Youth participation in sport and exercise is continuing to divide into under participators and over participators. How to bring youth to a safe, physically and psychologically healthy level of participation will be addressed from Achievement Motivation Theory and Self-Determination Theory perspectives. The overarching tenants of these two motivational theories and their consistent results across sport, exercise, and physical education will be presented to set the foundation for recent research results focusing on: 1) fostering youth participation through enjoyment, 2) promoting positive youth development through sport, and 3) decreasing the risks of over participation.

RESULTS: Results indicated intentionally structured programs scored higher on program quality, basic needs support, and PYD outcomes than non-intentionally structured programs, with intentional sport programs scoring significantly higher on some measures of program quality, basic needs support, and PYD than intentionally structured leadership programs. CONCLUSION: Understanding that it is important to intentionally teach life skills can help scholars working on the ground with stakeholders, particularly sport administrators involved in coach education and the development and evaluation of sport programs, to be able to improve applied practice. The knowledge derived from this research has the potential to inform how the context of youth sport should be structured to ensure that the sport context is one that not only of high quality, but also facilitates rather than inhibits needs support and positive developmental outcomes in youth. Supported by the Social Sciences and Humanities Research Council of Canada.

Sport has been identified as a favorable environment in which to promote positive youth development (PYD) as sport programming has been identified as the most popular extra-curricular activity for youth across North America. However, researchers argue that the context of sport must be intentionally structured to yield positive psychosocial outcomes. Environments that foster the three basic psychological needs of autonomy, competence, and relatedness have also been found to aid in positive psychological development. Moreover, deliberately teaching life skills can help scholars working on the ground: 1) fostering youth participation through enjoyment, 2) promoting positive youth development through sport, and 3) decreasing the risks of over participation.
Normative aging involves a progressive reduction in pulmonary function, resulting in mechanical ventilatory constraints during exercise. When matched for lung size, young women appear to have smaller conducting airways than men, which is associated with a higher work of breathing (WOB) and a propensity towards expiratory flow limitation (EFL) during exercise. However, the combined effects of aging and sex upon the mechanical ventilatory response to exercise have not been assessed. Purpose: To determine if aging affects sex-based differences in the mechanical ventilatory response to exercise previously observed in young subjects. Hypothesis: 1) older women have a higher WOB for a given ventilation (VE) compared to older men, and 2) older women experience EFL more frequently and at lower relative exercise intensities than older men. Methods: 14 healthy older subjects (60-80 years, n=9 men) and 15 healthy younger subjects (20-40 years, n=7 men) completed detailed pulmonary function testing and a maximal incremental cycle exercise test on two occasions. During exercise, subjects were instrumented with a catheter equipped with esophageal and gastric balloons to measure respiratory pressures. EFL was assessed using the negative expiratory pressure technique. To determine the independent effects of age and sex upon WOB and EFL, as well as their interactions, between-group comparisons were made as a function of VE and external work rate. Results: When comparing WOB as a function of absolute VE, there was a significant main effect for both age and sex (p<0.05), with no significant interaction effect (p>0.05). Aging increased the propensity towards EFL, but no sex-differences were observed in either the younger or older group. In the younger subjects, 57% of men and 50% of women showed EFL at maximal exercise, while no subjects in either group showed EFL at submaximal intensities. In the older subjects, EFL occurred submaximally: 44% men and 40% women showed EFL at 80% of peak work rate. At maximal exercise, 78% of older men and 100% of older women showed EFL. Conclusion: For a given absolute VE, the WOB was higher in women relative to men. This relationship appears to maintained over the course of the healthy aging process. The propensity towards EFL appears to be exacerbated by age, but no sex-differences were observed.

Infants born very preterm (≤32 weeks gestational age) with and without bronchopulmonary dysplasia (BPD, due to >28 days of postnatal O2 therapy) have arrested lung development characterized by abnormal angiogenesis and vasculogenesis. Consequently, some preterm infants have abnormally high pulmonary vascular pressures and abnormal pulmonary vascular responses to low O2, suggestive of pulmonary arterial hypertension. However, it is unknown if abnormal pulmonary vascular regulation persists into adulthood in those that survive preterm birth without BPD (BPD).

To address this question, BPD (n=20), PRE (n=15), and CON (N=25) were recruited. Participants were completed detailed pulmonary function testing and had exercise testing at 25, 50, 75, and 90% of peak workload breathing room air and, following a 60 min break, repeated the exercise protocol breathing 12% O2. PASP was measured via Doppler ultrasound and calculated using the modified Bernoulli equation: PASP = 4v^2 + Pao², where Pao = estimated right atrial pressure and v = measured peak velocity of the tricuspid regurgitation jet. Results: While breathing room air, PASP was not significantly greater in PRE compared to BPD and CON during exercise at 25, 75, and 90% of peak workload. However, during exercise at 50, 75, and 90% of peak workload, PASP was significantly greater in PRE compared to BPD and CON during exercise at 50, 75, and 90% of peak workload. In both conditions the slope of the PASP and VO2 relationship was significantly greater in PRE compared to BPD and CON. Conclusion: These data suggest that PRE have a reduced capacity for the pulmonary vasculature to accommodate the increases in cardiac output that occur during exercise in both normoxic and hypoxic conditions compared to CON and BPD. Support: American Heart Association Scientist Development Grant

Secondary data analysis from intervention studies has suggested that ≥250 min/wk of moderate-to-vigorous physical activity (MVPA) is associated with improved long-term weight loss within the context of a behavioral weight loss intervention; however, randomized clinical trials are needed to support these findings and to determine the feasibility of adults who are overweight or obese to achieve this recommended level of MVPA.

Purpose: This study examined the ability of a behavioral intervention to achieve MVPA levels recommended for public health (150 min/wk) or weight control (250 min/wk) in adults who were overweight or obese across 12 months.

METHODS: Data were examined from sedentary adults (N=230; BMI: 32.1±3.8 kg/m²; age=46.2±7.7 years) enrolled in a behavioral program and randomized to a reduced calorie diet (DIET, N=71), a diet plus a moderate dose of MVPA (MOD-EX, N=82), or a diet plus a high dose of MVPA (HIGH-EX, N=77). All groups received weekly intervention sessions in months 1-6 followed by 2 group and 2 telephone contacts per month in months 7-12, and were prescribed a diet to reduce energy intake (1200-1800 kcal/day). MOD-EX was prescribed an unsupervised MVPA that progressed to 150 min/wk, whereas HIGH-EX was progressed to 250 min/wk. WOB and weight were assessed at 0, 6, and 12 months.

RESULTS: MVPA at 6, 12 months was 52.3±60.5, 82.3±93.4, and 85.7±10.6 min/wk in DIET; 53.8±78.7, 173.1±112.5, and 185.8±134.5 min/wk in MOD-EX, and 73.2±92.2, 254.1±127.8, and 236.0±154.9 min/wk in HIGH-EX. Group X Time p-value <0.001. Weight significantly decrease in all groups at 6 months (DIET: -9.7±7.5 kg, MOD-EX: -10.2±6.4 kg, HIGH-EX: -9.5±5.4 kg; p<0.001) and 12 months (DIET: -9.7±7.5 kg, MOD-EX: -11.0±8.2 kg, HIGH-EX: -9.7±7.1 kg; p<0.001), with no significant difference between groups.

CONCLUSIONS: The MOD-EX and HIGH-EX interventions were successful at achieving the prescribed dose of MVPA in adults with obesity. The lack of additional weight loss with participation in higher amounts of MVPA may suggest that there is a compensatory response in factors influencing energy balance that warrant further investigation.

Supported by: NIH (R01 HL103646)
Few studies have examined if change in moderate-to-vigorous physical activity (MVPA) prior to bariatric surgery is associated with post-surgery weight loss. PURPOSE: To examine if change in pre-surgery MVPA resulting from 6-months of usual care (UC) or a pre-surgical behavioral lifestyle intervention (BLI) is associated with weight change following bariatric surgery. METHODS: Data from adults with severe obesity (N=97; BMI 47±5.9 kg/m²) electing to undergo either Roux-en-Y gastric bypass (RYGB) or laparoscopic adjustable gastric banding (LAGB) were used for this study. These subjects are a subset from a larger trial who provided complete physical activity and weight data, were randomized to UC or BLI for 6 months prior to their bariatric surgery procedure, and not lost to follow-up. UC received physician recommendations for diet and activity. BLI participated in a behavioral weight management program that included 12 in-person sessions and 12 telephone contacts. BLI was prescribed a reduced energy diet (1200-1400 kcal/day) and to increase MVPA to 30 minutes on 5 days/wk. MVPA was measured prior to and following the pre-surgical period, with MVPA defined as min/wk from activity bouts ≥10 minutes in duration at ≥3 METS. Weight was assessed pre- and post-UC or BLI, and 6, 12 and 24 months post-surgery. RESULTS: After controlling for weight change pre-surgery, change in MVPA prior to surgery in those receiving UC was not significantly associated with 24 month weight change post-surgery for LABG (r=0.40, p=0.13) or RYGB (r=0.09, p=0.74). The association between change in MVPA prior to surgery and 24 month loss post-surgery in those receiving BLI was 0.42 (p=0.09) in LABG and 0.07 (p=0.80) in RYGB. CONCLUSION: Pre-surgery change in MVPA was not predictive of post-surgery weight loss in patients undergoing either RYGB or LAGB. Whether pre-surgery MVPA is associated with other health benefits post-surgery warrants additional investigation. Supported by the NIH (R01 DK077102)

CONCLUSIONS: Changes in intermuscular adipose tissue and muscle quality are both independent predictors of improved physical function following exercise and weight loss in overweight/obese older women; however, their relative importance may vary according to the functional task. Funded in part by The Beef Checkoff: co-PIs; Evans & Johnson

Psychological factors related to eating behavior including components of the Three-Factor Eating Questionnaire (TFEQ) and the Power of Food Scale (PFS) may predict some of the variance in changes in weight and energy intake in response to a behavioral intervention. The ability of high intensity interval training (HIIT) to influence these variables is unknown, but evidence suggests that HIIT may offer similar or superior health benefits with decreased time commitment versus continuous aerobic exercise. PURPOSE: To examine changes in these psychological constructs in response to HIIT and determine if they are related to changes in body composition and energy intake.

METHODS: Active participants were either randomized to a control (n = 17) or one of three HIIT regimes (n = 27) for 6 weeks. Controls maintained their activity whilst participants in HIIT completed 3 d·wk-1 of training. Before and after training, participants completed the TFEQ, PFS, and a 4-day food record. HIIT groups were pooled for this analysis. Repeated-measures ANOVA for time, group, and sex were used to analyze data.

RESULTS: Complete survey data were available from all controls and 19 experimental subjects (17 W and 19 M). No main effects of group were observed (p>0.05), but a main effect of time (p<0.05) for Disinhibition and a group*time interaction for Hunger (p<0.05) were observed. Disinhibition decreased overall time (p<0.05) whilst hunger decreased from baseline in the HIIT group (p<0.05). For a subsample (13 M and 12 W), Flexible Restraint and Internal Disinhibition decreased overall time (p<0.05).

CONCLUSIONS: Data suggest that an HIIT intervention does not significantly impact eating behavior at a group level, though a slight reduction in susceptibility to hunger was observed. Individual variability in psychological measures of eating behavior may be linked to changes in energy intake and body weight.
CONCLUSION: The BMI of young adults seeking weight loss is inversely associated with both MVPA and fitness, but not associated with cognitive restraint and disinhibition. However the relationships between MVPA, fitness, and external disinhibition, as well as between fitness and flexible restraint warrant further exploration. These may indicate that these young adults use exercise as a compensatory behavior for disinhibited eating that occurs in response to environmental cues and are less flexible with approaches to their eating behavior. Supported by the NIH (U01 HL008840)

Previous studies have shown individual differences in the energy intake (EI) response to exercise, but homeostatic or cognitive mechanisms underlying these differences are unclear, particularly in youth. Fat-free mass is a known predictor of daily EI in adolescents and adults, predominantly through its effects on resting metabolic rate and total energy expenditure. In addition, studies in adults have shown that increased perceived difficulty of exercise is associated with caloric over-compensation through greater EI. However, the influence of these biological and psychological factors in children is unknown.

PURPOSE: To examine the predictors of post-exercise EI in children.

METHODS: Healthy-weight children ages 9-12 years (n = 18) reported to the laboratory for a baseline and 2 experimental visits (EX = exercise, SED = sedentary) each separated by 1 week in a randomized crossover design. Percent body fat (bioelectrical impedance analysis), weight (kg), and height (m) were used to calculate fat-mass index (FMI) and fat-free mass index (FFMI; kg/m²). On the EX day, children exercised at 70% estimated VO₂max for 30 minutes on a cycle ergometer and gave ratings of perceived exertion (RPE). Objective EI (kcal) was measured at identical meals on the EX and SED days: standard breakfast and ad libitum lunch, snack, and dinner. Paired t-tests, Pearson’s correlations, and multiple linear regressions were performed using SPSS.

RESULTS: Total EI was not statistically different between the EX and SED days (r = 0.47, p = 0.64). However, FFMI was positively associated with EI on the EX day (r = 0.50, p < 0.05), but not the SED day (r = 0.25). RPE was also positively associated with EI on the EX day (r = 0.78, p < 0.01). Together, FFMI and RPE explained 71% of the variability in EI on the EX day (r² = 0.71, p < 0.01).

CONCLUSIONS: Fat-free mass was associated with EI on the EX day but not the SED day, suggesting better homeostatic regulation of EI with imposed exercise. Despite experiencing the same 70% relative exercise intensity, children varied in their perceived difficulty of the exercise. Increased perceived difficulty predicted greater EI on the EX day. These findings demonstrate a role for both homeostatic and cognitive factors in post-exercise EI regulation in children.

Supported by USDA/NIFA Grant #2011-67001-30117 Program A2121.

CONCLUSIONS: While both active conditions increase TEE and the proportion of fat oxidation, SIT-C results in higher microbursts relative to SIT and WALK. Although one might speculate that sedentary conditions would have lower TEE, this did not occur. In fact, SIT had higher TEE compared to WALK during the microburst periods.

RESULTS: Based on the first activity performed, EE during WALK (55.9±14.2 kcal) was significantly greater than SIT-C (19.6±6.9 kcal), SIT-T (18.7±4.0 kcal), and STAND (21.9±5.1 kcal) (p<0.001). EE did not significantly increase when transitioning from SIT-C (19.6±6.4 kcal) to STAND (21.5±7.1 kcal), however, EE significantly increased when transitioning from SIT-T (18.6±4.0 kcal) to WALK (51.3±13.4 kcal) (p<0.001). EE significantly decreased when transitioning from STAND (21.9±5.1 kcal) to SIT-C (19.1±4.1 kcal) (p<0.024) and from WALK (55.9±14.1 kcal) to SIT-T (20.3±6.1 kcal) (p<0.001). Cumulative EE in SIT-T to WALK (74.5±17.9 kcal) and WALK to SIT-T (82.7±21.7 kcal) were significantly greater than EE in SIT-C to STAND (45.4±14.8 kcal) and SIT-C to SIT-T (45.6±9.7 kcal) (p<0.001).

CONCLUSION: Substituting walking for periods of sitting or standing increases EE; however, substituting periods of sitting with standing does not increase EE. Thus, the potential benefits of sitting as opposed to sitting need further investigation beyond the influence on EE.

PURPOSE: To compare the metabolic effects of 4 days of activity microbursts (MICRO: 5 minutes of moderate intensity walking every hour for 9 hours) to a isocaloric single 45-min bout of moderate intensity walking (ONE) and a sedentary control condition (SIT) in overweight adults.

METHODS: Nine (6F/3M, 31.7 ± 7.1 yo, BMI=31.0 ± 1.9 kg/m2) out of 24 subjects have completed all 3 conditions (MICRO, ONE, SIT) of an ongoing randomized crossover study. Each condition consisted of 3 days in a free living state during which physical activity and sedentary time were measured (ActiGraph and ActiPAL) followed by a 24hr stay in a whole room calorimeter to measure total energy expenditure (TEE) and substrate utilization. Protein oxidation was estimated by urinary nitrogen excretion. TEE and substrate use were also analyzed separately for the waking and nocturnal periods. Energy intake was controlled and matched across days and conditions by design.

RESULTS: As expected, 24hr TEE increased in both ONE and MICRO conditions resulting in a negative energy balance (ONE: -318 ± 183 kcal; MICRO: -331 ± 169 kcal) compared to SIT (+9 ± 136 kcal, p=0.05 for both). Respiratory quotient (RQ) decreased over 24hrs in both active conditions compared to SIT (p=0.05) with the most pronounced drop in RQ observed during the night (ONE: 0.866 ± 0.230, MICRO: 0.866 ± 0.012, SIT: 0.883 ± 0.280, p<0.03 for both) despite similar nocturnal EE among conditions. Although 24hr fat oxidation increased in both ONE and MICRO (p<0.05 for both), carbohydrate and protein oxidation did not change. Both ONE and MICRO doubled nocturnal fat oxidation (p=0.08 for both), while MICRO only decreased nocturnal carbohydrate oxidation (-24%, p=0.04) compared to SIT. In both free living and laboratory conditions, sedentary time tended to be lower during MICRO (p=0.07) compared to SIT. Using visual analog scale, subjects reported ONE more challenging to perform than MICRO (p=0.05).

CONCLUSIONS: While both active conditions increase TEE and the proportion of fat oxidized, the underlying mechanisms may be different between one bout and multiple bouts of physical activity. Changes in substrate oxidation observed at night suggest sleep is a key period involved in the regulation of energy homeostasis. Frequently interrupting sitting may be a promising strategy to reduce total sedentary time.

CONCLUSIONS: While substituting periods of sitting with standing does not increase EE, the potential benefits of sitting as opposed to sitting need further investigation beyond the influence on EE.

Sedentary behavior contributes to decreased energy expenditure (EE) and negative health outcomes. Thus, identifying effective strategies to reduce sedentary behavior that may increase EE will be important to combat the harmful effects of sedentary behavior.

PURPOSE: This study examined EE during acute periods of sitting, standing, and walking.

METHODS: Participants (N=74; age=24.2±3.6 years; BMI=24.3±3.2 kg/m²; % female=58%; % overweight=34%) were randomized to two of the following activities: sitting using a laptop computer (SIT-C), sitting watching television (SIT-T), standing watching television (STAND), or walking at a self-selected pace ≤3.0 mph (WALK). Each activity lasted 15 minutes with a three minute transition period between activities. The experimental conditions were: SIT-C to STAND (N=18), SIT-T to WALK (N=18), STAND to SIT-C (N=20), and WALK to SIT-T (N=18). EE was measured using indirect calorimetry.
was associated with meeting aerobic activity guidelines. Among Cubans, medium social cohesion (OR: 2.20; 95% CI: 1.06, 4.54) was associated with meeting aerobic activity guidelines. However, among Dominicans, those who reported medium and high social cohesion (OR: 0.18, 95% CI: 0.07, 0.51; OR: 0.33, 95% CI: 0.11, 0.99, respectively) were less likely to meet aerobic activity guidelines. CONCLUSION: Among Hispanics, neighborhood social cohesion is associated with meeting aerobic activity guidelines. The variation in activity and the role of neighborhood social cohesion across Hispanic subgroups should be considered when tailoring interventions.

613 Board #3 June 1, 1:00 PM - 3:00 PM
Predictive Relationship Between Body Mass Index and TGMD-3 Performance in Disadvantaged Children
Sara Goodrum, Timothy A. Brusseau, Yi Fang, Natalie L. Norris, Ryan D. Burns.
University of Utah, SALT LAKE CITY, UT.
(No relationships reported)

Acquiring motor skills are an important part to childhood development. The better a child is able to develop their motor skills the more likely they will be able to utilize the skills and participate in optimal levels of physical activity.

PURPOSE: The purpose of this study was to assess the predictive relationship between BMI classification and gross motor skills assessed using the TGMD-3 instrument in a sample of ethnic minority elementary school-aged children from low-income families. METHODS: The participants were a convenience sample of 525 children (Mean age = 9.4 ± 1.8 years; 1st - 6th grades; 246 girls; 279 boys; 93% low-income; 86% ethnic minority) recruited from a Title I school located in a metropolitan area from the Mountain West region of the U.S. Motor skills were assessed using the TGMD-3 instrument during physical education classes in the Fall of 2015. Height and weight measurements were recorded approximately 2 weeks prior to assessing motor skills. BMI was stratified into underweight (< 18.5 kg/m²), healthy weight (18.5 - 25 kg/m²; reference) and overweight or obese (> 25 kg/m²) categories. Multi-level mixed-effects models were used to examine the predictive relationship between BMI classification and performance on the locomotor sub-test, ball skill sub-test, and total TGMD-3 scores controlling for grade level, sex, and the clustering of students within classrooms. Alpha level was adjusted using the Bonferroni method because of multiple dependent variables.

RESULTS: Children who were overweight or obese performed 8.6 points lower on the TMGD-3 compared to children who had healthy BMI (β = −8.6, p < 0.001) and performed 5.9 points lower on the locomotor sub-test compared to children who had healthy BMI (β = −5.9, p < 0.001) after controlling for grade level, sex, and classroom-level clustering. There were no significant predictive relationships between BMI classification and the ball skill sub-test scores (p > 0.01).

CONCLUSION: Overweight and obese disadvantaged children tended to have poorer performance on the locomotor sub-test of the TGMD-3 compared to children with a healthy BMI, suggesting the importance of learning these fundamental skills at an early age.

614 Board #4 June 1, 1:00 PM - 3:00 PM
Latino Parents Of Preschoolers’ Perceptions Of Healthy Living: Focus Group Findings To Inform Intervention
Laura Macia, Patricia I. Documet, Carla Escobado, Tahereh Mirzakazemi, Ivonne Sanchez, Sharon E. Taunoro Ross.
University of Pittsburgh, Pittsburgh, PA. (Sponsor: Russell R. Pate, FACSM)
Email: lam60@pitt.edu
(No relationships reported)

PURPOSE: Latino preschool children have higher rates of obesity than children from other racial/ethnic backgrounds. The purpose of this study is to explore Latino parents’ perspectives on a healthy lifestyle and identify strategies to incorporate in a family-based child obesity prevention intervention.

METHODS: A trained team conducted five focus groups between November 2014 and June 2015 with 31 Latino parents of children 2-5 years of age. Participants were recruited from the community using flyers and word of mouth. The focus groups took place in Spanish at community venues and included a series of questions and prompts to elicit information regarding target behaviors, personal/environmental determinants of those behaviors, and culturally-appropriate intervention strategies related to diet, physical activity, and weight control. Discussions lasted approximately 1.5 hours, were audio-recorded and transcribed verbatim. A project team member verified transcripts against the audio file. Three project team members independently read the transcripts and developed initial codes and definitions. Two project team members coded all of the transcripts, compared results and solved disagreements through discussion. Data were then analyzed according to the constant comparison method to identify salient categories, themes, and patterns in the data.

RESULTS: Participants were eager to obtain more information on diet and exercise. Specifically, they wanted guidance on what to eat and how to prepare it, as well as...
S122 Vol. 48 No. 5 Supplement

MEDICINE & SCIENCE IN SPORTS & EXERCISE®

WEDNESDAY, JUNE 1, 2016

Board #5 June 1, 1:00 PM - 3:00 PM

Sensitivity And Specificity Of WHO-BMI Criteria For Obesity Of Asian Youth: The Asia-fit Study

Stanley Sai-chen Hui, FACSIM, Koya Suzuki, Hisashi Naito, Govindasamy Balasekaran, FACSIM, Jong Kook Song¹, Soo Yeon Park¹, Ying Mei Liu¹, Dajiang Lu², Bee Koon Poh², Kallaya Kijboonchoo⁴, The Chinese University of Hong Kong, Shatin, Hong Kong. ¹Juntendo University, Tokyo, Japan. ²Nanyang Technological University, Singapore, Singapore. ³Kyung Hee University, Seoul, Korea, Republic of. ⁴Yong In University, Seoul, Korea, Republic of. ⁵National Yang-Ming University, Taipei, Taiwan. ⁶Shanghai University of Sport, Shanghai, China. ⁷The National University of Malaysia, Kuala Lumpur, Malaysia. ⁸Mahidol University, Bangkok, Thailand.

Email: hui2162@cuhk.edu.hk

The WHO body mass index (BMI) standards have been used globally for defining childhood obesity (WHO, 2007), few studies have assessed their diagnostic accuracy in Asian adolescents.

PURPOSE: To investigate the sensitivity and specificity of WHO-BMI criteria for detecting excess fatness in Asian adolescents.

METHODS: As part of the Asia-Fit study, body height, weight, and percentage of body fat (%fat) of 12,428 Asian youths (age 12-15 yrs, 52% boys, 48% girls) drawn from eight metropolitan cities of Asia (Bangkok, Hong Kong, Kuala Lumpur, Seoul, Shanghai, Singapore, Taipei, and Tokyo, n=1,600 each city) were collected. Standardized procedures and equipment were adopted in each city. Height was measured using SECA height roller (SECA S-206, USA). Weight and %fat were measured by bioelectrical impedance scale (TANITA BC-740, Japan). Validity of the %fat scale was reported in another source (Wang & Hui, 2015). Obese adolescents were identified using WHO age-specific BMI criteria. Meanwhile criterion reference of obesity was defined as %fat ≥ 25% in boys and ≥ 30% in girls (Williams et al., 1992). All data was collected within 2013.

RESULTS: According to WHO-BMI criteria, overall prevalence of obesity was 10.3% (boys 13.8%, girls 6.6%), as compared to 26.4% (boys 24.4%, girls 28.6%) for %fat criteria. For all eight Asian cities, obesity rates for %fat criteria were two to three times higher than the WHO-BMI criteria. Prevalence of obesity among the eight cities was different (p<0.001). Tokyo youth reported the lowest prevalence (4.8%) for WHO-BMI standard & 15.7% for %fat standard), whereas highest was Taipei (14.4%) for WHO-BMI standard and Seoul (36.2%) for %fat standard. Overall sensitivity was low at 0.38 (ranged from 0.314 to 0.477 for the eight Asian cities), specificity was very high at 0.966 (ranged from 0.993 to 0.999 for the eight Asian cities). Correlations between BMI and %fat were very high (r=0.89-0.92 for boys; r=0.89-0.93 for girls). Regression revealed that the corresponding %fat cut-off for the WHO-BMI standards were high at 38.2% for girls and 28.7% for boys.

CONCLUSIONS: BMI and body fatness was highly correlated in Asian youth, thus would be a suitable measure for childhood obesity screening. However, the current WHO-BMI cut-off values need to be reviewed due to its' low sensitivity and very high specificity.

Board #6 June 1, 1:00 PM - 3:00 PM

Association Between Anthropometric Measures and Sedentary Time in HIV+ Adults in Puerto Rico

Gloria M. Torres-Ayala, Marcos A. Almambert-Birriel, Farah A. Ramirez Marrero, FACSIM, University of Puerto Rico, Rio Piedras Campus, San Juan, PR.

Email: torres.ayala.gloria@gmail.com

(Supplement) (No relationships reported)

Sedentary time (ST) and physical inactivity are risk factors for developing chronic health complications including metabolic syndrome and cardiorespiratory disease, both highly prevalent in HIV-infected (HIV+) adults. Morphologic changes are also present in this population, mostly characterized with increased visceral fat and reduced peripheral fat. PURPOSE: To evaluate the association between ST and anthropometric measures in HIV+ adults in Puerto Rico.

METHODS: A group of 58 HIV+ Hispanic adults (31 females, 27 men; mean age = 49.3±7.1 years) wore accelerometers for 7 consecutive days (ActiGraph GT3X+). Anthropometric measures were used to calculate body mass index (BMI), waist to hip ratio (WHR), and body shape index (ABSI). A t-test was conducted to detect gender differences, and correlation and regression analysis to evaluate associations between ST, BMI, WHR, and ABSI.

RESULTS: No gender differences were detected in ST (males = 844.2±62.6min; females = 789.7±30.8 min/week). Correlation and regression analysis showed no significant association between ST and BMI (r=0.20, P=0.14), but a significant and direct association between ST and WHR (r=0.35, P<0.007), and ABSI (r=0.32, P=0.02).

CONCLUSIONS: Hispanic HIV+ patients in this study showed similar trend for high ST observed in the general population. WHR and ABSI, two anthropometric characteristics related to metabolic and cardiovascular disease, were directly associated with ST. Reducing ST must be an important approach in the health management of HIV+ patients in Puerto Rico, independently of gender. Supported in part by NIH/CTSA KL2-RR024151, NIH/NCCR U54 RR026139.

Board #7 June 1, 1:00 PM - 3:00 PM

Neighborhood Environment, Physical Activity and Health Outcomes in Underserved Hispanic Children

Tao Zhang, Katherine Thomas Thomas, Scott Martin, FACSIM, Xiangli Gu, Gene Farren, University of North Texas, Denton, TX.

Email: TAO.ZHANG@UNT.EDU

(No relationships reported)

PURPOSE: Despite significant health benefits of regular physical activity (PA), many underserved Hispanic children do not meet recommended PA guidelines to promote their health. PA and health status are consistently lower among girls than boys (USDHHS, 2010). Thus, using a social ecological model as a framework, this study attempted to investigate the relationships among neighborhood environment attributes, PA, health-related quality of life (HRQOL), and body composition of underserved Hispanic children.

METHODS: Participants were 163 preschool children (M= 4.7 ± 5.5; 88 boys, 75 girls) who were enrolled in a childcare network in the United States. Children’s parents completed validated survey items which assessed neighborhood environmental attributes (Rosenberg et al., 2009) and HRQOL (Varni et al., 2001). Body composition was estimated by calculating the percent body fat from children’s triceps and calf skinfolds. Actical accelerometers (Koninklijke Philips Electronics, N.V.) were used to assess children’s seven-day moderate-to-vigorous PA (MVPA) and sedentary behavior.

RESULTS: Descriptive statistics indicated that parent proxy-reports of neighborhood environmental attributes and HRQOL values were relatively high. Although children’s percent body fat values were optimal, children spent around 45% of their time in sedentary behavior. Multiple regression analyses revealed street connectivity (β = 0.21, P < 0.05) and crime safety (β = 0.20, P < 0.05) were significant predictors of children’s MVPA (R² = 0.79 %). Further, neighborhood aesthetics (β = 0.18, P < 0.05) and residential density (β = −0.16, P = 0.05) were significant predictors of HRQOL (R² = 6.2%). A one-way MANOVA results (Wilks’s λ = 0.92, P < 0.05) indicated that boys (M = 18.54) have lower percent body fat than girls (M = 20.44).

CONCLUSION: Findings demonstrated that neighborhood environmental attributes were important in predicting Hispanic children’s MVPA and HRQOL. Further, boys have less subcutaneous fat than girls. This study suggests that while these underserved Hispanic children spent too much time in sedentary behaviors, the neighborhood environment was not a barrier. Thus, practitioners must consider other factors to increase PA and reduce sedentary behavior in underserved Hispanic children.

Board #8 June 1, 1:00 PM - 3:00 PM

Knowledge About Metabolic Syndrome In A Hispanic College Age Population In South Texas

Soojin Yoo, Jesus P. Martinez, Juanito Gonzalez, University of Texas, Rio Grande Valley, Edinburg, TX.

Email: sooj.yoo@utrgv.edu

(No relationships reported)

Purpose: To educate young Hispanic students that knowledge about metabolic syndrome and regular physical activity can reduce the risks for the development of chronic diseases among adults including cardiovascular disease, cancer, and diabetes. This study examined Hispanic college students’ knowledge about metabolic syndrome. Methods: Using a cross-sectional descriptive design, focus was on assessing knowledge performance and relating it to gender. Study participants were 50 Hispanic college students between the ages of 19-30 years of age. Participants completed a questionnaire designed to measure knowledge about metabolic syndrome. From the questionnaire developed and adopted by Yahia et al. (2014) and Becker et al. (2008), 59 items assessed students’ knowledge about metabolic syndrome. All data analyses performed using Statistical Package for Social Science version 21.0 (IBM, 2012). Sample respondents were categorized based on gender using Independent T-test. Results: Participants did not appear to know about metabolic syndrome (e.g., diabetes, adiposity, hypertension, high blood cholesterol, and arteriosclerosis). The overall

ACSM May 31 – June 4, 2016 Boston, Massachusetts
mean was 5.22 out of 10 (52.2%) with men scoring 57.1% than women (48.3%). Also, correct answer rates were varied on each concept; diabetes (58.6%), adiposity (44.9%), high blood pressure (40.8%), and arterial sclerosis (48.8%). Conclusions: The prevalence of diabetes and cardiovascular disorders is high in south Texas. Previous studies by Gonzalez, et. al (2015) showed high risk in Kinesiology majors for metabolic syndrome. Establishing the knowledge base in students about metabolic syndrome at a point in their lives where this condition can be reversed is impactful.

B-17 Thematic Poster - HIIT
Wednesday, June 1, 2016, 1:00 PM - 3:00 PM
Room: 101
Chair: Len R. Kravitz, University of New Mexico, Albuquerque, NM.

No relationships reported

619 Board #1 June 1, 1:00 PM - 3:00 PM Skeletal Adaptations After 16-Weeks of High Intensity Functional Training
Wade Hoffstetter, Allyson Box, Hannah Minnus, Paul Serafini, Mathew Smith, Braian Kliszczewicz, Gerald Mangine, Yuri Feito, FACSFM. Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSFM)

High-Intensity Functional Training (HIIT) has recently gained popularity due to its limited time commitment and purported positive physiological effects. PURPOSE: To examine if gender played a role in skeletal mass adaptations in active adults after 16-weeks of HIIT.

METHODS: Nine men (34.2 ± 9.12 yrs, 1.78 ± 0.05 m, 91.5 ± 17.7 kg) and 17 women (36.3 ± 7.84 yrs, 1.63 ± 0.07 m, 68.5 ± 12.8 kg) with CrossFit™ experience completed 16-weeks (2 - 5 sessions/wk) of HIIT. Within two weeks prior to training, pre-testing (PRE) measures of bone mineral density (BMD) and bone mineral content (BMC) were measured using Dual-Energy X-Ray Absorptiometry (DXA). Strength pre-testing (PRE) measures of bone mineral density (BMD) and bone mineral content (BMC) were measured using Dual-Energy X-Ray Absorptiometry (DXA). Strength was assessed via a five-repetition maximal front squat (5RM). Post-testing (POST) was completed following 16-weeks of training.

RESULTS: Repeated measures ANOVA did not indicate any significant (p > 0.05) differences in strength (PRE: 66.02 ± 21.52 Kg, POST: 74.43 ± 22.16 Kg) for the entire group. An increase in BMC (PRE: 2,855.7 ± 610.68 g, POST: 2,869.2 ± 600.44 g) and an increase in skeletal muscle mass (SMM) (PRE: 7,289.4 ± 1475.3 g, POST: 7,523.2 ± 1497.6 g) was observed for the entire group. Post-tests (POST) measures of bone mineral density (BMD) and bone mineral content (BMC) were measured using Dual-Energy X-Ray Absorptiometry (DXA). Strength post-testing (POST) measures of bone mineral density (BMD) and bone mineral content (BMC) were measured using Dual-Energy X-Ray Absorptiometry (DXA). Strength was assessed via a five-repetition maximal front squat (5RM). Post-testing (POST) completed following 16-weeks of training.

CONCLUSIONS: It appears that a 16-week HIIT program is a suitable exercise program to increase BMC and SMM. However, we believe the length of our study may not be suitable to positively influence BMD. Future studies should consider longer interventions and controlling for total work volume.

620 Board #2 June 1, 1:00 PM - 3:00 PM Skill-based Performance Improves After 16-weeks Of High-Intensity Functional Training
Mathew Smith, Allyson Box, Wade Hoffstetter, Gerald Mangine, Paul Serafini, Brian Kliszczewicz, Yuri Feito, FACSFM. Kennesaw State University, Kennesaw, GA. (Sponsor: Yuri Feito, FACSFM)

High-Intensity Functional Training (HIIT) is a new modality of training that uses functional compound movements, as well aspects of interval training, to achieve high workouts in small periods of time. A particularly widespread form of HIIT is CrossFit™.

PURPOSE: To determine if gender affected measures of skill-based performance following 16-weeks of HIIT.

METHODS: 26 apparently healthy men (n = 9; 34.2 ± 9.12 yrs; 1.78 ± 0.05 m; 91.5 ± 17.7 kg) and women (n = 17; 36.3 ± 7.84 yrs; 1.63 ± 0.07 m; 68.5 ± 12.8 kg) volunteered to complete 16-weeks (2 - 5 sessions/wk) of HIIT, with a focus on general physical preparedness (GPP) at a CrossFit™ affiliate. Prior to training (within 2-weeks), pre-testing (PRE) measures of skill-based performance were collected. These included: Thrusters (Squat Press) - 20 repetitions for time (seconds), Double-Unders (Rope Jumping) - as many repetitions as possible in two-minutes, maximal number of Russian Kettle-Bell Swings in three-minutes, and maximal number of Burpees in three-minutes. Post-testing (POST) occurred within 2-weeks of training completion.

RESULTS: Repeated measures ANOVA did not indicate any significant (p > 0.05) interaction (gender x time) for any of the skill-based performance measures. Paired-samples t-tests showed significant improvements in Thrusters (PRE: 93.50 ± 33.42 s, POST: 62.04 ± 24.32 s, p < 0.001), Double-Unders (PRE: 60.65 ± 69.42 reps, POST: 73.62 ± 69.54 reps, p < 0.001), Kettle-Bell Swings (PRE: 92.00 ± 14.26 reps, POST: 93.38 ± 12.89 reps, p < 0.001) and Burpees (PRE: 32.04 ± 9.33 reps, POST: 36.50 ± 12.46 reps, p = 0.006) for the entire group.

CONCLUSIONS: This study shows that a 16-week GPP program of HIIT improves skill-specific performance in both men and women.
CONCLUSION: In conclusion, 4 weeks of plyometric training improved 500m rowing performance, but not peak power, in a season when the athletes performed no sprint training. Interestingly, this increase in performance does not appear to be mediated by improvements in rowing economy or peak power, and requires further investigation.

High-intensity interval training (HIIT) is used as an alternative to traditional endurance training to increase cardiorespiratory fitness and energy expenditure, however, much less in known about HIIT resistance training (RT). In contrast, superset (SUPER) RT programs, consisting of performing two consecutive exercises on opposing muscle groups while limiting the rest duration between exercises, are common for both hypertrophy and energy expenditure.

Purpose: To compare the energy expenditure between an acute bout of HIIT and SUPER RT. METHODS: Twelve males (23.9±3.58 y) with at least six months of RT experience completed one-repetition maximum testing and an acute bout of both HIIT and SUPER RT. To ensure volume load (VL) was not different for both protocols, HIIT was always performed first so that VL could be calculated and the number of repetitions for each exercise in the SUPER session could be determined. At least 72 hours rest was taken between the HIIT and SUPER RT protocols. Oxygen consumption (VO2), respiratory exchange ratio (RER), rate of perceived exertion (RPE), total kcal (aerobic), and heart rate (HR) were each collected at rest and after every set throughout each exercise session including between the paired sets in SUPER. Whole blood lactate measures were taken with a capillary blood lactate probe immediately post-exercise. RESULTS: Significant differences were seen between HIIT and SUPER RT: Total overall energy expenditure (346±47.4 vs. 295±41.65 kcal, p<0.005), aerobic (132±1.13 vs. 157±2.15 kcal, p<0.0001), anaerobic (214±3.23 vs. 142±8.03 kcal, p=0.002), RER (1.29±0.17 vs. 1.18±0.17, p<0.0001), post-exercise lactate (15.56±2.49 vs. 10.83±2.42 mmol, p<0.0001), and RPE (14.81±3.41 vs. 12.73±8.31, p<0.001), respectfully, when comparing protocols. There were no significant differences in VO2 or HR. CONCLUSION: HIIT elicited higher total energy expenditure than SUPER despite an overall shorter duration (13:16±0:02 vs. 14:45±0:51, p<0.0001) and a lower one-repetition maximum percentage for each exercise.

High-intensity functional training (HIFT) aims to elicit gains across multiple fitness domains through cardiovascular and muscular improvements utilizing a general physical preparedness (GPP) program (versus specific training) done at relatively high intensity. Little research exists to support whether HIFT improves specific fitness domains. PURPOSE: To study examined the effect of HIFT through CrossFit on strength gains after 6 months (M). METHODS: Participants included 37 adults (46% women) ages 18-66 (mean age=31.41±1.73yrs) who were participating in a program evaluation study. Participants indicated previous HIFT experience, which was dichotomized as ≤6M (n=18), or ≥7M (n=19). Participants indicated previous HIFT experience. Strength was assessed by 1-repetition maximum (RM) lifts for the overhead press (P), back squat (S), and deadlift (D) using a standardized full-body warm-up and standard repetition progressions at baseline (B) and 6M. Paired samples T-tests were used to examine differences over time for each lift accounting for both experience and sex. RESULTS: Both men and women saw significant strength improvements from B to 6M. Women saw significant improvements in all three lifts in both experience categories. Differences for women were significant across a GPP model, elicited strength improvements in both men and women, novice and experienced alike, with women seeing the greatest number of improvements. The marked number of strength improvements seen in most participants engaging in HIFT could be due to greater peak power.
neuromuscular recruitment as a result of a constantly varied fitness program. More research is needed to determine the effects of HIIT on other measurable fitness domains.

**B-18** Thematic Poster - Military Nutrition

Wednesday, June 1, 2016, 1:00 PM - 3:00 PM
Room: 109

Chair: Andrew Young, FACSM, USARIEM, Natick, MA.

(No relationships reported)

628

**Board #1**

June 1, 1:00 PM - 3:00 PM

Inflammation And Hepcidin Responses To Nutritional Supplementation During Load Carriage And Short-term Military Training

Stefan M. Pasiakos1, Lee M. Margolis1, Nancy E. Murphy1, Holly L. McClung1, Svein Martini2, Yngvar Gundersen2, John W. Castellani3, J Philip Karl4, Hilde Teien5, Elisabeth H. Maddison6, James P. McClung7, Andrew J. Young, FACSM1, Scott J. Montain, FACSM1. 8USARIEM, Natick, MA. 9FPI, Kjeller, Norway.

(No relationships reported)

Prolonged low-to-moderate intensity load carriage (LC) endurance-type exercise may exacerbate the inflammatory and hepcidin response to traditional endurance exercise modes and contribute to poor iron status, particularly when LC is performed repeatedly during military training operations that result in severe energy deficits. Nutritional supplementation may mitigate this response by attenuating the energy deficit. PURPOSE: Two studies were conducted to assess inflammation and hepcidin responses to acute LC exercise and short-term (4-d) military training, with or without nutritional supplementation. METHODS: Study 1: 40 adults fed eucaloric diets were randomly assigned to perform 90-min, intensity-matched (2.2 ± 0.1 VO2 L·m⁻¹) LC (treadmill, 24 kg carried) or cycle ergometry (CE) exercise, during which protein and carbohydrate (10 g protein/46 g carbohydrate) or control (non-nutritive) drinks were consumed. Study 2: 73 soldiers were randomly assigned to receive three combat rations alone, three rations and four 20 g protein-based snacks, or three rations and four 48 g carbohydrate-based snacks during a 4-d arctic military training operation (51 km ski march, 45 kg LC) that produced a 55%, energy deficit. Interleukin-6 (IL-6), hepcidin, and ferritin were determined at baseline, 3-h, 24-h, 48-h, and 72-h post-exercise for study 1 and before (PRE) and after (POST) the 4-d training in study 2. RESULTS: Study 1: IL-6 was higher 3-h and 24-h for CE only (P < 0.05) vs. 0.4(±0.1) mmol/L with Cont-CHO condition. The additional novel finding of a doubling of glycogen was measured in muscle biopsies(pre and post feeding).

629

**Board #1**

June 1, 1:00 PM - 3:00 PM

The Effects Of Oral Ketones On Human Muscle Recovery Following Exercise


Email: davidaholdsworth@gmail.com

Reported Relationships: D.A. Holdsworth: Intellectual Property; My supervisor; a co-author is director of a company which markets the ketone supplement used in this study.

PURPOSE: Physical endurance is limited by muscle carbohydrate stores (glycogen). Glycogen depletion dramatically reduces external work. Ketone bodies (D-β-hydroxybutyrate and acetoacetate) are natural 4-carbon molecules synthesised in the fasted liver. Animal work shows ketones increase glycogen synthesis in the presence of carbohydrate. The study hypothesis was that ketone supplementation augments replenishment of glycogen stores in man. METHODS: 12 servicemen underwent a validated interval protocol to deplete muscle glycogen. They were randomised to control drink + intravenous carbohydrate(Cont-CHO), ketone drink + intravenous carbohydrate(Ket-CHO) or control drink + intravenous saline(Cont-saline) in a randomised, blinded, crossover study. Carbohydrate was delivered by standardised 2-hour 180 mg·L glucose - hyperglycaemic clamp. Glycogen was measured in muscle biopsies(pre and post feeding).

