. Use of model estimates of the effects of LA and Distance on direction FR splits to estimate unbiased 50-m FR performances is a practical, post-hoc tool to quantify the lane bias effect on race outcomes. 50-m swimmers in Lanes 6-8 benefitted the most, finishing 1 to 3 places higher than they would have without the bias. That some athletes may have won medals simply due to factors of the pool environment should be very alarming to all swim stakeholders.

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 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. Female Swimmers were included if they had logged their yearly training volume and had participated 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 (highest 25% of PPS) swimmers 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 ± 23.4 kg/m², t = 2.30, P = 0.02, d = 0.40). The later matures performed better than the earlier matures (PPS 802.6 ± 753.4 vs. 711.1, P = 0.04, d = 0.39) and had lower BMIs (22.5 ± 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 pertaining to weight per height (BMI) are consistent with these reports. And taken together, they 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.

CONCLUSIONS: This analysis provides evidence that 2016 Olympic swimmers’ performances were affected by their LA. Use of model estimates of the effects of LA and Distance on direction FR splits to estimate unbiased 50-m FR performances is a practical, post-hoc tool to quantify the lane bias effect on race outcomes. 50-m swimmers in Lanes 6-8 benefitted the most, finishing 1 to 3 places higher than they would have without the bias. That some athletes may have won medals simply due to factors of the pool environment should be very alarming to all swim stakeholders.

Masters athletes make every effort to maintain or even improve the athletic performance they accomplished when they were young. However, a decline in athletic 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: Fifteen 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 = 32.6s; Male = 30.5s) and 200 (Female = 168.6s; Male = 159.3s) 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 (-0.713; p = 0.003) and 200 yd (-0.724; p = 0.002) freestyle SP. Compared to the slower female, the faster swimmer 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 muscle mass can compete at higher levels. 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/ N00014-15-06069

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: Fifteen 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 = 32.6s; Male = 30.5s) and 200 (Female = 168.6s; Male = 159.3s) 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 (-0.713; p = 0.003) and 200 yd (-0.724; p = 0.002) freestyle SP. Compared to the slower female, the faster swimmer 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 muscle mass can compete at higher levels. 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/ N00014-15-06069

Masters athletes make every effort to maintain or even improve the athletic performance they accomplished when they were young. However, a decline in athletic performance is one of the inevitable consequences of aging. Precise physiological mechanisms of age-related decline in athletic performance are not known but it is thought to be driven by decreases in exercise training stimuli. PURPOSE: We determined the influence of changes in training volume with aging on swimming performance by using both cross-sectional and longitudinal approaches. METHODS: Competitive swimmers who were members of the US Masters Swimming association were included if they had logged their yearly training volume and had participated in 50m freestyle events at a USMS meet between 2011 and 2015. A total of 692 and 98 swimmers aged 20-88 years were studied in the cross-sectional and longitudinal analyses. Multiple regression and mixed effects multiple regression models were used with gender as a covariate. The longitudinal data was then centered around different ages to find the age at which training is a significant predictor of performance. RESULTS: Both cross-sectional and longitudinal analyses showed no significant associations between swimming training volume and age. In the longitudinal analyses, training volume was not significant as a predictor in swimming performance for younger swimmers. In mid-aged swimmers, respectively, 54-79 years, increases in training volume resulted in mildly better swimming performance (i.e., 3 miles/month increases in training volume were related to .05 sec better swimming time). Increases in training volume with advancing age had more significant effects on swimming performance in older swimmers (80 years and older) (i.e., 3 miles/month increases equated with 27.4 sec improvements).

CONCLUSION: In younger swimmers, changes in training volume did not have any significant impact on swimming performance. However, in middle-aged and older swimmers, there was a graded relationship between yearly increases in training volume and swimming performance such that the impact of training volume on swimming performance appears to become greater with advancing age.
calculated using a Monte Carlo simulation method. Residual squared error (RSE), $r^2$ (squared $r$), confidence interval (CI) length, and absolute difference between observed and predicted strength at each regression model were compared.

**RESULTS**: Average RSE, $(1.24 ± 1.25)$ RSE, $(1.39 ± 1.15)$ RSE, $(0.67 ± 0.25)$. No differences existed between length of CI between to sex groups ($p=0.76$). Absolute difference in predicted strength (CI) between sexes ($p=0.24$). No differences existed between the absolute difference in predicted and observed values for the men and women models ($p=0.19$). 92.3% (n=12) of observed men and 69.2% (n=9) observed women mean performances for 2016 fell within the 95% confidence interval of the predicted value models.

**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 precursors. 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. MYO (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, MYO) 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 creatinine kinase (CK), myoglobin (MYO) 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 a Bonferroni correction were performed, with data reported as means/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 over 16 hours to 20 total training hours/week over the first seven weeks of training. Significant changes were noted in CK (135±68; 144±723; 171±83; 202±80; 180±100; 206±170U/L; p=0.01), US (1.5±1.8; 3.9±1.7; 3.3±1.8; 5.4±1.6; 6.1±1.8; 3.7±2.0; p<0.0001), LS (1.3±1.5; 5.0±2.2; 3.4±1.8; 5.0±1.9; 4.8±1.8; 4.1±2.0; 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 MYO (39±20; 63±141; 29±18; 30±17; 24±14; 29±14ng/mL; p=0.32) or testosterone (33±14; 37±14; 36±14/dL; p=0.29). Significant correlations noted between CK vs. MYO (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 MYO=691ng/mL. 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, MYO) 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 strength 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 evaluated using isokinetic dynamometry applied to dominant shoulder rotators: peak torque (PT) for external and internal rotation at velocity of 60°/s and 180°/s. The evaluations were performed after a swimming activities program inside of the pool (SWI: 28 weeks); after a swimming activities program outside of the pool (OUT: 8 weeks); after 8 weeks detraining (DET). These three experimental moments happened sequentially over the time. Both programs consisted of 60-minute sessions twice a week targeted mainly upper limb strength muscles. For statistical analysis a two-way ANOVA with repeated measures with Tukey-Kramer post hoc was carried out. RESULTS: It was showed a PT decrease (p=0.05) after OUT (22.3 ± 7.7 N.m) and DET (21.1 ± 7.1 N.m) when compared with SWI (25.4 ± 7.7 N.m) for external rotation at 60°/s. Only DET (16.9 ± 5.7 N.m) showed significant difference when compared with SWI (21.4 ± 7.7) for external rotation at 180°/s. No significant differences were showed for internal rotation. CONCLUSION: Swimming activities program outside of the pool did not produce positive effects to maintain strength level acquired after a swimming activities program inside of the pool only for external rotation at 60°/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.