RESULTS: Ketone supplementation achieved a D-β-hydroxybutyrate of 5.3(±0.48) vs. 0.4(±0.1) mmol/L with Cont-CHO condition. There was an associated 33% increase in whole body glucose disposal 125.8(±4.2) vs. 94.7(±3.2) g, for Ket-CHO vs Cont-CHO (P < 0.000001). Muscle glycogen increased significantly 240.7(±2.4) vs 164.2(±12.5) mmol glycosyl units/kg dry weight of muscle (P < 0.017) and insulin levels doubled: 31.1(±5.7) vs 16.4(±2.7) mU/L (P < 0.001) for Ket-CHO vs Cont-CHO.

CONCLUSIONS: Ketones supplement glycogen levels more efficiently than carbohydrate alone.

630

**Board #2**

June 1, 1:00 PM - 3:00 PM

The Effects Of Oral Ketones On Human Muscle Recovery Following Exercise

Jay R. Hoffman, FACSM1, Yiftach Gepner2, Jeffrey R. Stout1, Matian W. Hoffman1, Daniel Ben-Dov3, Shany Funk1, Ido Daimont3, Adam J. Jain1, Jeremy R. Townsend1, Ilan Shelef3, Guy Avital1, Yacov Chen1, Hagai Frankel1, Ishay Ostfeld1.

1University of Central Florida, Orlando, FL. 2Ben Gurion University of the Negev, Beer-Sheva, Israel. 3Israel Defense Force, Netanya, Israel. 4Storoka Medical Center, Beer-Sheva, Israel. 5Israel Defense Force, Tel Hashomer, Israel.

Email: jay.hoffman@ucf.edu

(No relationships reported)

PURPOSE: Examine the effect of β-hydroxy-β-methylbutyrate Free Acid (HMB) supplementation on changes in immune and inflammatory responses and physical performance measures during highly intense military training. METHODS: Thirteen soldiers from an elite combat unit were randomly assigned to either a HMB (n=6) or placebo (PL, n=7) group. Soldiers were provided with 3 g day-1 of either HMB or PL for 23 days. During the final week of supplementation (days 18 - 23) soldiers participated in extreme physical training, which included night navigation of 6 - 8 hours across difficult terrain with approximately 35 kg of equipment on their back. During daylight hours, soldiers remained in camouflaged positions with minimal recovery. Due to a severe environmental stress (37°C and a sand storm) navigational training was performed on only the first two evenings of the week. Still, soldiers continued to be subjected to excessive physical training. During the 6 days of intense training the soldiers slept a total of 22.5 hours (3.8 ± 3.0 h per night). Fasting blood draws (IL-6, INFγ, TNFα, IL-8, IL-1β, IL-1α, IL-10, G-CSF, GM-CSF, MCP-1, and CXXCL1) and physical performance measures (vertical jump power, push-ups, isometric strength, speed [100m]) were performed prior to and following the supplementation period. All assessments were performed at the same time of day.

**B-18** Thematic Poster - Military Nutrition

Wednesday, June 1, 2016, 1:00 PM - 3:00 PM

Room: 109

Chair: Andrew Young, FACSM, USARIEM, Natick, MA.

(No relationships reported)
To examine the physiological demands, nutrient intake and energy expenditure (TEE) during cold weather military training.

**PURPOSE:**

To assess the effects of chronic beta-alanine ingestion on body composition and physical performance parameters in College-Aged Males Seeking Military Commission

**Methods:**

Using an experimental design with repeated measures, 30 resistance-trained male cadets seeking military commission (20.47 ± 1.4 yr) were randomly assigned to consume either 6.0 g/day beta-alanine or placebo supplement for 6 weeks. Pre and posttest measures on the following parameters were collected: body fat percentage (BF%), fat free mass (FFM), vertical jump (VJ), 1-repetition maximum (RM) back squat (SQ) and bench press (BP), and a repetition maximum bench press (RMBP) at 75% of the attained RM.

**Results:**

For all variables, no significant interactions existed (p > 0.05). In addition, no significant differences existed between conditions for all variables (p > 0.05). SQ and BP improved over 6 weeks in all subjects: SQ: 282.3 ± 96.92 lbs vs. 297.5 ± 102.48 lbs, p = 0.001; BP: 216.8 ± 61.98 lbs vs. 221.0 ± 63.28 lbs, p = 0.02.

**Conclusion:**

Beta-alanine did not influence any benefit relative to placebo for improving body composition or strength and performance parameters of individuals. Future studies should investigate the influence of beta-alanine supplementation on more military-specific assessments of strength and power performance.

**Keywords:**

beta-alanine, body composition, physical performance.

**References:**

Daniel A. Jaffe1, Tracey D. Matthews2, Vincent J. Paolone, FACSM, Sara M. Mazur, Brian A. Thompson, Samuel A.E. Headley, FACSM2, USMA West Point, West Point, NY.1Springfield College, Springfield, MA.2(Sponsor: Samuel Headley, FACSM)

Email: djaaf7@gmail.com

**No relationships reported**
Runners typically only replace a small percentage of sweat losses incurred during runs even if fluid is readily available. This paradigm creates additional importance on adequately rehydrating between exercise bouts.

**Abstracts were prepared by the authors and printed as submitted.**
Hyperhydrating before prolonged physical work with limited fluid intake may help maintain or limit the degradation of physiological functions and endurance. Adding sodium or glycerol to a hyperhydration solution optimizes fluid retention, with the former compound being more efficient than the latter. Mechanistically, sodium and glycerol produce their effects by acting on the osmoreceptors and kidneys, respectively. Hence, if added concurrently to a hyperhydration solution, their impact on fluid retention could potentially be greater than their singular effect. PURPOSE: Compare the effects of salt (SIH), glycerol (GIH) and salt + glycerol (SGIH)-induced hyperhydration on fluid balance responses during a 3h hyperhydration protocol.

METHODS: Using a randomized, crossover and counterbalanced protocol, 15 young men (22 ± 4 y, 63 ± 7 kg fat-free mass (FFM)) underwent three, 3h hyperhydration protocols. During the first 60 min of each trial, they ingested 30 mL/kg FFM of artificially sweetened water with either 1.75 g of salt/L (SIH); 2.14 g/kg FFM (GIH); or 3.5 g of salt/L + 1.4 g/kg glycerol/kg FFM (SGIH). Changes in urine production, fluid retention, hemoglobin, plasma volume and abdominal discomfort were monitored throughout the trials. RESULTS: Participants ingested 1885 ± 199 mL (24.9 ± 1.6 mL/kg bodyweight) of artificially sweetened water with either 14.0 ± 1.5 g of salt (SIH), 90.9 ± 8.5 g of glycerol (1.2 ± 0.1 g/kg bodyweight) (GIH) or both (SGIH). After 3h, there were no significant differences among treatments for hematocrit and plasma volume changes (SIH: 11.3 ± 9.9; GIH: 7.6 ± 12.7; SGIH: 11.3 ± 13.7%), but hemoglobin (SIH: 14.3 ± 10; GIH: 14.9 ± 13.1; SGIH: 14.5 ± 1.1 mmol/L) was lower with SIH than GIH, with no difference between SGH and GIH or SHL. Urine production (SIH: 775 ± 329; GIH: 1248 ± 270; SGIH: 551 ± 208 mL) and fluid retention (SIH: 1127 ± 212; GIH: 729 ± 115; SGIH: 1435 ± 140 mL) were significantly different among treatments. Abdominal discomfort was low and not significantly different among treatments. CONCLUSION: Results show that SGH reduces urine production and improves fluid retention compared with SIH or GIH. These findings may have implications for laborers, military personal and serious but fluid losses were minimized or fluid consumption was restricted, respectively. During recovery, participants were randomly assigned to a fluid replacement (FL) or no fluid replacement (NFL) group where they were given 10-minutes to consume water ad libitum at a volume matching fluid losses. Perception of thirst was measured using a 9-point scale and was measured periodically during and after exercise. A three-factor (trial x condition x time) repeated-measures ANOVA was used to measure differences in thirst perception post exercise between EUH-FL, EUH-NFL, HYPO-FL and HYPO-NFL. Results: %BMI was significantly greater in HYPO (2.7±0.7%) than EUH (0.4±0.6%) trials (p<0.001). Fluid replacement after exercise did not influence %BMI between HYPO (HYPO-FL, 2.8±0.9%; HYPO-NFL, 2.6±0.6%) and EUH (EUH-FL, 0.2±0.7%; EUH-NFL, 0.6±0.5%) trials (p=0.330). During exercise, thirst perception was significantly greater in HYPO trials than EUH trials beginning at minute 90 of exercise (p<0.05). Beginning at minute 5 during the recovery period, thirst perception was significantly greater in HYPO-NFL than EUH-FL, EUH-NFL and HYPO-FL (p<0.05). Conclusions: During exercise, changes in perception of thirst were reflective of increased fluid losses, especially when %BMI >2%. However, receiving a bolus of fluid post exercise when hypohydrated (%BMI >2%) negated differences in perception of thirst between those euhydrated and hypohydrated. Thirst could have limited utility in guiding hydrated practices when attempting to quickly reestablish euhydration following prolonged exercise in the heat.
Mean ± SD Hydration status marker response to progressive and fixed dehydration.

<table>
<thead>
<tr>
<th></th>
<th>Progressive Dehydration</th>
<th>Fixed Dehydration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Bout 1</td>
</tr>
<tr>
<td>Body Mass (kg)</td>
<td>±0.06</td>
<td>±0.1</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>±9.7</td>
<td>±9.6</td>
</tr>
<tr>
<td>Salivary Osmolality (mOsm/kg)</td>
<td>±0.11</td>
<td>±0.11</td>
</tr>
</tbody>
</table>

*Significant between conditions at measurement period, p<0.05.

RESULTS:

<table>
<thead>
<tr>
<th>Body Mass (%) change</th>
<th>Baseline</th>
<th>Bout 1</th>
<th>Bout 2</th>
<th>Bout 3</th>
<th>Baseline</th>
<th>Bout 1</th>
<th>Bout 2</th>
<th>Bout 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.012</td>
<td>±0.001</td>
<td>±0.001</td>
<td>±0.001</td>
<td>±0.001</td>
<td>1.014</td>
<td>±0.001</td>
<td>±0.001</td>
<td>±0.001</td>
</tr>
<tr>
<td>69</td>
<td>±15</td>
<td>±16</td>
<td>±17</td>
<td>±17</td>
<td>69</td>
<td>±18</td>
<td>±19</td>
<td>±19</td>
</tr>
</tbody>
</table>

CONCLUSION: During progressive dehydration, S, may be a more sensitive measure of hydration status than USG.

RESULTS:

CONCLUSION:

B-20 Free Communication/Slide - Running

Wednesday, June 1, 2016, 1:00 PM - 3:00 PM
Room: 102

644

June 1, 1:00 PM - 1:15 PM
Increasing Body Mass Increases The Incidence Of Injury In Runners Using Minimalist Shoes

Joel Fuller, Jonathan Buckley, Dominic Thewlis, Margarita Tar loos, Nicholas Brown, Joseph Hamill, FACSM1. University of South Australia, Adelaide, Australia. Australian Institute of Sport, Bruce, Australia. 2University of Massachusetts, Amherst, MA.
Email: joel.fuller@mymail.unisa.edu.au

Abstracts were prepared by the authors and printed as submitted.
Marathon training (MT) may be associated with metabolic and cardiovascular adaptations, including increased fat utilization, improved running economy, and decreased heart rate during submaximal running. Improvements in these measures are important given the high metabolic cost of running a 26.2-mile marathon.

**PURPOSE**: To assess steady state running variables pre- and post-MT.

**METHODS**: Sixty recreational female runners (ages 21.2 ± 1.6) completed a 2-mile time trial (2MI) to establish baseline fitness. A submaximal (SUBMAX) 6-minute treadmill run at 75% of 2-mile velocity was done 1-2 weeks later. An 18-week, progressive MT program was followed by all subjects, followed by a 3-week taper, prior to the completion of a marathon road race. The 2MI and SUBMAX were repeated during the taper period, with the same pace used for SUBMAX in the pre- and post-taper conditions. The final 5 minutes of the SUBMAX were averaged for analysis. Oxygen use (O2) and respiratory exchange ratio (RER) were assessed continuously during SUBMAX via metabolic cart. A subset of 15 subjects also wore heart rate (HR) monitors to assess HR during SUBMAX. Paired samples t-tests were used to assess changes in 2MI, O2, RER, and HR from pre- to post-tapering. Change in O2, HR, RER and 2MI were also calculated as percentages, and correlations between the changes were assessed using Pearson’s r.

**RESULTS**: During SUBMAX, RER decreased from pre- to post-testing (0.00 ± 0.05 vs. 0.86 ± 0.05; p < 0.001), 2MI improved (16.9 ± 1.6 min vs. 15.8 ± 1.6 min; p < 0.001), HR decreased (160.2 ± 7.2 vs. 154.2 ± 8.6; p < 0.001), but O2 did not change (30.3 ± 4.3 vs. 30.1 ± 4.1; p = 0.590). Change in RER was correlated with change in HR (r = −0.67; p < 0.014), and inversely correlated with change in O2 (r = 0.442; p = 0.046).

**CONCLUSIONS**: Consistent with previous studies, this study found that endurance training decreases RER during moderate exercise. This change is indicative of increased fat metabolism at the same absolute work rate. In this population, training-related changes can be expected in substrate utilization but not oxygen cost of running, possibly due to the higher oxygen cost of fat metabolism. This suggests that it may be more appropriate to look at energy cost, rather than oxygen cost of running, when assessing running economy.
CONCLUSIONS: LM exercise elicits a lower VO2peak response than TM exercise at a similar peak HR and RER. The mechanical intensity of LM maximal exercise is considerably lower than TM maximal exercise suggesting a lower risk of developing musculoskeletal injuries.

Exercise sweat loss is often measured by an athlete’s change in body mass (BM). Nude BM is the most accurate method, but is impractical in many field situations. When clothed BM is more practical, it is confounded by trapped sweat (TS) in clothing.

PURPOSE: To determine the effect of exercise intensity on whole-body TS, local TS, local sweating rate (SR), local sweat [Na+] and sweat [Cl-] in basketball uniforms.

METHODS: Trapped sweat in basketball uniforms during laboratory-based intermittent exercise performed at 12 different intensities (22°C and 60% rh). The L, M, and H trials elicited progressively higher heart rate (HR) responses (L: 64 ± 4%, M: 75 ± 6%, and H: 82 ± 6% HRmax). Nude and clothed (jersey top and shorts; compression tank, shorts, arm, and knee sleeves; headband; socks; sneakers) BM were measured 25 min into each bout to determine TS. A split-plot ANOVA followed by Fisher’s LSD was used to determine between-subjects (BM, age, sweating rate) and within-subject (exercise intensity) effects on TS. Data are expressed as mean ± SD (range).

RESULTS: Exercise intensity had a significant effect on TS (p < 0.001). At the end of the 2.5 h protocol, TS was greater in the TMs (L: 0.0 ± 0.0 kg, M: 0.1 ± 0.1 kg, H: 0.2 ± 0.2 kg), respectively. Trapped sweat also had a significant effect on TS with greater sweating rates (25 ± 10% HRmax). Local TS varied considerably during simulated basketball activity; sweating rate and exercise intensity were the most important factors determining inter- and intra-individual differences, respectively, in the amount of TS in basketball uniforms. Future research is needed to determine if similar results are found during on-court basketball practices/games and to investigate trapped sweat in outdoor sports played in variable environmental conditions.

Increases in exercise intensity have been shown to result in proportional increases in sweating rate (SR) and consequently sweat [Na⁺]; however, few studies have measured changes within individual athletes, particularly during team sport activity. PURPOSE: To determine the effect of exercise intensity on whole-body SR, local SR, local sweat [Na⁺], and associated intra-individual variability, during intermittent exercise.

METHODS: 18 male team sport athletes (24 ± 10 y, 77.9 ± 16.7 kg) completed 3 randomized trials consisting of 5 X 30-min sets of simulated team sport exercises at low (L, 65 ± 4% HRmax), moderate (M, 76 ± 4% HRmax), and high (H, 83 ± 4% HRmax) intensities in a temperature-controlled lab (23°C, 62% rh). After 30 min exercise, absorbent patches (14.5 cm²; absorbent pad, 42 cm²; total patch including tegaderm)
Absorbent patches are often used to determine local sweat sodium concentration, but the effect of methodological variations, such as the level of patch saturation, has not been studied. To establish normative data for sweat rate and sweat sodium concentration ([Na+]sw) in young athletes, the present study determined the impact of patch saturation level on local sweat rate and local sweat sodium concentration.

METHODS: Nine moderately trained young men (mean ± SD: age 21 ± 2 years; body mass 77.1 ± 10.5 kg) completed 5 X 30-min sets of intermittent, moderate-intensity exercise (60% V̇O₂peak). The exercise was performed in a hot dry environment (31.4°C; 41.4% RH; 29.8°C soil temperature). The exercise protocol consisted of 9 X 5-min periods of exercise (75% V̇O₂peak) separated by 10-min recovery periods. Local sweat was collected from the right dorsal forearm (L: 36.6 ± 19.3, M: 53.3 ± 28.1, H: 67.1 ± 30.4 mmol/L). Local sweat [Na+] was measured using an ion selective electrolyte analyzer (Ionera). Repeated measures ANOVA was used to determine the effect of exercise intensity (L < M < H, all p < 0.001) on whole-body and local sweat [Na+] and [K+].

RESULTS: There was a significant effect of exercise intensity (L < M < H, all p < 0.001) on whole-body and local sweat [Na+] and [K+]. The effect of exercise intensity on local sweat [Na+] was not significantly different among all patch saturation levels (L: 71.6 ± 31.1 mmol/L, M: 53.9 ± 26.9 mmol/L, and H: 44.0 ± 25.6 mmol/L; p = 0.001). There was also a significant effect of patch saturation level on local sweat [Na+] with H (0.74 ± 0.17 mg/cm²/min) significantly (p < 0.01) less than both L (1.09 ± 0.47 mg/cm²/min) and M (1.17 ± 0.53 mg/cm²/min). CONCLUSION: An increase in sweat patch saturation level was accompanied by a decrease in local sweat [Na+], which also corresponded with a decrease in local sweat rate; suggesting a possible hidromeiosis effect with higher absorbed sweat mass and/or adherence time on skin. To develop best practices in heat-stress and dehydration, future research is needed to determine the interaction effects of absorbed sweat mass and patch adherence time on sweat [Na+] and to cross-validate results against sweat [Na+] obtained using the same whole-body wash-down technique.
trained women [age 22.78 ± 2.38 yrs., (V'O2peak) 44.11 ± 5.56 ml-kg-1-min-1, BF 21.08 ± 5.56] who had refrained from oral contraceptives over the past 12 months and from the morning after pill during baseline and experimental procedures performed 45 min of cycle exercise at 55-65% of V'O2peak in a dehydrated state (USG >1.02) while having sweat rate, onset of sweat, Tr, Tsk, Tb, HR, thermal sensation and RPE measured every 5 min of exercise. All experimental sessions took place between 6:00 am and 12:00 pm. Sweat loss was estimated from pre and post exercise body weight difference. RESULTS: Sweat rate, the onset of sweat, thermal sensation and RPE were not affected by menstrual phase, however, as expected, there was a trend toward a higher sweat rate and an earlier onset of sweat in the luteal phase compared to the follicular phase in the dehydrated state. The mean sweat rate in the luteal phase was ML = 12.54 ± 4.18 ml/min and the mean sweat rate in the follicular phase was MF = 10.57 ± 2.25 min. The mean onset sweat rate time in the luteal phase was Tr = 11.24 ± 1.50 min and the mean sweat rate in the follicular phase was Tr = 12.34 ± 2.54 min. Mean Te, Tsk, and Tb were higher during the luteal phase than the follicular phase at all time points (p < 0.05). CONCLUSION: The elevation in core temperature observed in the current study may be associated with the increase in circulating progesterone during the luteal phase of the menstrual cycle. The increase in progesterone may be a potential mechanism explaining the increase in blood flow, thus, the onset of skin vasodilatation in the luteal phase, which ultimately causes skin and body temperature to rise. In conclusion, with the findings of the current study, researchers suggest that during exercise in the dehydrated state, sweat rate is reduced thereby enhancing thermoregulatory and cardiovascular demands during exercise in a hot environment. Future researchers may examine the effects of the menstrual cycle on exercise in a hot environment when in fact fluid replacement is controlled and hydration is maintained.

**METHODS:**

Six male subjects (25 ± 4 yrs) completed a 90 minute constant heat strain intermittent exercise-acclimation protocol for six consecutive days in an environmental chamber set at 45°C, 20% relative humidity, 1 m,3 air velocity with a target increase in core temperature (Tre) of 1.4°C above baseline. RSR were measured at two exercise intensities (I1, 55% VO2max; I2, 75% VO2max) on the torso and arms prior to following acclimation (Pre 449±90 g.m-2.h-1, Post 546 g.m-2.h-1; P<0.01). Highest RSR were observed on the central back both pre and post acclimation at I1 (pre 854 ± 269 vs. post 1178 ± 402 g.m-2.h-1) and I2 (pre 1221 ± 351 vs. post 1772 ± 396 g.m-2.h-1). Normalized ratio data showed no significant change in distribution of RSR following acclimation. I2 ratio values significantly decreased at the lateral upper back (p=0.01) and increased at the anterior and posterior upper arm, and anterior lower arm (p=0.05) versus pre-acclimation values. CONCLUSION: Controlled hyperthermia exercise-heat acclimation significantly increases GSL and absolute RSR, with a preferential redistribution of sweating towards the periphery at a higher exercise intensity. Highest and lowest RSR were consistently observed on the central back versus the anterior lower torso and arms, respectively. Funded by the Adidas Innovation Team.

**RESULTS:**

Hyperthermia exercise-heat acclimation significantly increases GSL and absolute RSR, and following acclimation using a modified absorbent technique. RESULTS: By design, heart rate (HR), Tr, and skin temperature were similar between heat acclimation days. Work rate increased from day one to six to elicit the same increase in Tre, but not significantly. Gross sweat loss (GSL) increased significantly from day one to six of exercise-heat acclimation in a hot-dry environment. METHODS: Six male subjects (25 ± 4 yrs) completed a 90 minute constant heat strain intermittent exercise-acclimation protocol for six consecutive days in an environmental chamber set at 45°C, 20% relative humidity, 1 m,3 air velocity with a target increase in core temperature (Tre) of 1.4°C above baseline. RSR were measured at two exercise intensities (I1, 55% VO2max; I2, 75% VO2max) on the torso and arms prior to following acclimation (Pre 449±90 g.m-2.h-1, Post 546 g.m-2.h-1; P<0.01). Highest RSR were observed on the central back both pre and post acclimation at I1 (pre 854 ± 269 vs. post 1178 ± 402 g.m-2.h-1) and I2 (pre 1221 ± 351 vs. post 1772 ± 396 g.m-2.h-1). Absolute RSR increased significantly at 12 of the 17 regions tested at 11 and 14 at I2 (p<0.05). Normalized ratio data showed no significant change in distribution of RSR at I1 following acclimation. I2 ratio values significantly decreased at the lateral upper back (p=0.01) and increased at the anterior and posterior upper arm, and anterior lower arm (p=0.05) versus pre-acclimation values. CONCLUSION: Controlled hyperthermia exercise-heat acclimation significantly increases GSL and absolute RSR, with a preferential redistribution of sweating towards the periphery at a higher exercise intensity. Highest and lowest RSR were consistently observed on the central back versus the anterior lower torso and arms, respectively. Funded by the Adidas Innovation Team.

**CONCLUSION:**

The elevation in core temperature observed in the current study may be associated with the increase in circulating progesterone during the luteal phase of the menstrual cycle. The increase in progesterone may be a potential mechanism explaining the increase in blood flow, thus, the onset of skin vasodilatation in the luteal phase, which ultimately causes skin and body temperature to rise. In conclusion, with the findings of the current study, researchers suggest that during exercise in the dehydrated state, sweat rate is reduced thereby enhancing thermoregulatory and cardiovascular demands during exercise in a hot environment. Future researchers may examine the effects of the menstrual cycle on exercise in a hot environment when in fact fluid replacement is controlled and hydration is maintained.
Knee Pain After Ankle Inversion In Soccer

Rajani Mohan DO, Jersey Shore University Medical Center, Neptune, NJ. (Sponsor: Stephen Rice MD, PhD, FACSM)
Email: rajanimohan1@gmail.com

HISTORY
19 year old male soccer player sustained injury to his left knee during practice. He reports inverting his ankle and experiencing severe pain in his left knee. He immediately presented to the athletic trainer with complaints of swelling, burning pain, and inability to bear weight in his knee. He denied any ankle discomfort. His knee was immobilized and he was given crutches. He presented to the team physician within 2 hours for evaluation as his pain did not improve with rest, icing and elevation.

PHYSICAL EXAM
Examination revealed swelling and ecchymosis over the left fibular head and proximal peroneal muscles. He was markedly tender to touch over the fibular head, which was located posterior and lateral in comparison to right side. His left knee was restricted in full extension, however flexion remained intact. Range of motion of the left ankle was limited in dorsiflexion. Left fibular head was restricted in anterior glide with full posterior glide. He was unable to bear weight on his left leg. There was decreased sensation noted over the left peroneal musculature below the knee.

DIFFERENTIAL DIAGNOSIS
1. Fibular head fracture
2. Posterior fibular head subluxation
3. Common Peroneal nerve injury
4. Call rupture

TESTS & RESULTS
X-rays of bilateral knees and tibia/fibula showed no fracture of the fibular head. There was no dislocation noted on report, however visible narrowing of space between tibia/fibula was seen on the left leg. Also, there is evidence of anterior displacement of the distal fibula on the left side noted by increased shadowing of the fibula on the talus.

FINAL WORKING DIAGNOSIS 1. Posterior fibular head subluxation
2. Common peroneal nerve injury

TREATMENT & OUTCOMES
1. OMT for a proximal fibular head dislocation. Used high velocity, low amplitude (HVLA) technique from The Kimberly Manual (2006, page 294), which glided the fibular head anterior and into anatomic position. The athlete reported a click, felt the fibula was seen on the left leg. Also, there is evidence of anterior displacement of the distal fibula on the left side noted by increased shadowing of the fibula on the talus.

2. Maintained reinforcement with McConnell taping to the lateral knee.

3. Athlete continued to complain of mild numbness and tingling over the proximal peroneals. He was allowed to return to play with gradual increase in activity. He attended daily physical therapy and was asymptomatic with no residual deficits in approximately 6 weeks.

Knee Pain That Wasn’t in a Twin Cities Marathon Finisher

William O. Roberts, FACSM1, Maria C. Ryan2, Jeffrey A. Macalena1, Steven D. Stovitz, FACSM1. 1University of Minnesota, Minneapolis, MN. 2North Memorial Medical Center, Minnetonka, MN.
Email: roberto37@umn.edu

HISTORY:
A 33 yo male marathon runner presented to the medical tent after finishing race complaining of R lalf knee & ant distal thigh pain. His R knee “gave out” 30 m from finish line. He hopped on his L leg to finish the race (3 hr 45 min).

He had completed several marathons without incident. He trained for 22 wk, but had 6 wk of self-diagnosed R “IT band pain” leading up to the race. He described his pain as starting in the hip & radiating down the thigh to his knee. He did not seek medical attention for this pain. He had no past history of stress fx, disordered eating, or tobacco use. He takes Vit D & calcium daily & drinks milk regularly.

PHYSICAL EXAM:
Gait: Unable to bear weight.
Inspection: (+) spasm of R quadriceps. No swelling, erythema, ecchymosis or atrophy. Palpation: Tender along gross, greater trochanter, & Gerdy’s tubercle. No effusion of knee or hip joint. Quad tendon-without noticeable defect. Knee non-tender. Active ROM: Unable to actively flex hip or elevate leg. SLR painful. Passive ROM & Strength: Hip & knee - limited by pain, able to fire quad against gravity & slide foot along bed in extension.

Differential Diagnosis: Femur Fx (Femoral neck, head, or shaft) Quad tendon strain/rupture Patellar tendon rupture ITB rupture ACL sprain/rupture

TESTS & RESULTS:
Imaging: Xray Femur: Comminuted fracture of femoral diaphysis with displacement & angulation. CT Scan Femur: Comminuted fx of femoral diaphysis centered proximal to middle-diastal 1/3 junction with angulation & displacement. No underlying lytic lesion. R femoral neck synovial herniation pit described as normal variant, but also associated with femoral acetabular impingement. Labs:
Testosterone: 726 ng/dl (nrl)
Vit D: 38 ng/ml (nrl)

FINAL WORKING DIAGNOSIS:
R Comminuted midshaft femur fracture atop a stress fx in marathon finisher

TREATMENT AND OUTCOMES:
ED transport by private vehicle
Orthopedic surgeon determined surgery indicated
Surgical procedure - locked intramedullary nail implanted
Post Op: WBAT & ROM of hip & knee as tolerated
DEXA scan scheduled

Knee Pain After Ankle Inversion In Soccer

ADAM J. SUSMARSKI1, Todd Franco2. 1University of Pittsburgh Medical Center and US Navy, Pittsburgh, PA. 2Allegheny Health Network, Pittsburgh, PA.
Email: susmarski@gpmc.edu

HISTORY:
A 19 year old male Division 1 football player with no medical history presented on Monday, October 13 to clinic with anterolateral knee pain and swelling. He reports inverting his ankle and experiencing severe pain in his left knee. He immediately presented to the athletic trainer with complaints of swelling, burning pain, and inability to bear weight in his knee. He denied any ankle discomfort. His knee was immobilized and he was given crutches. He presented to the team physician within 2 hours for evaluation as his pain did not improve with rest, icing and elevation.

PHYSICAL EXAM:
Examination revealed swelling and ecchymosis over the left fibular head and proximal peroneal muscles. He was markedly tender to touch over the fibular head, which was located posterior and lateral in comparison to right side. His left knee was restricted in full extension, however flexion remained intact. Range of motion of the left ankle was limited in dorsiflexion. Left fibular head was restricted in anterior glide with full posterior glide. He was unable to bear weight on his left leg. There was decreased sensation noted over the left peroneal musculature below the knee.

DIFFERENTIAL DIAGNOSIS
1. Fibular head fracture
2. Posterior fibular head subluxation
3. Common Peroneal nerve injury
4. Call rupture

TESTS & RESULTS
X-rays of bilateral knees and tibia/fibula showed no fracture of the fibular head. There was no dislocation noted on report, however visible narrowing of space between tibia/fibula was seen on the left leg. Also, there is evidence of anterior displacement of the distal fibula on the left side noted by increased shadowing of the fibula on the talus.

FINAL WORKING DIAGNOSIS 1. Posterior fibular head subluxation
2. Common peroneal nerve injury

TREATMENT & OUTCOMES
1. OMT for a proximal fibular head dislocation. Used high velocity, low amplitude (HVLA) technique from The Kimberly Manual (2006, page 294), which glided the fibular head anterior and into anatomic position. The athlete reported a click, felt the fibula was seen on the left leg. Also, there is evidence of anterior displacement of the distal fibula on the left side noted by increased shadowing of the fibula on the talus.

2. Maintained reinforcement with McConnell taping to the lateral knee.

3. Athlete continued to complain of mild numbness and tingling over the proximal peroneals. He was allowed to return to play with gradual increase in activity. He attended daily physical therapy and was asymptomatic with no residual deficits in approximately 6 weeks.
TREATMENT AND OUTCOMES

Patient underwent arthroscopic synovectomy and postero-medial mass excision without complication. Activity as tolerated at 4 weeks post-op.

B-23 Clinical Case Slide - Pulmonary Issues

Chair: Matthew R. Gammons. VT Ortho Clinic/Killington Medical Center, Rutland, VT.
(No relationships reported)

670 Discussant: Andrew Getzin, FACSM. Cayuga Medical Center, Ithaca, NY.
(No relationships reported)

672 Discussant: Amanda Weiss Kelly, University Hospitals, University Heights, OH.
(No relationships reported)

HISTORY: A 50-year-old female triathlete with a history of hypertension and asthma was referred to our clinic for exercise-induced bronchoconstriction testing. She reported an 8 year history of episodes of dyspnea and cough that come on while competing in the swimming leg of the triathlon and continue through the rest of the race. Symptoms generally resolve within 24 hours. They do not occur with every race. They have never occurred during training. Onset of symptoms has never occurred during the bike or running leg. She was diagnosed with asthma 3 years prior and has been using albuterol prior to exercise as well as Advair as a controller agent since then, with no change in frequency of episodes.

PHYSICAL EXAMINATION: Well-appearing, no acute distress. Neck without masses. No acute audible bristle. Lung sounds clear bilaterally, no wheezes, rales, or rhonchi. CV normal S1 and S2, regular, with no murmurs, rubs, or gallops. No peripheral edema. Periphera pulses 2+.

DIFFERENTIAL DIAGNOSIS: Swimming-induced pulmonary edema, asthma, exercise-induced bronchoconstriction, vocal cord dysfunction, cardiogenic pulmonary edema, coronary artery disease.

TEST AND RESULTS: Spirometry pre- and post-exercise were performed with no evidence of obstructive lung disease and no decrease in FEV1 post-exercise. Exercise stress echo was also performed, which showed normal cardiac function and no evidence of exercise-induced ischemia. The patient had a markedly hypertensive response to exercise. Post-exercise PA systolic pressure was estimated at 65-75 mm Hg.

FINAL WORKING DIAGNOSIS: Swimming-induced pulmonary edema in the setting of hypertension.

TREATMENT AND OUTCOMES: The patient was evaluated by cardiology. Hypertension was treated. She had not experienced any symptoms during her last few races.

669 June 1, 2:40 PM - 3:00 PM

Traumatic Knee Effusion

Keri L. Denay, University of Michigan Medical School, Ann Arbor, MI. (Sponsor: Robert (Bob) Kinningham, FACSM)
Email: kschwide@med.umich.edu
(No relationships reported)

HISTORY: 35 year-old male basketball player presented with right knee pain. Noticed during a game after awkward landing. No initial swelling, erythema, ecchymosis, change in motion. He awoke day before presentation with knee swollen and more tight so he presented for further evaluation. Pain diffuse and “tight”. No fever, chills, erythema, warmth, ecchymosis, catching, locking, giving way. No history of right knee injuries or surgeries. No other history of medical or surgical issues. No medications or allergies. Family history notable for a sister with lupus. No alcohol, tobacco, drug use.

PHYSICAL EXAMINATION:
Vitals stable.
GENERAL: well-appearing, nontoxic
RIGHT KNEE EXAM:
Moderate effusion. Laking about 10 degrees of full flexion and extension. Forced flexion painful but cannot localize. Positive buncase test for “tightness” in posterior pit of knee. Equivocal McMurray’s testing for pain but cannot localize. No palpable click. No tenderness to medial joint space. No tenderness in posterior pit of knee, lateral joint space, or over the patellar or quadriceps tendon. Equivocal Lachman’s given difficulty secondary to size of knee.

DIFFERENTIAL DIAGNOSIS:
- Medial meniscal tear
- Inflammatory/autoimmune arthropathy
- ACL and/or PCL pathology
- Osteochondral defect
- Degenerative arthropathy
- Fracture

Primary or metastatic process

668 June 1, 2:20 PM - 2:40 PM

Novel Posture-Based Neuromuscular Treatment for Chronic Pain and Dysfunction of the Lateral Knee - Basketball

Email: dpandrews2010@gmail.com
(No relationships reported)

HISTORY: A 16-year old female high school basketball player presented with chronic lateral right knee pain of nine months duration and without a reported mechanism of injury. She rated her pain 4 out of 10 on the Numeric Rating Scale (NRS) and rated her function 7 out of 10 on the Patient Specific Functional Scale (PSFS). The patient had previously been diagnosed with Iliotibial Band Syndrome and was treated with traditional therapy (e.g., strengthening exercises, myofascial release, corticosteroid injections). She denied any new injury had occurred since her previous diagnosis and reporting being otherwise healthy.

PHYSICAL EXAMINATION: Signs of acute injury were not noted, but palpation revealed tender points over lateral right knee and adductors. Orthopedic tests were negative for ligamentous or cartilage injury at the knee. The slump test was positive, but other neurological testing was unremarkable. A novel posture-based neuromuscular treatment classification system was utilized to evaluate the patient. The exam identified seven (out of 14) dysfunctional postures correlated to an S1 nerve root dysfunction in the system.

DIFFERENTIAL DIAGNOSIS: 1. ITB syndrome
2. Thoracic extensibility disorder
3. Sciatic Nerve Impingement

TEST AND RESULTS: Not Applicable

FINAL WORKING DIAGNOSIS: S1 Nerve Root Compression
CALIBER CHEST TUBE OVERLYING 2ND-3RD INTERCOSTAL SPACE

– Much improved left-sided pneumothorax measuring 5 mm from the apex with small-

6/18/15 – CXR status post CT-guided placement of chest tube

– No rib fractures seen

6/17/15 – CXR

TEST AND RESULTS:

1. Rib contusion
2. Rib fracture

DEEP INSPIRATION. ABDOMEN WITHOUT OBVIOUS DEFORMITY OR ECCYMOsis, NONTENDER,

PHYSICAL EXAM: On auscultation, there were diminished breath sounds at the left apex. Pain noted with deep inspiration. No rib fractures seen. He had 2-3 previous episodes, once while lifting and once at rest. The previous episodes resolved spontaneously and were not as severe. No near-syncpe, dizziness, or palpitations. No family history of sudden death.

PHYSICAL EXAMINATION: Exam revealed normal EKG was normal. The patient was diagnosed with a muscle strain of his chest wall and followed up in sports medicine clinic 5 days later. His pain was improving but was still noticeable if he took a deep breath. He denied any shoulder pain. At this point, he had a BP of 118/54, Pulse 67, and pulse ox of 99%. His shoulder and cardiac exam were normal. Respiratory exam revealed no tachypnea or respiratory distress. There were questionable decreased breath sounds in the left anterior upper chest only. AP and lateral chest x-rays revealed a left superior pneumothorax.

FINAL WORKING DIAGNOSIS: Spontaneous Pneumothorax

TREATMENT AND OUTCOMES: Pulmonology was contacted and the patient was sent back to the ER. The patient was placed on high flow oxygen and admitted to the surgery service. A chest tube was placed which remained in place for 3 days. Repeat x-ray showed resolution of the pneumothorax. Patient has been doing well with no recurrence of symptoms over the last 9 months.

676 June 1, 2:00 PM - 2:20 PM
Hemoptysis in a Football Player
Stephanie Bailey, Franklin Sease, Irfan Asif. Greenville Health Systems, Greenville, SC. (Sponsor: Kyle Cassas, FACSM)
Email: sbailey2@ghs.org

HISTORY: A 20-year-old collegiate wide receiver sustained a fall onto his chest after attempting to catch a pass during a regular season game. He was able to ambulate off the field, but immediately presented to the sideline complaining of shortness of breath and coughing up blood.

PHYSICAL EXAMINATION: Sideline examination revealed initial mild respiratory distress which resolved over 2-3 minutes. He had active, persistent hemoptysis. Lungs were clear to auscultation bilaterally. No chest wall tenderness to palpation, deformity, or crepitations. Tachycardia was present. Trachea was midline. Bilateral radial pulses were strong and equal. Sideline pulse oximetry revealed a heart rate of 118 and oxygen saturation of 92%. He was transported to the ED.

DIFFERENTIAL DIAGNOSIS: Pneumothorax, hemothorax, rib fracture, sternum fracture, pulmonary contusion, traumatic great vessel injury, tracheal injury, mediastinum injury

TEST AND RESULTS: PA and lateral chest x-ray: No evidence of fracture, aortic widening, or lung abnormality.

CT chest with and without contrast: No bony abnormality. Diffuse patchy infiltrates throughout the right upper, middle, and lower lobes consistent with pulmonary contusion.

CBC, coagulation profile, and BMP were within normal limits.

Repeat chest x-ray: No evidence of acute cardiopulmonary disease.

FINAL WORKING DIAGNOSIS: Pulmonary Contusion

TREATMENT AND OUTCOMES: The patient was admitted to the trauma surgery service overnight. He maintained adequate oxygen saturations on room air through the evening and was effectively using incentive spirometry with greater than 2L of inspiratory volume at the time of hospital discharge. He had intermittent, scant hemoptysis that completely resolved 48 hours after the injury. Four days after the injury he was exercised while monitoring his oxygen saturation which remained stable at 93%, however he complained of mild dyspnea. He was cleared to begin non-contact play under direct supervision of his athletic trainer. After successful non-contact practices without dyspnea and with exertional oxygen saturations of 95-99%, he was cleared to return to full play eight days post injury. The return to play decision-making was guided by clinical improvement as there is a lack of literature on exercise, RTP protocols, and follow-up after this type of injury.

B-24 Clinical Case Slide - Upper Extremity-Shoulder I
Wednesday, June 1, 2016, 1:00 PM - 2:40 PM Room: 203

677 Chair: William W. Briner, FACSM. Hospital for Special Surgery, Long Beach, NY.
(No relationships reported)

678 Discussant: Jonathan T. Finnoff, FACSM. Mayo Clinic, Minneapolis, MN.
(No relationships reported)

679 Discussant: Ramsey Shehab. Henry Ford, Detroit, MI.
(No relationships reported)
CASE:
HISTORY: A 55 year old female patient who is right hand dominant and who engages regularly in brisk walking as a means of exercise at a recreational level presented to the sports clinic with acute pain in her right shoulder of 4 days duration. She denied any lifting of heavy loads, any specific trauma to the right shoulder or any fall prior to this. She also denied any excessive overhead activities using her right shoulder. She claims that the pain was sudden in onset as she experienced severe pain only when she woke up in the morning. She graded her pain score on a scale of an 8 out of 10 and claims the pain was affecting both her activities of daily living as well as her work which is mainly a desk job. She denied any symptoms of numbness or tingling sensation in her fingers. She claims this excruciating pain is affecting her sleep.

She recalled being seen 4 days ago at a private centre where she was prescribed some medication and received 2 sessions of physiotherapy. When pain worsened over the last 2 days she decided to seek a second opinion.

PHYSICAL EXAMINATION: Patient is moderately built and nourished and vital signs were normal. Clinically she did not have wasting in the right shoulder muscles but she was tender to touch at the anterior aspect of her right shoulder. She was unable to abduct her right arm actively above 70 degrees while gently passively raising it further brought on more agonising pain. There was no drop arm sign. Severe pain was limiting any further tests to be done on that shoulder. Neck examination was normal.

DIFFERENTIAL DIAGNOSES:
1. Acute calcific Supraspinatus tendinitis
2. Adhesive capsulitis
3. Rotator cuff tear

TREATMENT:
1. Intralesional injection with Depo-medrol 40mg/1ml ( methyl prednisolone acetate)
3. Therapeutic ultrasound to the right shoulder started on day 4 post injection

OUTCOME:
Photo day 1 in clinic - range of motion for abduction right shoulder is 0 - 65 degrees
Photo day 4 in clinic post injection- range of motion for abduction is approximately 0 -160 degrees
Photo day 10 in clinic post injection- range of motion is full for both shoulders.

681
June 1, 1:20 PM - 1:40 PM
Not Your Typical Shoulder Pain in a Throwing Athlete - Softball
Yaowen E. Hu1, Thomas Howard, FACSFM, Frank Pettrone1.
1Kaiser Permanente Mid-Atlantic Physician Medical Group, McLean, VA. 2North Carolina State University, Raleigh, NC. 3Orthopedics of Virginia, Fairfax, VA. (Sponsor: Thomas Howard, FACSFM)
Email: eliot.hu@gmail.com
(No relationships reported)

HISTORY: 18 year old male division I collegiate football defensive back sustained a shoulder injury while tackling. During the second quarter of a midseason game he was pulling...
A 75 year-old, right-hand dominant female developed right shoulder pain that began while she was moving into a new condo. She was an active senior swimmer who did not appear to be related to age, maturation status, or years of experience. However, in this cross-sectional sample, ultrasound-derived pennation angle (CA, thickness (MT), pennation angle (PA), fascicle length (FL), and echo-intensity (EI)) of the dominant and non-dominant vastus lateralis (VL) was assessed via ultrasonography. The average of both legs was calculated for each morphological measure. Data were examined using stepwise regression to determine if CA, MO, or EXP were predictive of muscle morphology. Partial correlations were used to determine relationships among the identified predictive measures and muscle morphology.

RESULTS: MO was shown to be the best predictor (r=0.001) of CA (R2=0.748, SEE=3.807), and MT (R2=0.535, SEE=0.220), while CA was shown to be the best predictor (r=0.001) of FL (R2=0.602, SEE=0.665). CA was the best predictor of EI (R2=0.287, SEE=14.055, p=0.004), while the inclusion of EXP increased the predictive ability of the model by 23.5% (R2=0.522, SEE=11.741, p<0.001). None of the selected variables were predictive of PA. After accounting for BW, significant relationships were observed between MO and CSA (r=0.394, p=0.047), EI (r=0.409, p=0.038), and FL (r=0.461, p=0.018); between EXP and EI (r=0.436, p=0.026); and between CA and EI (r=0.574, p=0.002) and FL (r=0.504, p=0.009).

CONCLUSION: Biological age (i.e., maturity offset) appears to be indicative of lower body muscle size, whereas chronological age, and potentially years of experience, appears to be more indicative of lower body muscle composition among young judo athletes. However, in this cross-sectional sample, ultrasound-derived pennation angle did not appear to be related to age, maturation status, or years of experience.
CONCLUSIONS: We found that muscular fitness was associated with BMD in children and adolescents. Further prospective studies are needed to further investigate the association between muscular fitness and BMD in youth population. Funding: COLCIENCIAS (Contract N° 671-2014 Code 12265743978).

Tendons exhibit viscoelastic properties reflected by a non-linear force-deformation relation and energy loss upon stretching and release. It is known that tendon changes mechanical properties acutely after loading, which is attributed in part to tissue viscosity. Although sparse, tendons were vascularized but whether blood flow or viscosity pressure influences the mechanical properties acutely is unknown. Human cadaver specimens with intact vessels can be perfused at physiological pressure, which combined with tensile testing may yield information of the role of tissue perfusion on tendon function.

PUBLICATIONS: To examine if tissue perfusion influences the mechanical properties of tendons during loading and unloading. METHODS: Four fresh intact cadaver hand specimens were sectioned proximal to the processus styloideus. The a. ulnaris was cannulated to enable saline perfusion of the hand at physiological pressure. The flexor digitorum profundus tendon of the middle finger was mounted in a tensile testing device, and distally, the tip of the intact finger was clamped allowing repetitive loading of the tendon. Four series of 10 tendon loadings were conducted: 2 with perfusion and 2 series without. Series were separated by 5 min with or without perfusion. Subsequently the specimens were perfused with ink and upon dissection the vascular arteries were colored indicating that the tendons had received perfusion. RESULTS: Hysteresis was reduced over all series of loadings but the reduction was greater when the tissue was not perfused (40%) compared to loading series with perfusion (30%, P<0.05). Hysteresis recovered in rest periods, but recovery was doubled during perfused rest compared to rest without perfusion. Tendon stiffness increased through loading series but perfusion did not significantly influence the increase. However, reduction of tendon stiffness during rest periods was greater with perfusion (9%) compared to no perfusion (3%, P<0.05). CONCLUSIONS: Despite the physiological conditions the present data indicate that tissue perfusion may influence the mechanical properties of the force bearing tissues both with respect to stiffness and ability to store and release energy. It should be noted that a limited number of cadavers were available suggesting that caution be taken when data are interpreted.
ultrasonographic images were taken from rectus femoris (RF) and biceps femoris (BF) of the mid-thigh before and after a 6-month physical training period. Echo intensity as an index of IMF was calculated.

RESULTS: After the training, echo intensity of RF and BF was significantly lower compared with before (RF, 80.6 ± 10.0 a.u. to 72.5 ± 14.0 a.u.; BF, 63.1 ± 11.4 a.u. to 57.9 ± 12.0 a.u., p < 0.05), suggesting IMF could be decreased as a result of training. In the Cont group, echo intensity was significantly increased in RF (75.9 ± 7.6 a.u. to 83.8 ± 11.5 a.u., p < 0.05); however, no change in BF (65.2 ± 7.8 a.u. to 70.1 ± 8.9 a.u., p = 0.07). The relative change of echo intensity was significantly different between Ex group and Cont group in RF (Ex group, -9.8 ± 16.2%; Cont group, 10.8 ± 14.1%, p < 0.05) and BF (Ex group, -6.9 ± 18.5%; Cont group, 8.4 ± 14.5%, p < 0.05).

CONCLUSIONS: Physical training decreases IMF in two different thigh muscles of elderly individuals requiring nursing care. This result suggests that change in muscle quality is earlier than we expect in elderly individuals requiring nursing care.

B-26 Free Communication/Poster - Bone, Bone Mineral Density, and Connective Tissue
Wednesday, June 1, 2016, 1:00 PM - 6:00 PM
Room: Exhibit Hall A/B

691 Board #7
June 1, 3:30 PM - 5:00 PM
Parathyroid Hormone (PTH) Secretion is Controlled by both Ionised Calcium and Phosphate During Exercise and Recovery.
Rebecca Townsend1, Kirsty J. Elliott-Sale2, Ana J. Pinto3, Jonathan P.R Scott4, Kevin Currell5, William D. Fraser6, Craig Sale2. 1Nottingham Trent University and the English Institute of Sport, Nottingham, United Kingdom. 2Nottingham Trent University, Nottingham, United Kingdom. 3University of Sao Paulo, Sao Paulo, Brazil. 4Wyle GmbH, Cologne, Germany. 5The English Institute of Sport, Loughborough, United Kingdom. 6University of East Anglia and Norfolk and Norwich University Hospital, Norwich, United Kingdom. Email: becky.townsend@ntu.ac.uk

The mechanism by which PTH is controlled during and after exercise is poorly understood, as previous studies have not taken samples with sufficient temporal frequency.

Purpose
To examine the temporal pattern of PTH, phosphate (PO4), albumin adjusted calcium (ACa) and ionised calcium (Ca2+) during and after 30 min of treadmill running at 55%, 65% and 75%VO2max.

Methodology
Ten males (age 23±1 y, height 1.82±0.07m, body mass 77.6±7.5kg, VO2max 56±6.3 ml kgBM-1 min-1) volunteered to participate. Participants completed 30 min of treadmill running at three different intensities, followed by 2.5 h of recovery. Blood was obtained at baseline, after 2.5, 5, 7.5, 10, 15, 20, 25 and 30 min of exercise and after 2.5, 5, 7.5, 10, 15, 20, 25, 30, 60, 90 and 150 min of recovery for the determination of PTH, PO4, ACa and Ca2+.

Data were analysed using repeated measures ANOVA and post hoc Tukey’s HSD. Cubic interpolation was performed to adjust for unevenly temporally-spaced data, followed by cross-correlational analysis to determine temporal relationships between PTH and PO4, ACa and Ca2+. Results
PTH increased with exercise at all intensities (12% at 55%VO2max, 22% at 65%VO2max and 47% at 75%VO2max) but was only significantly increased at the end of exercise at 75%VO2max (P<0.001). PTH concentrations peaked during early recovery, then gradually decreased towards baseline and were not significantly different from baseline after 15 min of recovery at 55%VO2max and after 25 min of recovery at 65% and 75%VO2max. PO4 followed a similar temporal pattern to PTH, albeit peaking at the end of exercise. Ca2+ followed a similar but inverse pattern to PTH. Overall PTH concentrations were significantly correlated with Ca2+ concentrations across all intensities (r=0.739 to 0.790, P<0.001). During the exercise induced increase in PTH, the strongest cross-correlation was with Ca2+ at 0 lags (3.5 min) (r=0.902 to 0.950).

During the recovery induced decrease in PTH, the strongest cross-correlation was with PO4 at 0 lags (8 min) (r=0.987 to 0.995).

Conclusions
The changes in PTH concentrations are most likely explained by changes in Ca2+ and PO4. ACa was not a suitable surrogate for Ca2+ when investigating the instantaneous response to exercise, since ACa concentrations did not reflect temporal PTH responses or correlate strongly with PTH.

Sclerostin is a protein secreted by osteocytes that acts as a negative regulator of bone formation. Sclerostin expression is suppressed by parathyroid hormone (PTH) and mechanical loading; however, it is unknown whether exercise alters serum sclerostin levels. PURPOSE: The purpose of this study was to determine whether an acute bout of exercise reduces serum sclerostin. METHODS: 16 male volunteers (21.9 ± 3.8 yrs, 173.7 ± 6.7 cm, 80.8 ± 12.2 kg) performed an acute bout of 10 sets of 10 repetitions of isokinetic jumps at 40% of their 1 repetition-maximum. A calcium-controlled diet (1,000 mg/day) was implemented to maintain serum PTH concentrations. Blood was drawn for analysis of serum sclerostin, markers of bone formation (bone alkaline phosphatase, BAP; osteocalcin, OCN), and a marker of bone resorption (tartarate-resistant acid phosphatase 5b, TRAP5b) prior to exercise and 12, 24, 48, and 72 hours following exercise. Participants fasted for 8 hours prior to blood draws with the exception of the 12-hour draw. Changes in serum concentrations were converted to percentages based on individual baselines, which were set to 100%. Data were analyzed by repeated measures ANOVA with Tukey correction for multiple comparisons. RESULTS: There were no significant differences in circulating sclerostin between baseline and any time point following exercise. A 16.7% decrease in circulating sclerostin was detected between 12 hours (109.9% ± 18.35%; mean ± SD) and 24 hours (93.2% ± 19.88%) after exercise (P<0.05). Twelve hours following exercise, TRAP5b was 8.4% ± 4.80% lower than baseline (P<0.001), and between

693 Board #9
June 1, 3:30 PM - 5:00 PM
Effects Of An Acute Bout Of Pylometric Exercise On Serum Sclerostin Over A 72-hour Period In Men
Katelyn I. Guerriere1, Erin Gaffney-Stomberg1, Julie M. Hughes1, Jeffery S. Staab1, Mary L. Bouxsein2, Ronald W. Matheny, Jr.1. 1U.S. Army Research Institute of Environmental Medicine, Natick, MA. 2Center for Advanced Orthopaedic Studies, Beth Israel Deaconess Medical Center, Endocrine Unit, Massachusetts General Hospital, Department of Orthopaedic Surgery, Harvard Medical School, Boston, MA. Email: katelyn.i.guerriere.ctr@mail.mil

Understanding fascicle behaviors during muscle contraction is essential for our understanding of muscle function. Several studies have examined fascicle behaviors during contractions of different muscles, however little is known about vastus intermedius (VI) fascicle behavior during eccentric contractions. The VI fascicles originate directly on the femur, but those of vastus lateralis (VL) originate on a compliant aponeurosis. Thus, it is assumed that fascicle behavior is different between VI and VL during eccentric knee extensor contractions.

PURPOSE: This study compared VI and VL fascicle length changes during maximal eccentric knee extensor contractions using ultrasonography.

METHODS: Thirteen healthy men (age: 27.1 ± 3.5 y, height: 176.1 ± 6.1 cm, body mass: 76.0 ± 7.9 kg) performed passive knee flexions and maximal eccentric knee extensor contractions through the same knee joint range of motion from 35° to 105° − full extension at an angular velocity of 30° s−1. B-mode ultrasound images of VI and VL were simultaneously recorded at 30 Hz using two serially-arranged ultrasound probes (11 cm imaging window) placed on the skin surface over VL. VI and VL fascicle lengths at knee joint angles of 40° and 100° were measured from the images, and the magnitude of fascicle lengthening from 40° to 100° was calculated.

RESULTS: VI and VL fascicle lengths at 40° were 92.2 ± 13.3 mm and 99.8 ± 8.8 mm during passive knee flexion, and 72.7 ± 7.5 mm and 75.8 ± 8.8 mm during eccentric contraction, respectively. VI and VL fascicles were lengthened similarly during passive knee flexion (VI: 36 ± 5 mm, VL: 33 ± 9 mm), but VI fascicles were lengthened more (35 ± 9 mm) than VL fascicles (24 ± 5 mm) during eccentric contraction (P<0.05).

The magnitude of fascicle lengthening was similar between passive knee flexion and eccentric contraction for VI, but was smaller during eccentric contraction than passive knee flexion for VL (P<0.05).

CONCLUSIONS: These results show that VI fascicles are lengthened more than VL fascicles during eccentric contractions. This may suggest that either VI is less activated or VI receives greater mechanical stress during eccentric contraction when compared with VL. Further study is necessary to investigate how the different fascicle behaviors affect the magnitude of muscle damage induced by eccentric contractions between the muscles.
Both high-load strength training and high-velocity power training are effective means of increasing vertical jump height. However, only strength training is able to elicit increases in tendon stiffness. Because a stiffer tendon will require more force to adequately lengthen it and will recede at a greater velocity when lengthened changes in tendon stiffness may alter joint kinematics differently than power training. Purpose: To determine if training induced changes in tendon stiffness will alter jump kinematics.

Hypothesis: Strength training will increase tendon stiffness that will elicit subsequent changes in jump kinematics that differ from those experienced by power training.

Methods: 36 physically active but non-strength trained males were randomly assigned to one of four groups: a strength training group that performed high-resistance parallel-depth squats (SQ-P, n = 8), one of two power training groups that performed high-speed jump squats from either a self selected depth (JS, n = 10) or parallel depth (JS-P, n = 9) or a control group (C). Each intervention was 8-weeks in duration before and after which subjects had their quadriceps tendon stiffness measured during a ramp isometric contraction with tandem ultrasonography and their knee kinematics measured using high-speed cinematography during a maximal vertical jump. Comparisons were made between groups and time using a 4x2 mixed model MANOVA with Bonferroni adjustments. Analyses were performed using SPSS (version 25.0) with an alpha level of 0.05.

Results: JS and JS-P had increased eccentric velocity and knee flexion while SQ-P and C had no significant changes to jump kinematics.

Conclusion: Quadriceps tendon stiffness increased from baseline to the end of the intervention and was greatest in the JS-P group. Comparisons between the groups revealed that only the JS-P group had increased tendon stiffness and change in jump kinematics. These results make a strong case for the use of isometric contraction with tandem ultrasonography and the use of high-speed cinematography when studying tendon stiffness and jump kinematics.

Purpose: The purpose of this study was to identify the tendon stiffness differences between groups and time and to determine if training induced changes in tendon stiffness will alter jump kinematics.

Hypothesis: It is hypothesized that training will increase tendon stiffness and alter jump kinematics.

Methods: Thirty-nine healthy physical therapy students were randomly assigned to one of three groups: a static group (S, n=13) that performed static isometric contractions, a combined static and dynamic group (SD, n=14) that performed both static and dynamic contractions, and a dynamic group (D, n=12) that performed only dynamic contractions. All groups were assigned to either an experimental group (E) or a control group (C). E groups performed 8-weeks of static only, static and dynamic, or dynamic training, respectively, before which their quadriceps tendon stiffness was measured using high-speed cinematography after a ramp isometric contraction. Comparisons were made between groups and time using a 4x2 mixed model MANOVA with Bonferroni adjustments. Analyses were performed using SPSS (version 25.0) with an alpha level of 0.05.

Results: Quadriceps tendon stiffness increased from baseline to the end of the intervention and was greatest in the D group. Comparisons between the groups revealed that only the D group had increased tendon stiffness and change in jump kinematics. These results make a strong case for the use of tandem ultrasonography and the use of high-speed cinematography when studying tendon stiffness and jump kinematics.

Conclusion: Quadriceps tendon stiffness increased from baseline to the end of the intervention and was greatest in the D group. Comparisons between the groups revealed that only the D group had increased tendon stiffness and change in jump kinematics. These results make a strong case for the use of tandem ultrasonography and the use of high-speed cinematography when studying tendon stiffness and jump kinematics.
Osteoporosis Knowledge, And Beliefs Among College Students In The US

Martha Bass, Melinda Valliant, Allison Ford-Wade, Lois Coleman. The University of Mississippi, University, MS.
(Sponsor: Dr. Mark Loftin, FACSM)
Email: mbassel1@olemiss.edu

Previous studies have reported that women have inadequate knowledge and perceptions of osteoporosis, which may influence a lack of preventive health behaviors. However, many of these studies have been conducted in postmenopausal women living outside of the US. PURPOSE: The purpose of this study was to explore osteoporosis knowledge and health beliefs among female college students in the US. METHODS: Female undergraduate students (n = 80) attending The University of Mississippi, Oxford, MS completed the Osteoporosis Health Belief Scale (OHBS) and Osteoporosis Knowledge Test (OKT) (Kim et al., 1991). Pearson’s correlation was used to assess relationships between knowledge, perceived susceptibility and severity, perceived exercise benefit and barriers, perceived calcium benefit and barriers, and health motivation. Chi-square test was conducted to assess the influence of knowledge and health beliefs on dietary intake and exercise.

RESULTS: Osteoporosis knowledge was found to have a significant relationship with perceived exercise benefit (r = -.36, p < .05) as well as calcium benefit (r = -.221, p < .05). Relationships were also found between perceived severity and calcium benefit (r = -.23, p < .05) and exercise barriers (r = -.31, p < .05); exercise barriers and calcium barriers (r = -.25, p < .05); and health motivation with knowledge (r = -.222, p < .05), exercise benefit (r = -.048, p < .05), and exercise barriers (r = -.39, p < .05). Knowledge of osteoporosis had a significant association with exercise (X2 = 22.59, p < .05) but not with dietary intake. Health motivation was associated with dietary intake (X2 = 37.09, p < .05) but not exercise. The OKT scores ranged from 7 to 20 out of a possible 24 points (r = 13.29; 2.6, 55%). CONCLUSION: Female college aged students are not only lacking in knowledge of osteoporosis but also have a low level of perceived susceptibility, and severity of the disease. Previous studies indicate that females are at risk for depletion of bone mineral density as they age. Primary prevention of osteoporosis should begin at a young age to maximize peak bone mass in this population. Health educators and professionals need to focus on increasing knowledge and perceptions regarding osteoporosis in young females to reduce the incidence of this disease.

FES-Rowing and Long-Term Reversal of Osteoporosis Following Spinal Cord Injury: A Case Study

Eziamaka C. Okafor1, Rajiv Gupta2, David Estrada2, J. Andrew Taylor1, Can Ozan Tan1. 1Spaulding Rehabilitation Hospital/ Harvard Medical School, Charlestown, MA. 2Massachusetts General Hospital/Harvard Medical School, Boston, MA.
(Sponsor: Dr. Mark Loftin, FACSM)
Email: eokafor1@partners.org

Among the long-term consequences of spinal cord injury (SCI) is severe osteoporosis due to immobility and subsequent mechanical unloading of the paralyzed limbs. In fact, all individuals with motor complete SCI develop osteoporosis below the level of the injury. Unfortunately, physical therapy does not appear to have proven efficacy and there is no conclusive evidence supporting effective pharmacologic intervention for prevention and treatment. Recent advances in the application of functional electrical stimulation (FES) for rowing exercise provide a new and exciting opportunity to improve bone metabolism and to provide mechanical strain to the paralyzed lower limbs. Specifically, FES-row exercises use electrical stimulation of the paralyzed quads and hamstrings to actively engage both the arms and the legs in a full rowing cycle. However, while FES rowing exercise appears to be sufficient to stimulate new bone formation acutely, there are no longitudinal assessment of its long-term osteogenic effect. PURPOSE: To provide a case study of the long-term osteogenic effects of FES-Rowing after SCI resulting in bilateral lower extremity paralysis. METHODS: We obtained volumetric CT scans of proximal tibia and distal femur of an adult male (36 years old, normal BMI, T4 AIS A complete SCI, 13 years post-injury) who uses a wheelchair as primary mode of mobility and enrolled in an FES rowing program, at baseline and after 6 and 66 months of rowing exercise (12 days/month, 30 minutes/day at 150 bpm HR in the first 6 months, and 9 days/month, 25 minutes/day at 132 bpm in months 6 - 66). Subsequently, we estimated compressive bone strength via finite element analysis (9% margin of error). RESULTS: Compared to baseline, both femur and tibia were stronger (respectively, 37%/37% [Left/Right] and 55%/38%) after 6-months of FES-row exercise. Remarkably, this improvement was not only preserved, but also continued throughout the five years of exercise (46%/87% and 67%/54%, compared to baseline). CONCLUSION: These results suggest that FES rowing exercise is a sufficiently robust osteogenic stimulus for long-term prevention and reversal of osteoporotic changes after lower extremity paralysis, and warrant further long-term cohort studies. Supported by the Ellen R. and Melvin J. Gordon Center for the Cure and Treatment of Paralysis.
**Board #17 June 1, 2:00 PM - 3:30 PM**

**Pilot Study Examining the Effects of Doxorubicin Treatment and Voluntary Wheel Running on Kidney Antioxidants**

Raquel L. Borges, Leanne M. Hochberg, Eric C. Bredahl, David S. Hydock. **University of Northern Colorado, Greeley, CO.**

**Earmark:** 5,05 -23,50 ± 4,1 0,02 0,008 0,002 0,03 0,02 NS

Chronic kidney disease (CKD) is a major health problem worldwide. One of the mechanisms involved in the progression of CKD is linked to a reduction in antioxidant enzymes. Doxorubicin (DOX) is a chemotherapy agent whose clinical use is limited by its toxicity. Moreover, DOX is used as a model for inducing kidney damage as oxidative stress is one of the primary mechanisms leading to DOX-induced kidney damage. DOX-induced side effects are a clinical concern, and approaches to minimize its toxicity, such as using exercise, have received attention. However, very little is known about the effects of exercise in managing DOX-induced kidney damage.

**PURPOSE:** To conduct a pilot study investigating the effects of DOX administration and exercise on kidney antioxidant expression as a marker of kidney damage.

**METHODS:** Male Sprague Dawley rats received 2 mg/kg DOX (i.p.) weekly for 6 weeks. During this time, animals were either housed in cages with voluntary running wheels as the exercise condition (EX) or were restricted to normal cage activity as the sedentary condition (SED). Upon conclusion of DOX administration, EX continued having access to running wheels and SED remained in normal cages for an additional 4 weeks (10 weeks total). Control animals received saline (SAL) weekly for 6 weeks and were housed in standard cages. After the treatment period, kidneys were excised and Western blotting was performed to assess antioxidant expression.

**RESULTS:** DOX treatment resulted in a 29% reduction in glutathione peroxidase (GPX) expression and a 47% decrease in catalase (CAT) expression (SED/DOX vs. SED+SAL). Exercise during and following DOX treatment did not protect against the DOX-induced reduction in GPX and CAT as EX-DOX expressed 34% lower GPX and 59% lower CAT than SED+SAL. CONCLUSION: Weekly DOX administration reduced GPX and CAT expression, and exercise did not protect against this decline. These preliminary data suggest that voluntary wheel running did not protect against DOX-induced reductions in GPX and CAT.

**Board #19 June 1, 2:00 PM - 3:30 PM**

**Aerobic Interval Training Prevents Cancer-induced Diastolic Dysfunction Through The Modulation Of The Cardiac Mitochondrial Phosphoproteome**

Daniel Moreira-Gonçalves, Rui Vitorino, Rita Ferreira-Nogueira, Sandra Magalhães, Paula Oliveira, Rita Ferreira. **CIAFEL, Faculty of Sport, Porto, Portugal.**

**Earmark:** -19,01 ± 2,1 -24,1 ± 0,008 -25,08 ± 0,5 -24,42 ± 5,3 -25,94 ± 5,3

Purpose: Clarify the impact of aerobic interval training (AIT) on cancer-related cardiac dysfunction and cardiac mitochondrial phosphoproteome.

**METHODS:** Male mice (age=4wk) were exposed to 0.05% N-butyl-N-(4-hydroxybutyl) nitrosoamine (BBN) for 12 weeks (BBN+EX) or tap water (CONT, n=14). After 12 weeks, half of the animals from each group started AIT (10x4 min at 25 m/min, interspersed by 2 min at 10m/min, 10°, for 8wk, 5 d/wk) (CONT+EX and BBN+EX) while the other half remained sedentary (CONT+SAL and BBN+SAL). After, animals were prepared for hemodynamic evaluation, sacrificed and heart tissue was collected to isolate mitochondria for TiO2 enrichment followed by LC-MS/MS for phosphoproteomic analysis.

**RESULTS:** Contrarily to BBN+CONT, BBN+EX showed preserved diastolic function, cardiomyocyte hypertrophy, and reduced structural derangement and fibrosis. LC-MS/MS analysis allowed identifying 373 distinct proteins implicated in generation of precursor metabolites and energy, muscle contraction and cellular respiration. BBN mice showed unique proteins related to cardiac tissue morphogenesis whereas the most represented in CONT were involved in cellular respiration and negative regulation of mitochondrial membrane permeability. AIT induced the up-regulation of proteins belonging to cardiac muscle contraction, ATP metabolism and Smad signaling transduction, and led to the down-regulation of cardiac morphogenesis proteins. We also identified 536 distinct phosphorylated peptides, corresponding to 524 phosphoproteins. Five phosphoproteins were common to all animals, with more phosphoproteins identified in BBN. The biological processes up-regulated by phosphorylation in BBN+CONT were ventricular system development and vasocstriction while in BBN+EX were cardiac muscle hypertrophy and negative regulation of G-protein coupled receptor protein signaling pathway. PDHK, p38 MAPK and NEK6 were among the predicted kinases activated in cardiac mitochondria from BBN+EX, while GRK1, CAMK4, STKR and NEK2 were in BBN+CONT. Conclusion: AIT protects from cancer-related cardiac dysfunction, which was related to the modulation of cardiac mitochondrial proteome and phosphoproteome.

Funding: EXPL/DT-P/1010/2013; FCOMP-01-0124-FEDER-041115; PTDC/ DTP-DES/6077/2014

**Board #20 June 1, 2:00 PM - 3:30 PM**

**Lower Rate-pressure Product During Submaximal Walking Is Associated With Fatigue Improvement Among Breast Cancer Survivors**

Stephen J. Carter, Gary R. Hunter, FACS*M, Edward McAuley, Kerry S. Courneya, FACS*M, Philip M. Anton, Laura Q. Rogers, FACS*M. **University of Alabama at Birmingham, Birmingham, AL.**

**Earmark:** -19,01 ± 2,1 -24,1 ± 0,008 -25,08 ± 0,5 -24,42 ± 5,3 -25,94 ± 5,3

Purpose: Research linking exercise-induced changes in aerobic fitness and reduced fatigue after cancer diagnosis has been inconsistent. We evaluated the association between rate-pressure product (RPP), a reliable index of myocardial oxygen demand, and fatigue response to a physical activity intervention among post-primary treatment breast cancer survivors (BCS).

**RESULTS:** DOX treatment resulted in a 29% reduction in glutathione peroxidase (GPX) expression and a 47% decrease in catalase (CAT) expression (SED+DOX vs. SED+SAL). Exercise during and following DOX treatment did not protect against the DOX-induced reductions in GPX and CAT.

**Abstracts were prepared by the authors and printed as submitted.**
Eighteen healthy, sedentary men (age: 25 ± 5 y, BMI: 26.7 ± 5.8 kg/m²) participated in the study. Subjects trained three days/week for eight weeks. Training consisted of sprinting protocols using the Naughton protocol.

RESULTS: The magnitude of change (Δ) in resting and submaximal RPPs at M3 were greater in the INT group from stage 1 (1 mph; 90% grade) (ARPP1; INT -13 ± 17 vs. UC +7 ± 18; p = 0.03) than stage 4 (2 mph; 7% grade) (ARPP4; INT -21 ± 26 vs. UC -9 ± 24; p < 0.01) of the walk test. The INT group reported significantly reduced fatigue at M3 (INT -0.7 ± 2.0 vs. UC -0.1 ± 2.0; p = 0.02). FMD was positively associated with ARPP during stages 2-4 of the walk test but not ΔΔRPP fitness. Path analyses revealed a significant indirect effect of group randomization on ΔΔfatigue through ARPP4, β = −0.167, 95% CI [-0.46, -0.06]. The full model including group randomization and ARPP4 as predictors accounted for 25% of the total variance in ΔΔfatigue.

CONCLUSIONS: Lower RPP during submaximal walking was significantly associated with reduced fatigue among BCS. Exercise/physical activity training programs that lower the physiological strain during submaximal walking may produce the largest improvements in reported fatigue. Further research concerning the role of autonomic function and the cardiovascular system (contributors to RPP) in mediating exercise training effects on fatigue in BCS is needed.

NIH R01CA136859 (Rogers), R01DK094779 (Hunter), & P30DK056336 (Cartier). Kerry S. Courneya is supported by the Canada Research Chairs Program.

B-28 Free Communication/Poster - Cardiovascular I

Wednesday, June 1, 2016, 1:00 PM - 6:00 PM
Room: Exhibit Hall A/B

High-intensity interval training (HIIT) is a novel mode of exercise training that has been shown to improve several components of health in various healthy and diseased populations.

Purpose: The purpose of the present study was to assess arterial stiffness and intima media thickness at three time points of an 8-week HIIT intervention in healthy adult males.

Methods: Eighteen healthy, sedentary men (age: 25 ± 5 y, BMI: 26.7 ± 5.8 kg/m²) participated in the study. Subjects trained three days/week for eight weeks. Training was comprised of three to six ‘all out’ Wingate cycling tests separated by 4.5 min of active recovery. Vascular assessments were taken at baseline, after four weeks, and after eight weeks of training. Augmentation index at 75 beats per minute (AIx@75) and pulse wave velocity (PWV) were assessed by applanation tonometry. Carotid intima media thickness (CIMT) was measured using b-mode ultrasonography. Data were analyzed using repeated measures ANOVA. Pairwise comparisons after Tukey’s LSD adjustment were used to identify significance between measurements. Pearson correlations determined the relationship between baseline values and the change in values at 8 weeks. Significance was set at p < 0.05.

Results: The magnitude of change (Δ) in resting and submaximal RPPs at M3 were greater in the INT group from stage 1 (1 mph; 90% grade) (ARPP1; INT -13 ± 17 vs. UC +7 ± 18; p = 0.03) than stage 4 (2 mph; 7% grade) (ARPP4; INT -21 ± 26 vs. UC -9 ± 24; p < 0.01) of the walk test. The INT group reported significantly reduced fatigue at M3 (INT -0.7 ± 2.0 vs. UC -0.1 ± 2.0; p = 0.02). FMD was positively associated with ARPP during stages 2-4 of the walk test but not ΔΔRPP fitness. Path analyses revealed a significant indirect effect of group randomization on ΔΔfatigue through ARPP4, β = −0.167, 95% CI [-0.46, -0.06]. The full model including group randomization and ARPP4 as predictors accounted for 25% of the total variance in ΔΔfatigue.

Conclusions: Lower RPP during submaximal walking was significantly associated with reduced fatigue among BCS. Exercise/physical activity training programs that lower the physiological strain during submaximal walking may produce the largest improvements in reported fatigue. Further research concerning the role of autonomic function and the cardiovascular system (contributors to RPP) in mediating exercise training effects on fatigue in BCS is needed.

NIH R01CA136859 (Rogers), R01DK094779 (Hunter), & P30DK056336 (Cartier). Kerry S. Courneya is supported by the Canada Research Chairs Program.
Effects of Low to Moderate-Intensity Interval Exercise on Arterial Stiffness

Kazumichi Kurobe1, Misaki Watanabe2, Naoyuki Matsumoto2. 1Hannan University, Matsubara, Japan. 2Prefectural University of Kumamoto, Kumamoto, Japan.

Email: kurobe@hannan-u.ac.jp

Recently, it has been reported that high-intensity interval exercise effectively decreases arterial stiffness. However, high-intensity exercise is also associated with some cardiovascular risks, especially for unhealthy people. Interval exercise has the advantage in which exercise-induced subjective fatigue is weakened when compared with continuous exercise. Therefore, if the beneficial effects on arterial stiffness of low to moderate intensity exercise can be made clear, it could be adopted as a new exercise prescription.

PURPOSE: The present study aimed to examine and compare the effects of two types of exercise (continuous vs. interval) at low to moderate-intensity on systemic arterial stiffness.

METHODS: Eight young men (age, 19.2 ± 0.2 years; height, 172 ± 1.1 cm; weight, 64.4 ± 2.8 kg; body mass index, 21.5 ± 0.8 kg/m2) participated in this study. All subjects were healthy, physically active, unmedicated, non-smokers, and normotensive (blood pressure <140/90 mmHg). They participated in the following four cycle ergometer trials in random order, with each trial separated by at least a day: a trial with a single, 30-min bout of continuous exercise (CE) and a trial with three 10-min bouts of interval exercise separated by 10-min periods of rest (IE) each at 40% and 60% of VO2max. Arterial stiffness was evaluated 2 hours after exercise by car-dio-ankle vascular index (CAVI).

RESULTS: Although arterial stiffness during the recovery period did not change after CE and IE at 40% VO2max compared with the baseline, it significantly decreased from the baseline in both exercise conditions at 60% VO2max immediately after each exercise (CE, 5.7 ± 0.2 vs. 4.4 ± 0.2, P < 0.05; IE, 5.7 ± 0.2 vs. 4.8 ± 0.1, P < 0.05). Moreover, the decreased CAVI value after exercise in CE was maintained until 30 min after exercise (5.1 ± 0.1, P < 0.05 vs. baseline), and the value was significantly lower than IE (5.1 ± 0.1 vs. 5.4 ± 0.1, P < 0.05). The rating of perceived exertion during exercise was significantly lower in IE than CE in both exercise intensities (P < 0.05).

CONCLUSIONS: These results suggest that aerobic exercise at 40% of VO2max was not enough to reduce systemic arterial stiffness for young healthy men. However, it was found that the reducing effect of systemic arterial stiffness after exercise at 60% of VO2max was more effective in CE than IE.

The Acute Effect Of High Intensity Interval Exercise And Moderate Continuous Exercise On Endothelial Function In Children.

Nicola D. Hopkins, Daniel J. Green, Ellen A. Dawson, Helen Jones. Research Institute for Sport and Exercise Science, Liverpool John Moores University, Liverpool, United Kingdom. (Sponsor: keith George, FACSM)

Email: spsnhopk@ljvm.ac.uk

(Purpose: chronic exercise training improves conduit artery endothelial function. Acute changes in endothelial function following a single bout of exercise are intensity and duration dependent, and are hypothesised to determine the chronic endothelial response to exercise training. Whilst this acute response is relatively well characterised in adults, little is known about the acute endothelial response in children.

METHODS: Nine, healthy 10-11 year old children (7 female, BMI 16.6 ± 2.9 kg/m2) completed an acute RE bout during the early follicular phase of the menstrual cycle.

RESULTS: In the HIT condition, FMD was 7.68% (5.10 to 10.41) at PRE, then declined at POST (5.23% (2.45 to 8.02) and POST2 (4.92% (2.42 to 7.43). In the CONT condition, PRE FMD was 9.31% (6.70 to 12.03), POST1 11.07% (8.38 to 13.87), and POST1 8.68% (7.00 to 12.43). Whilst FMD significantly differed by the mode of the exercise (P < 0.001), there was no significant main effect of time (P = 0.29), or interaction between exercise mode and time (P = 0.20).

CONCLUSION: In agreement with findings in adults and adolescents, our novel data suggest that changes in endothelial function in response to an acute bout of exercise in healthy, pre-pubertal children may be dependent on the type and intensity of the exercise performed, with high intensity interval exercise appearing to have a greater impact on post exercise FMD. Further research is needed to fully define the relationship between acute exercise intensity and FMD in children, and to establish how acute vascular responses determine chronic vascular adaptation.

Menstrual Phase and the Vascular Response to Acute Resistance Exercise In Women

Jacqueline A. Augustine, Kayla M. Nunemacher, Kevin S. Heffernan, Syracuse University, Syracuse, NY. (Sponsor: Bo Fernhall, FACSM)

Email: Jaimse@syr.edu

(Purpose: Exercise during the menstrual cycle may affect the vascular response to acute resistance exercise. Although arterial stiffness is increased during the luteal phase of the menstrual cycle, it is unknown if other menstrual phase changes affect the vascular response to exercise.

METHODS: Forty 10-15 year-old male Sprague-Dawley rats were randomly divided into 4 groups: CON: 8-week sedentary control, AT: aerobic exercise training (treadmill running for 60 min at 30m/min, 5days/wk for weeks), HIT: high-intensity intermittent exercise training (fourteen 20sec swimming sessions with a weight equivalent to 14-16% of each body weight and 10 sec pause for 120 minutes between sessions, 20 days/wk for weeks), and RT: resistance training (ladder climbing, 8-10 sets/day, 3days/wk for weeks) groups (n=10 each group). After training session, we measured aortic pulse wave velocity (aortic PWV) as an index of arterial stiffness and plasma nitrite/nitrate concentrations (NOx) and eNOS protein expression in the aorta.

RESULTS: Aortic PWV was significantly reduced in both AT and HIT groups as compared to CON and RT groups, whereas there was no difference between AT and RT groups. HIT-induced reduction of aortic PWV was equal to AT. Additionally, eNOS protein expression and plasma NOx level were significantly elevated in both AT and HIT groups as compared to CON and RT groups, whereas there was no difference between RT and CON groups. Moreover, HIT-induced increase in eNOS protein and plasma NOx levels was equal to AT.

CONCLUSIONS: These results suggest that HIT-induced increase in aortic NO production may improve central arterial stiffness, as same degree of AT in rats, but was not changed by RT.
Arterial stiffness and obesity are independent predictors of coronary heart disease and cardiovascular disease mortality; however, there is conflicting evidence for the association between arterial stiffness and obesity. Central stiffness refers to stiffness of larger, elastic arteries such as the aorta and the carotid artery. Aortic stiffness research of young Hispanic males is limited. PURPOSE: To examine the association between measures of obesity and aortic stiffness of young Hispanic males. METHODS: All data are expressed as mean ± SD. Participants were 23 non-obese (nOB; BMI 25.87 ± 3.09 kg/m²) and 21 obese (OB; BMI 35.42 ± 4.87 kg/m²) young Hispanic males (age range 18-25 years). Measures of obesity included body fat percentage, BMI, waist circumference, hip circumference, and waist-to-hip ratio. Arterial stiffness was determined at rest and post-exercise (50% heart rate reserve) with pulse wave velocity (PWV) and augmentation index (AIx). Between-group comparisons (nOB vs. OB) were conducted with a mixed model analysis of variance and multivariate analysis was used to determine the strongest predictor of arterial stiffness. RESULTS: PWV at rest was significantly greater (p = 0.013) in the OB group (8.49 ± 1.23 m/s) compared to the nOB group (7.53 ± 1.17 m/s) and the difference approached significance post-exercise (OB: 8.16 ± 1.24; nOB: 7.42 ± 1.71 mmHg, p = 0.055). There was no significant between-group difference in AIx at rest (OB: -6.1 ± 16.71%; nOB: -11.4 ± 10.25%), or post-exercise (OB: -9.1 ± 15.63%; nOB: -12.9 ± 15.9%, p = 0.03). Of the predictors entered into the statistical models, waist-to-hip ratio and waist circumference were stronger predictors of PWV and AIx than body fat percentage or BMI. CONCLUSION: The results of this study suggest that for young Hispanic men the distribution of adipose tissue may be a better predictor of arterial stiffness than total body fatness. These results for young Hispanic men reiterate the potential negative impact of central adiposity on the risk for cardiovascular disease. Additionally, acute exercise did not result in physiological vascular changes in these Hispanic young men which may have been related to the exercise intensity or duration. Future studies are needed to determine if higher intensity exercise may elicit changes.

Purpose: Cardiovascular disease (CVD) begins in childhood primarily due to exposure to lifestyle-mediated risk factors such as inactivity and low cardiorespiratory fitness. Endothelial dysfunction is one of the earliest events in the development of CVD and is characterized by a reduction in nitric oxide (NO) bioavailability. Sedentary behaviour induces hemodynamic alterations within the vasculature, in particular low shear stress, which results in a direct reduction in NO bioavailability. To date, no published studies have objectively evaluated sedentary behaviour and EF in adolescents. The purpose of this study was to compare objectively measured sedentary behaviour and EF in low fit (LF), moderately fit (MF) and high fit (HF) male adolescents and to examine the relation between sedentary behaviour and EF.

Methods: LF (n=18, VO2max = 40.8 ± 4.3 mL·kg⁻¹·min⁻¹), MF (n=18, VO2max = 53.0 ± 4.1 mL·kg⁻¹·min⁻¹) and HF (n=18, VO2max = 63.3 ± 3.9 mL·kg⁻¹·min⁻¹) males aged 15.6 ± 0.6 yr participated in the study. Study participants wore a tri-axial ActiVital accelerometer for 6 hours. Percentage of waking day spent sitting/lying (%SLT) and the duration of sedentary bouts >20 min, 30 min and 60 min were calculated using previously published methodology. High-resolution ultrasonography was used to assess endothelial dependent dilation (EED) in response to brachial artery flow mediated dilation. Endothelial independent dilation (EID) was assessed following sublingual administration of 400 μg of glyceryl trinitrate.

Results: EDD was lower in LF than MF (p<0.001) and HF (p<0.001). There was no between group difference in EID, %SLT was higher in LF (p=0.01) and LF was significantly higher in LF than HF. There was a significant inverse relation between %SLT and EED (r = -0.51, p<0.001), 30 min (r = -0.47, p<0.001) and 60 min (r = -0.38, p<0.01). Conclusion: Measures of sedentary behaviour were significantly higher in LF and MF than HF and adolescent males were inversely related to EDD. Funded by Insight Centre for Data Analytics, Dublin City University, Ireland.

### Table: Measures of Stiffness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Condition</th>
<th>Rest</th>
<th>Post-10 min</th>
<th>10 min</th>
<th>20 min</th>
<th>30 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF-PWV (m/s)</td>
<td>Early Folicular</td>
<td>5.6 ± 0.8</td>
<td>5.8 ± 0.7*</td>
<td>5.6 ± 0.7*</td>
<td>5.6 ± 0.7*</td>
<td>5.7 ± 0.8*</td>
</tr>
<tr>
<td>Ovulation</td>
<td>5.6 ± 0.6</td>
<td>5.9 ± 0.7*</td>
<td>6.1 ± 0.8*</td>
<td>6.1 ± 0.9*</td>
<td>6.0 ± 0.9*</td>
<td></td>
</tr>
<tr>
<td>CR-PWV (m/s)</td>
<td>Early Folicular</td>
<td>7.9 ± 0.3</td>
<td>6.8 ± 0.3*</td>
<td>7.2 ± 0.3*</td>
<td>7.8 ± 0.3</td>
<td>7.3 ± 0.4</td>
</tr>
<tr>
<td>Ovulation</td>
<td>7.9 ± 0.3</td>
<td>6.8 ± 0.3*</td>
<td>7.1 ± 0.3*</td>
<td>7.6 ± 0.3</td>
<td>7.3 ± 0.3</td>
<td></td>
</tr>
<tr>
<td>MAP (mmHg)</td>
<td>Early Folicular</td>
<td>79 ± 7</td>
<td>83 ± 9</td>
<td>80 ± 10</td>
<td>76 ± 10</td>
<td>79 ± 9</td>
</tr>
<tr>
<td>Ovulation</td>
<td>78 ± 6</td>
<td>79 ± 6</td>
<td>75 ± 7</td>
<td>76 ± 6</td>
<td>76 ± 8</td>
<td></td>
</tr>
</tbody>
</table>

* Significantly different from baseline (time effect), p < 0.05; MAP, Mean Arterial Pressure.

### Board #29

June 1, 3:30 PM - 5:00 PM

**Sedentary Behaviour and Vascular Endothelial Function in Male Adolescents with Low, Moderate and High Cardiorespiratory Fitness**

Sinead E. Sheridan¹, Kieran P. Dowd², Paul L. O’Connor³, Cleona Gray⁴, Nicola R. Hurley⁴, Michael Harrison⁵, Alan E. Donnelly⁶, Ronan P. Murphy⁶, Niall M. Moyna, FACSM⁷.

¹Dublin City University, Dublin, Ireland. ²University of Limerick, Limerick, Ireland. ³Central Michigan University, Mount Pleasant, MI. ⁴Mater Misericordiae University Hospital, Dublin, Ireland. ⁵Waterford Institute of Technology, Waterford, Ireland. Email: sinead.sheridan9@mail.dcu.ie

No relationships reported.

Purpose: Sedentary behaviour and vascular endothelial function in adolescent males with low, moderate and high cardiorespiratory fitness were examined. Sedentary behaviour is a lifestyle factor that is associated with increased risk of cardiovascular disease. This study examines the impact of sedentary behaviour on endothelial dependent and independent dilation in adolescents.

### Board #30

June 1, 3-30 PM - 5:00 PM

**Serum Adropin Level Is Associated With Arterial Stiffness And Cardiorespiratory Fitness In Older Adults**

Shumpei Fujie¹, Natsuki Hasegawa¹, Koji Sato¹, Satoshi Fujita², Kiyoshi Sanada³, Takafulama Hamaoka⁴, Motoyuki Iemitsu⁵, Ritsumeikan University, Kusatsu, Japan. ³ Kobe University, Kobe, Japan. ⁴Tokyo Medical University, Tokyo, Japan. ⁵Sponsor: Takafumi Hamaoka, FACSM.

Email: sh0017hv@ed.ritsumei.ac.jp

No relationships reported.

Aging-induced deterioration of arterial stiffness is decreased by endurance exercise training, and increased nitric oxide (NO) production participates in this effect. Individuals with high cardiorespiratory fitness have lower arterial stiffness, concomitant with the elevation of plasma nitrate/nitrite (NOx) level. Adropin is a regulator of endothelial NO synthase and NO release, and circulating adropin level decreases with age. However, the association between serum adropin level and arterial stiffness or cardiorespiratory fitness level remains unclear. PURPOSE: This study aimed to clarify whether serum adropin level is associated with both arterial stiffness and cardiorespiratory fitness in healthy middle-aged and older adults.

METHODS: Eighty healthy middle-aged and older subjects (66 ± 1 years; males: n = 37, female: n = 43) were enrolled in this study. We evaluated serum adropin concentration, plasma NOx concentration, VO2peak as an index of cardiorespiratory fitness, and carotid beta-stiffness as an indicator of arterial stiffness. VO2peak was measured using an incremental cycle exercise test on a cycle ergometer.

RESULTS: A significant negative correlation was observed between serum adropin level and carotid beta-stiffness whether the comparison was unadjusted (r = -0.437, P < 0.001) or adjusted for age and sex (β = -0.441, P < 0.001). Serum adropin level was positively correlated with plasma NOx level (unadjusted for age and sex: r = 0.493, P < 0.001, adjusted: β = -0.501, P < 0.001). Furthermore, serum adropin level was positively correlated with VO2peak (adjusted for age and sex: r = 0.457, P < 0.001, adjusted: β = 0.392, P < 0.001). However, serum adropin level was not correlated with other parameters (age, height, body weight, BMI, blood pressure, lipid profile, glucose, heart rate).

CONCLUSION: These results suggest that serum adropin level is associated with both arterial stiffness and cardiorespiratory fitness in healthy middle-aged and older adults. Thus, the middle-aged and older individuals with high cardiorespiratory fitness have higher serum adropin level and it may participate in decreased arterial stiffness. Supported by Grants-in-Aid for Scientific Research (#26823199, M. Iemitsu)
Cardiovascular disease is the leading cause of mortality in the world. Research has consistently shown that high blood pressure is a major cardiovascular risk factor, which emphasizes the need to monitor it in all individuals. Blood pressure measurements are typically obtained using the brachial artery, but core blood pressure obtained using pulse wave analysis (PWA) has been gaining popularity. This is due to the fact that previous research supports that core blood pressure may be a better predictor of cardiovascular events.

**PURPOSE:** To determine if a 4-week functional exercise intervention will change blood pressure measurements obtained in adults using the traditional brachial cuff and the more novel PWA procedure.

**METHODS:** Eleven healthy adults have finished the 4-week self-report exercise intervention. Participants completed pre- and post- fasted and fitness tests. During the fasted appointment, clinic brachial systolic (SBP) and diastolic blood pressure (DBP), and core systolic (CSBP) and diastolic blood pressure (CDBP) were measured. Core blood pressure was obtained through PWA, which utilizes a tonometer placed on the radial artery. During the fitness appointment blood pressure was again measured. For the intervention, 3 times a week, participants completed a 6-station exercise circuit, rotating through the stations 3 times. The circuit included functional exercise such as weighted carries, balance, and core balance.

**RESULTS:** Participants’ average age was 32 ±15.7 yrs, and body weight was 156.6 ±28.8 lbs. Adherence to the 4-wk exercise program was 95.5%. We found that body fat decreased from 23.2 to 22.1% and VO2peak increased from 39.8 to 41.6 ml/kg/min. We found improvement in brachial blood pressures with the intervention (SBP decreased 2.3mmHg from 119.3 ±6.6 to 117 ±7.7mmHg, p<0.03; DBP decreased 2.8mmHg from 70.8 ±6.5 to 68 ±7.5mmHg). We also found improvement in core blood pressures (CSBP decreased 1.1mmHg from 109.6 ±12.1 to 108 ±11.7mmHg; CDBP decreased 2.2mmHg from 75.5 ±12.3 to 73.3 ±7.5mmHg). We found no change in augmentation index.

**CONCLUSIONS:** It appears that four weeks of a functional exercise program improves clinic and core blood pressures. We hypothesize that with a larger sample size obtained from our ongoing study we will find more significant results.
FDA approved compound, which has been used as an adjuvant therapy and is also often used in drug and food formulations, should be reconsidered given the effect of SA on the vasculature.

**Board #36**  
June 1, 3:30 PM - 5:00 PM  
**Novel Characterisation of In-Exercise Vascular Shear Rate: Mechanisms for Improvement in Endothelial Function**  
Gemma K. Lyall, Carrie Ferguson, Karen E. Porter, Karen M. Birch. University of Leeds, Leeds, United Kingdom. (Sponsor: Keith George, FACSM)  

(NO relationships reported)

**PURPOSE:** Exercise induced changes in vascular shear stress act as the stimulus for improvements in endothelial function. Similar improvements in endothelial function have been found with interval (IT) compared to continuous (CON) exercise. This study aimed to distinguish the differing patterns of shear produced by these protocols and determine whether these patterns differentially influence acute changes in endothelial function.

**METHODS:** 9 healthy (23 ± 3 yrs, 23.9 ± 2.1 kg/m², 7 male vs. 2 female) participants completed a ramp incremental test on a supine ergometer. Participants then performed 4 different intensity and duration matched protocols consisting of 24 min at work rates (WR) equivalent to 125% lactate threshold (LFT) (i) continuous exercise (CON), (ii) 180s of work interspersed with 180s of active recovery (10 W: LFT), (iii) 60s of work with 60s active recovery (SHORT IT) and (iv) 180s second work with 180s recovery at WR equivalent to 70% LT (LONG IT 70). During each protocol heart rate and blood pressure were measured via Doppler ultrasound and leg vascular conductance (LVC) was assessed as an index of endothelial function pre and 15 min post each protocol. Data were assessed via two-way repeated measures ANOVA for protocol and time (pre vs. post).

**RESULTS:** Anterograde shear increased continuously during CON and SHORT IT but oscillated with WR during IT. Peak retrograde shear was greater in IT than CON and oscillated with WR during IT. Shear during moderate- (NO3⁻) supplementation has been shown to reduce resting blood pressure. However, the mechanism(s) responsible for the reduction in blood pressure often used in drug and food formulations, should be reconsidered given the effect of SA on the vasculature.

**CONCLUSION:** These data demonstrate that acute dietary nitrate supplementation does not alter sympathetic vasoconstrictor responsiveness at rest and during exercise in young healthy males. Supported by NSERC, Canada.

**MEDICINE & SCIENCE IN SPORTS & EXERCISE®**

**Board #38**  
June 1, 3:30 PM - 5:00 PM  
**Short-term Exercise Effects on the Arterial Stiffness of Overweight Postmenopausal Women**  
Diana Liu. University of New South Wales, Sydney, Australia. (Sponsor: Stephen H. Boucher, FACSM)  

Email: dianaliu29@gmail.com  

(NO relationships reported)

**Short-term exercise effects on the arterial stiffness of overweight postmenopausal women**

Diana Liu, Chun Ping Lin, Stephen H. Boucher FACSM, Yati N. Boucher University of New South Wales, Sydney, AUSTRALIA.

Exercise has been shown to reduce the arterial stiffness of premenopausal women. The effect of 8 weeks of interval sprinting exercise (ISE) on the arterial stiffness of overweight postmenopausal women, however, has not been determined.

**PURPOSE:** The purpose of this study was to examine the arterial stiffness of overweight sedentary postmenopausal women following 8 weeks of ISE.

**METHODS:** Overweight postmenopausal females (N=20), aged 53±1.1 years, with a BMI of 28±0.9 kg/m², and body mass of 76.4±3.1 kg underwent assessment of arterial stiffness using applanation tonometry (Sphygmocor). Augmentation index (AIx), a measure of reflection wave, and carotid femoral pulse wave velocity (PWV) were assessed at pre and post 8 weeks of ISE. Maximal oxygen uptake was also assessed using a metabolic cart. Postmenopausal women were randomly assigned into either ISE (n=10) or control (n=10) groups. The ISE group was required to exercise on a cycle ergometer for 20 minutes per session (8 x sprint, 12 x recovery), three times per week for 8 weeks, whereas controls performed no structured exercise for 8 weeks. The control group was also asked to maintain their normal daily activity.

**RESULTS:** There was no significant difference in PWV between groups at post assessment, however, the exercise group significantly reduced their AIx by 2.9%, whereas controls increased their AIx by 4.5%, p<0.05. Aerobic power was significantly (p<0.05) increased in the exercise group by 21% whereas no change occurred in the control group.

**CONCLUSION:** Eight weeks of ISE significantly reduced arterial stiffness and improved aerobic power of sedentary, overweight postmenopausal women.

**Board #37**  
June 1, 3:30 PM - 5:00 PM  
**Acute Dietary Nitrate Supplementation Does Not Alter Sympathetic Vasoconstrictor Responsiveness At Rest And During Exercise.**  
Christopher J. de Vries, Chance W. Reinhart, Ian M. MacLean, Darren S. DeLorey, FACSM. University of Alberta, Edmonton, AB, Canada.  

Email: cdevries@ualberta.ca  

(NO relationships reported)

**Dietary nitrate (NO3⁻) supplementation** has been shown to reduce resting blood pressure. However, the mechanism(s) responsible for the reduction in blood pressure has not been identified. Dietary NO3⁻ supplementation may attenuate sympathetic vasoconstrictor responsiveness. **PURPOSE:** To investigate the hypothesis that acute dietary NO3⁻ supplementation may attenuate sympathetic vasoconstrictor responsiveness at rest and during exercise. **METHODS:** In a double-blind randomized crossover design, 12 men (23.5±3 years) performed a cold pressor test (CPT) at rest and during moderate- (30% WR) and heavy-intensity (60% WR) alternate-leg knee-extension exercise after consumption of NO3⁻ rich beetroot juice (~12.9 mmol NO3⁻) or a NO3⁻ depleted placebo (~0.13 mmol NO3⁻). Venous blood was sampled before and 2.5 hours after the consumption of beet root juice for the measurement of total plasma NO3⁻. Beat-by-beat blood pressure was measured by Finometer. Leg blood flow (LBF) was measured via Doppler ultrasound and leg vascular conductance (LVC) was calculated. Sympathetic vasoconstrictor responsiveness was calculated as the percentage decrease in LVC in response to the CPT. **RESULTS:** Total plasma NO3⁻ was greater (p<0.001) in the NO3⁻ (285±120 µM) compared to the placebo (65±30 µM) condition. However, mean arterial blood pressure was not different (p<0.05) between NO3⁻ and placebo conditions at rest (NO3⁻: 82±5 mmHg; Placebo: 84±7 mmHg) and during moderate- (NO3⁻: 98±7 mmHg; Placebo: 101±5 mmHg) and heavy- (NO3⁻: 115±12 mmHg) intensity exercise. Sympathetic vasoconstrictor responsiveness was also not different (p>0.05) between nitrate and placebo conditions at rest (NO3⁻: -33±10 %; Placebo: -35±11 %) and during moderate- (NO3⁻: -17±5 %; Placebo: -20±10 %) and heavy- (NO3⁻: -12±9 %; Placebo: -11±9 %) intensity exercise.

**CONCLUSION:** These data demonstrate that acute dietary nitrate supplementation does not alter sympathetic vasoconstrictor responsiveness at rest and during exercise in young healthy males. Supported by NSERC, Canada.

**Board #39**  
June 1, 3:30 PM - 5:00 PM  
**Augmented Flow-Mediated Dilation Following Aquatic Treadmill Compared to Land Treadmill Exercise**  
Dustin P. Joubert, Jorge Z. Granados, Peter W. Grandjean, FACSM1, Stephen F. Crouse, FACSM1, Stephen F. Austin State University, Nacogdoches, TX. 2Texas A&M University, College Station, TX. 3University, Waco, TX. (Sponsor: Stephen F. Crouse, FACSM)  

Email: joubertd@sfasu.edu  

(NO relationships reported)

Flow-mediated dilation (FMD) is a marker of endothelial function and predictive of blood pressure (BP) reactivity. Chronic aquatic treadmill (ATM) training offers similar gains in aerobic capacity as land treadmill (LTM) training while also reducing BP reactivity and increasing eNOS content in muscle. **Purpose:** Determine the effects of an acute bout of ATM and LTM on FMD and plasma nitrate/nitrite (PN) in inactive, pre-hypertensive men. **Methods:** Following BP screening and a maximal exercise test, 20 men (33 ± 12 years, 29.5 ± 9.6% fat, 38.0 ± 8.2 ml·kg⁻¹·min⁻¹ at 130 ± 7 ± 78 ± 119 cm Hg) completed an acute bout of both ATM and LTM. FMD was measured pre-exercise, 1-hour post, and 24-hours post-exercise. Blood was obtained at the same time points, as well as immediately post-exercise (IPE) and analyzed for PN. Changes in FMD from pre-exercise to 1 and 24-hours post were calculated for each mode and compared by a dependent sample t-test. PN measures were analyzed by a 2 (Mode) x 4 (Time Point) repeated measures ANOVA. **Results:** Raw data and the calculated change values are displayed for FMD in the table. There was a significant difference in the change in FMD from pre-exercise to 1-hour post between ATM and LTM. There was no main effect for mode on PN, but there was a main effect for time (p = 0.020) with post-hoc analysis revealing a decline in PN measures from pre-exercise (5.40 ± 0.88 µM) to 1-hour post (4.82 ± 0.82 µM). **Conclusions:** Our findings indicate that ATM exercise may elicit a more favorable endothelial response than LTM exercise in inactive, pre-hypertensive men, furthering the efficacy of aquatic exercise. Since there was no mode specific difference in the PN response, we are unable to conclude increased PN production as the mechanism behind the FMD changes.
Atherosclerosis of the carotid arteries is a major cause of ischemic cerebrovascular events. Estrogens protect against atherosclerosis in women, and the arterial compliance in the common carotid artery (CCA) fluctuates throughout the menstrual cycle (Hayashi K. 2006). Additionally, carotid arterial wall structure is related to the development of atherosclerosis (Hori E. 2008). The internal carotid artery (ICA) is a muscular artery, whereas the CCA is an elastic artery. Estrogens increase the production of the endothelium-derived vasodilator NO, and they also relax vascular smooth muscle directly (Murphy JG. 2000). From this, we hypothesized that the variations of arterial elasticity throughout the menstrual cycle was greater in ICA (muscular artery) than that in CCA (elastic artery). Recently it has been reported that ultrasound shear wave elastography (SWE) in carotid wall has potential clinical applications (Rammarine KV. 2014). In this study, we use this new technique that estimates localized tissue stiffness to assess the arterial elasticity.

PURPOSE: To determine the variations of arterial elasticity in ICA and CCA during the menstrual cycle in young women using SWE imaging.

METHODS: In six healthy women (21±0.8 years, mean±SD), we investigated the variations of arterial elasticity in ICA and CCA, and blood pressure (common carotid artery). The mean inter-frame coefficient of variation (CV) for YM in an individual menstrual cycle was 0.083. Arterial elasticity of ICA varied cyclically, with decreases from the mean YM seen in the ovulatory phase (46.7±11.0 kPa) to that seen in the menstrual phase (84.5±19.9 kPa). However, the mean YM of CCA did not exhibit significant changes during menstrual cycle. Additionally, no significant changes were found in carotid and brachial blood pressures throughout the menstrual cycle.

CONCLUSIONS: This study shows that the variation of elasticity of ICA using SWE coordinated with the phases of the menstrual cycle in young women is greater than that in CCA.

Acute high-intensity resistance exercise increases arterial stiffness, which is one potential mechanism of the increased arterial stiffness resulting from resistance exercise training. Estrogen concentrations in women may also influence arterial stiffness. Therefore, changes in arterial stiffness after high-intensity resistance exercise might differ according to the menstrual cycle.

PURPOSE: The purpose of this study was to determine the effects of menstrual cycle phase on arterial stiffness after high-intensity resistance exercise. METHODS: Nine eumenorrheic females participated in this study (age 21.3±0.8 years). None of the participants were taking oral contraceptives. Menstrual cycles were categorized according to serum estrogen and progesterone concentrations. Maximal muscle strength was assessed using one repetition maximum (1RM) strength tests 1 week before starting this study. The participants performed five sets of five repetitions using 80% of the 1RM bench press and five sets of ten repetitions using 70% of the 1RM biceps curl with an inter-set rest periods of 2 min at each of the menstrual, ovulatory, and luteal phases of the menstrual cycle. RESULTS: Serum estrogen concentrations were significantly higher at the ovulatory and luteal phases than at the menstrual phase (ovulatory and luteal phases vs. menstrual phase; 192±58, 170±32 vs. 40±7 pg/ml, P<0.05). The baPWV at the menstrual phase was significantly increased from baseline at 30 min (baseline vs. after 30 min; 952±16 vs. 1061±29 cm/sec, P<0.05) after the resistance exercise and persisted for 60 min (baseline vs. after 60 min; 952±16 vs. 1044±23 cm/sec, P=0.05), whereas the ovulatory and luteal phases did not significantly differ before and after the resistance exercise. Blood pressure and heart rate did not significantly differ before and after high-intensity resistance exercise during any phase. CONCLUSION: These results suggest that arterial stiffness induced by high-intensity resistance exercise changes according to phases of the menstrual cycle.

Central arterial stiffness is inversely related to upper body muscular strength in young men, suggesting there may be a link between skeletal muscle and arterial function. This relationship has not been explored in women. There are also age-related differences in muscle mass and vascular function; it is unclear if age mediates this potential relationship.

PURPOSE: To examine the relationships between regional lean body mass, strength, arterial stiffness and microvascular blood flow measures in younger and older women.

METHODS: Eighteen younger (18-25 years) and 17 older (50-64 years) women had measures of lean body mass (dual-energy X-ray absorptiometry), strength (sum of three upper body and three lower body assessments of one-repetition maximum, 1RM), central (aortic) and peripheral (femoral) pulse wave velocity (PWV), and forearm blood flow (resting flow, peak reactive hyperemia, and total hyperemia measured with venous occlusion plethysmography). Relationships between variables were tested using Pearson's correlation coefficients, with and without controlling for age.

RESULTS: Central PWV (6.8±1.7 m/s) was correlated with strength (270.9+/− 51.8 kg) (r=0.53; p=0.002) but this relationship was not statistically significant when controlling for age (r=0.37; p=0.06). Resting blood flow (2.74+/−1.15 ml/min/100ml) (r=0.45; p=0.009) and total hyperemia (75.1±30.1 AUC) (r=0.48; p=0.049) were significantly related to lean body mass (4.2+/−0.6 kg) in the arms. The relationships between resting forearm blood flow (r=0.49; p=0.012) and total hyperemia (r=0.47; p=0.011) and lean body mass in the arms remained significant when controlling for age. Peripheral PWV (9.0+/−1.5 m/s) was not related to measures of arterial stiffness or lean body mass (p>0.05).

CONCLUSIONS: These data suggest that central artery stiffness is related inversely to muscle strength but that this relationship appears to be due to the effects of age. Forearm microvascular function is related to regional lean body mass and this relationship appears to be independent of age. This suggests that the link between muscle mass and vascular function may be most apparent in the microvasculature and less apparent in large vessels in women.

Aging is associated with declines in vascular function along with concomitant increases in peripheral and central blood pressure (BP). Resistance training (RT) is currently recommended for middle-aged women in order to improve muscle and bone health. However, the effects of RT on vascular function in middle-aged women are still unknown. PURPOSE: The purpose of the present study was to examine the effects of 12-weeks RT on vascular function in middle-aged women. METHODS: Thirty-two middle-aged women (mean±SD; MW: Age: 50±11 yrs; BMI: 30.1±5.9kg/m2) and sixteen young women (YW: Age: 21±2 yrs; BMI: 24.13±3.8kg/m2) volunteered for the study. MW completed 12-weeks of RT that was performed twice a week consisting of 9 different exercise machines for 3 sets of 8-12 repetitions at 50-60% of 1 repetition maximum; YW did not participate in RT. Central BP was determined by pulse wave reflection using applanation tonometry. A one-way analysis of variance with BMI as a covariate (ANOVA) was used to compare the baseline BP and pulse wave reflection between groups. A repeated-measures ANOVA was used to compare BP and the pulse wave reflection after RT in the MW. RESULTS: At baseline, there were significantly lower brachial diastolic BP (YW: 72.8±8mmHg; MW: 80.9±9mmHg, p=0.005), aortic
systolic BP (YW: 98±10 mmHg; MW: 111±16 mmHg; p=0.003) and aortic diastolic BP (YW: 73±8 mmHg; MW: 81±9 mmHg; p<0.003) in YW compared to MW before RT, but no significant differences as calculated for the peripheral systolic BP (p=0.33). In addition, at baseline YW had significantly lower augmentation index (Aix; YW: 10.9±10.2; MW: 28.2±6.7%; p<0.0001), Aix normalized at 75% BP (YW: 1.3±1.47%; MW: 12.8±3.6%; p<0.0001), augmentation pressure (YW: 1.6±1.4 mmHg; MW: 9.1±4.8 mmHg; p<0.0001), time of the reflected wave (YW: 164±50.1 ms; MW: 136±9.0 ms; p<0.001) and wasted energy (YW: 357.3±106.3 dynes s/cm²; MW: 160±35.2 dynes s/cm²; p<0.0001). There were no effects of 12-weeks RT on peripheral or central BP, or pulse wave reflection in the MW. CONCLUSION: The present study shows that middle-aged women have increases in peripheral and central BP, and pulse wave reflection at rest compared to young women. Furthermore, the present study suggests that 12-weeks of RT does not change peripheral and central BP or pulse wave reflection in middle-aged women.

**SENSITIVITY OF THE VASCULAR RESPONSE RANGE IN DETERMINING AEROBIC FITNESS**

Preston L. Bell, Lena M. Cialdella, Daniel P. Credeur. University of Southern Mississippi, Hattiesburg, MS.

Email: preston.bell@eagles.usm.edu

(No relationships reported)

Previous work demonstrates a direct relationship between aerobic fitness and vasodilatory function (i.e., Flow-mediated Dilation; FMD). Recent evidence suggests that arterial vasoconstrictor responses to reductions in blood flow (Low-Flow Mediated Constriction; LFMC) may compliment FMD, and provide an overall range of vascular responsiveness. **METHODS:** To test the hypothesis that the vascular response range (VRR=FMD+LFMC) is sensitive to differences in aerobic fitness. **METHODS:** Fourteen healthy males (age: 22±4 yrs) were recruited, and divided evenly into a high (HF) vs. low (LF) aerobic fitness group, quantified via YMCA cycle ergometry (VO2 peak extrapolation), and a 3-min step test (1-min HR recovery). Doppler-ultrasound was used to assess brachial artery VRR. In brief, artery diameter and flow velocity signals were obtained simultaneously for 2 mins prior to, 30 sec during, and for 3 mins following release of a distally placed occlusion cuff (220 mmHg, for 5 mins). FMD was calculated as the peak change in artery diameter following cuff-release, and LFMC was calculated from the nadir diameter obtained during the 30 sec prior to cuff-release. **RESULTS:** VO2 peak (HF=55±10 vs. LF=38±6; p<0.01) and HR recovery (HF=38±12 vs. LF=24±9 beats; p=0.05) were greater in the HF group. VRR and LFMC% were similar between groups; however, LFMC tended to be greater in HF (HF=0.1±0.6 vs. LF=-0.02±0.7 mmHg; p=0.05). A correlation analysis revealed an inverse relation between LFMC (%) and HR recovery (r=-0.631, P=0.016). Finally, the resting diameter (mm) calculated as a percentage of VRR (i.e., % tone) tended to be greater in HF (LF=72±17 vs. 96±25%; p=0.055). CONCLUSION: These preliminary findings suggest that brachial VRR is not sensitive to aerobic fitness in healthy young men; however, high fit individuals may exhibit less tone, and greater vasoconstrictor responses to reductions in blood flow.
Eight healthy (23.8 ± 1.8 yrs ±(SD)) men (n=3) and women (n=5) reported to the facility following a 12 h fast. Each subject rested in either the supine (BA) or prone position (PA) to obtain baseline measurements of the artery of interest. Endothelial-dependent vascular function was assessed using the flow-mediated vasodilation (FMD) technique. Each subject consumed a high fat meal consisting of 90g total fat (63 g saturated fat), 364 mg cholesterol, 17 g carbohydrate and 139 mg sodium. BA and PA FMD responses were obtained 60 min following ingestion of the HFM. Longitudinal images of the BA were obtained using a B-mode using a linear array probe with an operating frequency of 7.0 MHz. Images were captured (10 fps) and analyzed using a commercially available system that incorporates an automated wall detection program. FMD (%) was calculated as the difference between baseline diameter and the maximal diameter measured following release of the occlusion cuff (250 mmHg) placed around the forearm for 5 min. RESULTS: Compared to baseline, consumption of a HFM resulted in a decrease (p<0.05) in vascular reactivity for both the BA (pre, 10.6 ± 3.7 vs. post, 6.2 ± 2.2 %FMD) and the PA (pre, 4.8± 1.2 vs. post, 2.1 ± 1.2 %FMD). When expressed as a relative change in FMD within a limb, the decrease in the PA (55.3%) was greater (p<0.005) than for the BA (42.6%). CONCLUSIONS: While the differences in the FMD response to a HFM between the BA and PA artery are apparent, the mechanism behind this difference warrants further investigation.

METHODS: Twenty-three high school female rhythmic gymnasts (age, 16.4±0.9 years, mean±SD) who participate in national tournament for high school students in Japan participated in a cross-sectional study. Endothelial function was determined as flow-mediated vasodilation (FMD) measured by high frequency ultrasound in the brachial artery. Subjects completed the Eating Attitudes Test-26 (EAT-26), which is a standard screening tool of eating disorder (ED) risk. Profile of Mood States (POMS) was used to estimate mood states. Menstrual disorder was defined as the status including oligomenorrhea, secondary amenorrhea and delayed puberty.

RESULTS: There were no relationship between body composition (BMI and %fat) and normalized %FMD (relative peak diameter increase normalized to the area under the curve of share rate with hyperemia). The prevalence of ED among the subjects (EAT-26 scores ≥20) were 39% (n=7). The normalized %FMD of the subject with ED (0.091±0.034, A.U.) was significantly lower than that of subjects without ED (0.159±0.062, A.U.). The normalized %FMD was negatively correlated with scores of EAT-26 (r=-0.51, p<0.05). There was also significant negative correlation between the normalized %FMD and score of “Anger-Hostility (A-H)” of POMS (r=-0.42, p<0.05). Menstrual dysfunction was in 19.3%, but there were no difference in normalized %FMD, scores of EAT-26 and POMS between subjects with normal or disordered menstrual status.

CONCLUSIONS: The degree of eating disorder and negative mood state but not presence of menstrual disorder may be involved in impaired endothelial function in high school female rhythmic gymnasts.

- The Effect of Bikram yoga on endothelium-dependent vasodilation in human skeletal muscle.
- The Vasodilatory Function In Human Skeletal Muscle Feed Arteries.
- The Effect Of Mitochondria-targeted Antioxidant On The Vasodilatory Function In Human Skeletal Muscle Feed Arteries.
- Effects Of Bikram (Hot) Yoga On Endothelium-dependent Vasodilation In Young And Older Adults.
- Resting And Exercise Blood Pressure And Clustered Activity-related Risk In Adolescents.

| Board #48 | June 1, 3:30 PM - 5:00 PM | The Effect Of Mitochondria-targeted Antioxidant On The Vasodilatory Function In Human Skeletal Muscle Feed Arteries. |
| Board #49 | June 1, 3:30 PM - 5:00 PM | Endothelial Function In High School Female Rhythmic Gymnasts: Effects Of Eating Disorder And Mood States |

- Board #50
- Board #51

Abstracts were prepared by the authors and printed as submitted.
waist-to-height-ratio (WHtR), screen time, moderate-to-vigorous activity (MVPA), physical fitness (Physical Working Capacity 170), BP at rest and during a submaximal ergometer exercise test (at 1.5 W/kg body weight) were assessed. A clustered risk index was calculated as the sum of standardized z-scores of the subcomponents (BMI-percentile, WC, MVPA, screen time, physical fitness) in order to evaluate the associations with SBP values using linear regression models. Results: The average resting BP was 117.2 ± 13.5 / 7.6 ± 6.8 mm Hg and exercise BP was 149.9 ± 19.8 / 54.2 ± 8.6 mm Hg. After adjusting for age, sex and height, resting and exercise SBP were both directly related (p=0.001) to BMI-percentile (r=0.287 vs. r=0.316), WC (r=0.339 vs. r=0.303) and WHtR (r=0.310 vs. r=0.275). A higher amount of MVPA per week was beneficially linked to resting (r=0.095, p=0.02) and exercise-induced SBP (r=0.087, p=0.036), while longer screen-based sedentary behavior (r=0.098, p=0.024 vs. r=0.123, p=0.005) and poorer physical fitness (r=0.271 vs. r=0.275, p<0.001) were adversely associated to both parameters. We found a statistically significant association between the clustered activity-related risk score and SBP at rest (r=0.333, p<0.001), as well as during submaximal exercise (r=0.351, p<0.001). Conclusions: Our data suggest that among adolescents SBP during submaximal exercise is associated with negative lifestyle behavior patterns, which are in turn closely linked to physical activity. The prevention of clustered lifestyle risk factors should start in the younger age.

736 Board #52
June 1, 3:30 PM - 5:00 PM
"Excess" Vo2: The Effect Of Strength Training On Metabolic Efficiency And Exercise Tolerance
Silvia Pogliaghi, FACSM, Giorgia Spigolon, Federico Y. Fontana, Università di Verona, Verona, Italy. Email: silvia.pogliaghi@univr.it (No relationships reported)

During whole-body physical activity (e.g. cycling) exercise capacity is reduced by an "excess" in oxygen cost (Vo2) relative to power output (PO) (i.e. higher VO2/PO ratio) that appears above the lactate threshold (LT). This loss of muscle efficiency, of which type I fibers fatigue and/or increased type II fibers recruitment are putative causes, impair exercise tolerance. PURPOSE: We tested the hypothesis that a strength training intervention (ST), by increasing maximal force (Fmax) and reducing the recruitment of high-threshold motor units at a given exercise intensity will reduce the "excess" VO2 during a cycling incremental exercise. METHODS: 16 young healthy males were randomly assigned to a control (C) and a strength-training (ST) group (three, one-hour sessions per week). Pre and Post a 5-weeks intervention, VO2/PO relationship during an incremental test to exhaustion was modelled using a double-linear fit: the slopes of the VO2/PO relationship below (S1) and above (S2) the LT were calculated. Peak power deficit ([Unsupervised Character - Symbol Font Ï‰165508;]) PO) was calculated as: (maximal aerobic power as estimated based on VO2max and VO2/PO ratio below LT) – (experimentally attained PO). Parameters were compared using two-way (time, group) MANOVA. RESULTS: During the ST group: Fmax significantly increased (15 ± 5% for squat) while VO2max and POmax did not change (overall mean 3317 ± 405 ml/min-1W-1) along with a significant reduction in ∆PO (30 ± 20 vs 8 ± 5 W). No changes were detected for the C group. CONCLUSIONS: In agreement with our hypothesis, ST significantly reduced the "excess" VO2 during a cycling incremental exercise. Although further studies are warranted to identify a direct cause-effect relationship, this finding support a role of ST in improving aerobic exercise capacity through an attenuation of muscle inefficiency in the heavy-exercise domain.

737 Board #53
June 1, 3:30 PM - 5:00 PM
The Acute Effect Of Foam Rolling On Heart Rate Variability
Thomas Kopeck, Bailey Welborn, Andew Flatt, Michael Esco, FACSM, The University of Alabama, Tuscaloosa, AL. (Sponsor: Michael Esco, FACSM) Email: kopeck001@crimson.ua.edu (No relationships reported)

PURPOSE: To determine if an acute bout of foam rolling has an effect on heart rate variability (HRV). METHODS: Seven subjects participated in this study (age = 22.25 ± 3.45 years, height = 173.67 ± 6.78 cm, weight = 71.67 ± 17.36 kg) and recorded baseline HR on an electrocardiogram (ECG) for 5 minutes while lying supine. Following the baseline measures, subjects performed a foam rolling protocol on their triceps surae, hamstrings, quadriceps, low back, and pectorals on each side of the body for 1 minute on each area. Finally, subjects immediately returned to a supine position for 30 minutes to measure post-foam rolling HRV with another ECG analysis. The following HRV frequency domain metrics were recorded in Hz: low frequency power (LF), high frequency power (HF) and root mean square of standard deviations in R-R intervals (RMSSD). The raw values were normalized using a natural log (LN) function. The analysis included 30-minute recording period after performing a formal rolling for 30 seconds. Data was analyzed with repeated measures ANOVA followed by least significant difference (LSD) calculations for any significant findings between the baseline HRV values. RESULTS: We found no statistically significant differences among the HRV metrics for each time point. There were small Cohen’s D effect sizes with LF at pre-1520 interval (d = -0.2183), pre-2530 interval (d = 0.1863) and HF at pre-510 minutes (d = 0.2215). Moderate effect sizes were noted with HF at pre-1520 interval (d = 0.5955) and RMSSD at pre-1520 interval (d = -0.3919). CONCLUSIONS: There was a trend towards more parasympathetic influence during the 30-minute recovery following foam rolling at the 1200 interval. Although this study did not find any statistically significant differences between HRV values before and after a bout of foam rolling, the moderate Cohen’s D effect size in HF and RMSSD elevation indicates a practical difference may be present. These findings indicate a need for follow-up with larger sample size to determine if foam rolling can increase HRV.

738 Board #54
June 1, 3:30 PM - 5:00 PM
Metabolic and Cardiovascular Effects of Body Weight Support Treadmill Running
Jeremiah Vaughan1, Neil Fleming1, 1Kent State University, Kent, OH. 2Trinity College Dublin, Dublin, Ireland. (Sponsor: Ellen L. Glickman, FACSM) Email: jvaughah9@kent.edu (No relationships reported)

PURPOSE: To determine the association between body weight support (%BWS) and velocity on cardiorespiratory variables during body weight supported treadmill running. METHODS: Fifteen apparently healthy, male recreational runners (age = 23 ± 2.5y, height = 1.79 ± 0.05m, mass = 74 ± 11.1kg, BMI = 23.2 ± 2.7 kg/m², VO2max = 50.9 ± 7.5 ml.kg-1.min-1) visited the laboratory on two separate occasions. Visit 1 comprised of a graded incremental treadmill test to quantify VO2max. Visit 2 comprised of 12 x 4 min running trials at 3 individually calculated velocities (equivalent to 60, 70 and 80% VO2max) and 4 gravitational loads (40, 60, 80, and 100 %BWS) with 2 minutes recovery between trials. A Latin Square design was used to randomize trial order. Oxygen consumption (VO2) and heart rate (HR) data were averaged during the last minute of each stage. Kolmogorov-Smirnov tests quantified normality and log transforms were applied to non-normally distributed data sets (VO2). A 2 factor (velocity x %BWS) repeated measures ANOVA was performed with post-hoc significance (P<0.05). A multiple regression analysis was performed to predict VO2 from treadmill velocity (measured in km-h-1), %BWS and subject body mass (BM). RESULTS: The multiple regression analysis significantly predicted VO2 (R=0.737)=-396.0, p=0.0005, R2=0.762). The following equation accurately predicted VO2 when running in a lower body positive pressure (LBPP) treadmill using 3 independent variables (SEEP=3.51.ml.kg-1.min-1=VO2= (1.841 + velocity x 0.0234 + 0.022 %BWS) - (0.126 x BM) + 3.448. Increasing velocity had a significant effect on VO2 (F=8.11.7, p=0.001) and HR (F=26.65, p<0.001). Increasing %BWS had a significant effect on VO2 (F=267.37, p=0.001) and HR (F=146.520, p<0.001). A significant interaction existed between velocity and %BWS on VO2 (F=5.526, p= 0.001) and HR (F=4.530, p<0.001). CONCLUSION: An equation was created using a multiple regression analysis to accurately predict VO2 while running in a LBPP device based off velocity, %BWS and BM. Clinicians and athletic trainers can use this equation to more accurately prescribe exercise intensity based on VO2 for individuals training on a LBPP treadmill. This should assist in developing an individualized exercise program to enhance the rehabilitation and training process.

739 Board #55
June 1, 3:30 PM - 5:00 PM
VO2 Slow Component: The Effect Of Strength Training On Metabolic Efficiency And Exercise Tolerance.
Federico Y. Fontana, Giorgia Spigolon, Silvia Pogliaghi, FACSM. University of Verona, Verona, Italy. Email: federico.fontana.01@univr.it (No relationships reported)

The VO2 slow component (VO2sc) is a slowly developing increase in Oxygen consumption (VO2) as a function of time, during a constant work rate exercise (CWR) performed above the heavy-intensity boundary. This loss of muscle efficiency, of which type I fibers fatigue and/or increased type II fibers recruitment are putative causes, impairs exercise tolerance. PURPOSE: We tested the hypothesis that a strength training intervention (ST), by increasing maximal force (Fmax) and reducing the recruitment of high-threshold motor units at a given exercise intensity, will reduce the amplitude of VO2sc and enhance exercise tolerance. METHODS: 16 young healthy males were randomly assigned to a control (C) and a strength training (ST) group (three, one-hour sessions per week). Pre and post a 5-weeks intervention, subjects performed three repetitions of a 10-min CWR exercise at 350. VO2 was modelled...
that of the NS group warrants further study, since fitness levels did not differ between previous findings, statins may increase RHR and reduce HRV in endurance-trained ES: d=-0.9, r=-0.5) and pNN50 (NS: 38.0 ± 7.4 vs S: 16.4 ± 7.7%, p=0.03; ES: d=-0.9, r=0.5). HRV time domain measures NN50 (NS: 95.5 ± 20.3 vs S: 40.3 ± 20.3, p<0.05; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.

740 Board #56 June 1, 3:30 PM - 5:00 PM Statins May Increase Resting Heart Rate and Decrease Heart Rate Variability in Trained Masters Athletes Lisa Ferguson-Stegall1, Anthony Wolfe1, Mary Vang2, Kevin Cook1. 1Hamline University, Saint Paul, MN, 2Century Community College, Minneapolis, MN. (Sponsor: John L. Ivy, FACSM) Email: lstegall01@hamline.edu

No relationships reported.

Statins are prescribed to lower LDL cholesterol and reduce cardiovascular disease risk. Pleiotropic effects of statin use may include improved autonomic nervous system (ANS) function. Many studies have examined this relationship, but findings have been inconsistent, with ~50% finding improved heart rate variability (HRV), which is often used to assess ANS function. Resting heart rate (RHR) findings are also inconsistent. Endurance training increases HRV and lowers RHR. However, the effects of statins on RHR and HRV in athletes are not yet characterized. PURPOSE: This study aimed to determine if statins affected RHR and HRV by comparing Masters swimmers taking statins (S) to those not taking statins (NS). We hypothesized that there would be no difference between the groups, as athletes typically already have lowered RHR and significantly lower in NS (NS: 51.1 ± 2.7 vs S: 58.3 ± 2.4 bpm, p=0.04; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.

740 Board #56 June 1, 3:30 PM - 5:00 PM Statins May Increase Resting Heart Rate and Decrease Heart Rate Variability in Trained Masters Athletes Lisa Ferguson-Stegall1, Anthony Wolfe1, Mary Vang2, Kevin Cook1. 1Hamline University, Saint Paul, MN, 2Century Community College, Minneapolis, MN. (Sponsor: John L. Ivy, FACSM) Email: lstegall01@hamline.edu

No relationships reported.

Statins are prescribed to lower LDL cholesterol and reduce cardiovascular disease risk. Pleiotropic effects of statin use may include improved autonomic nervous system (ANS) function. Many studies have examined this relationship, but findings have been inconsistent, with ~50% finding improved heart rate variability (HRV), which is often used to assess ANS function. Resting heart rate (RHR) findings are also inconsistent. Endurance training increases HRV and lowers RHR. However, the effects of statins on RHR and HRV in athletes are not yet characterized. PURPOSE: This study aimed to determine if statins affected RHR and HRV by comparing Masters swimmers taking statins (S) to those not taking statins (NS). We hypothesized that there would be no difference between the groups, as athletes typically already have lowered RHR and significantly lower in NS (NS: 51.1 ± 2.7 vs S: 58.3 ± 2.4 bpm, p=0.04; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.

740 Board #56 June 1, 3:30 PM - 5:00 PM Statins May Increase Resting Heart Rate and Decrease Heart Rate Variability in Trained Masters Athletes Lisa Ferguson-Stegall1, Anthony Wolfe1, Mary Vang2, Kevin Cook1. 1Hamline University, Saint Paul, MN, 2Century Community College, Minneapolis, MN. (Sponsor: John L. Ivy, FACSM) Email: lstegall01@hamline.edu

No relationships reported.

Statins are prescribed to lower LDL cholesterol and reduce cardiovascular disease risk. Pleiotropic effects of statin use may include improved autonomic nervous system (ANS) function. Many studies have examined this relationship, but findings have been inconsistent, with ~50% finding improved heart rate variability (HRV), which is often used to assess ANS function. Resting heart rate (RHR) findings are also inconsistent. Endurance training increases HRV and lowers RHR. However, the effects of statins on RHR and HRV in athletes are not yet characterized. PURPOSE: This study aimed to determine if statins affected RHR and HRV by comparing Masters swimmers taking statins (S) to those not taking statins (NS). We hypothesized that there would be no difference between the groups, as athletes typically already have lowered RHR and significantly lower in NS (NS: 51.1 ± 2.7 vs S: 58.3 ± 2.4 bpm, p=0.04; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.

740 Board #56 June 1, 3:30 PM - 5:00 PM Statins May Increase Resting Heart Rate and Decrease Heart Rate Variability in Trained Masters Athletes Lisa Ferguson-Stegall1, Anthony Wolfe1, Mary Vang2, Kevin Cook1. 1Hamline University, Saint Paul, MN, 2Century Community College, Minneapolis, MN. (Sponsor: John L. Ivy, FACSM) Email: lstegall01@hamline.edu

No relationships reported.

Statins are prescribed to lower LDL cholesterol and reduce cardiovascular disease risk. Pleiotropic effects of statin use may include improved autonomic nervous system (ANS) function. Many studies have examined this relationship, but findings have been inconsistent, with ~50% finding improved heart rate variability (HRV), which is often used to assess ANS function. Resting heart rate (RHR) findings are also inconsistent. Endurance training increases HRV and lowers RHR. However, the effects of statins on RHR and HRV in athletes are not yet characterized. PURPOSE: This study aimed to determine if statins affected RHR and HRV by comparing Masters swimmers taking statins (S) to those not taking statins (NS). We hypothesized that there would be no difference between the groups, as athletes typically already have lowered RHR and significantly lower in NS (NS: 51.1 ± 2.7 vs S: 58.3 ± 2.4 bpm, p=0.04; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.

740 Board #56 June 1, 3:30 PM - 5:00 PM Statins May Increase Resting Heart Rate and Decrease Heart Rate Variability in Trained Masters Athletes Lisa Ferguson-Stegall1, Anthony Wolfe1, Mary Vang2, Kevin Cook1. 1Hamline University, Saint Paul, MN, 2Century Community College, Minneapolis, MN. (Sponsor: John L. Ivy, FACSM) Email: lstegall01@hamline.edu

No relationships reported.

Statins are prescribed to lower LDL cholesterol and reduce cardiovascular disease risk. Pleiotropic effects of statin use may include improved autonomic nervous system (ANS) function. Many studies have examined this relationship, but findings have been inconsistent, with ~50% finding improved heart rate variability (HRV), which is often used to assess ANS function. Resting heart rate (RHR) findings are also inconsistent. Endurance training increases HRV and lowers RHR. However, the effects of statins on RHR and HRV in athletes are not yet characterized. PURPOSE: This study aimed to determine if statins affected RHR and HRV by comparing Masters swimmers taking statins (S) to those not taking statins (NS). We hypothesized that there would be no difference between the groups, as athletes typically already have lowered RHR and significantly lower in NS (NS: 51.1 ± 2.7 vs S: 58.3 ± 2.4 bpm, p=0.04; ES: d=1.2, r=0.5). TB (time delay), A (amplitude) of the primary (p) and slow (s) components. t (time to exhaustion). t and t indicate a significant difference from “Pre” and “Control” (p < 0.05).

CONCLUSIONS: In agreement with our hypothesis a 5-week ST significantly reduced the magnitude of the slow component (-80%) while increasing exercise tolerance (+37%) in young healthy subjects.
Resting heart rate variability (HRV) and heart rate recovery (HRR) from exercise are indices of autonomic function that have been used as clinical and training tools. Results have been mixed as to whether there is a relationship between HRV and HRR, with HRV often measured as delta 60. PURPOSE: To determine the relationship between HRV and HRR with a focus on a previously-unstudied, yet validated, vagal index of HRV, T30. METHODS: Males (N = 23) aged 18 to 25 years (body fat: 14.7 ± 6.4%) of varying fitness (VO_{2,max} = 42.8 ± 7.1 ml/kg/min) were studied. HRV was measured for 5 min in the supine position, in the time (i.e., SDNN) and frequency (i.e., HF, power, normalized HF power [HFnu], LF power, normalized LF power [LFnu], and LF/HF ratio) domains. Two HRV indices were assessed during passive recovery from cycle ergometer exercise: 1) T30 (i.e., negative reciprocal of the slope of the regression line of natural log of HR data for 30 sec after exercise; measured after 8 min steady state exercise at 40% VO_{2,max}) and 2) delta 60 (i.e., HR at the end of exercise minus HR at 1 min recovery; measured after exercise terminated at 85% max HR). A logarithm transformation was applied to variables violating normality. Pearson product correlations were used to assess the relationship between HRV and HRR.

RESULTS: Except for a significant negative correlation between Log T30 and Log LF (r=-.45, p<.05) no significant relationships were found between HRV and HRR. T30 was significantly related to delta 60 (r=-.68, p<.001) but neither body fat nor aerobic fitness related to any of the HRV or HRR measures. CONCLUSION: Resting HRV may not be related to HRR from exercise; each may assess different aspects of autonomic control.

| Pearson Product Correlations between Log T30 and Supine Resting HRV (N = 23) |
|-----------------------------|-----------------------------|
| Log T30                     | LogHF (ms²/Hz)              |
|                             | -.40                        |
| LogLF (ms²/Hz)              | -.45*                       |
| LogLF/HF Ratio              | .024                        |
| HFnu (ms²/Hz)               | -.030                       |
| LFnu (ms²/Hz)               | .030                        |
| LogSDNN (ms)               | .40                         |
| Note: p<.05                |                             |

474 Board #60

The Factors Associated With Good-control For Hypertensive Persons In Korea

Email: dongho17@hanmail.net

The factors associated with good-control for hypertensive persons in Korea

Purpose: The prevalence of hypertension increases with aging society, however, it is not adequately controlled yet. The purpose of this study was to investigate the associations among the control of blood pressure and the life style, physical activity and nutritional status in adults.

Methods: This study was based on the data from the Korea National Health and Nutrition Examination Survey in 2013, and the subjects were 1,492 participants diagnosed as hypertension out of 4,212 participants aged 40 years or over. The associations of the blood pressure control and various factors were analyzed by chi-square test and multivariate logistic regression analysis was done to calculate the odds ratio and 95% CI.

Results: The prevalence of hypertension was 28.2% in males and 28.1% in females. Among participants with hypertension, 51.5% belonged to the controlled group. The results of the univariate analysis showed better blood pressure control in participants who exercised by walking than those who exercised with moderate or vigorous intensity. The income, education and EQD3 also revealed significant differences between the two groups (p<.05). Multiple logistic regression analysis was revealed no significant relations in blood pressure control regarding to the intensity of physical activity, but the blood pressure was better controlled in the participants who slept 8 hours or more (OR 1.34, 95% CI 1.03-1.75), non-smokers (OR 0.68, 95% CI 0.48-0.97), and had dyslipidemia (OR 1.91, 95% CI 1.43-2.57).

Conclusions: This study showed that good-control of hypertension is associated with sleep hours, smoking status and dyslipidemia, but the intensity of the physical activity does not seem to have correlations with it.
RESULTS: Myocardial architecture abnormality and minor cardiac fibrosis were found in OZR, compared to LZR. The protein levels of TGF-β, mitogen-activated protein kinase/extracellular signal-regulated kinase (ERK), CTGF, and matrix metalloproteinase (MMP)-9 (not MMP-2) were significantly increased in OZR relative to LZR. Exercise training decreased OZR-induced myocardial architecture abnormality and cardiac fibrosis as well as decreased OZR-induced TGF-β, ERK, CTGF, and MMP-9 (not MMP-2).

CONCLUSIONS: Exercise training prevents cardiac TGF-beta-CTGF fibrotic pathway and MMP-9 in obese models. Our findings imply that exercise therapy could be one of possible therapeutic approaches to prevent delirious cardiac fibrosis in obesity.

747

Board #63

June 1, 3:30 PM - 5:00 PM

Decreased Time To Achieve VO2MAX During Successive High Intensity Intervals

Daryl L. Parker, Adam J. Switgers, Shannon Wilson, Roberto Quintana. CSU Sacramento, Sacramento, CA.

Email: parkerd@csus.edu

(No relationships reported)

Research examining the effect of priming exercise (hard effort preceding an intense bout of exercise), has been shown to significantly alter oxygen kinetics in favor of more rapid adjustment to the workload. It is unclear if multiple hard efforts would further this effect. PURPOSE: This study was conducted to evaluate if VO2max would be achieved at a consistent time point during consecutive high intensity intervals. METHODS: Eleven male trained cyclists (Height: 183.4±4.3 cm, Weight: 77.7±7.3 Kg, VO2max: 66.7±4.4 mL.min^-1) participated in the study. Volunteers performed a graded exercise test (GXT) on the cycle ergometer at 35 W.min^-1 to volition fatigue. The highest power output at the beginning of the plateau in VO2max was defined as the pVO2max. Following a rest period of 30 minutes, subjects performed an endurance test at pVO2max (Tmax). Within seven days volunteers returned to the laboratory to perform an interval session (INT). The interval sessions required volunteers to cycle at 60% of Tmax during the interval and then recover between intervals at an equal duration (20W). Intervals were repeated four times. HR and expired air were measured continuously throughout the interval bout. One-way ANOVA with repeated measures and Tukey’s post hoc procedure was used to assess the results. RESULTS: The percentage of time to achieve VO2max decreased significantly from INT1 to INT2 (63.8±11.3 vs 43.8±9.3%Tmax) and again from INT2 to INT4 (34.9%). VO2max was not significantly different between GXT and Tmax test (67±4.8 vs. 65.7±5.6 mL.kg^-1.min^-1). Peak VO2 during INT1 was significantly lower than GXT (62.9±4.0 mL.kg^-1.min^-1). Peak VO2 during INT-2 was not significantly different from GXT. O2 pulse was not significantly different across trials. HR during INT1 was significantly lower than GXT (173±10 vs 181 ±11 bpm). HR during INT 2-4 was not significantly different than GXT. VE was significantly lower during INT1 than GXT (186±29 vs. 147.6±15.9 L.min^-1). VE during INT2-3 were not significantly different from GXT, but during INT4 VE increased significantly from INT2 (176±6.27 ±1.1 min^-1). CONCLUSION: We conclude that the time to achieve VO2max decreases significantly with consecutive intervals. Further, INT 1 primes the HR and VE, while late in the bout the preceding intervals prime VE.

748

Board #64

June 1, 3:30 PM - 5:00 PM

Correlation Between Cardiac Autonomic Function At Rest And Heart Rate Recovery After Submaximal Exercise Test

Giliard L. Garcia1, Carlos J. Gomes1, Keila E. Fontana1, Luiz Guilherme G. Porto2, Luiz F. Junqueira Jr.1, Guilherme E. Molina1, 1University of Brasilia - Faculty of Physical Education, Brasilia, Brazil. 2Visiting Scientist supported by a CNPq - Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (scholarship number: PDE 207136/2014.9) at Harvard T. H. Chan School of Public Health, and Faculty of Physical Education - University of Brasilia - B, Brasilia, Brazil. 3University of Brasilia - Faculty of Medicine, Brasilia, Brazil. Email: giliardgarcia@gmail.com

(No relationships reported)

The active orthostatic stress (AOE), induced by active standing, and the heart rate recovery (HRR) after exercise testing are markers of the cardiac autonomic function (CAF). It is not clear whether HRR after submaximal exercise testing (SET) is associated with CAF responsiveness to AOE. PURPOSE: We aim to correlate the CAF responsiveness to AOE with the HRR after submaximal SET in active men. METHODS: We evaluated 24 active men according to the IPAQ-questionnaire, aged 27 ± 4.4 years and with BMI – 24.8±1.8 kg/m². CAF was assessed by 5-min heart rate variability (HRV) at rest supine and orthostatic postures by the rMSSD index and by the SD1 index during the 5-min recovery period after SET, using the Polar RS800® heart rate acquisition and the Kubios software for analyses. The HRR was calculated as the absolute (Abs) and relative (Rel) differences from peak HR at ET minus HR at 1st to 5th min of active recovery at 2.4 km/h and 2.5% grade (HR1 – HRR5). CAF responsiveness was estimated by the Abs variation of rMSSD and SD1 from supine to orthostatic postures. Due to non-normal distribution of variables (Shapiro-Wilk test) we used the Spearman correlation at the 5% level of significance. RESULTS: We observed a positive correlation between rMSSD and SD1 variations after AOE and HRR, in almost every moments from min 1 to min 5, as shown in Table 1.

Table 1: Correlation between resting CAF responsiveness and HRR during a 5 min of recovery period.

<table>
<thead>
<tr>
<th>Variable</th>
<th>HRR 1th</th>
<th>HRR 2th</th>
<th>HRR 3th</th>
<th>HRR 4th</th>
<th>HRR 5th</th>
<th>REL %1th</th>
<th>REL %2th</th>
<th>REL %3th</th>
<th>REL %4th</th>
<th>REL %5th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abs rMSSD</td>
<td>rs = 0.41 (p &lt; 0.01)</td>
<td>rs = 0.46 (p &lt; 0.01)</td>
<td>rs = 0.38 (p &lt; 0.03)</td>
<td>rs = 0.50 (p &lt; 0.01)</td>
<td>rs = 0.41 (p &lt; 0.02)</td>
<td>rs = 0.35 (p &lt; 0.04)</td>
<td>rs = 0.33 (p &lt; 0.05)</td>
<td>rs = 0.42 (p &lt; 0.06)</td>
<td>rs = 0.32 (p &lt; 0.03)</td>
<td></td>
</tr>
<tr>
<td>Abs SD1</td>
<td>rs = 0.50 (p &lt; 0.01)</td>
<td>rs = 0.57 (p &lt; 0.01)</td>
<td>rs = 0.51 (p &lt; 0.01)</td>
<td>rs = 0.50 (p &lt; 0.01)</td>
<td>rs = 0.46 (p &lt; 0.01)</td>
<td>rs = 0.46 (p &lt; 0.01)</td>
<td>rs = 0.46 (p &lt; 0.01)</td>
<td>rs = 0.44 (p &lt; 0.03)</td>
<td>rs = 0.38 (p &lt; 0.03)</td>
<td></td>
</tr>
</tbody>
</table>

* Spearman correlation test (p < 0.05).

Conclusion: We found significant positive correlation between the resting CAF vagal responsiveness and HRR after SET in active men. Our results reinforce the hypothesis that the capacity to re-establish HR to the baseline levels after submaximal efforts, which has been shown to be a cardiovascular risk marker, could be predicted by the vagal CAF responsiveness to AOE.

749

Board #65

June 1, 3:30 PM - 5:00 PM

Fetal Heart Rate Variability Following An Acute Bout Of Maternal Exercise During Pregnancy

Joseph P. Abaji, Robert Davis Moore, Elise Labonté-Lemoyne, Daniel Curnier, Dave Ellemberg. Université de Montréal, Montreal, QC, Canada.

(No relationships reported)

PURPOSE: It is well known that the fetal environment influences the development of the fetus’ nervous system. For example, pregnant women who regularly engage in aerobic exercise give birth to babies with greater brain maturity (May et al. 2014; LeMoyne et al. 2013). This suggests that the autonomic nervous system of the fetus may be stimulated while the mother is exercising. The purpose of this study was to examine fetal cardiac-autonomic function following an acute bout of maternal exercise. METHODS: Electrocardiograms were placed on a group of 10 pregnant women in order to detect fetal cardiovascular activity. Participants then completed 30-minutes of cycling at 50% of their maximum oxygen consumption. Fetal Heart Rate (HR) and Heart Rate Variability (HRV) were analyzed for 5 minutes before the start of exercise and for a period of 10 minutes immediately after the exercise session. RESULTS: A series of one-way repeated measure ANOVAs revealed that spectral power of fetal HR was significantly greater immediately following exercise cessation, as indicated by increased absolute power at very-low (VLF), low (LF), intermediate (int) and high frequencies (HF) (p<0.05). Furthermore, fetal HRV was significantly greater immediately following exercise cessation, as indicated by an increase in the standard deviation of beat-to-beat intervals (SDNN/NN) and root mean square standard deviation (RMSSD/NN) (p<0.05). These modifications returned to pre-exercise baseline within 10 minutes of exercise cessation.

CONCLUSIONS: An acute bout of exercise during pregnancy leads to significant alterations in multiple fetal HRV parameters, suggesting a modification in fetal cardiac-autonomic activity. The current findings add to our knowledge regarding the influence of maternal exercise on fetal cardiac-autonomic function, reaffirming the benefit of maternal exercise on fetal health.

750

Board #66

June 1, 3:30 PM - 5:00 PM

Moderate To Vigorous Physical Activity Influences Aerobic Capacity Independent Of Body Composition


(No relationships reported)

Purpose: To assess the influence of time spent engaging in moderate to vigorous physical activity (MVPA) on aerobic capacity among young to middle-aged adults, controlling for muscle mass and %fat. Methods: Bivariate correlations and hierarchical linear regression analyses were conducted among a sample of adults between 18-44 years (N= 343, 173 females). All participants completed a graded maximal exercise test to assess aerobic capacity (VO2max absolute). Soft tissue body composition (muscle mass and %fat) was...
assessed using Dual Energy X-ray Absorptiometry (DXA). Daily 5-minute spent engaging in MVPA (> 1951 counts per minute) was monitored using an accelerometer (Actigraph GT3x+) worn for at least 4 days (minimum 8 hours/day).

Results: According to the bivariate correlations, aerobic capacity was positively correlated with sex (r=0.76, P<0.01) such that males had higher aerobic capacity. In addition, muscle mass (r=0.89, P<0.01) and MVPA (r=0.56, P≤0.001) were positively related to aerobic capacity. In contrast, aerobic capacity was inversely correlated with age (r=-0.15, P<0.01) and %fat (r=-0.56, P≤0.001). Hierarchical linear regression analyses revealed that the positive effect of MVPA on aerobic capacity was sustained even after controlling for age, sex, and body composition variables.

Conclusions: Previous research has demonstrated that age, sex, and body composition are important determinants of aerobic capacity across the lifespan. However, the effects of habitual physical activity on measures of aerobic capacity are inconsistent. These data demonstrate that time spent being moderately-to-vigorously active is positively related to aerobic capacity and that these effects are independent of age, sex, and body composition. These findings have implications for public health policy advocating for greater daily MVPA for cardiorehabilitation benefits among adult populations.

Support: Research reported in this publication was supported by the Intelligence Advanced Research Projects Activity (IARPA), contract number 2014-1317T000004 to the Beckman Institute for Advanced Science and Technology at the University of Illinois (PI, Barbee). The content is solely the responsibility of the authors and does not necessarily represent the official views of IARPA.
Cardiovascular Hemodynamic Response to the Normal and Pathologic Human Diving Reflex

Jiri Dostal1, Jakub Stritecky2, Milos Matous1. 1Institute of Sports Medicine, Prague, Czech Republic. 2Charles University, Faculty of Medicine Hradec Kralove, Hradec Kralove, Czech Republic. Email: jiri.dostal@sportovnilekarstvi.cz

PURPOSE: This study followed our award winning clinical abstract from ACSM 2015. Human diving reflex is well known reaction of the cold water immersion. However only limited data are available for those cases, when clinically significant case appears. The aim of the study was to monitor hemodynamic response for two groups of individuals - one with physiological appropriate reaction, and second with pathological reaction manifested by clinically relevant symptoms.

METHODS: Two groups of individuals were monitored during cold water face immersion. Each individual placed the face into the cold water (7°C) immersion until exhaustion. The test has been repeated three times for each individual. The cardiovascular hemodynamic parameters were monitored via 12 lead ECG and noninvasive bio-impedance system PhysioFlow. The following parameters were recorded: heart rate (HR), stroke volume (SV), cardiac output (CO), and systemic vascular resistance (SVR).

RESULTS: 2 individuals with symptomatic pathology (pre-syncpe, dizziness or dyscoordination during swimming) and 5 normal individuals were included. All together 21 measurements were recorded. The detailed information are included in the following table:

<table>
<thead>
<tr>
<th>HR (bpm)</th>
<th>SV (ml)</th>
<th>CO (l/min)</th>
<th>SV (l dyn x m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology response</td>
<td>Mean</td>
<td>Pre</td>
<td>Test</td>
</tr>
<tr>
<td>T1</td>
<td>5±4</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>T2</td>
<td>5.1</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Normal response</td>
<td>Mean</td>
<td>Pre</td>
<td>Test</td>
</tr>
<tr>
<td>1.1</td>
<td>6.2</td>
<td>5.1</td>
<td>4.9</td>
</tr>
</tbody>
</table>

CONCLUSION: Our study demonstrated for the first time, that pathological (overshoot) response to the face water immersion is not only manifested by severe bradycardia. This is rather a whole body circulatory collapse with clinically relevant drop in heart rate and stroke volume resulting in insufficient cardiac output, compensated by global systemic vasconstriction. Results might help us to understand better possible causes of the sudden death of swimmers and triathlon racers.

Cardiac autonomic dysfunction reduces cardiac reserve in neuropathic patients with diabetes. People with uncomplicated diabetes also have reduced cardiac reserve, but the influence of cardiac autonomic (dys) function has not been identified in these people.

PURPOSE: To determine whether people with uncomplicated type 2 diabetes have reduced chronotropic and inotropic responses to β-adrenergic stimulation.

METHODS: 8 people with uncomplicated type 2 diabetes (T2D) and 7 matched controls (CON) performed a VO2max test with (ECG) and DEKA scan. On a second visit, heart rate (HR), left ventricular end-diastolic (EDV), end-systolic (ESV), stroke volume (SV) and cardiac output (Q) were measured with echocardiography during supine rest, parasympathetic blockade (atropine), and during incremental β-adrenergic stimulation (dobutamine). All volumes were indexed to fat free mass (QFMM). Data were analyzed with linear mixed models and students t-tests.

RESULTS: HR/VO2max and heart rate reserve (HRR) were lower in T2D (P < 0.05) as expected. At rest, HR was higher (P < 0.01) and stroke volume (SVFMM) was smaller (P < 0.05) in T2D but cardiac output (QFMM) and ejection fraction (EF) were not different between the groups. After parasympathetic blockade, HR (112 ± 8 vs. 105 ± 8 beats/min−1; P = 0.08) and the increase in HR (ΔHR) were not different (39 ± 8 vs. 45 ± 9; P = 0.22) between the groups. HR was greater in T2D during dobutamine infusion (P < 0.05); but ΔHR (interaction) was not different between groups. T2D achieved 85% maximal HR at a lower dobutamine dose than CON (11 ± 4 vs. 20 ± 10 μkg·min−1; P < 0.05). EDV and ESVFMM was lower (P < 0.05) during β-adrenergic stimulation in T2D but ESVFMM was not different between groups. Ejection fraction increased (P < 0.05) equally in both groups during β-adrenergic stimulation and SVFMM and EF were not different in T2D, but increased in CON (P < 0.05). QFMM increased in CON but did not change in T2D during β-adrenergic stimulation (P > 0.05).

CONCLUSIONS: HR is increased and SVFMM is reduced in T2D at rest and during β-adrenergic stimulation. EF and ESVFMM were not different during β-adrenergic stimulation, but EDV and SVFMM were smaller in T2D. These data indicate that reduced β-adrenergic responsiveness does not contribute to reduced cardiac reserve in uncomplicated type 2 diabetes during submaximal stress.

Thoroughbred horses start training in the fall as one-year-olds, equivalent to middle-school age in humans. It is unclear exactly what causes resting heart rate (HR) to decrease during this period because aging and growth, training and changes in vagal tone associated with training all tend to reduce resting HR; aging by reducing intrinsic HR, training by increasing cardiac stroke volume (SV) and vagal tone by slowing the pacemaker. We hypothesized that training may differentially affect SV and vagal tone to induce the observed resting bradycardia.

PURPOSE: To determine the effects of initial one-year training on resting HR, SV, left ventricular mass and heart rate variability (HRV) in young Thoroughbreds.

METHODS: Twenty yearling Thoroughbred horses were studied. Ten horses trained for one year from September as one-year-olds (TR); 10 horses had no training to control for aging and growth (UT). Variables measured before and after training included maximal oxygen consumption (VO2max) measured on a treadmill at supramaximal speeds sustainable for 120 s (approximately 115% VO2max) and heart rate variability (HRV) in young Thoroughbreds.

PURPOSE: To determine the effects of initial one-year training on resting HR, SV, left ventricular mass (LVM) and heart rate variability (HRV) in young Thoroughbreds.

METHODS: Twenty yearling Thoroughbred horses were studied. Ten horses trained for one year from September as one-year-olds (TR); 10 horses had no training to control for aging and growth (UT). Variables measured before and after training included maximal oxygen consumption (VO2max) measured on a treadmill at supramaximal speeds sustainable for 120 s (approximately 115% VO2max) and heart rate variability (HRV) in young Thoroughbreds.

RESULTS: VO2max in TR was higher than in UT (159±9 vs. 140±7 SD ml/(kg·min)) (+14%), P<0.05. Resting HR in TR was lower than in UT (32.0±3.5 vs. 38.3±1.8 beats/min (-16%), P<0.05). The HR was higher than in UT (1008±692 vs. 476±400 ms2 (+212%), P<0.05). SV in TR was larger than in UT (1.88±0.24 vs.1.42±0.24 ml/(kg·min)) (+32%), P<0.05. There were no differences in CO (71.4±14.1 vs. 63.3±11.8 ml/kg·min (+13%) or LVM 4.9±1.3 vs. 4.1±1.2 g/kg (+20%) between TR and UT, although power was low for these tests (0.15-0.18).

Abstracts were prepared by the authors and printed as submitted.
CONCLUSIONS: Vagal tone increased over six-fold more than other factors, including the difference between TR and UT groups, suggesting age-growth had less effect on resting bradycardia than vagal tone. Higher SV in TR lowered resting HR modestly without changing CO. Resting bradycardia in young horses in training may be influenced primarily by vagal tone.

Exaggerated blood pressure response to exercise testing (ExBPR) in healthy individuals tends to develop future hypertension, and is a strong predictor of cardiovascular morbidity and mortality. For cardiac patients, however, the definition and impact of ExBPR are controversial. PURPOSE: To identify the optimal critical value of ExBPR associated with health risk category of exercise capacity. METHODS: This study was a cross-sectional investigation of 260 consecutive patients who completed cardiopulmonary exercise test 6 to 8 weeks after cardiac surgery at the heart center in a hospital, Taipei, Taiwan. Five cutoff points of ExBPR were set either at peak or stage II of modified Bruce treadmill exercise testing, which included BP_peaks (190/110 mmHg) and BP stage II (180/90 mmHg) as defined in healthy population, BP peak (180 mmHg) and BP. Stage II (170 mmHg) defined by SBP greater than the 90th percentile during exercise testing among cardiac patients, and BP_slope (14 mmHg per MET). For worse health outcomes existed if exercise capacity below 5 METs, thus, the associations between ExBPRs and binary category of exercise capacity were analyzed by logistic regression. RESULTS: After adjusting with age and BMI health risk of exercise capacity below 5 METs was significantly associated with ExBPR with definition of BP stage II (OR(95%CI):2.2 (1.0-4.8)) and BP_slope (OR(95%CI):7.7 (2.8-23.7) ). The below 5METs was significantly associated with ExBPR with definition of BP_90th stage II. CONCLUSIONS: ExBPR is an important predictor of post cardiac surgery health outcomes.

Feasibility Of 2D Strain For Assessing Myocardial Function In Trained And Not-trained Renal Transplant Recipients

Gianni Pedrizzetti1, Laura Stefani2, Stefano Pedri1, Marco Mandolfi1, Giorgio Galanti2. University of Trieste, Department of engineering and architecture,Trieste, Italy. 1Sports Medicine Center-University of Florence, clinical and Experimental Department Florence, Italy. 2Esato-Italy, Clinical and Experimental Department Florence, Italy. Email: laura-stefani@tiscali.it

Purpose: Deformation parameters are normally employed to early discover a possible myocardial damage. This aspect is particularly important in post-transplant renal patient populations. METHODS: A group of 8 transplant recipients (aged 45±5 yrs) following a program of moderate (75% of the max effort) aerobic exercise added to a low resistance exercise for at least 3 times a week for 1 year was compared to a group of 6 subjects not trained. All participants underwent an echocardiographic exam with the evaluations of the standard 2D parameters and by Lo Strain calculation by a dedicated software (ESAOTE Xstrain). Results: All parameters were within the normal range. Lo Strain was feasible in all subjects. The limited number of subjects did not allow to detect statistically significant differences between the groups, despite the higher values of Lo Strain values in apical segments. Conclusions: There is evidence of feasibility of Lo ST evaluation in post transplant patients. Lo Strain confirms the normal LV function in renal recipients and plays a role in following the progressive improvement of the myocardial function in post transplant renal syndrome submitted to the exercise program. More studies are necessary to evaluate the possible contribution of physical exercise to the improvement of deformation parameters.

Exercise intolerance is a common phenotype observed in patients with cystic fibrosis (CF). We have recently published the presence of impaired oxygen uptake kinetics (i.e. VO2 response time and functional VO2 gain) in CF which can translate into early fatigue and lower exercise capacity via greater oxygen debt at the onset of and throughout exercise. Sub-chronic treatment with sildenafil, a phosphodiesterase type 5 (PDE5) inhibitor, has previously been shown to improve exercise capacity in other patient populations. PURPOSE: To assess the efficacy of sildenafil on exercise capacity and oxygen uptake kinetics in patients with CF. METHODS: Ten patients with CF (age 26 ± 10 years) participated in this study. A maximal exercise test on a cycle ergometer using the Godfrey protocol was performed at baseline and following 4 weeks of treatment with sildenafil (20 mg, TID). Exercise capacity (VO2 peak), VO2 response time (VO2 RT), functional VO2 gain (ΔV02/ΔWR), and exercise duration were determined at each time point. RESULTS: The VO2 RT decreased (32 ± 17.5 vs. 40 ± 14.7 sec; p=0.006) and exercise duration increased (445.9 ± 101.5 vs. 463.8 ± 130.7 sec; p=0.017) following sildenafil treatment. A strong correlation between baseline FEV1 (% predicted) and the change in relative VO2 peak (ml kg⁻1 min⁻1; r=0.678; p=0.031) was observed. Controlling for baseline FEV1 (% predicted) using analysis of covariance, relative VO2 peak (27.43 ± 4.28 vs. 28.34 ± 4.51 ml/kg/min; p=0.048) improved after the treatment. Patients with a baseline FEV1 of ≥ 85 % predicted appear to have a greater change (p=0.067) in VO2 peak (3.3 ± 3.6 ml kg⁻1 min⁻1) compared to patients with < 85 % predicted (0.53 ± 2.2 ml kg⁻1 min⁻1). No difference was seen in ΔV02/ΔWR following the treatment (8.77 ± 1.07 vs. 8.54 ± 1.13; p=0.581). CONCLUSIONS: There appears to be improvements in exercise capacity and oxygen uptake kinetics following 4 weeks of sildenafil in patients with CF. Findings also revealed that baseline pulmonary function may play an important role in the effectiveness of treatment, whereby patients with baseline FEV1 of ≥ 85 % seem to have greater improvements in exercise capacity following sildenafil therapy. Supported in part by NIH/NIDDK R21DK100783 (RAH).

Comparison of Physiological and Accelerometer Responses between Yoga and Slow Walking

Bethany M. Forseth, Scott J. Strath, FACSM, Ann M. Swartz, FACSM. University of Wisconsin -Milwaukee, Milwaukee, WI.

Purpose: To compare oxygen consumption, heart rate, and accelerometer counts between a commercially available yoga video routine and walking. Because both yoga and slow walking are estimated to require 2.5 METs, it was hypothesized that responses would not significantly differ from each other. METHODS: Adults, aged 20-80 years, were recruited to complete a slow walking bout (walking on a treadmill at 2 mph) and/or a yoga routine (of ‘Easy Yoga for Arthritis with Peggy Cappy), each for 7 minutes, with at least 5 minutes rest before and after each activity. Oxygen consumption, heart rate, and hip-worn accelerometer counts were measured continuously. Paired t-tests were used to compare physiological and accelerometer responses between activities. RESULTS: 30 adults (53.6±16.6 years, BMI: 25.9 ±2.6 kg/m²) completed the slow walk and 29 adults (48.6±15.2 years, BMI: 26.7 ±2.6 kg/m²) completed the yoga routine. No differences were observed in any parameters. Conclusions: The tests were composed of activities that responses would not significantly differ from each other.
Yoga has become a worldwide practice utilized for improving overall mental and physical health. Most recently, yoga has increased in popularity as a weight loss intervention among its practitioners; however, there is little evidence highlighting the differences in energy expenditure across different yoga poses and practices. Results showing the difference in caloric expenditure among these factors can help instructors design and prescribe specific yoga programs for individuals targeting weight loss. PURPOSE: To compare the difference in energy expenditure of the commonly practiced yoga sequence, Sun-Salutation B, during high-speed (HS) or low-speed (LS) performances. METHODS: Seven subjects (2M, 5F) (31.43 ± 1.92 y) performed eight minutes of multiple Sun-Salutation B yoga sequences using HS (3s interval) vs LS (12s interval) programs. Energy expenditure was calculated for each minute of performance using the cumulative volume of oxygen consumed (VO2) and the volume of carbon dioxide expired (VC02) per minute during the eight minute performances. RESULTS: Significant differences in energy expenditure were found between HS (52.14 ± 21.1 kcal) and LS (26.07 ± 10.6 kcal) performances (p<0.005). CONCLUSION: No specific rest intervals were given and subjects were instructed to move from one machine to the next as quickly as possible (MLEC=15.2±4.0s; Sf=60.0±13.3 sec) vs LS (12s interval) performances. Energy expenditure was calculated for the HS routine than during the LS routine. This difference indicates that our high-speed yoga training would likely be more effective than typical low-speed yoga training during Exercise (Ex) (p<0.01). Post hoc analysis revealed that the HLCC produced significantly higher EE values than HLEC (Mean 11.39±3.08 vs 7.63±2.30 kcal/min; p<0.001). Heart rate (85.05 vs 85.88 bpm; p>0.041), and vector magnitude accelerated counts (441 vs 2389 cpm; p<0.001) were lower during yoga when compared with walking at 2 mph, respectively. CONCLUSIONS: Yoga was significantly lower than walking in both physiological responses and body movement responses, with the greatest differences observed in oxygen consumption and accelerometer data. Future research should examine the mindfulness, muscular, and subjective components to better assess and quantify yoga across all yoga styles.
Pickleball is increasing in popularity nationwide. However, research investigating the physiological demands of pickleball is limited; no one has investigated intensity differences between pickleball and a common exercise activity such as walking.

**PURPOSE:** The purpose of this study was to (1) compare movement intensity parameters between pickleball and walking, and (2) correlate those parameters with caloric expenditure.

**METHODS:** 16 novice to intermediate level pickleball players (8 male, 8 female; age = 44 ± 14 years, mass = 76.0 ± 12.4 kg; height = 1.67 ± 0.09 m) participated in two data collection sessions in a counterbalanced order: pickleball doubles and walking at a self-selected speed. Each session lasted 30 minutes. During each session, participants wore a HexoskinTM vest which measured cadence, resultant doubles and walking at a self-selected speed. Each session lasted 30 minutes. During each session, participants wore a HexoskinTM vest which measured cadence, resultant acceleration, and caloric expenditure. Paired sample t-tests were used to determine differences in movement intensity between activities, while Pearson product-moment correlation coefficients were used to evaluate the relationship between movement intensity and caloric expenditure.

**RESULTS:** During the walk, average cadence (110.1 ± 13.1 steps/min) and acceleration (0.37 ± 0.07 g) were significantly greater than average cadence (80.3 ± 9.2 steps/min) and acceleration (0.28 ± 0.06 g) during pickleball (p < 0.001). Peak cadence (194.4 ± 17.9 steps/min) and acceleration (1.75 ± 0.5 g) during pickleball, however, were significantly greater than peak cadence (139.6 ± 24.3 steps/min) and acceleration (0.65 ± 0.16 g) during the walk (p < 0.001). Both peak and mean acceleration during pickleball significantly correlated with caloric expenditure during the walk. CONCLUSIONS: Movement intensity differs between pickleball and walking. On average walking provides greater movement compared to pickleball. However, at times, pickleball is more intense which may lead to increased caloric expenditure. These results provide evidence that pickleball offers greater physiological demand when compared to walking. Further investigation of potential differences in movement intensity between pickleball and other racket sports is warranted.

**REFERENCES:**


Running With A Stroller: Kinematic And Energetic Changes Across Different Stroller Pushing Techniques

Ryan S. Alcantara, Cara M. Wall-Scheffler. Seattle Pacific University, Seattle, WA.

Email: alcantarar@spu.edu

(No relationships reported)

PURPOSE: Following the transition to parenthood, people often initiate Stroller Running (SR) as it provides an opportunity for physical activity within proximity of their child. While the benefits of physical activity are well established, limited literature exists surrounding the potential disruption in gait and energetic cost caused by SR. Given that there are options in how one pushes a stroller, three commonly used stroller-pushing methods were investigated to detect potential changes in metabolic cost, speed, and stride length.

METHODS: Sixteen individuals (male n=10, female n=6) with minimal stroller experience prior to the study ran around a track for 800m at each of four conditions: an independent running (IR) control, and the three SR conditions. The SR conditions included (1) Pushing the stroller with both hands, (2) Pushing with one hand, (3) Pushing and chasing the stroller. Each runner was instructed to maintain a consistent pace within and across all conditions. Metabolic cost was measured using a portable respirometer, speed was measured every 100m with a stopwatch, and stride length was calculated from measured stride frequency.

RESULTS: There was a significant decrease in stride length (p<0.001) and speed (p<0.01) between IR and all SR conditions; SR conditions did not vary amongst themselves. There was not a significant change in metabolic cost, suggesting that for a given speed, the metabolic cost of SR is greater. Men and women showed different patterns of cost and speed changes, potentially due to the fact that in this sample, men ran significantly faster than women (p<0.05). Specifically, for men at the one-handed SR condition, the slope of mass and speed on cost (per unit time) was flat; for women, all conditions showed positive slopes.

CONCLUSIONS: The linear relationship between running speed, body mass, and energetic cost means that generally a decrease in speed will result in a decrease in energy expenditure. We found that though the use of a stroller while running significantly decreases running speed, metabolic cost does not significantly decrease. Our data suggest that any SR condition is more energetically costly than IR, and that lower limb kinematics significantly differ between SR and IR at self-selected running speeds.

The Effects of Sagittal Plane Postural Alterations on Metabolic Cost in Running

Nina Carson, Justus Ortega. Humboldt State University, Arcata, CA.

Email: nm37@humboldt.edu

(No relationships reported)

Running economy (metabolic cost) is a key predictor of running performance. Some have suggested that running with a maximum forward lean improves running mechanics and improves running economy. PURPOSE: To investigate the effect of sagittal plane postural strategy on running economy. METHODS: 16 healthy young adult runners (23±4.89 years) who participate in running for fitness or competition, with a 5k time 22 minutes, ran on a treadmill at 8 mph (3.576 m/s). Real time video feedback was used while subjects ran on a motorized treadmill at three lean angles (upright (0°), maximal forward lean (8.34°±1.35), and moderate forward lean (4.18°±0.68)). For both the maximal forward lean and the moderate forward lean subjects were instructed to “lean from their ankle.” Additionally, subjects repeated the maximal forward lean and moderate forward lean while instructed to “lean from the torso.” For each of the five trials, we quantified running economy as metabolic power (Watt/kg) using indirect calorimetry during the last two minutes of each five-minute trial. A 2-way repeated measures ANOVA was used to determine the effect of postural lean and postural strategy (ankle vs. torso) on running economy. RESULTS: Postural lean significantly influences running economy (p<0.001). Specifically, running economy was reduced by 4-6% when running with maximal forward lean as compared to running upright (p<0.005). However, running economy did not change when running with a moderate forward lean, as compared to running upright (p=0.148). Postural strategy (leaning from ankle vs. torso) had no effect on metabolic cost of running across the range of postural lean (p=0.993). CONCLUSION: Despite claims that running with a large forward lean will improve running economy, this study suggests that running with an upright posture or more moderate forward lean, either from the ankles or torso, may be more energetically optimal. These findings have implications for altering running technique and methods that coaches may prescribe to runners.

The Energy Cost of Cross Training at a Constant Power Varies with User Cadence

Cory Hofmann1, Ross Robarge2, Rachel Bronmberg3, Paul Juris1. 1Cybex Research Institute, Medway, MA. 2University of Massachusetts-Lowell, Lowell, MA.

Reported Relationships: C. Hofmann: Salary; Cybex International Inc.

There exists an optimal cadence for cyclic activities that is most energetically efficient for a given power output. The metabolic costs are primarily associated with two factors: the cost of doing ‘internal work’ resulting in moving the limbs in a cyclic fashion, and the ‘external work’ done on the environment (e.g., a bicycle pedal) or the body’s center or mass (e.g., walking, running). Despite the prevalence of cross trainers in fitness settings, experiments investigating metabolic costs under varying cadences at a fixed mechanical power on these devices are scarce. PURPOSE: To quantify the energy cost of using a cross trainer when the user varied cadence while the machine adjusted resistance to maintain a constant external power.

METHODS: Eighteen healthy subjects (11M; 7F; 35 ± 11 yr) attended one laboratory session during which they exercised on a cross trainer at a workload (150 ± 42 watts) eliciting approximately 75% of age-predicted maximum heart rate at a cadence of 130 steps/min, then worked at a faster and slower cadence in a counterbalanced order (110, 150 steps/min). Metabolic cost (kcal/min) was quantified using indirect calorimetry, and compared across conditions with a one-way repeated measures ANOVA (α = 0.05).

RESULTS: Our findings suggest that working at 150 steps/min elicited greater cost (13.24 kcal/min, P < 0.001) relative to 130 steps/min (12.19 kcal/min) and 110 steps/min (11.61 kcal/min).

CONCLUSIONS: Altering cadence, independent of altering the rate of external work done on the environment, can result in significant changes in metabolic demand while exercising on a cross trainer. These data suggest that the most energetically costly strategy involves increasing the cadence at which an exerciser works, suggesting that the role of performing internal work may be a limiting factor when exercising on a cross trainer at a sub-anerobic threshold.
**Effects of Treadmill Walking with Hand-Held Weights on Energy Expenditure and Excess Post-Exercise Oxygen Consumption**

Catherine T. Campana, Pablo B. Costa. California State University Fullerton, Fullerton, CA.

Email: catherinetcampana@gmail.com

(No relationships reported)

While any form of exercise might be beneficial, walking is a simple activity that should be encouraged. Progression may involve moving hand-held weights (HHW) to raise energy expenditure, thus increasing weight loss. **PURPOSE:** The purpose of this study was to compare the relative oxygen uptake (ml/kg·min⁻¹) responses and excess post-exercise oxygen consumption (EPOC) in sedentary women between treadmill walking with HHW versus without. **METHODS:** Eight untrained women (mean ± SD; age = 21.9 ± 1.81, height = 163.0 ± 5.32 cm, body mass = 67.5 ± 15.6 kg, BF% = 30.1 ± 8.55 BMI, BW = 26.0 ± 6.58 lbs) participated in two randomized sessions of either walking with 3 lbs HHW or a control condition. The entire testing session included 5 min of sitting, a warm-up, and 30 min exercise followed by subsequent quiet sitting for 30 min. Participants alternated their arms 12 inches forward and backward while maintaining elbow flexion at 90° for both sessions during the warm-up and exercise.

Treadmill grade was set at 1% and speed was adjusted to the participant’s target heart rate set between 40-59% of heart rate reserve, a moderate level of intensity. VO₂max was collected every 5 min interval. Two-way repeated measures ANOVAs were used to analyze the data. Results: There were no differences between walking with HHW versus without, HHW might provide 240 sec measurements (RMR) were determined using indirect calorimetry. Oxygen consumption (VO₂) was measured continuously during and intermittently for 5 h post-exercise. EE was estimated from VO₂ assuming 5 kcal per L O₂ consumed. **RESULTS:** With “all-out” running efforts, EE during the first hour post-exercise was not different between 30:240 (221.1±16.7 kcal) and both 15:120 (126.8±12.5 kcal; P=0.443) and 5:40 (110.6±11.0 kcal; P=0.081), though 15:120 was greater compared to 5:40 (P<0.007). EE during the second (5:40; 97.8±6.7 kcal; 15:120, 100.7±8.3; 30:240, 98.3±6.4) and third (5:40; 92.9±7.2 kcal; 15:120, 97.7±7.1; 30:240, 95.8±7.3) hour post-exercise was not different between protocols (P=0.088). Total EE during the 3 h post-exercise period was not different (P=0.280) between 15:120 (325.3±27.0 kcal) and 30:240 (315.3±25.4 kcal) though both were greater (P<0.032) compared to 5:40 (301.3±22.9 kcal). **CONCLUSION:** These results suggest that modified SIT protocols with shorter work bouts (5-15 s) promote greater increases in EE during exercise, as well as comparable EE post-exercise compared to traditional SIT.

**Energy expenditure above resting levels after exercise is particularly attractive for weight control and energy balance.** PURPOSE: This study examined differences in excess post-exercise oxygen consumption (EPOC) over a 24-hour period between a 30-minute submaximal treadmill run and a 30-minute submaximal free-swim. **METHODS:** Subjects (N=6) (25.0±4.5 y; 77.7±9.8 kg; VO₂max: 48.8±6.0 ml/kg·min⁻¹) completed one control and three experimental conditions compared to 100% BW. One-way repeated measures ANOVAs indicated a main effect of time for EPOC. However, there was a main effect for time for EPOC. Pairwise comparisons across all four BW conditions were no differences between conditions during exercise (p < 0.05) or between conditions for EPOC. However, there was a main effect for time for EPOC. Pairwise comparisons collapsed across conditions indicated VO₂max was significantly higher immediately after exercise compared with baseline (p < 0.05). No other significant differences were found for the indirect calorimetry measurements (RMR) were determined using indirect calorimetry. Oxygen consumption (VO₂), carbon dioxide production (VCO₂), minute ventilation (Vₐ), heart rate (HR) and rectal temperatures (Tₑₑ) were measured during each minute of the 30-minute run. HR was recorded every 15 seconds during the swim. Rectal temperatures were determined prior to and immediately following the 30-minute swim. Oxygen consumption, Vₑ, HR and Tₑₑ were recorded for the first 60-post-exercise minutes again for 10 minutes at 4, 6, and 24-hours between both exercise modes. Paired t-tests probed for significant differences in EPOC between the sub-maximal run and sub-maximal swim at the p<0.05 level. **RESULTS:** EE was significantly higher during the sub-maximal swim than the sub-maximal run (137.0±4.82 vs. 124.0±5.37bpm). Tₑₑ was significantly higher for 9 minutes post-exercise following the sub-maximal run than the sub-maximal swim (38.0±4.4 vs. 37.4±0.5°C). EPOC significant differences were observed when comparing VO₂ and Vₑ following the sub-maximal swim compared to the sub-maximal run, 24 hours post-exercise (3.82±0.12 vs. 3.38±0.12ml/kg·min⁻¹; 9.30±0.31vs. 8.60±0.39 min/m). A repeated measures ANOVA analyzed VO₂, Vₑ, HR and Tₑₑ at 1, 4, 6, and 24-hours post-exercise with only HR being significantly different between 4 and 24 hours post-exercise for the swim and run, respectively, (60.90±2.66 vs. 62.09±4.57bpm; 50.00±1.61vs. 50.00±1.85bpm). **CONCLUSION:** This work is suggestive that different workload intensities, regardless of the exercise mode, have a greater impact in elevating EPOC levels over a 24-hour period than an elevated core temperature.

**Excess Post-Exercise Oxygen Consumption Following A Sub-maximal Run and Swim in Females - A Pilot Study**

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

Email: joan.grossman@scranton.edu

(No relationships reported)
The Effect of Pedaling Frequency and Stretching on FAT/CHO Crossover Point
Nolynn E. Sutherland, Neil M. Johannsen, Arnold G. Nelson, FACSM. Louisiana State University, Baton Rouge, LA.

An acute bout of stretching will decrease muscular strength, power and endurance, which could possibly be due to an increased inhibition of motor neurons. Animal research has well established that slow motor neurons are activated first and are more oxidative. Unfortunately, research has been inconclusive as to whether the stretch induced inactivation of motor units also has speed specificity like that of activation; therefore it is possible a stretch induced inactivation would alter the amounts of carbohydrates(CHO) and fat(FAT) used at slower speeds.

PURPOSE: To determine if stretching changes substrate utilization during exercise, yielding different FAT/CHO crossover points.
METHODS: 15 Men and women (age 22±4.5y; mean±SD) college aged participants (VO2max = 31.9±5.5mL·kg-1·min-1) were recruited for the study. Each participant was tested on a Velotron® cycle ergometer with and without pre-cycling stretching. Stretching consisted of five different passive static stretches which were held for fifteen seconds and repeated three times. An assistive stretching session followed with the same five stretches held for fifteen seconds and repeated three times. The non-stretched condition consisted of ten minutes of quiet sitting. Following the stretch treatment participants pedaled at 50 revolutions per minute (RPM) for 6 minute stages. The exercise workload started at 15 watt(W) and increased by 15W until an RER of 0.95 was reached, ensuring the crossover point (RER > 0.85) had been surpassed. RESULTS: Mean VO2 (L/min) corresponding to the crossover point was 0.51±0.37 L/min and 0.58±0.51 L/min for stretching and non-stretching conditions at 50 RPM, respectively (p<0.5). The results revealed no difference (P>0.5) in the crossover point, demonstrating no difference in substrate utilization with and without stretching prior to cycling at a slow speed.

CONCLUSION: These data suggest that prior static and active stretching does not elicit a stretch induced inactivation that can alter substrate usage.

778 Board #95 June 1, 2016 - 2:00 PM - 3:30 PM
Nutritional State of High-Intensity Interval Exercise Does Not Influence Metabolism or Diet
William J. Perez1, Corey A. Rynders2, David P. Swain, FACSM3. 1Old Dominion University, Norfolk, VA. 2University of Colorado Denver, Aurora, CO.

Email: wiper005@odu.edu

No relationships reported.

PURPOSE: To investigate immediate and delayed metabolic and dietary responses to a single bout of cycling-high-intensity interval exercise (HIEI) performed in the fasted and fed state.
METHODS: Baseline values of seven subjects (3 female/4 male, mass = 72 ± 11 kg, VO2max = 9.5 ± 1.6 L·min−1 · kg−1) for resting energy expenditure (REE), resting VO2, VO2peak and appetite score (VAS) were measured on the first visit. Energy balance (EB) was determined using diet tracking logs, REE, physical activity energy expenditure (paEE) and the thermic effect of feeding. Trials began in a fasted state (FST) and repeated three times 12 hours after HIIE. An assistive stretching session followed with the same five stretches held for fifteen seconds and repeated three times. The non-stretched condition consisted of ten minutes of quiet sitting. Following the stretch treatment participants pedaled at 50 revolutions per minute (RPM) for 6 minute stages. The exercise workload started at 15 watt(W) and increased by 15W until an RER of 0.95 was reached, ensuring the crossover point (RER > 0.85) had been surpassed. RESULTS: Baseline values of seven subjects (3 female/4 male, mass = 72 ± 11 kg, VO2max = 31.9±5.5mL·kg-1·min-1) were recruited for the study. Each participant was tested on a Velotron® cycle ergometer with and without pre-cycling stretching. Stretching consisted of five different passive static stretches which were held for fifteen seconds and repeated three times. An assistive stretching session followed with the same five stretches held for fifteen seconds and repeated three times. The non-stretched condition consisted of ten minutes of quiet sitting. Following the stretch treatment participants pedaled at 50 revolutions per minute (RPM) for 6 minute stages. The exercise workload started at 15 watt(W) and increased by 15W until an RER of 0.95 was reached, ensuring the crossover point (RER > 0.85) had been surpassed. RESULTS: Mean VO2 (L/min) corresponding to the crossover point was 0.51±0.37 L/min and 0.58±0.51 L/min for stretching and non-stretching conditions at 50 RPM, respectively (p<0.5). The results revealed no difference (P>0.5) in the crossover point, demonstrating no difference in substrate utilization with and without stretching prior to cycling at a slow speed.

CONCLUSION: These data suggest that prior static and active stretching does not elicit a stretch induced inactivation that can alter substrate usage.

779 Board #96 June 1, 2016 - 2:00 PM - 3:30 PM
Effects Of Moderate Intensity Exercise On Epoc And Dit
Katsunori Tsuji, Yuzhong Xu, Izumi Tabata, FACSM. Ritsumeikan University, Kusatsu, Japan. (Sponsor: Izumi Tabata, FACSM)

Email: gr0055sx@ed.ritsumei.ac.jp

No relationships reported.

PURPOSE: The purpose of the present investigation is to elucidate the effects of moderate intensity exercise (MIE) on excess post-exercise oxygen consumption (EPOC) and diurnal thermogenesis (DIT). METHODS: Eight young healthy males volunteered for the experiment. Means ± standard deviations (SDs) of the subjects’ age (yrs), height (m), body mass (kg), and VO2max (mL/kg/min) were 23.2 ± 1.74 ± 0.06, 1.74 ± 0.06, 76.7 ± 9.7, and 52.5±4.6, respectively. For the exercise-meal (E-M) day, the subjects entered the metabolic chamber at 9:00. The subjects started MIE (30 minutes at 70% VO2max) from 10:04. After the exercise, the subjects stayed in the metabolic chamber until 16:00. They were served lunch at noon. For the exercise-fasting (E-F) day, the subjects followed the same protocol as E-M day, except for meal. For non-exercise-meal (NE-M) day and non-exercise-fasting (NE-F) day, the subjects followed the same protocol as E-M day and E-F day, except for meal. RESULTS: The order of the four trials day were randomly assigned for each subject.

RESULTS AND DISCUSSION: Compared with the NE-M day (22.2±1.78 mL·kg·min−1) and NE-F day (228.0±1.07 mL·kg·min−1), oxygen uptake from the end of the exercise until 11:30 was significantly higher on the E-M day (273.1±12.9 mL·kg·min−1) and E-F day (267.3±13.3 mL·kg·min−1), respectively, suggesting that MIE induced EPOC for ~60 min. However, no significant differences in oxygen uptake was observed between 11:30 to noon neither on exercise day nor non-exercise day, suggesting that EPOC induced by the exercise were worn off before noon (lunch). No difference in oxygen uptake between E-M day and NE-M day was noted from 12:00 to 12:30, suggesting that DIT during and just after lunch is not affected by MIE. Compared with the NE-M day, oxygen uptake from 12:30 to 13:00 was significantly higher on the E-M day, suggesting that DIT during this time is affected by MIE.

CONCLUSION: MIE elevated DIT observed from 30 min after the lunch. However, the total MIE-induced DIT (25.3±15.8 mL·kg·4h (12:00-16:00)) was less than that induced by exhaustive high intensity intermittent exercise (58.1±28.6 mL·kg·4h (12:00-16:00)) which we measured for the same subjects.

780 Board #97 June 1, 2016 - 2:00 PM - 3:30 PM
Reducing Sprint Interval Volume Does Not Elicit Excess Post-Exercise Oxygen Consumption
Logan K. Towndsen, Hashim Islam, Tom J. Hazell. Wilfrid Laurier University, Waterloo, ON, Canada.

Email: town9000@mylaurier.ca

No relationships reported.

Logan K. Townsend, Hashim Islam, Tom J. Hazel Wilfrid Laurier University, Waterloo, ON, N3L 3C5 town9000@mylaurier.ca

Sprint-interval training (SIT) utilizing various interval durations (8 – 30 s) has resulted in positive body composition changes, potentially due to elevated post-exercise energy expenditure (EE). Recent work utilizing a manipulated sprint bout (5 s) and recovery length (40 s) while maintaining the 2 min of exercise during an 18 min session demonstrated similar during and post-exercise EE as traditional SIT (4 x 30 s periods with 4 min rest). PURPOSE: To determine if a reduced volume of SIT elicits a protracted excess post-exercise oxygen consumption (EPOC) response. METHODS: Five males (23.0±3.4 y, 78.8±6.4 cm, 78.8±8.8 kg, 4.1±0.3 L·min−1) had their VO2 measured during and for 3 h following one control session and 3 exercise sessions (all sprint intervals were 5 s “all-out” efforts separated by 40 s recovery): 1) 2 min exercise (24 sprints, 18 min session); 2) 1.5 min exercise (18 sprints, 13.5 min session); 3) 1 min exercise (18 sprints, 9 min session); and 4) non-exercise control (C-TRL). A one-way repeated measures ANOVA was used to compare sprint exercise EE (kcal), post-exercise EE (kcal), and EPOC (L·O2). EE was estimated from VO2 assuming 5 kcal per L·O2 consumed. RESULTS: During exercise EE for 2 min (218.9±18.3 kcal) was greater than 1.5 (150.0±14.2 kcal, P<0.001) and 1 min (94.3±13.2 kcal, P<0.001). All were elevated above CTRL (274.2±8.2 kcal, P<0.001). At one hour post-exercise, all sessions exhibited similar EPOC (2 min: 4.84±1.12, 1.5 min: 2.90±2.22; 1 min: 3.14±1.96 L O2; P<0.076). At 2 h post, EPOC was increased in the 2 min session (2.26±0.84 L O2) compared to both 1.5 min (0.00;1.20; P<0.008) and 1 min (0.44;0.72; P=0.049). However, at 3 h post, EPOC was not different between groups (P=0.136). Total session (during and post-exercise) EE was greater for 2 min (678.5±57.0 kcal) compared to 1.5 min (575.6±33.4; P=0.016) and 1 min
Daily energy expenditure is influenced by several factors and physical activity (PA) is the most variable (Foureaux et al., 2006). However, depending on activity's intensity, different substrates can be metabolized to consume energy. **PURPOSE:** This study aimed to analyze differences in metabolic indicators and energy expenditure in two different types of fitness classes: Aerobic Dance (AD) and Localized Fitness (LF).

**METHODS:** Participants were 15 adult women aged 33.3±8.3 years with a minimum of six months experience in AD and LF. Maximum oxygen uptake (VO2max) and maximum heart rate (HRmax) were measured during a maximal treadmill test. During exercise sessions (AD and LF), heart rate (HR), oxygen uptake (VO2), respiratory exchange ratio (RER), metabolic equivalents (MET), percentage of fat oxidation (%FAT), percent of carbohydrates (%CHO) and energy expenditure (EE), were assessed using a portable gas analyzer (Kubios, Cosmed, Italy). Paired samples Student's T-test was used to analyze differences between AD and LF. Significance level as set at 5%.

**RESULTS:** Results indicated greater values during the AD session in comparison to the LF session on the following variables: VO2 (53.7±4.7 vs. 20.2±3.4 mL kg−1 min−1; p<0.001); HR (160.9±13.2 vs. 133.9±19.4 bpm; P<0.001); MET (10.2±1.3 vs. 5.8±1.0 MET; P<0.001); EE (608.3±73.7 vs. 350.3±64.5 kcal h−1; P<0.001), total fat oxidation (5.6±4.6 vs. 2.7±2.0 g h−1; p<0.001) and total CHO oxidation (139.9±14.1 vs. 81.6±16.5 g h−1; P<0.001). No differences were found for RER, %FAT and %CHO. During AD sessions, %CHO was higher than %FAT (92.3±6.2 vs. 79.6±6.4%; P<0.001). During LF sessions, %CHO was higher than %FAT (92.5±4.3 vs. 72.5±4.5%; P<0.001). **CONCLUSION:** These results suggest that AD engages higher metabolic demands and energy expenditure than LF. However, engaging AD or LF to 3 to 5 times a week seems enough to achieve PA recommendations of 150 minutes of moderate-to-vigorous intensity activities per week (WHO, 2010), promoting several health benefits (ACSM, 2011). Although, AD and LF are equivalents on the percentage of fat and carbohydrate oxidation, carbohydrate is the main energy supply for both fitness classes.

During the sitting interrupted by walking task compared to all other tasks (p<0.05). The upper body muscle activation during the sitting interrupted by walking task in older adults (10.8±1.5% max) was over twice the activation level of younger adults (4.8±0.6% max, p<0.05).

**CONCLUSIONS:** SB alternatives had little effect on upper body musculature of young adults, while older adults required twice the muscle activation of younger adults to perform an interrupted walking task. Whether age-related divergences in muscle activation differentially affect metabolic health markers needs to be determined.

**REFERENCES:**

1. Marcelo Marques1, José Carlos Ribeiro2, Gustavo Silva1.
2. Faculty of Physical Education and Physiotherapy, University of Amazonas, Manaus, Brazil. 3. Faculty of Sports, University of Porto, Porto, Portugal. 4. Higher Institute of Educational Sciences of Douro, Penafiel, Portugal.

**Email:** p.marcelomarques@gmail.com

(No relationships reported)
Energy flux, which reflects the rate of daily total energy expenditure (TDEE) and energy intake (EI), has been suggested to play an important role in the regulation of energy balance.

**Energy flux**

**Method:** To compare inactive obese postmenopausal women displaying lower vs higher Framingham 10-Year Risk Score for body composition, metabolic profile, inflammatory markers and daily energy expenditure.

**Methods:** 132 postmenopausal women (age: 57.6±4.8 yrs; BMI: 32.3±4.6 kg/m²) were studied. Subjects were first divided into tertiles based on the Framingham 10-Year Risk Score. Subjects in the second tertile (3.2 to 5%) were combined with those in the third one (>5%), and then compared with those in the first tertile (<3.2%). Variables of interest were: body composition (DXA), body fat distribution (CT scan), glucose homeostasis (fasting state and euglycemic/hyperinsulinemic clamp), fasting lipids, resting blood pressure, inflammatory markers, resting metabolic rate (indirect calorimetry), and energy expenditure (BMI).

**Results:** A significant difference was found between groups for age. No significant difference was observed between groups for body composition, body fat distribution and glucose homeostasis measures and inflammatory markers. Compared to women with the higher score, those in the first tertile showed significant higher values for physical activity levels (2.01±0.28 vs 1.84±0.25; p=0.005), daily physical activity energy expenditure (1027±281 vs 864±283 kcal/day; p=0.03) and resting metabolic rate (1284±173 vs 1335±189 kcal/day; p=0.003). Also, women in the first tertile had lower values for plasma triglycerides (1.39±0.49 vs 1.79±0.80 mmol/L; p<0.001), total cholesterol/HDL-cholesterol ratio (3.52±0.70 vs 3.95±0.88; p<0.001), and triglycerides/HDL-cholesterol ratio (0.93±0.43 vs 1.37±0.76; p<0.001). These differences were still significant after controlling for age.

**Conclusions:** The present study showed that, even in women displaying an overall low Framingham Score, those with the lowest score also displayed higher physical activity levels and daily physical activity energy expenditure, as well as a better lipid profile.

**RESULTS**

- **Baseline**
  - Weight, kg: 67.8±9.4
  - TDEE, kcal/day: 2068±267
  - REE, kcal/day: 1226±162
  - NEAT, kcal/day: 662±278
- **End of intervention**
  - Weight, kg: 66.7±9.3
  - TDEE, kcal/day: 2110±337
  - REE, kcal/day: 1205±167
  - NEAT, kcal/day: 616±301

**Conclusion:** In this group of older sedentary women, a 4-month aerobic exercise training did not cause significant changes in total or components of EE at the group level. It seems that REE and NEAT decreased slightly to compensate for the extra training did not cause significant changes in total or components of EE at the group level.

**CONCLUSIONS**

- More than half (57%) of the study population maintained body weight, while 14% lost weight and 29% gained weight. There was no difference in baseline anthropometric measurements across weight-change groups after adjusting for sex. The weight loss group displayed an average weight loss of 6.9±3.4 kg and the weight gain group experienced an average increase of 7.1±3.6 kg over 2 years. The majority of weight change was due to change in body fat (79% and 82% in weight loss and weight gain, respectively). There was no significant difference in TDEE and EI at baseline across weight change groups and absolute TDEE and EI did not change significantly over the 2-year observation period in either weight change group (p>0.17). Weight loss, however, was associated with a significant increase in MVEP (35±49 min/day; p<0.01), while MVEP decreased significantly in the weight gain group (35±46 min/day; p<0.01).
- **Conclusions:** Results of this study indicate that TDEE and EI remain stable over time despite considerable changes in body weight and body composition. Weight gain, therefore, may be a natural response of the human body to maintain energy flux when physical activity is reduced. An increase in MVEP, on the other hand, appears to maintain TDEE at a lower body weight.

**Purpose:** Establishment of Overlying Descriptive Metaphor that accommodates the previously described physical fields but includes the vast new information that derives from molecular biology and thermodynamics.

**Methods:** Development of novel terminology that creates an explanatory platform for biology.

**Results:** This new rubric provides the language of bioenergetics that is absent in the prior geocentric formulations.

**Conclusions:** The conceptual platform provided by the Metabolic Field generates a comprehensive domain for life. Exercise is Medicine. It is also THE LAW.

**Purpose:** To compare inactive obese postmenopausal women displaying lower vs higher Framingham 10-Year Risk Score for body composition, metabolic profile, inflammatory markers and daily energy expenditure.

**Methods:** 132 postmenopausal women (age: 57.6±4.8 yrs; BMI: 32.3±4.6 kg/m²) were studied. Subjects were first divided into tertiles based on the Framingham 10-Year Risk Score. Subjects in the second tertile (3.2 to 5%) were combined with those in the third one (>5%), and then compared with those in the first tertile (<3.2%). Variables of interest were: body composition (DXA), body fat distribution (CT scan), glucose homeostasis (fasting state and euglycemic/hyperinsulinemic clamp), fasting lipids, resting blood pressure, inflammatory markers, resting metabolic rate (indirect calorimetry), and energy expenditure (BMI).

**Results:** A significant difference was found between groups for age. No significant difference was observed between groups for body composition, body fat distribution and glucose homeostasis measures and inflammatory markers. Compared to women with the higher score, those in the first tertile showed significant higher values for physical activity levels (2.01±0.28 vs 1.84±0.25; p=0.005), daily physical activity energy expenditure (1027±281 vs 864±283 kcal/day; p=0.03) and resting metabolic rate (1284±173 vs 1335±189 kcal/day; p=0.003). Also, women in the first tertile had lower values for plasma triglycerides (1.39±0.49 vs 1.79±0.80 mmol/L; p<0.001), total cholesterol/HDL-cholesterol ratio (3.52±0.70 vs 3.95±0.88; p<0.001), and triglycerides/HDL-cholesterol ratio (0.93±0.43 vs 1.37±0.76; p<0.001). These differences were still significant after controlling for age.

**Conclusions:** The present study showed that, even in women displaying an overall low Framingham Score, those with the lowest score also displayed higher physical activity levels and daily physical activity energy expenditure, as well as a better lipid profile.

**RESULTS**

- **Baseline**
  - Weight, kg: 67.8±9.4
  - TDEE, kcal/day: 2068±267
  - REE, kcal/day: 1226±162
  - NEAT, kcal/day: 662±278
- **End of intervention**
  - Weight, kg: 66.7±9.3
  - TDEE, kcal/day: 2110±337
  - REE, kcal/day: 1205±167
  - NEAT, kcal/day: 616±301

**Conclusion:** In this group of older sedentary women, a 4-month aerobic exercise training did not cause significant changes in total or components of EE at the group level. It seems that REE and NEAT decreased slightly to compensate for the extra training did not cause significant changes in total or components of EE at the group level.

**CONCLUSIONS**

- More than half (57%) of the study population maintained body weight, while 14% lost weight and 29% gained weight. There was no difference in baseline anthropometric measurements across weight-change groups after adjusting for sex. The weight loss group displayed an average weight loss of 6.9±3.4 kg and the weight gain group experienced an average increase of 7.1±3.6 kg over 2 years. The majority of weight change was due to change in body fat (79% and 82% in weight loss and weight gain, respectively). There was no significant difference in TDEE and EI at baseline across weight change groups and absolute TDEE and EI did not change significantly over the 2-year observation period in either weight change group (p>0.17). Weight loss, however, was associated with a significant increase in MVEP (35±49 min/day; p<0.01), while MVEP decreased significantly in the weight gain group (35±46 min/day; p<0.01).
- **Conclusions:** Results of this study indicate that TDEE and EI remain stable over time despite considerable changes in body weight and body composition. Weight gain, therefore, may be a natural response of the human body to maintain energy flux when physical activity is reduced. An increase in MVEP, on the other hand, appears to maintain TDEE at a lower body weight.

**Purpose:** Establishment of Overlying Descriptive Metaphor that accommodates the previously described physical fields but includes the vast new information that derives from molecular biology and thermodynamics.

**Methods:** Development of novel terminology that creates an explanatory platform for biology.

**Results:** This new rubric provides the language of bioenergetics that is absent in the prior geocentric formulations.

**Conclusions:** The conceptual platform provided by the Metabolic Field generates a comprehensive domain for life. Exercise is Medicine. It is also THE LAW.
Revised by: June 1, 2016

S166 Vol. 48 No. 5 Supplement

790

Board #106
June 1, 2:00 PM - 3:30 PM
Reduction in Vigorous Physical Activity during Intermittent Fasting Under Free-Living Conditions
Iain Templeman, Dylan Thompson, Javier Gonzalez, James Betts, FACSM. University of Bath, Bath, United Kingdom.
Email: i.s.templeman@bath.ac.uk

Purpose: To examine the effects of a short-term intermittent fasting diet on body weight whilst also evaluating its influence on fat distribution and physical activity under free-living conditions. Methods: Six men and five women (mean ± SD; age 28 ± 14 years, mass 77.4 ± 14.6 kg, BMI 25.7 ± 2.0 kg/m²) undertook a three week intervention consisting of two phases; an initial one week control phase followed by a two week intervention phase. For the intervention, participants fasted on alternate days as defined by their sleep-wake cycles (approximately 30-32 hours) with only calorie-free beverages permitted during fasting periods. On the intervening days participants maintained their habitual diet. Physical activity was monitored throughout each phase using combined heart rate and accelerometry, whilst energy intake and body fat percentage were quantified using weighed diet records and skinfold measurements respectively. Results: Adherence to the fasting intervention was 99.4% with no significant change seen in energy intake on feeding days compared to control days (p=0.45), indicating good compliance with the dietary protocol. A significant 2.1 ± 0.8 kg reduction in body mass (p<0.01) was seen during the intervention phase which (p=0.45), indicating good compliance with the dietary protocol. A significant 2.1 ± 0.8 kg reduction in body mass (p<0.01) was seen during the intervention phase which (p=0.45), indicating good compliance with the dietary protocol. A significant 2.1 ± 0.8 kg reduction in body mass (p<0.01) was seen during the intervention phase which (p=0.45), indicating good compliance with the dietary protocol. A significant 2.1 ± 0.8 kg reduction in body mass (p<0.01) was seen during the intervention phase which (p=0.45), indicating good compliance with the dietary protocol.

791

Board #107
June 1, 2:00 PM - 3:30 PM
Association between Weight Fluctuation and Fitness Level in Young Adults over One Year
Madison M. DeMello1, Clemens Drenowitz2, Gregory A. Hand, FACSM3, Steven N. Blair, FACSM4. University of South Carolina, Columbia, SC. 1West Virginia University, Morgantown, WV.
Email: demello@email.sc.edu

The increasing prevalence of overweight and obese adults living within the United States continues to be a health burden, as obesity increases the likelihood of several chronic diseases. Weight gain has been predominantly associated with changes in diet and PA, while there remains limited research on the association with fitness. PURPOSE: The purpose of this research is to evaluate the association between weight change and fitness classifications in healthy young adults over 1 year duration. METHODS: A sample of 197 young adults (53% male), between the ages of 21 and 35 and with a body mass index (BMI) between 20 and 35 kg/m2 provided valid data and completed both fitness assessment measurements. Cardiorespiratory fitness (CRF) was determined as the highest VO2 value during a graded exercise test. In addition, participants completed a dual energy x-Ray absorptiometry scan to measure fat mass and fat free mass, percent body fat (%BF) was subsequently calculated. RESULTS: The average BMI of the sample was 25 ±1.38 kg/m2 with a baseline cardiorespiratory fitness value of 43.2±7.4 and 33.2 ± 7.8 ml/kg/min for males and females respectively. The entire sample displayed weight gain of 1.9 ± 5.3 kg, which was associated with a loss in VO2 of 2.1 ± 5.1 ml/kg/min over the 15 months observation period. Linear regression models adjusting for sex, age and baseline body composition showed an inverse association between change in CRF and body weight (β=-0.61, p<0.01) as well as %BF (β=-0.20, p<0.01) at 15-months follow-up. Analyzing normal weight (BMI=25) and obese/obese participants (BMI=25) separately showed a stronger association between change in fitness and subsequent body weight in overweight/obese (β=-0.231, p<0.001 vs. β=-0.088, p=0.02) and %BF (β=-0.260, p<0.01 vs. β=-0.163, p<0.01) compared to normal weight. CONCLUSION: These results indicate that a decrease in fitness level is associated with an increase in both weight and body fat. It appears there is a stronger relationship in the overweight/obese group, therefore an increase in fitness may be more beneficial for weight loss in those who are overweight/obese. The study was funded by a grant from the Coca-Cola Company.

792

Board #108
June 1, 2:00 PM - 3:30 PM
Metabolic And Corticosterone Response To Different Exercise Training In Rats With High-fat- Or Restricted-diet
Youqing Shen1, Guoyuan Huang2, Xiangfeng Xu1, Zhiqiang Huang1, Katie Loehrlein1. 'Hubei University of Education, Wuhans, China, 2University of Southern Indiana, Evansville, IN.
Email: future0104@126.com

PURPOSE: To investigate if different exercise training would induce different metabolic phenotype response and corticosterone (CORT) activation in rats with different combinations of restricted-fat- or high-fat-diet. METHODS: Fifty-three rats were randomly assigned into non-exercise (NE) with restricted-fat-diet (RFD), mild-intensity endurance exercise (MEE) with RFD, high-intensity interval exercise (HIE) with RFD, NE with high-fat-diet (HFD), MEE with HFD, and HIE with HFD. All exercise groups were trained for 10 weeks with matched running distances. Dietary intake, body weight, body fat, metabolic blood chemicals, and serum CORT concentration were measured and analyzed. Histological lipid droplets in liver were observed. SPSS for Windows 18.0 was used for the statistical analyses and a significant level was set at P<0.05. RESULTS: No statistically significant difference in caloric intake was observed between RFD and HFD groups. NE rats with HFD led to high level of body weight, body fat, blood glucose, triglycerides, total cholesterol, and lipid vacuoles in hepatic histology, but low level of quantitative insulin sensitivity check index (QUICKI). HIE rats with HFD improved metabolic phenotype, reduced body weight (406.7±18.9 g, P<0.001), showed lower blood glucose (8.6±0.7 mmol/L, P<0.01) and lipid profiles, but higher QUICKI (0.298±0.004, P<0.01). The levels of CORT in HFD groups were much higher compared to those in RFD groups (P<0.001), especially in NE rats. HIE training significantly reduced the CORT concentration in HFD rats (41.1±0.6 ng/ml, P<0.001). Correlations analyses revealed that CORT levels were significantly associated with fat weights (r=0.50, P<0.001), blood glucose (r=0.52, P<0.001), and triglycerides (r=0.28, P<0.05), while it inversely correlated with QUICKI (r=-0.38, P=0.01) for all groups. CONCLUSIONS: HIE training and HFD, independently and/or synergistically, have profound effects on metabolic phenotype and stress response. HFD could induce metabolic disorder and elicit the exacerbated stress response by stimulating elevated serum CORT and imbalance blood chemicals. HIE training contribute to the improvement in metabolic phenotypes and the decreases in serum CORT levels so as to reduce susceptibility to high-fat-stress-associated disorders.

Board #109
June 1, 2:00 PM - 3:30 PM
Body Composition And Physical Activity Maintenance One Year After A 12-week Exercise Intervention In Women
Catherine L. Jarrett1, Brandon J. Sawyer1, Clarissa M. Cabbage1, Glenn A. Gaesser, FACSM1, 1Arizona State University, Phoenix, AZ; 2Point Loma Nazarene University, San Diego, CA. (Sponsor: Glenn Gaesser, FACSM)

PURPOSE: Considerable individual variability in body fat changes occurs in response to aerobic exercise training, including fat loss and fat gain (Sawyer et al, J Strength Cond Res, 2015;29:297-304). It is not known whether losses or gains in body fat return to pre-training levels after cessation of a supervised training program. We hypothesized that regardless of body fat loss or gain in response to a 12-week supervised exercise program, during a 1-year follow-up the most significant predictor of changes in body fat from initial baseline to 1 year would be continued engagement in vigorous-intensity exercise. METHODS: Out of 81 sedentary women who completed the initial 12-week exercise intervention (3 days/wk for 30 min at 70% of VO2peak) 24 (age: 31±7.6yrs; BMI: 25.5±5.5 kg/m2) participated in 1-year follow-up study. Subjects underwent Dual-energy X-Ray Absorptiometry at baseline, 12-weeks and 15 months, and filled out the International Physical Activity Questionnaire Short Form (IPAQ-SF) at 15 months. RESULTS: After the initial 12-week exercise program, women were categorized as compensators or non-compensators based on the sum of estimated exercise expenditure and energy intake from body composition changes. 15 were compensators, and gained body fat during the initial 12-week program (0.761±1.14kg; p=0.002), but not at follow-up (0.22±3.25kg). 9 non-compensators lost body fat (-1.52±0.66kg; p<0.001) during the initial 12-week program, and experienced no further fat loss at follow-up (0.01±2.61kg). Regardless of initial body fat changes in response to the 12-week program, there was a significant group difference (p=0.003) in fat mass change from 12 weeks to follow-up between subjects who continued regular vigorous exercise (-2.21±3.07kg) and those who did not (-1.32±2.16kg). Energy compensation and body weight and body composition changes during the initial 12-week intervention were moderate predictors of body weight and body fat changes from baseline to follow-up.
CONCLUSIONS: During a 1-year follow-up after a 12-week supervised exercise program, women displayed a net loss of fat mass during the follow-up period if regular vigorous exercise was continued, regardless of whether they were classified as compensators or non-compensators during the initial supervised program.

B-30 Basic Science World Congress/Poster - Energy Balance, Appetite, and Energy Intake

Wednesday, June 1, 2016, 1:00 PM - 6:00 PM Room: Exhibit Hall A/B

Board #111

June 1, 3:30 PM - 5:00 PM

Exercise after Overnight Fasting Reduces Energy and Fat Balance, but not Carbohydrate Balance

Javier Gonzalez1, Robert Edithburn1, James Betts, FACSM1, Jean-Philippe Walhin1, Rebecca Travers1, Dylan Thompson1, Gareth Wallis1, Lee Hamilton1, Emma Stevenson1, Kevin Tipton1. 1University of Bath, Bath, United Kingdom; 2University of Birmingham, Birmingham, United Kingdom; 3University of Stirling, Stirling, United Kingdom. 4Northumbria University, Newcastle-upon-tyne, United Kingdom. (Sponsor: James Betts, FACSM)

Email: J.T.Gonzalez@bath.ac.uk

Reported Relationships: J. Gonzalez: Consulting Fee; PepsiCo, Luceacce Ribena Santoru.

When sedentary, breakfast omission often results in reduced overall energy intake due to inadequate compensation at lunch. The effect on energy balance however, particularly in the context of exercise, is less clear. PURPOSE: To define the effect of breakfast prior to exercise on energy balance following subsequent ad libitum intake. METHODS: Nine physically active men completed 3 5-hour trials in a randomized, crossover design: 1) breakfast consumption (451 kcal) followed by rest (control); 2) breakfast followed 2 hours later by 60 min of cycling at 50% Wmax (fed); and 3) extended overnight fasting followed by cycling (fasted). At the end of each trial, energy intake was determined by an ad libitum lunch.

Expired breath was sampled hourly at rest, and every 15 min during exercise, to estimate substrate oxidation and energy expenditure. Substrate oxidation and nutrient intake were used to determine energy and substrate balance. RESULTS: During control, energy expenditure and energy intake (including breakfast) were 457±59 and 1642±361 kcal, respectively, leading to an energy balance of 1185±404 kcal. Exercise increased energy expenditure to 1075±116 and 1096±122 kcal (both p<0.05 vs control), when performed fasted and fed, respectively. Energy intake was lower when exercised in the fed state (1300±264 kcal vs fed state (1558±222 kcal, p<0.01), which led to an energy balance which was less positive with exercise in the fasted (226±324 kcal) vs fed state (462±290 kcal, p<0.05), but both exercise trials produced a less positive energy balance than control (p<0.05). Carbohydrate balance did not differ when exercise was performed in the fasted (-384±132 g) vs fed state (-381±116 g, p>0.05), but was higher with control (162±63 g, p<0.001). In contrast, fat balance was lower with exercise in the fed state (-27±24 g) vs control (3±26 g, p<0.05), but more negative when exercise was performed in the fasted state (-72±30 g, p<0.05) vs both other trials. CONCLUSION: Neither energy expended with exercise, nor energy consumed at breakfast was fully compensated for at lunch. This led to a reduction in energy balance with exercise, lowered further by breakfast omission. The lower carbohydrate balance and breakfast omission is mainly accounted for by lower fat, but not carbohydrate intake. Supported by ESPEN and Rank Prize Funds.

796 Board #112

June 1, 3:30 PM - 5:00 PM

Impaired Bone Turnover In Women, But Not In Men, In Response To Low Energy Availability

Maria Papageorgiou1, Kirsty J. Elliott-Sale1, Julie P. Greaves2, William D. Fraser1, Craig Sale, FACSM1, 1Nottingham Trent University, Nottingham, United Kingdom; 2Headquarters Army Recruiting, and Training Division, United Kingdom. 3University of East Anglia, Norwich and Norwich University Hospital, Norwich, United Kingdom.

Email: maria.papageorgiou2012@my.nyu.ac.uk

No relationships reported.

Low energy availability (EA) is associated with impaired bone turnover in active women. Comparative data in athletic men are currently lacking. PURPOSE: To evaluate sex-differences in bone turnover in response to low EA through dietary restriction and exercise energy expenditure (EEE) METHODS: Using a randomised cross-over design, 11 men (M) and 11 eumenorrhoeic women (W) (age, M: 27±3 vs W: 26±5 yrs; VO2max, M: 54.2±5.3 vs. W: 47.9±5.5 ml·kg−1·min−1) completed 2 9-day trials with controlled (CON; 45 kcal·kgLBM−1·d−1) or restricted (RESS; 15 kcal·kgLBM−1·d−1) EA. Three days of habitual dietary intake and no exercise was followed by a 5-day experimental protocol (Days 4-8) at one of the two EAs, with female participants starting Day 4 in the early follicular phase of two menstrual cycles. Participants ran daily on a treadmill at 70% VO2max resulting in an EEE of 15 kcal·kgLBM−1·d−1 and consumed diets providing 60 and 30 kcal·kgLBM−1·d−1 to achieve the CON and RES EAs. Blood samples were collected on Days 1, 3, 5, 7 and 9 and bone turnover markers: β-CTX and P1NP and regulatory markers (PTH, IGF-1, GLP-2, T3, and insulin). The ratio between P1NP and β-CTX (Bone Turnover Ratio-BTR) was calculated as a cumulative index of bone turnover. Percentage changes from baseline (BAS) were calculated and used to determine the area under the curve (AUC) for all variables during both trials (%BAS change x time (in days)). RESULTS: The AUC increased for β-CTX (CON: 16.6±4; RES: 82.5±63) % BAS change -d) and decreased for P1NP (CON: -23.1±3.49; RES: -60.8±13.6 %BAS change -d) with RES in women (p<0.05). A sex and a condition effect were observed in BTR AUC (p<0.05), with decreases of the index in women only (p<0.05). Insulin was lower after low EA in women (p<0.05). No changes in PTH, IGF-1, GLP-2 or T3 were observed in either sex (p>0.05). CONCLUSION: This study shows differences in bone turnover response to short-term low EA between men and women. Five days of 15 kcal·kgLBM−1·d−1 EA decreased bone formation and increased bone resorption leading to impaired bone turnover in women but not in men, suggesting less susceptibility to the negative effects of low EA on bone.

797 Board #113

June 1, 3:30 PM - 5:00 PM

Orexin A Plasma Levels and Self Reported Physical Activity in Young Male Adults.

Sergio Marquez-Gamino1, Karla S. Vera-Delgado2, Omar A. Espinoza-Cruz3, Francisco J. Alcantar-Aranda1, Cipriana Caudillo-Cisneros1, Monserrat G. Vera-Delgado1, 1Universidad de Guanajuato, León, Guanajuato, Mexico. 2Universidad de Guanajuato, Guanajuato, Guanajuato., Mexico.

Email: smgamino@yahoo.com

No relationships reported.

Orexin A (ORX-A) has been involved in energy balance regulatory mechanisms, mainly those related to feeding behaviour. Also has been described that, in experimental conditions, ORX-A stimulates spontaneous physical activity in rodents.

Abstracts were prepared by the authors and printed as submitted.
Up to date, there are not evidences of a relation between physical activity and ORX-A plasma levels in humans. **PURPOSE:** to search if a relation exists between ORX-A plasma levels and declared physical activity in young male adults. **METHODS:** participants, responding to an open invitation to University of Guanajuato undergraduate students, and to leisure runners affiliated to local athletics clubs, were anthropometrically characterized by measuring weight and height, and body mass index calculation (BMI). As well, body fat was estimated after skin fold measurements. Consumption of triglycerides and blood glucose were measured to evaluate metabolic conditions of participants. ORX-A plasma levels were determined by the method of enzyme immune assay. In addition, participants answered the International Physical Activity Questionnaire (IPAQ), from which the physical activity level was estimated. Data were analysed by means of descriptive and inferential statistics. In particular, seeking relation between physical activity and ORX-A plasma levels a Spearman correlation test was performed. **RESULTS:** the sample was build of 56 participants. Mean age was 22.8 ± 3.1 years, body weight 71.7 ± 12.4 kg, height 1.72 ± 0.07 m, and BMI 24.1 ± 3.5 Kg/m². Plasma ORX-2 concentration resulted of 1.03 ± 0.39 ng/ml. Blood glucose was 89.8 ± 8.6 mg/dl, triglycerides 136.1 ± 5.66 mg/dl and cholesterol 160 ± 42.4 mg/dl. Results: Spearman ORX-A and reported physical activity was 0.2843, p < 0.03. **CONCLUSIONS:** results demonstrated that levels of ORX-A are related to self-reported physical activity in young, healthy men. Direct VO2 simultaneously measured with ORX-A must be done to confirm this observation.

INTRODUCTION: Changing meal frequency (MF) has been proposed as a means to improve weight loss and changes in ghrelin responses. Specifically, this study sought to determine the relationship of body weight loss between conditions and MF. The study hypothesized that while ratings of hunger (p =0.15), satiety (p=0.07), and desire to eat (p=0.12) were not significantly different between 2 MF and 6 MF conditions. These results suggest that hormonal and subjective hunger and appetite scores yielded similar results following the 2 MF and 6 MF conditions. These conditions suggest that hormonal and subjective hunger responses are similar between a 2 MF and 6 MF feeding pattern following a two-week sequence of MF. This study was supported by Nutri-Systems, LLC, an OFAC faculty award and a New Mexico Student Research Grant.

**INTRODUCTION:** Changing meal frequency (MF) has been proposed as a means to manipulate ghrelin responses, which subsequently may impact appetite control. The purpose of this study was to determine the impact of consuming a portion-controlled equi-hypocaloric diet as a two meals per day (2 MF) or three meals plus three snacks per day sequence (6 MF) on weight loss and changes in ghrelin responses. Specifically, this study sought to determine the relationship of body weight loss between conditions on total-ghrelin concentrations following a test meal. METHODS: Using a crossover approach, eleven (N = 11) obese female subjects (52 ± 7 years, 101.7 ± 22.6 kg, 39.1 ± 7.6 kg/m²) were randomized to either the 2 MF or 6 MF treatment condition for two weeks, completed a two-week washout, and alternated treatment conditions for the remaining two weeks. Following each treatment condition, changes in body mass, subjective hunger ratings using a visual analogue scale (VAS), and total-ghrelin were measured in response to a standardized test meal. RESULTS: As expected, percent body weight loss (%BWL) from baseline between treatment conditions was not significantly different (2 MF: -2.7±1.4 vs. 6 MF: -1.9 ± 1.5 %, p=0.378). Total-ghrelin area-under-the-curve (AUC) responses at 120 minutes following the test meal were not significantly different between conditions (2 MF: 36499 ± 19857, 6 MF: 35435 ± 17574 pg/ml/120 min, p=0.557). Correlations between total-ghrelin AUC and %BWL following the 2 MF (r=0.446, p=0.170) and the 6 MF condition (r=0.096, p=0.779) were not statistically significant. However, subjective ratings of hunger between the 2 MF and 6 MF were significantly different between conditions (2 MF: 3728.82 ± 1940.9 vs. 6 MF: 36458 ± 17081, p=0.001). CONCLUSIONS: No change in body mass loss was observed between conditions while total-ghrelin concentrations and subjective hunger and appetite scores yielded similar results following the 2 MF and 6 MF conditions. These results suggest that hormonal and subjective hunger responses are similar between a 2 MF and 6 MF feeding pattern following a two-week change in MF. This study was supported by Nutri-Systems, LLC, an OFAC faculty award and a New Mexico Student Research Grant.

**INTRODUCTION:** Changing meal frequency (MF) has been proposed as a means to manipulate ghrelin responses, which subsequently may impact appetite control. The purpose of this study was to determine the impact of consuming a portion-controlled equi-hypocaloric diet as a two meals per day (2 MF) or three meals plus three snacks per day sequence (6 MF) on weight loss and changes in ghrelin responses. Specifically, this study sought to determine the relationship of body weight loss between conditions on total-ghrelin concentrations following a test meal. METHODS: Using a crossover approach, eleven (N = 11) obese female subjects (52 ± 7 years, 101.7 ± 22.6 kg, 39.1 ± 7.6 kg/m²) were randomized to either the 2 MF or 6 MF treatment condition for two weeks, completed a two-week washout, and alternated treatment conditions for the remaining two weeks. Following each treatment condition, changes in body mass, subjective hunger ratings using a visual analogue scale (VAS), and total-ghrelin were measured in response to a standardized test meal. RESULTS: As expected, percent body weight loss (%BWL) from baseline between treatment conditions was not significantly different (2 MF: -2.7±1.4 vs. 6 MF: -1.9 ± 1.5 %, p=0.378). Total-ghrelin area-under-the-curve (AUC) responses at 120 minutes following the test meal were not significantly different between conditions (2 MF: 36499 ± 19857, 6 MF: 35435 ± 17574 pg/ml/120 min, p=0.557). Correlations between total-ghrelin AUC and %BWL following the 2 MF (r=0.446, p=0.170) and the 6 MF condition (r=0.096, p=0.779) were not statistically significant. However, subjective ratings of hunger between the 2 MF and 6 MF were significantly different between conditions (2 MF: 3728.82 ± 1940.9 vs. 6 MF: 36458 ± 17081, p=0.001). CONCLUSIONS: No change in body mass loss was observed between conditions while total-ghrelin concentrations and subjective hunger and appetite scores yielded similar results following the 2 MF and 6 MF conditions. These results suggest that hormonal and subjective hunger responses are similar between a 2 MF and 6 MF feeding pattern following a two-week change in MF. This study was supported by Nutri-Systems, LLC, an OFAC faculty award and a New Mexico Student Research Grant.
PURPOSE: To investigate the effect of different solutions consumed during moderate intensity exercise on post-exercise appetite.

METHODS: Eight healthy young men (mean ± SD; Age: 23 ± 2 yr, Body Mass Index: 23.5 ± 2.7 kg/m², VO2max: 43.6 ± 9.3 ml/kg/min) completed two main trials in a randomized cross-over study design. In each trial, participants completed 30 min of 60% VO2max ergometer cycling, followed by another 30 min of recovery. Two different solutions, i.e., sucrose solutions (SUC) and placebo solutions (PLA), were provided to participants immediately before, every 15 min during exercise, and 15 min immediately after exercise. The sucrose concentration was 6% in SUC trial, and the solution was distilled water with artificial sweetener in PLA trial. The drinking volume at each time was 3 ml/kg body weight. Every 15 min during exercise and during recovery period, blood glucose and lactate concentration, heart rate (HR), rating of perceived exertion (RPE), rating of perceived thirst (RPT), rating of abdominal discomfort (RAD), and subjective appetite score were collected.

RESULTS: No difference was found in subjective appetite score at the end of recovery (SUC vs. PLA: 52 ± 9 vs. 57 ± 8, p=0.126). Blood glucose concentration in SUC trial tends to be higher than in PLA trial during exercise (SUC vs. PLA: 5.45 ± 0.16 vs. 5.04 ± 0.23 mmol/L, p=0.069). The blood lactate concentration, HR, RPE, RPT, and RAD were higher during exercise than those during recovery period. However, no differences were found between the two trials.

CONCLUSIONS: It seems that two different solutions consumed during moderate intensity exercise in the present study do not affect post-exercise appetite.

2004 Board #120 June 1, 3:30 PM - 5:00 PM Influence of Summer Training Camp on Food Intake in Adolescent Rugby Football Players.
Chihiro Nagayama, Keiko Muto, Momoe Iwami, Takuro Tobina. University of Nagasaki, Nishinosonogai, Japan.
(No relationships reported)

Sufficient and well-balanced nutrients are essential for optimal athletic performance. However, high-intensity training attenuates appetite and food intake. Changes in food intake are affected by training intensity and season.PURPOSE: To investigate appetite and food intake after summer training camp in adolescent rugby football players.

METHODS: Forty male high school rugby players (17 ± 1 yr) who took part in a 4-day camp participated in this study. Heart rate was measured during the training period, and the energy expenditure (EE) was calculated by the heart rate/oxygen consumption regression. Daily physical activity level (PAL) was calculated using accelerometers (free-living conditions) and the heart rate (training period). Food intake during camp was recorded using photographs and food weight. Before and after the camp, an ad libitum buffet test was carried out. The buffet meal consisted of 39 foods presented at evening meals, and subjects were instructed to eat until satiated. The energy and macronutrient intake were calculated using nutritional facts on package and standard Japanese tables of food composition. We also measured food composition, subjective appetite (visual analog scale) and fatigue (profile of mood states). The study was approved by the ethics committee of University of Nagasaki.

RESULTS: Total EE and PAL were 3,658 ± 431 kcal/day, and 21.0 ± 2.0. The ratios of protein, fat, and carbohydrate (CHO) to energy intake (3,867 ± 386 kcal/day) during camp were 14 ± 2%, 28 ± 2%, and 58 ± 4%, respectively. There were no differences in body mass, lean body mass, and fat mass before and after camp. The fatigue score increased (5 ± 4 vs. 8 ± 5, p<0.05). In the buffet test, energy (1,919 ± 331 kcal vs. 1,716 ± 315 kcal, p<0.05) and CHO intake (297 ± 39 g vs. 257 ± 51 g, p<0.01) decreased. However, subjective appetite did not change. Stepwise multiple regression analysis showed that changes in the intake amount of rice and snacks accounted for the alteration of CHO intake (r=0.669, p<0.001). Rice (r=0.572, p<0.05) and wheat noodle (r =0.596, p<0.05) intakes were correlated with PAL.

CONCLUSIONS: This study indicates that summer training camp attenuates energy intake, including CHO intake. CHO foods such as noodles help adolescent rugby football players to intake sufficient energy. This study was supported by a grant from Yaraya.
Windows. Significance was set at P<0.05, values are mean±SD. RESULTS: Participant age did not differ between groups (lean 42.9±15.7 vs. overweight 45.5±12.8 y, P=0.62). BMI and waist circumstance (WC) were higher in overweight vs. lean individuals (BMI: 29.1±2.4 vs. 22.5±1.7 kg/m², WC: 91.6±10.4 vs. 76.8±8.7 cm, both P<0.01). Remaining data are summarised in Table 1. CONCLUSIONS: These findings indicate a transient suppression of hunger and no compensation for energy intake in either lean or overweight/obese individuals in the 7 h after a bout of treadmill walking/running. Thus, in the short term, hunger and food intake responses to exercise do not differ in lean vs. overweight/obese individuals.

| Table 1. Energy expenditure, ad libitum energy intake and area under the curve (AUC) hunger values |
|---------------------------------------------------|---------------------|---------------------|
| Energy expenditure (kJ) (Values are for 1 h of rest or exercise. N=24) | Lean | Overweight |
| Condition | Control | 303±88 | 332±61 |
| | Trial P<0.01 | Group P=0.25 |
| | Interaction P =0.26 |
| Exercise | 1864±706 | 2224±776 |
| Ad libitum energy intake (kJ) | Control | 3293±1538 | 3408±1676 |
| | Trial P=0.60 | Group P=0.54 |
| | Interaction P=0.30 |
| AUC hunger | Control | 284±130 | 227±113 |
| | Trial P=0.05 | Group P=0.29 |
| | Interaction P=0.48 |

High prevalences of atrial fibrillation (AF) have been reported among endurance athletes, whereas moderate physical activity has been shown to lower the risk of AF. Given that physical activity generally is reversely related to resting heart rate (RHR), RHR may be a mediator in the association between physical activity and AF. PURPOSE: To examine the role of RHR in the association between physical activity and hospital-diagnosed AF in a Norwegian cohort. METHODS: The study has a prospective design and 20,764 nondiabetic Japanese women (median (IQR) age 59 (52-65) years) who are members of a private fitness club which provides a 30 minute circuit program combining aerobic and resistance training. Participants enrolled between 2005 to 2010 with follow-up until August 2014. The frequency of combined aerobic and resistance training was counted using the check-in system of the fitness club from entry day to 9 months after the enrolment year. Age, height and weight were collected via a self-administered questionnaire on enrolment day at the fitness club. In 2014, women reported whether or not they had diabetes, as well as the year of developing diabetes in a questionnaire. Hazard ratios and 95% confidence intervals for the incidence of type 2 diabetes were obtained using Cox proportional hazard models to assess the relationship between training frequency of combined aerobic and resistance training and the incidence of type 2 diabetes. RESULTS: The average duration of follow-up was 5.6 years, with 160 women developing type 2 diabetes during this period. Using the lowest frequency of exercise (quartile I) group as the reference category, the hazard ratios for quartiles II through IV were: 0.95 (0.64-1.41), 0.75 (0.49-1.16), 0.72 (0.46-1.11), respectively (p for trend = 0.079). After adjustment for age and body mass index, the hazard ratios were: 0.88 (0.59-1.30), 0.66 (0.43-1.02), 0.59 (0.37-0.92), respectively (p for trend = 0.008). CONCLUSIONS: Although we did not adjust for other potential confounding factors, such as alcohol consumption or family history of diabetes, these results suggest that a higher frequency of combined aerobic and resistance training was associated with a lower risk of developing type 2 diabetes among older Japanese women.

CONCLUSIONS: The relationship between leisure time physical activity and AF followed a J-shaped pattern, whereas RHR was inversely associated with risk of AF. The associations remained after mutual adjustment. RHR does not appear to be a mediator in the association between physical activity and AF.
following criteria at least twice: 1) fasting blood glucose \( \geq 126 \) mg/dL or HbA1c \( \geq 6.1\% \) (the Japan Diabetes Society criteria) or 2) self-reported diagnosis of diabetes by a physician and, in addition, with hypoglycemic symptoms. The cohort was defined as the year of diabetes development. Hazard ratios (HRs) and 95% confidence intervals (CIs) for the incidence of diabetes were obtained using Cox proportional hazards models.

RESULTS: During the follow-up period, 1,011 men developed diabetes. The crude HRs (95% CI) for T2DM across quartiles of CRF (lowest to highest) were 1.00 (reference), 0.87 (0.75-1.01), 0.77 (0.65-0.92), and 0.58 (0.47-0.71) (P for trend < 0.001). After adjustment for potential confounding factors, the HRs (CIs) for AQ4 through AQ4 as a reference, were 0.62 (0.53-0.72), 0.47 (0.40-0.55), and 0.29 (0.24-0.35), respectively (P for trend < 0.001). After the adjustment for potential confounding factors, the HRs (CIs) for AQ2 through AQ4 were 0.79 (0.67-0.93), 0.71 (0.58-0.86), and 0.51 (0.39-0.66), respectively (P for trend < 0.001).

CONCLUSIONS: Higher levels of an integrated measure of CRF over the long-term period had a protective influence on the subsequent incidence of type 2 diabetes among Japanese men.

809 Board #125 June 1, 2:00 PM - 3:30 PM

Long-Term Impact of Cardiorespiratory Fitness on Type 2 Diabetes Incidence in Japanese Men

Ryoko Kawakami, Susumu S. Sawada, FACSM, I-Min Lee, FACSM, Yuko Gando, Haruki Momma, Nobumasa Kikugawa, Chihiro Kinigawa, Takashi Okamoto, Koji Tsukamoto, Mitsuru Higuchi, FACSM, Motohiko Miyachi, Steven N. Blair, FACSM. Waseda University, Saitama, Japan. National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 1Harvard Medical School, Boston, MA. 2Tokyo University, Sendai, Japan. 3Tokyo Gas Health Promotion Center, Tokyo, Japan. 4University of South Carolina, Columbia, SC. (No relationships reported)

Many studies have indicated that high cardiorespiratory fitness (CFR) is associated with a lower risk of developing type 2 diabetes mellitus (T2DM). Although CFR changes over the long-term, the influence of duration on the association between CFR and the incidence of T2DM is not clear.

PURPOSE: To investigate the influence of follow-up period on the association between CFR and the incidence of T2DM among Japanese males.

METHODS: This study was conducted in 7,840 non-diabetic male workers, aged 19 to 60 years (median age 37 years) at baseline, enrolled in 1986. Participants were given a submaximal exercise test, a medical examination, and questionnaires on their health habits in 1986. CFR was measured using a cycle ergometer and maximal oxygen uptake was estimated. During 1986-2009, participants were followed for development of T2DM, which was diagnosed from annual health checkups. Hazard ratios (HRs) and 95% confidence intervals (95%CIs) for the incidence of T2DM were estimated using Cox proportional hazards models.

RESULTS: During a median of 19 years of the follow-up, 1,054 men developed T2DM. After adjustment for age, BMI, systolic blood pressure, cigarette smoking, alcohol intake, and family history of diabetes, the HRs (95%CIs) of developing T2DM across quartiles of CRF (lowest to highest) were 1.00 (reference), 0.87 (0.75-1.01), 0.77 (0.65-0.92), and 0.58 (0.47-0.71) (P for trend < 0.001). In analysis by follow-up period (1986-1993, 1994-2001, 2002-2009), the HRs (95%CIs) were 1.00 (reference), 0.85 (0.66-1.01), 0.78 (0.58-0.94), and 0.68 (0.48-0.95) (P for trend = 0.014) for 1986-1993, 1.00 (reference), 0.86 (0.67-1.09), 0.76 (0.59-0.99), and 0.57 (0.41-0.78) (P for trend < 0.001) for 1994-2001, 1.00 (reference), 0.99 (0.73-1.35), 0.78 (0.55-1.12), and 0.46 (0.29-0.72) (P for trend = 0.001) for 2002-2009, respectively.

CONCLUSIONS: These results suggest that high CFR is associated with a lower risk of developing T2DM over a long-term period in Japanese men.

810 Board #126 June 1, 2:00 PM - 3:30 PM

The Association Of Changes In Physical Activity And Body Composition With Systolic Blood Pressure

Leanna M. Ross, FACSM, I-Min Lee, FACSM, Steven N. Blair, FACSM. 1University of South Carolina, Columbia, SC. 2West Virginia University, Morgantown, WV. (No relationships reported)

Nearly one-third of American adults have hypertension, and an additional third of American adults are considered prehypertensive. Therefore, it is important to investigate the extent to which changes in body composition, weight, and physical activity affect blood pressure in young adults at risk for developing hypertension.

PURPOSE: To determine the prospective association of changes in body weight, percent body fat (%BF), and physical activity (PA) on change in systolic blood pressure (SBP).

METHODS: Data were obtained from 228 healthy individuals (50% male) aged 21-35 enrolled in the Energy Balance Study. Height, weight, body composition, and SBP were assessed in the morning after a 12-hour fast at baseline, six month, and 12 month follow-up. Body composition was assessed via dual X-ray absorptiometry. PA was measured objectively using arm-based activity monitors for \( \geq 7 \) days at each time point. Minutes per day of moderate-vigorous physical activity (MVPA) were averaged for each period. Based on baseline BMI (kg/m²), the sample was divided into normal weight (18.5-24.99 kg/m²) or overweight/obese (≥25 kg/m²) categories.

RESULTS: For the total sample, average baseline SBP was 115.6 ± 9.4 mmHg with no significant change over the 12-month observation period. The participants experienced a significant gain in body weight (3 ± 3.4 kg) and %BF (0.5 ± 2.4), while change in MVPA was not significant. In overweight/obese (n=103) individuals, linear regression showed a significant association for change in MVPA (β=-0.04, p=0.033) with SBP at 12 months after adjusting for baseline MVPA and SBP. Changes in body composition were not significantly associated with SBP (p>0.11). Those classified as normal weight did not show significant associations for changes in body weight, %BF, or MVPA with SBP.

CONCLUSION: These results emphasize the beneficial effects of PA on blood pressure, particularly in those who are overweight or obese. The associations between body composition and body weight changes with SBP were not significant. Supported by a grant from the Coca-Cola Company.

811 Board #127 June 1, 2:00 PM - 3:30 PM

Associations Of Total Activity Counts And Bouted Minutes Of Moderate-to-Vigorous Activity With Insulin Resistance And Insulin Sensitivity: NHANES 2003-2006

William R. Beyer, Dana L. Wolff-Hughes, David R. Bassett, FACSM, James R. Churilla, FACSM, Eugene C. Fitzhugh, University of Tennessee, Knoxville, TN. 2National Cancer Institute, Washington, DC. 3University of North Florida, Jacksonville, FL. (Sponsor: David R. Bassett, FACSM) (No relationships reported)

Purpose: To contrast the associations of accelerometer-derived total activity counts per day (TAC/d) and minutes of bouted moderate-to-vigorous physical activity (MVPA) with insulin resistance (IR) and insulin sensitivity (IS). Methods: The sample included 2,394 adults (\( \geq 20 \) y.) from the 2003-2006 National Health and Nutrition Examination Survey (NHANES) who attended the morning medical examination center and fasted for at least 8 hours. Time spent in MVPA, using the 12,020 counts/min (cpm) cut-off, was calculated in bouts of \( \geq 10 \) minutes. TAC/d reflects total volume across all intensities. Insulin resistance was measured via the homeostatic model assessment for insulin resistance (HOMA-IR). Insulin sensitivity was measured via the quantitative insulin sensitivity check index (QUICKI). Two nested regression models regressed HOMA-IR and QUICKI, respectively, on minutes of bouted MVPA and TAC/d.

An adjusted Wald F statistic was used to illustrate strength of association. Results: Following adjustment for age, gender, race, education, smoking status, hypertension, weight and glycemic status, TAC/d was more strongly associated with both HOMA-IR (Adj. Wald-F 51.63, p<0.001) and QUICKI (41.52, p<0.001) compared to bouted MVPA (HOMA-IR 0.53, p=0.50; QUICKI 1.01, p=0.31). Following further adjustment for waist circumference, the same results were obtained. Conclusions: The results of this study indicate that TAC/d may be the preferred metric over minutes of bouted MVPA, since it has stronger associations with IR/IS. The most likely explanation is that only TAC/d captures light PA and intermittent MVPA, and these may influence insulin action.

812 Board #128 June 1, 2:00 PM - 3:30 PM

Sedentary Behaviors: The Role Of Acculturation Between Mexicans Living In Mexico And Mexican-americans Living In The U.s.

Katia Gallegos-Carrillo, Lourdes Baezconde-Garbanati, Britni R. Belcher, Chih-Ping Chou, Genevieve F. Dunton. 1Instituto Mexicano del Seguro Social/University of Southern California, Los Angeles, CA. 2University of Southern California, Los Angeles, CA. (No relationships reported)

Purpose: In this study, we explored the role of acculturation in sedentary behaviors, including transportation sitting time and TV viewing, computer time, use of videogames and other screen time among sample of US-born Mexican Americans, foreign-born Mexicans living in the United States, and Mexicans living in Mexico.

Methods: We examined data from binational surveys, the National Health and Nutrition Examination Survey (NHANES) 2011-2012 and the National Health and Nutrition Survey of Mexico (ENSANUT) 2012. For these descriptive analyses, both samples are treated as community samples. These databases included self-reported sedentary behaviors such as transportation sitting time, TV viewing, videogames, and recreational computer use. We included sociodemographic data, acculturation, and anthropometric measures. Multiple regression techniques were used to investigate the

Abstracts were prepared by the authors and printed as submitted.
role of acculturating on sedentary behaviors based on levels of acculturating: US-born Mexican Americans, foreign-born Mexicans living in the US, and Mexicans living in Mexico.

Results
Analyses were adjusted for age, sex, and educational status. There was higher TV viewing/screen time among Mexicans living in Mexico (188.3 min/day) and US born Mexican-Americans (218.8 min/day) in comparison to foreign-born Mexican living in the US (128.8 min/day) (p < 0.01). The same pattern was observed in sitting time in Mexicans (323.7 min/day) and Mexican-Americans (335.5 min/day) living in their respective country of origin, these spent more minutes per day sitting when compared to Mexicans individuals living in the US (211.1 min/day) (p < 0.01).

Conclusions
Acculturating may play a role in sedentary behaviors, with less sitting and TV viewing/screen time among less acculturated populations of Mexican origin living in the US when compared with those more acculturated Mexican Americans who were born in the US. Mexican Americans were more similar to their Mexico-born counterpart living in Mexico, than to the Mexican-born immigrant population living in the US. These differences may, in part, be due to occupational activities of those of Mexican origin who have immigrated to the US. These findings help improve our understanding of the impact of acculturating in sedentary behaviors among individuals of Mexican origin who have immigrated to the US.

813 Board #129 June 1, 2:00 PM - 3:30 PM
Cardiorespiratory Fitness and High Levels of non-HDL-cholesterol: Cohort Study of Japanese Men
Natsumi Watanabe1, Sasumuni S Sawada, FACSM2, I-Min Lee, FACSM3, Yuko Gando4, Kazunori Shimada4, Ryoko Kawakami4, Motohiko Miyachi5, Haruki Momma6, Yumiko Hagi7, Chihiro Kinugawa8, Takashi Okamoto9, Steven N Blair, FACSM10
1College of physical & early childhood care education Tokyo YMCA, Tokyo, Japan. 2National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. 3Harvard Medical School, Boston, MA. 4Gunenden University, Tokyo, Japan. 5Waseda University, Saitama, Japan. 6Tohoku University, Sendai, Japan. 7Tokai University, Kanagawa, Japan. 8Tokyo Gas Health Promotion Center, Tokyo, Japan. 9University of South Carolina, Columbia, SC.
Email: natsumi.w10@gmail.com

Previous papers show that there is an inverse relationship between cardiorespiratory fitness and coronary heart disease. Recent papers further suggest that non-HDL-cholesterol (non-HDL-C) is a good marker of coronary heart disease risk. However, few studies are available on the relationship between cardiorespiratory fitness and high levels of non-HDL-C. PURPOSE: To investigate the relationship between cardiorespiratory fitness and high levels of non-HDL-C among Japanese Men.
METHODS: We evaluated cardiorespiratory fitness and incident development of high levels of non-HDL-C (≥ 170 mg/dL) from 1986 to 2006 on 6,548 Japanese men [median (IQR) age 36 (30-44) years] who were free from high levels of non-HDL-C. Participants were given a submaximal exercise test, a medical examination, and questionnaires on their health habits in 1986. Cardiorespiratory fitness was estimated by using a cycle ergometer and maximal oxygen uptake was estimated. Incident development of high levels of non-HDL-C was estimated by comparing the presence of MetS (with, and without) and divided by the median of SedPA, LPA, MVPa and steps/day (less, more). Between groups comparisons were performed using ANCOVA, with Bonferroni post hoc test. Analyses were adjusted for age.
RESULTS: The prevalence of MetS was 41%. Accelerometers mean wear time was 13.3±1.5 hours/day. Participants with MetS and less SedPA have a significantly higher cfPWV when compared to those with MetS and less SedPA (9.8±1.0 m/s versus 8.8±1.0 m/s; p<0.05, respectively), after adjustments for age. The group with MetS and less LPA or MVPa has a significantly higher cfPWV compared to the non-MetS group (p<0.05). Similar results were found for sedentary.
CONCLUSIONS: MetS in addition to a higher amount of SedPA shapes a significantly higher cfPWV.

814 Board #130 June 1, 2:00 PM - 3:30 PM
Metabolic Syndrome And Time Spent In Sedentary Activity Shape Carotid-femoral Pulse Wave Velocity
Lucimere Bohn1, Ana Ramoa2, Gustavo Silva1, Nuno Silva1, João Tiago Guimarães1, Sandra Abrue1, Fernando Ribiero1, Jose Oliveira1. 1Research Center in Physical Activity, Health and Leisure, Faculty of Sport, University of Porto, Porto, Portugal. 2Primary Care Unit Espaço Saúde, Aaldur, Porto, Portugal. 3Faculty of Medicine, University of Porto, Porto, Portugal. 4School of Health Sciences, University of Aveiro, and CINOTES, UA, Aveiro, Portugal.
Email: lucimerebohn@gmail.com

(NO relationships reported)

PURPOSE: To compare carotid-femoral Pulse Wave Velocity (cPWV) according to the time spent in physical activity (PA) categories of intensity, in individuals with and without metabolic syndrome (MetS).
METHODS: The study sample encompassed 197 randomized individuals (mean age 47.40 ± 12.90 years; 57.86% female) enrolled in a primary health care unit. Arterial stiffness was assessed through cPWV with the Sphygmocor System. Daily PA was objectively assessed during 7 days using accelerometers and data were reduced in time spent in sedentary PA (SedPA), light PA (LPA), moderate-to-vigorous PA (MVPa) and number of steps per day (steps/day). MetS was determined according to the clustering of at least 3 from 5 metabolic risk factors (central obesity, hypertension, glucose impairment, high triglycerides and low HDL-cholesterol). Participants were classified and compared according the presence of MetS (with, and without) and divided by the median of SedPA, LPA, MVPa and steps/day (less, more). Between groups comparisons were performed using ANCOVA, with Bonferroni post hoc test. Analyses were adjusted for age.
RESULTS: The prevalence of MetS was 41%. Accelerometers mean wear time was 13.3±1.5 hours/day. Participants with MetS and more SedPA have a significantly higher cfPWV when compared to those with MetS and less SedPA (9.8±1.0 m/s versus 8.8±1.0 m/s; p<0.05, respectively), after adjustments for age. The group with MetS and less LPA or MVPa has a significantly higher cfPWV compared to the non-MetS group (p<0.05). Similar results were found for sedentary.
CONCLUSIONS: MetS in addition to a higher amount of SedPA shapes a significantly higher cfPWV.
Conclusion: Total sedentary time was positively associated with VAT in Caucasians but not in African Americans. Television viewing time was positively, and total physical activity inversely, associated with VAT in men and women of both races, independent of subcutaneous fat volume and potential confounders.

In Japan, the incidence of kidney stones has increased markedly in recent years. Physical activity and water intake after exercise or sport may enhance the early release of urinary tract stone(s). However, to our knowledge, no data are available on the relationships of sedentary behavior and physical activity with the incidence of kidney stones in Japanese men and women.

**PURPOSE:** We investigated the relationships between sedentary behavior, physical activity and the incidence of kidney stones in middle-aged Japanese men and women in the Niigata Wellness Study.

**METHODS:** A cohort of 16,458 Japanese men [median (IQR) age 49 (43-54) years] and 7,141 women [median (IQR) age 48 (43-53) years] free of kidney stones completed a health examination, and reported on sedentary work-site behavior (average time per day spent in sedentary work) and leisure-time physical activity (average time per week spent in exercise) in 2001. The participants were divided into tertiles based on sedentary work-site behavior, and also divided into three categories (0 min/week, 1-119 min/week, ≥120 min/week) based on leisure-time physical activity. The development of kidney stones during follow-up from 2001 to 2006 was based on self-reports from questionnaires at another medical examination in 2006. Odds ratios and 95% confidence intervals (95% CI) for the incidence of kidney stones were obtained using logistic regression models while adjusting for age, sex, body mass index, cigarette smoking, alcohol intake, and sedentary work-site behavior or leisure-time physical activity.

**RESULTS:** During the follow-up period, 169 participants developed kidney stones. Using the lowest sedentary work-site behavior tertile as reference, odds ratios and 95% CIs for the 2nd and 3rd tertiles were 1.40 (95% 0.207-1.43) and 1.43 (95% 0.032-1.78) (p for trend = 0.052). Using the lowest physical-activity group as reference, odds ratios and 95% CIs for the 2nd and 3rd tertiles of exercise were 0.71 (95% 0.44-1.15) and 0.64 (95% 0.40-1.02) (p for trend = 0.034).

**CONCLUSIONS:** These results suggest that higher levels of sedentary behavior and lower levels of physical activity are associated with greater incidence of kidney stones in middle-aged Japanese men and women.

**Depression influences a worker’s productivity and mental health substantially. Lifestyle factors such as sedentary behavior, physical inactivity, poor fitness, and vitamin D deficiency are positively associated with symptoms of depression. On the other hand, regular exercise can improve mood in people with mild to moderate depression. However, little is known regarding the relationships between depression and the modifiable risk factors in office workers, especially in Korea.

**Purpose:** To investigate the association between depression and the modifiable lifestyle risk factors in a sample of Korean office workers.

**Methods:** In a cross-sectional design, a total of 492 office workers aged 30 to 60 years (321 men and 171 women) completed assessments of body composition, physical fitness, sedentary behavior, and low serum vitamin D levels. A standardized Korean version of Beck Depression Inventory (BDI) was used to assess the existence and severity of symptoms of depression (The Korean Journal of Counseling and Psychotherapy 2005; 4: 855-876). Based in BDI scores, subjects were classified as normal (NO) with BDI score of ≤9, mildly depressed (MLD) with BDI score of 10-15), and moderately depressed (MO) group with BDI score 16-23.

**Results:** The Kruskal-Wallis tests for linear trends showed significant decreases in sitting time (p <0.01), lean body mass (p<0.01), serum vitamin D (p<0.01), upper strength (p<0.01), and endurance across the incremental severity of depression symptoms from NO to MO. In addition, a significant linear increase in sitting time (p<0.01) was found across the incremental severity of depression symptoms. Linear regression analyses showed that serum vitamin D (beta = -0.331, SE=0.031, p<0.001) and sitting time (beta= -1.07, SE=0.101, p=0.010) were independent predictors for the severity of depression symptoms even after adjustment for age and sex.

**Conclusion:** The current findings of the study showed that low lean body mass, poor physical fitness, sedentary behavior, and low serum vitamin D levels were independent risk factors of depression, implying a need of a healthy lifestyle promotion along with vitamin D supplementation for sedentary office workers.
HI HIV infection and the antiretroviral therapy (ART) used to treat it have been shown to increase cardiovascular disease (CVD) risk. In the past two decades, mortality trends have shown increasing CVD-related mortalities and decreasing AIDS-related mortalities. Studies have shown several health benefits in HIV-infected individuals who participate in regular physical activity (PA). PURPOSE: To investigate the associations between PA and several CVD risk factors in HIV-infected and uninfected women enrolled in the Women’s Interagency Study History (WISH), a longitudinal cohort study examining the epidemiology of U.S. women living with HIV and at risk for CVD. METHODS: Cross-sectional, secondary data analyses were completed on 496 WISH participants from 6 sites (Brazo = 91, Brooklyn = 128, Chicago = 35, District of Columbia = 101, Los Angeles = 116, San Francisco = 2). Self-reported PA was assessed using an adaptation of the Physical Activity History Questionnaire validated in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Multivariate linear regression with backward selection models were used to assess the associations of PA with waist circumference, hemoglobin A1c, triglycerides, high-density lipoprotein cholesterol, and blood pressure (BP). Separate models were run for HIV-infected and uninfected women. Age (≥ 20 years), race (African American or non-Hispanic white), BMI (≥ 18.5 kg/m2), and smoking status were included as covariates and included in the final model if the association was P ≤ 0.10. Significance was defined as P ≤ 0.05. RESULTS: Among all women, PA was associated with significantly reduced waist circumference (P ≤ 0.02); however, the interaction between PA and HIV was marginally significant (P ≤ 0.06). There was a significant interaction between PA and HIV on diastolic BP (P ≤ 0.04), where PA was inversely related to diastolic BP in uninfected women (P ≤ 0.81). In addition, PA was associated with significantly lower systolic BP (P < 0.01). CONCLUSIONS: These data suggest that PA is associated with a reduction in some CVD risk factors in HIV-infected women. Further research is needed to more fully examine the association between PA and CVD risk factors in individuals infected with HIV.

Gene-environment interactions have been reported to contribute to fetal growth. The placenta mediates effects of maternal behaviors on fetal growth. The role of placental genetic variation in previously reported sex-specific associations of maternal physical activity (LTPA) with offspring birth size is unknown. PURPOSE: We examined whether offspring sex-specific associations of maternal LTPA with offspring birthweight (BW) differ by placental growth-related common genetic variations. METHODS: Participants (N=412) were identified from the Omega study, a prospective pregnancy cohort study. Participants reported LTPA duration (hours/week) and energy expenditure (MET-hours/week) in the year before pregnancy (ppLTPA) and in early pregnancy (epLTPA). BW was abstracted from medical records. Placental tissue was collected at delivery and genotyped for common single nucleotide polymorphisms (minor allele frequency (MAF) ≥20%) related to fetal growth: rs1482853 (LEKR1/CCNL1), rs9883204 (ADCY5), rs1042725 (HMGA2), rs724557 (LCLR2), rs1801253 (ADRB1), and rs4432842 (Sg112). Interaction terms and stratified regression models were used to determine effect modification of associations of maternal LTPA with offspring birthweight (BW) by sex and placental fetal growth-related common genetic variations. RESULTS: Among females, rs1482853 (MAF=43%) modified associations of ppLTPA (P for interaction=0.05) and epLTPA (P for interaction=0.01) duration with BW. Each quartile increase in ppLTPA duration was associated with 154g greater BW (95% CI: 12-295) among females homoygous for the rs1482853 minor allele, while it was associated with 120g lower BW (95% CI: 223-18) among heterozygous females. Similarly, each quartile increase in epLTPA duration was associated with 158g greater...
BW (95% CI: 1, 316) among females homozygous for the rs1482853 minor allele, while it was associated with a marginally significant 53 g lower BW (95% CI: -156, 50) among heterozygous females. Genotypes did not modify LTPA-BW associations among males. Results were similar for energy expenditure.

**CONCLUSIONS:** Placental genetic variation in LEKR1/CCNL1 may modify associations between maternal LTPA and birthweight among females, but not males. Replication of results and research on mechanisms of interaction between LTPA, placental genes, and fetal growth are warranted.

---

**Purpose:** The study examined the co-occurrence of health-related behaviors among US active duty service members. The goal was to determine whether they naturally form a singular lifestyle dimension or multiple health-related lifestyles. Alcohol consumption, smoking, diet and exercise patterns, dietary supplements use, and sleep are behaviors commonly assessed to evaluate service member health and performance. However, it is currently unclear whether these behaviors naturally co-occur as a single lifestyle.

**Methods:** Data from the 2011 Health Related Behaviors Survey of Active Duty Military Personnel (HRBS) were used (N = 12,172). Exercise frequency, eating behaviors, use of selected health-marketed dietary supplements, drinking frequency, cigarette smoking, and average hours of sleep per night were entered into a principal components analysis with varimax rotation.

**Results:** A clear two-dimensional structure emerged. The first dimension consisted of health promoting behaviors, such as regularly exercising, eating healthy foods, and taking selected dietary supplements. This health promotion dimension predicted high soldier resiliency and positive affect. The second dimension consisted of unhealthy behaviors, including limited sleep, frequent binge drinking, and high tobacco usage. The unhealthy behaviors dimension predicted uniformly negative outcomes, such as lower resiliency, higher anger, depression, anxiety, interpersonal conflict, and higher perceived stress from both military and personal sources.

**Conclusion:** Health-related behaviors appear to be part of two independent lifestyles: a health promotion lifestyle and an unhealthy behaviors lifestyle. These lifestyles appeared to be largely unrelated to each other. Thus, service members could participate in just one lifestyle or both of them. Whether targeting the cluster of behaviors that form each lifestyle would have a positive impact on interventions remains to be determined.

---

**Purpose:** To study the independent associations between change in sedentary behavior (SB), moderate-to-vigorous physical activity (MVPA) and objectively measured cardiorespiratory fitness (CRF) over 10 years, and concurrent change in clustered cardio-metabolic risk and its individual components (waist circumference, fasting glucose, HDL-cholesterol, triglycerides and blood pressure). We also determined whether any associations were mediated by change in waist circumference or dietary intake.

**Methods:** A population-based sample of 425 adults (age (mean) ± SD: 55.83 ± 9.40; 65% men) were followed prospectively for 9.61 ± 5.2 years. Participants self-reported SB and MVPA and performed a maximal cycle ergometer test to estimate peak oxygen uptake at baseline (2002-2004) and follow up (2012-2014). Multiple linear regression and the product of coefficients method were used to examine independent associations and mediation effects, respectively.

**Results:** Greater increase in SB was associated with more detrimental change in clustered cardio-metabolic risk (standardized β = -0.12, p<0.01) and triglycerides (standardized β = -0.12, p<0.05), independently of baseline and change in MVPA and CRF. Greater increase in MVPA was associated with greater increase in HDL-cholesterol, independently of baseline and change in SB and CRF (standardized β = -0.15, p<0.01). Greater decrease in CRF was associated with more detrimental change in clustered cardio-metabolic risk and all other individual components, independently of baseline and change in SB (absolute standardized β ranging from 0.12 to 0.38, p<0.05). Change in waist circumference mediated the relationship between change in CRF and change in fasting glucose, HDL-cholesterol and triglycerides (a*b [95% CI]: fasting glucose: -0.11 [0.18, -0.04]; HDL-cholesterol: 0.15 [0.08, 0.22]; triglycerides: -0.40 [-0.81, -0.01]).

**Conclusions:** A combination of decreasing SB and increasing MVPA and CRF is most beneficial towards cardio-metabolic health. However, some associations between changes in CRF and changes in cardio-metabolic risk were mediated through changes in waist circumference. Therefore, from a public health perspective, lifestyle intervention programs need to focus on all three components, which is decreasing SB, increasing MVPA and CRF.
The participants were classified as low, intermediate and high MEF levels. Logistic regression models were used to test the association between muscular endurance and depressive symptom in women, independent of CRF. Muscular endurance fitness might be utilized as an important component to prevent depressive symptom in women.

### RESULTS

Poor levels of handgrip strength have been associated with higher mortality and diseases. There is scanty information about metabolic risk factors in shoe workers. PURPOSE: To examine novel parameters describing the variability of physical activity volume and associations with cardiometabolic biomarkers. METHODS: Data from the 2003 - 2006 NHANES were used for this analysis. The sample included adults ≥ 20 y, not pregnant or lactating, who had self-reported PA and ≥ 4 d of accelerometer data with ≥ 10 h wear time (N = 5668). The volume of PA was represented by total activity counts per day (TAC/d), defined as the mean accelerometer counts acquired on valid days. Using minute-level activity count data, the following parameters of activity volume variability were derived and averaged across valid days: skewness, kurtosis, coefficient of variation, range, and variance. Biomarkers included: blood pressure (BP), body mass index (BMI), waist circumference, triceps and subscapular skinfolds, cholesterol, triglyceride, glycemicoglobin, plasma glucose, C-peptide, insulin, C-reactive protein, and homocysteine. Simultaneous regressions were used to regress biomarkers on TAC/d and activity variability parameters independently, while adjusting for relevant covariates.

### RESULTS

Of the five volume parameters examined, skewness was found to have the greatest independent association with biomarkers. In the TAC/d plus skewness model, a significant negative association was found between skewness and the following biomarkers: diastolic BP, BMI, waist circumference, triceps skinfolds, subscapular skinfolds, triglycerides, insulin, and C-reactive protein (adj. Wald F = 3.8 - 16.4, P < 0.05 - 0.0001). Compared to a TAC/d only model, the TAC plus skewness model resulted in a significant association of TAC/d with diastolic BP (PTAC = 0.09 vs. PTAC+skew = 0.02) and triglycerides (PTAC = 0.2 vs. PTAC+skew = 0.02).

### CONCLUSIONS

The skewness of TAC/d appears to be a valuable parameter that provides additional information about activity volume. However, further research is needed with more complex data analyses in order to determine the utility of such measures in clinical and diagnostic assessment.

### Physical Activity

Physical activity has been beneficially associated with cardiometabolic risk factors, whereas long sedentary time has been detrimentally associated with cardiometabolic risk factors. These associations are typically examined after adjusting for confounders. It would be best to consider a finite time interval while treating sedentary and physical activities as interdependent.

### PURPOSE

To examine the association between cardiometabolic risk factors, objectively measured sedentary time, and time allocated to light-intensity physical activity (LPA) or moderate- to vigorous-intensity physical activity (MVPA). METHODS: One hundred two-eight men (average age 49 ± 9.2 y, average body mass index [BMI], 26.8 ± 3.7 kg/m²) wore triaxial accelerometers (Active style Pro, OMRON HEALTHCARE Co., Ltd.) on the hip for 2 consecutive weeks to assess sedentary time, LPA, and MVPA during waking hours (instructed to remove the device for swimming and bathing). The participants who obtained no less than 72 h of data, corresponding to a period of physical activity of ≥210 hours/day, with at least one valid weekend day, were included in the study. The association between BMI, waist circumference, blood pressure, high-density lipoprotein cholesterol level, triglyceride...
RESULTS: BMI, waist circumference, and triglyceride level were positively associated (P < 0.05) with sedentary time and less LPA. Diastolic blood pressure was negatively associated (P < 0.05) with LPA. High-density lipoprotein cholesterol level was positively associated (P < 0.05) with LPA and MPA. Less sedentary time (-30 min/day) with MPA and VPA was positively associated with BMI (β = -0.31 kg/m²; 95% confidence interval [CI] -0.59 to -0.04), waist circumference (β = -1.08 cm; 95% CI, -1.81 to -0.35), and diastolic blood pressure (β = -0.08 mmHg; 95% CI, -1.74 to -0.22). Less sedentary time (<30 min/day) with MPA and VPA (<30 min/day) was positively associated with triglyceride level (β = -26.99 mg/dL; 95% CI, -0.97 to -4.00).

CONCLUSIONS: Reallocating sedentary time in LPA and MPA may contribute to determining cardiometabolic risk factors.
of the PA domains (household/yard work, transportation, leisure time, or total PA) had a statistically significant association with LTL. However, age-group-specific analyses indicated a positive association between leisure time PA and LTL in the older population (65-84 years old) (p=0.001, p=0.049), but not in young (20-44 years old) and middle-aged (45-64 years old) populations. In the subset analysis, VO2max was significantly associated with LTL (p=0.002, p<0.001). CONCLUSION: LTL had a positive linear association with leisure time PA in older individuals, but not in young or middle-aged adults. In the subset population, cardiovascular fitness had a positively linear association with LTL. Future studies should examine the association between PA and LTL by exploring other potential mediators such as genetics, fruit and vegetables intake and chronic conditions. In addition, studies should determine whether cardiovascular fitness is associated with LTL in older adults.

The magnitude and direction of the association between sedentary time, physical activity (PA) of various intensities and weight status remain unclear. PURPOSE: The purpose of this study was to examine the cross-sectional and longitudinal effects of replacing sedentary time with light PA, moderate PA or vigorous PA on BMI in a large representative sample of adults and older adults.

METHODS: We conducted cross-sectional (n=5013) and longitudinal (n=1823) analyses in a prospective cohort study in which PA was measured objectively by accelerometer (ActiGraph GT1M and GT3X+) for 7 days at both baseline (year 2008/09) and after 5 years. Exposure variables were daily time spent sedentary (below 100 cpm), and daily minutes spent performing light (100-199 cpm), moderate (200-2999 cpm) and vigorous PA (6000 cpm and up). Outcome variable was BMI (kg/m2) derived from self-reported height and weight. Isotemporal substitution modelling was performed to convey the effects of replacing sedentary time with active behaviours on participant’s BMI.

RESULTS: The isotemporal substitution models showed that replacing 10 minutes/day of sedentary time with an equal amount of time of moderate PA (B=0.2 95% CI: -0.2 to 0.6) or vigorous PA (B=1.0; 95% CI: -1.2 to 0.7) were associated with estimated beneficial effects on BMI after adjustments for age and socio-economic status in both genders. For men, replacing sedentary time with light PA also showed small but significant beneficial associations with BMI (B=0.1; 95% CI: -0.17 to -0.03). There were no longitudinal associations when replacing sedentary time with any of the PA intensities, after adjusting for baseline BMI.

CONCLUSIONS: Replacing sedentary time with active behaviours is associated with BMI in cross-sectional but not prospective analyses. This may suggest that substituting sedentary time with an equal amount of time of either moderate PA (B=-0.2 95% CI: -0.50; p<0.05) and moderate negative correlation with FTSS (r = -0.50; p=0.05). There was no significant difference (p=0.24) for PAL between mild and moderate spasticity groups (28.3±1.26 vs. 25.66±0.65 kcal/kg/day, p=0.24). PAL between twelve non-fallers and eight fallers were 28.4±1.31 vs. 22.14±1.5 kcal/kg/day showed significant difference (p<0.05). Linear regression analysis showed that FTSS contributed 25% of the explained variance (p<0.05) and is the most relevant factor to affect PAL.

Conclusion: This study demonstrated functional ability and motor function were the important factors to influence PAL of community dwelling stroke patients and a lower PAL were related to increase fall risk. Clinicians should prescribe the treatment strategy focus on improving functional ability and motor function to promote higher PAL of stroke survivors.

Although many investigators have shown that overweight defined by body mass index (BMI, kg/m2) is protective association with mortality, this relation remains unknown after accounting for muscle mass.

PURPOSE: We investigated the associations of BMI with cardiovascular disease, chronic disease and all-cause mortality in US men and women after accounting for muscle mass.

METHODS: We followed 14,421 men and women, aged 20 to 90 years, who participated in the Third National Health and Nutrition Examination Survey. All participants completed baseline anthropometric measurements, lifestyle behavior questionnaires, and blood lipid profiles. BMI was classified as underweight (<18.5), normal weight (18.5-25), overweight (25-30), and obese (≥30 kg/m2). Skeletal muscle mass (SM) was computed using bioelectrical impedance equation, and sarcopenia was defined as relative muscle mass (SM in kg/m2) less than 20% of the sex-specific distributions (men ≤7.26 kg/m2; women ≤5.67 kg/m2). There were a total of 2,864 deaths (296 chronic individuals; 1182 CVD) during an average of 13.7 years of follow-up (214,404 person years). RESULTS: After adjustment for age, sex, race, and multiple risk factors, there was a U-shaped association between BMI and CVD mortality (P trend <0.001). We further estimated hazards ratios (HRs) across sarcopenia-specific categories due to an effect modification between sarcopenia and BMI on CVD mortality. Men and women with sarcopenia and normal weight had a 1.47 (95% CI: 1.17y to 1.79y) and 4.99 (95% CI: 1.17y to 4.65y) HRs difference in CVD mortality, respectively, as compared with men and women with non-sarcopenia and normal weight (NNW) (HR =1). There was no HRs difference between persons in theNNW and persons with non-sarcopenia and overweight/obese category (P = 0.15). These trends remain similar across sarcopenia by normal weight, overweight, and obese categories. The associations also remain persistent in chronic disease and all-cause mortality and across diabetic patients.

CONCLUSION: Maintaining an optimal level of body weight but significant muscle loss is associated with greater risk of CVD, chronic disease, and all-cause mortality. Being overweight and muscle loss is also associated with greater risk of CVD, chronic disease, and all-cause mortality.
average steps/day of the NRG was significant higher compared with the IRG (6156 ± 2485 steps vs. 2683 ±1688 steps; p < .001), respectively. CONCLUSIONS: The findings suggest that persons with MS who have increased fall risk accumulate fewer steps/day [i.e., increased activity curtailment] compared with those at normal fall risk. However, regardless of fall risk, persons with MS are far from the recommended 10,000 steps/day. This underscores the need for interventions that improve walking behavior in this population, particularly those with increased fall risk.

Previous studies have related the decrease in muscular strength with an increase of cardiovascular risk factors. The works related to this topic have mostly used the strength of upper limbs through grip strength as an assessment method. Previous studies have related the decrease in muscular strength with an increase of cardiovascular risk factors. The works related to this topic have mostly used the strength of upper limbs through grip strength as an assessment method. Previous studies have related the decrease in muscular strength with an increase of cardiovascular risk factors. The works related to this topic have mostly used the strength of upper limbs through grip strength as an assessment method. Previous studies have related the decrease in muscular strength with an increase of cardiovascular risk factors. The works related to this topic have mostly used the strength of upper limbs through grip strength as an assessment method.
higher in overweight female compared to normal-weight (72.1 ± 8.4 mmHg vs. 69.8 ± 7.2 mmHg), independently to daily energy expenditure. There were no differences in DBP between daily energy expenditure classifications for both genders. There was no significant interaction between BMI and total daily energy expenditure for SBP and DBP. CONCLUSIONS: in general, overweight adolescents showed higher blood pressure levels, independently of total daily energy expenditure. These higher values demonstrated by overweight adolescents are worrying because blood pressure tends to remain at higher levels in adulthood, increasing the chances of becoming hypertensive and suffer the consequences of this condition in adulthood.

There are racial/ethnic differences in prevalence of overweight and obesity in 2-5 year old children. An important factor in early obesity development for all children includes unhealthy dietary patterns and movement behaviors. Child-care centers can be a health intervention target since 60% of young children spend substantial time in these facilities. PURPOSE: The purpose of this study is to examine the relationship of race/ethnicity, dietary intake and movement by Body Mass Index (BMI) percentile in children attending child-care centers. METHODS: An observational study at child-care centers was conducted during 2011-2014. BMI was calculated from measured height and weight and BMI percentile was calculated based on age and sex. Parental report of race included American Indian/Alaska Native (AI/AN), white, and black. Dietary intake was determined from observed lunch food consumption and analyzed using dietary analysis software. Independent dietary variables used included sugars (g), total kcal and total fruits-and-vegetables consumed. Physical activity intensity and duration was measured for the entire school day using waist-worn accelerometers. Data was recorded and analyzed with age-specific cut points to determine intensity. Independent movement variables included minutes of sedentary, light and moderate-to-vigorous physical activity. RESULTS: Participants included 174 children, age 3.8±0.7, 51% male, AI/AN 32%, white 46% and black 20%. AI/AN had the highest mean BMI percentile (72.2±25.8) compared to white (62.9±27.8, p=0.02) and black (65.2±27.8, p=0.05). When a second race was included for AI/AN children of mixed heritage, AI/AN only children (79.8±21.8) had a higher BMI percentile compared to AI/AN-mixed children (61.8±27.3, p<0.05). There were no significant differences found between race/ethnicities in movement behaviors. After adjusting for race, only higher kcal consumption (β=0.039, SE=0.01, p=0.004) was associated with higher BMI percentile. CONCLUSION: In support of previous research, AI/AN children had a higher mean BMI percentile than other races. This difference was further amplified when AI/AN only children were examined, AI/AN-mixed BMI percentile was not different than white. After adjusting for race, total kcal was still associated with BMI Percentile.

843 Board #159 June 1, 3:30 PM - 5:00 PM
The Role Of Race/ethnicity, Dietary Intake And Movement On Obesity In Children Attending Oklahoma Child-care Centers
Chelsea L. Smith, June Eichner, Michael A. Anderson, Ashley Weeden, Susan B. Sisson, FACSM. University of Oklahoma Health Sciences Center, Oklahoma City, OK. (Sponsor: Susan B. Sisson, FACSM).
Email: csmith37@ouhsc.edu

844 Board #160 June 1, 3:30 PM - 5:00 PM
Child and Parent Stress Association with Obesity and Media Use: National Survey of Children's Health
Susan B. Sisson, FACSM1, Amanda Sheffield-Morris2, Stephanie Broyles3, Kathryn C. Nesbit1, Katheryn Swyden1. 1University of Oklahoma Health Sciences Center, Oklahoma City, OK. 2University of South Carolina, Columbia, SC. 3Mercy Health, University of the Pacific, Sacramento, CA. 4Public Health Agency of Canada, Ottawa, ON, Canada. 5McMaster University, Hamilton, ON, Canada. 6Children’s Hospital of Eastern Ontario Research Institute, Ottawa, ON, Canada. 7University of Victoria, Victoria, BC, Canada. 8Children’s Hospital of Eastern Ontario Research Institute, Ottawa, ON, Canada. (Sponsor: Mark Tremblay, FACSM)
Email: susan-sisson@ouhsc.edu

845 Board #161 June 1, 3:30 PM - 5:00 PM
Relationships between Objectively Measured Physical Activity and Health Indicators in School-Aged Children and Youth
Veronica J. Poitras1, Casey E. Gray1, Michael M. Borghese2, Valerie Carson3, Jean-Philippe Chaput1, Ian Janssen2, Peter T. Katzmarzyk, FACSM3, Russell Pate, FACSM4, Sarah Connor-Gorber5, Michelle E. Kho6, Margaret Sampson7, Mark S. Tremblay, FACSM1. 1Children’s Hospital of Eastern Ontario Research Institute, Ottawa, ON, Canada. 2Queen’s University, Kingston, ON, Canada. 3University of Alberta, Edmonton, AB, Canada. 4Pennington Biomedical Research Center, Baton Rouge, LA. 5University of South Carolina, Columbia, SC. 6Public Health Agency of Canada, Ottawa, ON, Canada. 7McMaster University, Hamilton, ON, Canada. 8Children’s Hospital of Eastern Ontario, Ottawa, ON, Canada. (Sponsor: Mark Tremblay, FACSM)
Email: vepoitras@cheo.on.ca

Purpose: Moderate-to-vigorous physical activity (MVPA) is an accepted strategy for disease prevention and health promotion. Emerging evidence suggests that other intensities of physical activity (PA), including light-intensity (LPA), may also be important in this regard, but there has been no rigorous evaluation of the evidence. Therefore, the purpose of this review was to examine the relationships between objectively measured PA (total and all intensities) and health indicators in children and youth.

Methods: Online databases were searched for peer-reviewed studies that met the a priori inclusion criteria: population (apparently healthy, aged 5-17 years), intervention/exposure and comparator (volumes, durations, frequencies, and intensities of objectively measured PA), and outcome (adiposity, cardiometabolic biomarkers, fitness, behavioural conduct/pro-social behaviour, cognition/academic achievement, quality of life/well-being, harms, bone health, motor development, psychological distress, self-esteem). Quality of evidence was assessed using the GRADE framework. Heterogeneity precluded meta-analyses; narrative synthesis of included studies was conducted.

Results: 162 publications were included (85,532 participants from 31 countries). Overall, there was strong, consistent evidence that total PA (greater durations and intensities) was favourably associated with adiposity, fitness, cognition/academic achievement and bone health; weaker evidence of favourable relationships with cardiometabolic biomarkers and motor development; and little evidence regarding other outcomes. LPA was favourably associated with some cardiometabolic biomarkers; there was a paucity of data in relation to other outcomes. Evidence quality was very low to moderate.

Conclusion: These findings continue to support the importance of MVPA for health promotion and disease prevention in children and youth, but also highlight the potential benefits of LPA and total PA. All intensities of PA should be considered in future work aimed at better elucidating the health benefits of PA in children and youth.

Funded by: Canadian Society for Exercise Physiology, Conference Board of Canada, Healthy Active Living and Obesity Research Group at the CHEO Research Institute, Public Health Agency of Canada.
It has been suggested that behavioural and biological factors are linked to metabolic syndrome (MS) in children. Given the recent population increase on MS in youth, it is useful to explore the effects of these factors to provide better information when designing interventions. PURPOSE: To identify behavioural and biological correlates of MS in Portuguese children. METHODS: Body mass index (BMI), maturity offset, BMI markers (fasting glucose, triglycerides, HDL-cholesterol, waist circumference, and systolic blood pressure), light (LPA) and moderate-to-vigorous (MVPA) physical activity, and sedentariness (SED) during school-days and weekend, week mean sleep time (ST), and muscle strength (MSig) were collected in 389 children (mean age 10.5 years; 218 girls) from 23 schools located in Porto, Portugal. MVPA, LPA, SED and ST were measured with the GT3X Acctigraphometer with at least 4 days (at least one weekend day) of at least 10 hours/day of monitoring. MSig was measured by a handheld test, IOTF cut points were used to classify children as normal-weight or overweight/obese, and children were classified as having MS (≥ 3 MS indicators at risk) or not. Binary logistic regression was used to identify significant correlates of MS. RESULTS: Boys (OR: 7.5; 95%CI: 1.8-31.7), children ahead in their biological maturation (OR: 5.6; 95%CI: 1.9-16.5), and those overweight/obese (OR: 4.8; 95%CI: 1.7-14.0) were more likely to have MS; on the other hand, children who spent more time in MVPA during school-days (OR: 0.97; 95%CI: 0.94-0.99) had a slightly lower chance of having MS. No significant effect was found for MSig, ST, LPA, SED, and MVPA during the weekend. CONCLUSIONS: Sky, biological maturation, BMI, and MVPA are significant correlates of MS among Portuguese children. These results reinforce that biological and behavioural characteristics play important roles in children’s health.

Previous studies have suggested that the level of leisure-time physical activity is positively associated with cognitive performance and educational attainment. However, the direction of the association is unclear. PURPOSE: The aim of the study was to examine the direction and magnitude of the associations between leisure-time physical activity and academic performance in a longitudinal study across adolescence and young adulthood. METHODS: The participants were families with twins (born 1983-1987) taking part in the population-based FinnTwin12 study. The twins were surveyed at ages 12, 14, 17 and 22 years. Altogether, 4350 twins were included in the analyses. Self-reported questionnaire data at each study wave were used to assess the frequency of leisure-time physical activity. Academic performance was assessed with teacher-reported grade point average at ages 12 and 14 and with self-reported student status and educational level at ages 17 and 22 years, respectively. A cross-lagged path model with data from the four time points was conducted in the Mplus statistical software package, treating sex as well as parents’ education and physical activity level as covariates. RESULTS: Across age, leisure-time physical activity and academic performance were positively associated. The associations were the strongest between the frequency of leisure-time physical activity at age 22 years and academic performance at all four ages; the polyserial correlations ranged between 0.27 (p=0.12) and 0.37 (p=0.05). In the cross-lagged path model, higher academic performance at ages 12, 14 and 17 years predicted statistically significantly higher levels of leisure-time physical activity in the follow-up time-points (standardized path coefficients at ages 14 (0.07, p=0.002), 17 (0.13, p=0.001) and 22 (0.08, p=0.04)), even though the previous level of leisure-time physical activity as well as parents’ education and physical activity level were taken into account. In contrast, physical activity did not predict later academic performance at any time point.

CONCLUSION: The results indicate that a higher level of academic performance in adolescence is modestly associated with increased leisure-time physical activity in late adolescence and young adulthood independently of the prior level of leisure-time physical activity.

Abstracts were prepared by the authors and printed as submitted.
PORPOSE: We examined a relationship among fitness, obesity, vascular risk, and cognition in young adults.

METHODS: Fitness (VO2max, BMI, and waist circumference) were collected to examine the relationship with cognitive performance in healthy, young adults (n=93, 57.0% female, aged 23.01±3.67 years). Cognitive performance was assessed using Stroop interference ratio, Psychomotor Vigilance Task (PTT: attention, msce), and Delayed Match to Sample memory task (DMS: working memory, msce and correct trial number). A multiple linear regression was used to examine the associations among VO2max, BMI, CRP, and cognition adjustment for age, gender, and race. Multinomial logistic regression was calculated to identify whether VO2max and BMI were associated with risk of cognitive function, including hypertension, diabetes, and dyslipidemia. This study was conducted in healthy, young adults to examine the relationship between cardiovascular fitness and cognitive performance in young adults.

RESULTS: Health indices (i.e., VO2max, BMI, CRP) significantly predicted VO2max (β = 0.25, P < 0.001) and VO2max (β = 3.55, P < 0.005) significantly predicted VO2max in a model (R2 = 0.48, F3, 259 = 5.365, P < 0.001). VO2max significantly predicted slower memory retrieval latency (β = -0.341, P = 0.017; R2 = 0.192; F2, 94 = 2.620, P < 0.048), and lower correct trial (β = -0.284, P < 0.045; R = -0.183; F2, 94 = 2.466, P < 0.045) in DMS. VO2max significantly predicted slower score in Stroop interference (β = -0.235, P < 0.041; R = -0.134; F3, 92 = 2.671, P < 0.039). Among health indices and the cognitive variables, only VO2max predicted higher correct trial (β = -0.380, P < 0.030; R2 = 0.158, F3, 92 = 2.021, P = 0.042) and slower memory retrieval latency (β = -0.488, P < 0.006; R2 = 0.159, F3, 92 = 2.041, P < 0.043) in DMS. From the health indices and CRP to cognitive variable, BMI significantly contributed to CRP that decreases DMS performance [Exp(B)=1.002, P = 0.031] in high CRP risk compared with low CRP risk in a model [β (10, n = 93) = 21.6, P = 0.023].

CONCLUSION: Young adults who maintained higher fitness level had a greater cognitive performance while those who had higher vascular risk with obesity revealed poorer cognitive performance. The beneficial effect of cardiorespiratory fitness on cognitive enhancement might have been mediated by aerobic fitness that reduces vascular risk and obesity.

Although youth’s health-related physical fitness is often assumed to be significantly related to the frequency and intensity of their physical activity (PA) behavior, current literature has not yet clearly established the legitimacy of this relationship (Blair et al., 2011).

PURPOSE: To examine the multivariate shared relationship between four different PA intensity variables sets (PAIVS) and a physical fitness variable set (PFVS).

METHODS: Participants were 157 students (61.1% Female, M± SD = 12.91 ± 9.2) from three public middle schools in the Southwest U.S. Students wore an Actical accelerometer for seven days, and PA intensity was classified as sedentary, light, moderate, or vigorous based on the number kcal/kg/min exerted (Puyau et al., 2004). Each PAIVS included the percent time students were engaged in the relevant intensity during school, after school, and during the weekend. FITNESSGRAM® health-related physical fitness assessment manual was used, and PFVS included waist-height ratio, BMI, body-fat %, PACER, VO2max, pushups, curls, trunk lift, and back saver sit-and-reach measures. Four canonical correlation analyses (CCA) were conducted to examine the relationship between each PAIVS and the PFVS, respectively.

RESULTS: The CCA revealed that only frequency of vigorous PA was statistically related to PFVS, which yielded two functions with squared canonical correlations of approximately .23 for Function 1 (F1) and .16 for Function 2 (F2), Wilks’s λ = .61, F(27, 424.12) = 2.903, p < .001. An examination of the squared structure coefficients (r²) for both F1 and F2 revealed that VO2max (r² = .50) and curls (r² = .72) respectively shared the largest percentage of variance with the synthetic dependent variables, and frequency of vigorous PA during (r² = .96) and after school (r² = .82) respectively shared the largest percentage of variance with the synthetic criterion variables.

CONCLUSION: These findings suggested that increasing adolescents’ frequency in vigorous PA during and after school may improve their health-related physical fitness, especially VO2max and curls. Further, varying the frequencies of sedentary, light, and moderate PA in adolescents may not significantly affect their health-related physical fitness.
Adolescents with greater sedentary time are more likely to have elevated metabolic risk factors. On the other hand, physical activity (PA) is inversely associated with metabolic risk in adolescents. A better understanding of how these variables interact with adolescent metabolic health is important to identify if the benefits of PA are present in adolescents with different levels of sedentary time.

**PURPOSE:** To identify association between PA and metabolic risk factors in adolescents with different levels of sedentary time

**METHODS:** A cross-sectional study was conducted on 941 adolescents (411 males) aged 12 to 17 from public schools in Curitiba, Brazil. Fasting blood glucose, Total Cholesterol, LDL-cholesterol, HDL-cholesterol, Triglycerides, Waist Circumference (WC) were determined by z-scores and z-corrected inversely calculated for HDL-cholesterol where high values indicate low levels of this variable. The sum of z-scores indicated a total metabolic risk score. The Adolescent Sedentary Activity Questionnaire measured the daily time spent with sedentary activities. The adolescents were divided in three groups according to their sedentary behavior (Low, Moderate and High sedentary time).

**RESULTS:** Significant associations between MVPA and metabolic risk factors in Low sedentary time group was only shown for waist circumference ($r = -0.122; p=0.037$).

**CONCLUSIONS:** MVPA related inversely to metabolic risk factors only in Low and Moderate sedentary time groups. MVPA related to WC in the first group and to Fasting blood glucose, HDL-cholesterol and Metabolic risk score in the second group. It seems to exist a moderator influence of sedentary time in associations between MVPA and metabolic risk factors.
minutes after-school hours. Adolescents averaged 18.9±11.0 repetitions for push-ups (49% Healthy Fitness Zone; HFZ), 44.5±26.4 repetitions for curl-ups (64% HFZ), 34.7±24.8 PACE (32% HFZ), and 22.1±10.0% percent body fat (54% HFZ).

CONCLUSIONS: Adolescents within the Juvenile Justice System are falling short of the recommended 60 minutes of MVPA per day and 30 minutes of MVPA during school hours and are also in need to improve their health-related fitness, especially cardiorecirculatory endurance, where only 1 in 3 youth were in the HFZ. Additional physical activity and health-related fitness programming is needed in these facilities.

858 Board #174
June 1, 3:30 PM - 5:00 PM
Changes in Cardiorespiratory Fitness in Children and Adolescents Predicts Adulthood Body Composition Phenotypes
João Magalhães, Xavier Melo, Diana Santos, Rui Ornelas, Luis Sardinha. 1Faculty of Human Kinetics - University of Lisbon, Lisbon, Portugal. 2Centre of Social Sciences, Funchal, Portugal.
Email: joaoPEDRO.M87@gmail.com
(No relationships reported)

PURPOSE: Childhood and adolescence are critical periods for the decrease or increase of cardiorespiratory fitness (CRF), which may influence the development of selected obesity phenotypes in adulthood. We investigated the independent associations between CRF changes from childhood to adolescence to adulthood, with body composition phenotypes in adulthood, including total body fat (TBF), android fat (AF) and trunk fat (TF).

METHODS: Baseline assessments, from the Portuguese European Youth Heart Study arm, were conducted in 1999/2000 in 26 girls and 43 boys aged 9-15 years old, which were later followed into young adulthood (24-31 years old). CRF, as estimated by a maximal cycle ergometer test was taken at baseline and follow-up. CRF was dichotomized using established criteria and grouped as follow (initial/follow-up): FIT/FIT, FIT/UNFIT, UNFIT/FIT, UNFIT/UNFIT.

RESULTS: Changes in CRF were negatively associated with TBF (R=-0.249, p=0.044), AF (R=-0.289, p=0.018) and TF (R=-0.282, p=0.022) in adulthood. Logistic regression analysis demonstrated that children and adolescents that remained unfit through adulthood were at increased risk for high TBF, AF and TF. After adjusting for possible confounders (age, gender, follow-up period and initial BMI), only TBF (OR=6.59, CI: 1.27-34.72) and TF (OR=8.22, CI: 1.37-46.09) associations remained significant.

CONCLUSIONS: Low CRF values during childhood and young adulthood are associated with unfavorable body composition phenotypes. These results highlight that CRF should be considered as an important attribute in childhood and adolescence to prevent long-term total and central obesity phenotypes.

859 Board #175
June 1, 3:30 PM - 5:00 PM
Children’s Cardiovascular Fitness, Rather Than Weight Status, Is Associated With Cardiovascular Disease Risk
Jacob Szczuszek, Sonia Vega-López, Noe C. Crespo. Arizona State University, Phoenix, AZ.
(No relationships reported)

PURPOSE: Determine associations between cardiovascular fitness (CFV), weight status, and CVR risk factors among ethnically diverse children, and compare associations based on the obesity measure used.

METHODS: This analysis included baseline data from 51 children (9.35±1.64 y) who were participating in a large community-based lifestyle intervention. CFV categories were determined by the YMCA 3-minute step test using the Fitnessgram criteria. Body weight status (normal weight [NW] and overweight/obese [OW/ OB]) was determined based on BMI categories or total percent body fat (DXA). CVR risk factors assessed included resting blood pressure (BP), waist circumference (WC), and fasting glucose, insulin, cholesterol, and triglycerides. Children were grouped into four categories based on fitness (high fit [HF] vs. low fit [LF]) and body weight status (NW vs. OW/ OB) as follows: 1) NWHF, 2) NWF, 3) OWHF, and 4) OWLF. CVR risk factors were compared among the four groups via ANOVA. The NWLF group was excluded from analyses due to small sample size (<2).

RESULTS: Based on DXA-derived cutpoints, the OWLF group had significantly higher WC (81.8±9.6 cm) than the NWHF (58.1±6.0 cm) and OWHF (57.9±6.4 cm) groups. Systolic BP was significantly greater for the OWLF group than the OWHF group (107.0±10.0 mm Hg vs. 96.8±8.0 mm Hg). The OWLF group had significantly greater fasting insulin (23.3±14.5 μIU/L) than the NWHF (10.1±3.7 μIU/L) and OWHF (7.4±2.5 μIU/L) groups. Fasting triglycerides were significantly greater for the OWLF group (23.3±14.5 μIU/L) than the NWHF (10.1±3.7 μIU/L) and OWLF group (106±10 mm Hg vs. 96±8 mm Hg). The OWLF group had significantly greater WC (81.8±9.6 cm) than the NWHF (58.1±6.0 cm) and OWLF group (106±10 mm Hg vs. 96±8 mm Hg). The OWLF group had significantly greater WC (81.8±9.6 cm) than the NWHF (58.1±6.0 cm) and OWLF group (106±10 mm Hg vs. 96±8 mm Hg).

CONCLUSIONS: OW/OB children who are unfit have poorer CVR risk profiles compared to children who are NW or OW/OB. Findings suggest that fitness status may be a more important determinant of child cardiovascular health than weight status.

860 Board #176
June 1, 3:30 PM - 5:00 PM
Routine Physical Activity and Associations with Diurnal Cortisol and Stress Indicators among Children with Maltreatment
Kari J. Hilgendorf, Judy Knuth. Washington State University, Spokane, WA.
Email: kihilgendorf@wsu.edu
(No relationships reported)

Child maltreatment is a complex concern worldwide (800,000 cases and 1700 deaths identified annually in the United States) with pervasive long- and short-term mental, physical and physiological damage, emphasizing the need for effective treatment strategies. Interdisciplinary action is needed to elicit paramount therapies for the care of this population. Exercise is a promising therapeutic tool for these children as it is associated with amelioration of both long- and short-term sequelae attributed to maltreatment. PURPOSE: To examine the impact of aerobic exercise on biochemical and behavioral markers of stress in children with chronic maltreatment. METHODS: Diurnal salivary cortisol was measured in a sample of youth with maltreatment (7 - 16 years, N=37) throughout a 12 week summer physical activity program. Oral swabs and unusual events were obtained in repeated measures (pre-, mid-, post-intervention and follow-up), quasi-experimental design. Fitness pre- and post-intervention were compared via paired sample t-test. Qualitative behavior interviews were conducted post-program. Independent alterations in peak, evening, and daily decline values of cortisol were examined with Repeated Measures ANOVA and post-hoc Bonferroni. RESULTS: Participation in the physical activity program was associated with increased cardiovascular fitness (34 ± 1.6 vs 37 ± 1.9 mLO2/kg/min, p = 0.047) and overall altered diurnal cortisol peak for F [3, 8] 3.265, p = 0.080, daily decline F [3, 6] 5.473, p = 0.037) and evening F [3, 18] 3.672, p = 0.032). When comparing mid- to pre-intervention or follow-up, pairwise comparisons indicated reduced peak (-0.45 [mid] vs -0.30 [follow-up] log μg/dL, p = 0.03), daily decline (0.37 [pre] vs 0.24 [mid] μg/dL, p = 0.05) and increased evening (-1.0 [mid] vs -1.2 [follow-up] log μg/ dL, p = 0.06) cortisol during participation. CONCLUSIONS: Regular participation in exercise is associated with altered diurnal cortisol and anecdotal evidence for improved behavior among children with chronic maltreatment. The direction of the association between exercise and diurnal cortisol is dependent on time of day and sustained exercise. Findings warrant further research to determine therapeutic benefits of physical activity and corresponding diurnal cortisol shifts among youth with maltreatment.

861 Board #177
June 1, 3:30 PM - 5:00 PM
Adverse Reactions During Procedural Sedation in Children with Long Bone Fractures - Does BMI Matter?
Diane G. Hirsch, John Tyo, Brian Wrotink.1 Women and Children’s Hospital of Buffalo/University at Buffalo, Buffalo, NY. 2Women and Children’s Hospital of Buffalo, Buffalo, NY. (Sponsor: Dilip Patel, FACSM)
(No relationships reported)

Procedural sedation is commonly used in emergency departments to facilitate reduction of pediatric long bone fractures. There is little published data that compares the risk of procedural sedation in obese vs healthy weight children despite childhood obesity being a serious problem in the United States. The body mass index (BMI) is used to define overweight and obese in adults. However in children, BMI criteria is used to define overweight and obese in adults. However in children, BMI criteria for overweight and obese vary by age and gender and thus are defined in percentiles. The CDC defines four BMI categories in children: (1) underweight is less than the fifth percentile, (2) healthy weight is the fifth percentile to less than the eighty-fifth percentile, (3) overweight is eighty-fifth percentile to less than the ninety-fifth percentile, and (4) obese is greater than or equal to the ninety-fifth percentile. There is a suggestion in the limited published data that obesity in children is associated with a greater incidence of complications such as hypoxia. PURPOSE: The purpose of the study was to determine if obese children as compared with healthy weight children ages 2-17 years have a greater incidence of complications during procedural sedation for a long bone fracture. METHODS: The study was a retrospective chart review of patients age 2-17 years admitted to Women and Children’s Hospital of Buffalo Emergency Department during the time period of 2012-2014 with a diagnosis of a long bone fracture. Statistical
analysis of the association between BMI and desaturation as well as sedation medication adverse effects were evaluated. We defined desaturations as less than or equal to 90% or pulse oximetry.

RESULTS: Analyses were based on a total of 547 charts. Our findings indicate that the prevalence of desaturation with procedural sedation in children with obesity (10.16%) was approximately twice that of children with healthy weight (5.40%), p = 0.071. The desaturation for children with overweight was 7.69%.

CONCLUSION: Although not statistically significant, when evaluating children for procedural sedation physicians should consider children’s BMI and recognize that obese children may be at greater risk of respiratory compromise.

A low prevalence of physical activity is found in all age groups worldwide. Although physical activity is associated with many health outcomes, the relationship with lung function remains poorly elucidated in the literature.

PURPOSE: To evaluate the association between physical activity from 11 to 15 years of age with lung function gain from 15 to 18 years of age among adolescents belonging to a birth cohort in Brazil.

METHODS: 5,249 live births in Pelotas (Brazil) participated in the 1993 Pelotas Birth Cohort Study. At ages 11, 15, and 18 years, all participants were sought for follow-up (follow-up rates: 87.5%, 85.7% and 81.3%, respectively). Physical activity (leisure-time and total) was self-reported at 11 and 15 years, while spirometric tests were performed at 15 and 18 years. Outcome variables were gains in forced expiratory volume in one second, forced vital capacity, and peak expiratory flow expressed as z-scores. crude and adjusted linear regressions, stratified by sex, were performed.

RESULTS: In adjusted analyses active boys at 11 and 15 years in leisure-time and total physical activity had higher gains in forced expiratory volume in one second (β = 0.146; 95% CI: 0.054;0.237, β = 0.113; 95% CI: 0.016;0.210), and peak expiratory flow (β = 0.202; 95% CI:0.066;0.338, β = 0.149; 95% CI:0.005;0.293) than inactive ones. Vigorous-intensity physical activity in boys was associated with gains in forced expiratory volume in one second (β = 0.136; 95% CI:0.016;0.257) and for vital capacity (β = 0.112; 95% CI:0.015;0.209). Furthermore, the analyses of the association between active periods and lung function gain showed a significant trend for boys, with a dose-response effect. It was also observed that boys who were only active at 11 age years had greater lung function gains than the never-active boys. On the other hand, boys who were only active at 15 years did not have higher gains in lung function than the inactive boys. No significant associations were found for girls.

CONCLUSIONS: Physical activity in early adolescence is associated with lung function gain by the end of adolescence among boys.

Recent literature emphasizes a positive relationship between physical activity and physical fitness with executive function and academic performance. However, data on the association of muscle fitness with executive function and academic performance is scarce. Purpose: To examine the association of muscle fitness with executive function and academic performance in 10-year-old children. Methods: We included 1,069 children (mean (SD) age 10.2 (0.9) years, 48% girls from 58 schools in Sogn and Fjordane county, Norway. Data were collected from August to October 2014. Independent variables were muscle fitness index (standing broad jump and handgrip strength) as well as sex and parental education. Dependent variables were executive function (sumscore of inhibition, flexibility and working memory) and academic performance (mean of grades in Reading, English and Math). We used multiple regression models to examine the association of muscle fitness with executive function and academic performance after controlling for potential confounders. Moreover, we used logistic regression models to estimate the odds ratios (OR) for being in the upper quartile of executive function and academic performance across quartiles of muscle fitness. Results: Muscle fitness index was associated with executive function (β = 0.102, P = 0.001) and academic performance (β = 0.067, P = 0.031) after adjustment for sex and parental education. Moreover the OR for scoring in the top quartile of executive function were 2.22 (95% confidence interval CI 1.47 - 3.35) for those in the upper quartile compared with those in the lowest quartile of muscle fitness. Similarly, OR for scoring in the top quartile of academic performance were 1.55 (95% CI 1.04 - 2.32) for those in the upper quartile compared with those in the lowest quartile of muscle fitness. Conclusions: These findings show that muscle fitness is associated with executive function and academic performance in children. Physical activities that improves muscle fitness should be considered as part in the overall strategy for improving executive function and academic performance in schools.
Supported by FCT Grant SFRH/BD/75276/2010.

regardless of the nature (commercial or natural food) of the beverage.

CONCLUSIONS

A time × beverage interaction-effect was detected (p=0.038), with MS presenting the lowest values detected 48 h after exercise (T5<T1 and T2; p<0.05).

A time main-effect (p=0.002) was also observed for β-hydroxybutyrate (0.05; 0.05; 0.05; 0.04; 0.04 mmol/L), with the lowest values detected 48 h after exercise (T5<T1 and T2; p<0.05).

was detected for LDL (p=0.033), with MS trial showing higher values. A time main-effect (p=0.033) was also observed for plasma glucose (p=0.033), with the lowest values detected 48 h after exercise (T5<T1 and T2; p<0.05).

During the 2 h after the protocol participants ingested 0.8 g carbohydrate/kg/h and 0.26 g protein/kg/h of CS or MS (skimmed milk, strawberries and banana). Blood samples were collected before (T1), immediately (T2), 2 h (T3), 24 h (T4), and 48 h (T5) after protocol. Linear mixed models were used to analyse differences in the biomarkers over time and between beverages. Data are presented as mean±SD or median.

RESULTS: There were no significant differences among the beverages.

Anthocyanin, present in blackcurrant, induces vasorelaxation in rat aortic rings. Seven day intake of New Zealand blackcurrant (NZBC) powder (6 g/d containing ~139 mg/d anthocyanins) in endurance athletes had an effect on resting cardiovascular function (e.g. decreased peripheral resistance). Dose effects of NZBC on resting cardiovascular function are not known.

PURPOSE: To examine the dose-response relationship of NZBC extract on resting cardiovascular function in trained cyclists. METHODS: Fifteen males (mean±SD; age: 38±12 years, height: 178±5 cm, body mass: 76±10 kg, VO2max: 56±8 L/kg/min, maximum minute power: 378±55 W) completed four 20-minute resting protocols in supine position with recording of cardiovascular function (Portapres® Model 2). A counterbalanced Latin-square design assigned the order of four experimental visits (0, 300 (i.e. one capsule), 600 or 900 mg/d NZBC extract). Supplementation (CurraNZ, Health Currency Ltd, UK; each capsule contains 35% spray-dried anthocyanin concentrate) was provided for 7-days with 14-day washout periods. Cardiovascular function at rest for all parameters were averaged over 10 consecutive beats, with the lowest systolic blood pressure and associated measures recorded and then doses were compared with a one-way ANOVA and Bonferroni post hoc testing. Significance accepted at p<0.05. RESULTS: There was no effect on systolic and diastolic blood pressure and heart rate. There was a difference between doses for stroke volume (0: 70±8; 300: 66±15; 600: 76±12; 900: 82±11 mL) and cardiac output (0: 4.1±0.9; 300: 4.4±0.9; 600: 4.6±0.9; 900: 5.1±1.2 L/min) and total peripheral resistance (TPR) (0: 22.6±8.1; 100: 30.4±6.0; 600: 18.2±6.9; 900: 17.5±7.3 mmHg/L/min). Increases of 17.7% for stroke volume (0 vs. 900), 15.3% and 27.5% for cardiac output (300 vs 900 and 0 vs. 900 mg/d, respectively) and a reduction of 20.2% for TPR (0 vs. 900) were observed. CONCLUSION: Intake of New Zealand blackcurrant extract for 7-days demonstrated a dose-response effect on resting cardiovascular function. The effect on New Zealand blackcurrant extract on resting cardiovascular function may support the recovery of endurance athletes. CurraNZ was provided by Health Currency Ltd (UK), Blackcurrants New Zealand Inc (NZ) provided funding for conference attendance.

CONCLUSIONS: Similar outcomes were found for both beverages in terms of metabolite recovery. We suggest that similar recovery processes can be obtained regardless of the nature (commercial or natural food) of the beverage.

Supported by FCT Grant SFRH/BD/75276/2010.

test performance.

METHODS: Ten male athletes (21.7±3.4 yrs, 73.3±4.5 kg) completed 2 trials of a commercial Or Homemade Beverage Following An Exhaustive Eccentric Protocol

Mónica Sousa1, João Brito2, Denisa Mendonça3, João Tiago Guimarães1, Vitor Hugo Teixeira4, José Soares3, ‘Centro de Investigação, Formação, Intervenção e Inovação em Desporto (CIFID) [Centre of Research, Education, Innovation and Intervention in Sport], Faculdade de Desporto [Faculty of Sport], Universidade do Porto [University of Porto], Porto, Portugal. 1Portuguese Football Federation, Lisbon, Portugal. 2Instituto de Ciências Biomédicas Abel Salazar (ICBAS) [Institute for the Biomedical Sciences Abel Salazar], Universidade do Porto, Instituto de Saúde Pública (ISPUP) [Institute of Public Health], Universidade do Porto, Portugal. 3ISPUP, Faculdade de Medicina [Faculty of Medicine], Universidade do Porto; Centro Hospitalar de São João [São João Hospital Center], Porto, Portugal. 4Faculdade de Ciências da Nutrição e Alimentação [Faculty of Nutrition and Food Sciences], Universidade do Porto, Centro de Investigação em Atividade Física, Saúde e Lazer (CHAFEL) [Research Centre on Physical Activity Health and Leisure], Porto, Portugal.

Email: monicavcsousa@gmail.com (No relationships reported)

PURPOSE: To examine the effect of a commercial (CS) and a homemade (MS) recovery beverages with similar nutritional content on metabolic markers.

METHODS: Nine male athletes (21.08±2.72 yrs, 77.51±6.34 kg) completed 2 trials of a unilaterial exhaustive eccentric exercise protocol on an isokinetic device comprising CON/ECC knee extension/flexion bouts at 60°/s. The protocol comprised 3 bouts of 100 reps with 200 sec rest intervals between sets, with n rps in the 3rd set until the torque of 3 consecutive reps fell <25% of the ECC peak torque of the quadriceps. The protocol consisted of running at 8 mph and 20% incline until volitional fatigue. GI tolerance of Commercial Or Homemade Beverage Following An Exhaustive Eccentric Protocol

Mónica Sousa1, João Brito2, Denisa Mendonça3, João Tiago Guimarães1, Vitor Hugo Teixeira4, José Soares3, ‘Centro de Investigação, Formação, Intervenção e Inovação em Desporto (CIFID) [Centre of Research, Education, Innovation and Intervention in Sport], Faculdade de Desporto [Faculty of Sport], Universidade do Porto [University of Porto], Porto, Portugal. 1Portuguese Football Federation, Lisbon, Portugal. 2Instituto de Ciências Biomédicas Abel Salazar (ICBAS) [Institute for the Biomedical Sciences Abel Salazar], Universidade do Porto, Instituto de Saúde Pública (ISPUP) [Institute of Public Health], Universidade do Porto, Portugal. 1Portuguese Football Federation, Lisbon, Portugal. 2Instituto de Ciências Biomédicas Abel Salazar (ICBAS) [Institute for the Biomedical Sciences Abel Salazar], Universidade do Porto, Instituto de Saúde Pública (ISPUP) [Institute of Public Health], Universidade do Porto, Portugal. 3ISPUP, Faculdade de Medicina [Faculty of Medicine], Universidade do Porto; Centro Hospitalar de São João [São João Hospital Center], Porto, Portugal. 4Faculdade de Ciências da Nutrição e Alimentação [Faculty of Nutrition and Food Sciences], Universidade do Porto, Centro de Investigação em Atividade Física, Saúde e Lazer (CHAFEL) [Research Centre on Physical Activity Health and Leisure], Porto, Portugal.

Email: monicavcsousa@gmail.com (No relationships reported)

PURPOSE: To compare the effect of a commercial (CS) and a homemade (MS) recovery beverages with similar nutritional content on metabolic markers.

METHODS: Ten male athletes (21.7±3.4 yrs, 73.3±4.5 kg) completed 2 trials of a unilateral exhaustive eccentric exercise protocol on an isokinetic device comprising CON/ECC knee extension/flexion bouts at 60°/s. The protocol comprised 3 bouts of 100 reps with 200 sec rest intervals between sets, with n rps in the 3rd set until the torque of 3 consecutive reps fell <25% of the ECC peak torque of the quadriceps. During the 2 h after the protocol participants ingested 0.8 g carbohydrate/kg/h and 0.26 g protein/kg/h of CS or MS (skimmed milk, strawberries and banana). Blood samples were collected before (T1), immediately (T2), 2 h (T3), 24 h (T4), and 48 h (T5) after protocol. Linear mixed models were used to analyse differences in the biomarkers over time and between beverages. Data are presented as mean±SD or median.

RESULTS: There were no significant differences among the beverages.

Coconut water (CW) is a new sports beverage on the market, appealing to consumers who are seeking a more natural alternative to a traditional carbohydrate-containing (CHO) sports beverage. CW contains five electrolytes as compared to a CHO beverage which typically contains two or three. Little research has been completed in testing the effectiveness of Coconut Water on Treadmill Anaerobic Test Performance Rayanne K. Nguyen, Judith M. Lukaszk, Josh P. Alis, Amanda J. Salacinski, David A. Walker, Josephine Umoren. Northern Illinois University, Dekalb, IL. (Sponsor: Jeffrey A. Potteiger, FACSM)

Coconut water (CW) is a new sports beverage on the market, appealing to consumers who are seeking a more natural alternative to a traditional carbohydrate-containing (CHO) sports beverage. CW contains five electrolytes as compared to a CHO beverage which typically contains two or three. Little research has been completed in testing the effectiveness of Coconut Water on Treadmill Anaerobic Test Performance Rayanne K. Nguyen, Judith M. Lukaszk, Josh P. Alis, Amanda J. Salacinski, David A. Walker, Josephine Umoren. Northern Illinois University, Dekalb, IL. (Sponsor: Jeffrey A. Potteiger, FACSM)

Coconut water (CW) is a new sports beverage on the market, appealing to consumers who are seeking a more natural alternative to a traditional carbohydrate-containing (CHO) sports beverage. CW contains five electrolytes as compared to a CHO beverage which typically contains two or three. Little research has been completed in testing the effectiveness of Coconut Water on Treadmill Anaerobic Test Performance Rayanne K. Nguyen, Judith M. Lukaszk, Josh P. Alis, Amanda J. Salacinski, David A. Walker, Josephine Umoren. Northern Illinois University, Dekalb, IL. (Sponsor: Jeffrey A. Potteiger, FACSM)
CONCLUSION: Participants performed similarly during the CW, water, and CHO trials in terms of TAT time. CW can be considered as a potential replacement for a CHO beverage with additional research needed to continue to examine CW as an ergogenic aid.

<table>
<thead>
<tr>
<th>Board #184</th>
<th>June 1, 2:00 PM - 3:30 PM Effects Of An Amaranth-based Beverage On Cycling Endurance Performance</th>
<th>868</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever Espino-Gonzáleza, María J. Muñoz-Daw, Juan M. Rivera-Sosa, Lourdes De la Torre-Díaz, Gabriel Cano, Juan C. De Lara-Gallegos</td>
<td>University of Chihuahua, Chihuahua, Mexico.</td>
<td>-</td>
</tr>
<tr>
<td>Cycling Bicycle Laboratory CicloLab, Chihuahua, Mexico. Email: <a href="mailto:ever1pm.esp@hotmail.com">ever1pm.esp@hotmail.com</a></td>
<td>(No relationships reported)</td>
<td>-</td>
</tr>
</tbody>
</table>

Carbohydrate-protein (CHO-P) ingestion during exercise has been shown to improve trial performance, and produce lower body weight losses induced by dehydration through exercise.

Amaranth contains carbohydrate and protein. Its balance of essential amino acids is higher than that of many vegetable proteins. On an ideal protein value of 100, amaranth has 75. Based on the above, amaranth can be an option to create a CHO-P beverage.

PURPOSE: The aim of this study was to compare the effects of an amaranth-based beverage and a commercially carbohydrate-alone beverage on endurance performance in trained cyclists.

METHODS: In a randomized, counterbalanced, crossover design, five trained men (weight: 77.8±9.3 kg; relative power: 3.72±0.75 Watts/kg) and one woman (weight: 54.7 kg; relative power: 2.73 Watts/kg) performed two trials separated by seven days, each trial comprised two time trials, one of 32.20 km and another of 5 km. Participants consumed either an amaranth-based beverage (CHO-P: 10% and 1.5% concentrations) or a commercially carbohydrate-alone beverage (CHO: 6%). Changes in hematocrit and body weight, rating of perceived exertion, and average power were assessed throughout both trials.

RESULTS: 32.2-km time trial performance was enhanced with CHO-P (54.3±4.1 min) compared to CHO (55.6±4.8 min), (p<0.05). However, no other variable measured in this study was significantly different between treatments.

CONCLUSIONS: Compared to CHO, ingestion of CHO-P during exercise demonstrated an ergogenic effect on cycling time trial performance. Further research is necessary to determine whether these results were the result of higher total caloric content of the CHO-P beverage or due to specific protein mechanisms of the amaranth.

<table>
<thead>
<tr>
<th>Performance differences between treatments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AP = Average power, T = Time, RPE = Rating of perceived exertion</td>
<td>*Significant difference between treatments (p &lt; 0.05)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Watts (min)</th>
<th>T 32.20 km</th>
<th>T 5 km</th>
<th>RPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHO beverage</td>
<td>230±34±33</td>
<td>55±6±8</td>
<td>8.4±0.6</td>
</tr>
<tr>
<td>CHO-P beverage</td>
<td>232±35±41</td>
<td>54.3±8</td>
<td>8.0±0.9</td>
</tr>
<tr>
<td>p</td>
<td>0.52</td>
<td>0.05*</td>
<td>0.06</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**: Lactobacillus plantarum TKW10 supplementation improves exercise performance and affects the fecal microbiota in mice.

**PURPOSE**: Anti-inflammatory and antioxidant effects of tart cherry juice accelerate exercise recovery (Bell 2015). These effects likely yield additional health benefits. The purpose of this study was to examine the effect of regular consumption of tart cherry juice on exercise performance, intensity and duration of migraine headaches in a single patient with a 4-year history of migraines. The study rationale was threefold: (1) migraineurs have elevated c-reactive protein (CRP) and nitric oxide (NO) (Lippi 2014; van der Kuy 2014); (2) cherries can reduce CRP and NO (Kelley 2006); (3) tart cherry anthocyanin bioavailability is high in brain tissue (Kirakosyan 2015).

**METHODS**: The 24 yo female patient had a 4-year history of migraine with aura, sensory (pins-and-needles) and visual disturbance (Alice in Wonderland). She had a 4-year history of migraine headache during the menstrual cycle when the patient was taking cherry juice but not during either menstrual cycle when the patient was taking cherry juice.

**RESULTS**: When taking tart cherry juice migraine frequency and duration were reduced by 65% and 78%, respectively. Medication use was reduced by 91%. Migraines occurred during 3 of 4 menstrual cycles when the patient was not taking cherry juice, but during neither menstrual cycle when the patient was taking cherry juice.

**PURPOSE**: To determine if sub-acute curcumin supplementation between repeated downhill runs alters human adaptation to exercise induced stress and muscle damage considering cardiovascular and muscular variables.

**METHODS**: Twenty-one (11m/10f) recreationally active volunteers (24±16.2 y, 48.9±7.6 mT/kg/min) completed 2 downhill runs (60% VO2max, -12 grade). At baseline, then 24h, 48h, and 72h post exercise, measures of muscle damage (CK, DOMS) (1000p visual analogue scale), inflammation (hs-CRP, IL-6), blood pressure, vascular stiffness (PWV), and reactive hyperemia (RHI) were taken. The procedure was repeated for phase 2, using a double blind allocation for supplementation with either 200mg curcuminoids (CUR) or a placebo (PLA) for 7d.

**RESULTS**: DOMS and CK levels were elevated following downhill run 1 in both groups (p<0.001). At the initiation of run 2, CK levels had returned to baseline in the CUR group, but not the PLA (p<0.05). Following run 2 the CK response was blunted in the CUR group (304; 81 vs 197; 86, p=0.02), but not PLA, and peak DOMS was higher in the CUR group versus the control at 24h (PLA 170±129 CUR 322±188, p=0.046) and 48h (PLA 245±147 CUR 476±228, p=0.01). No significant alterations were observed for any cardiovascular indices including blood pressure, PWV, or RHI following run 1 or 2. Non-significant elevations (p>0.06) were observed for hs-CRP and IL-6, with no difference following supplementation.

**CONCLUSIONS**: The sub-acute use of curcumin for 7d after the first 72hr of recovery affected physiological response and perceived pain resulting from a repeated downhill run 1 week following the first. Decreases in creatine kinase (CK) suggest supplementation was effective for altering delayed recovery properties, as well as peak damage. DOMS revealed curcumin supplementation between bouts led to a greater level of discomfort following the second exposure. This may be indicative of alterations to the natural adaptive process and could have implications for repeated training.

**References**: 870 Board #186 June 1, 2:00 PM - 3:30 PM Effect of Curcumin Supplementation on Physiologic Response and Recovery Following Repeated Stressful Exercise

Jamie F. Burr, Matthew S. Boulter, Joshua T. Slysz, Kathy T. Gottschall-Pass, University of Georgia, Athens, ON, Canada. University of PEI, Charlottetown, PE, Canada. (No relationships reported)

Curcumin is a powerful anti-inflammatory, antioxidant and scavenger of reactive oxygen/nitrogen species. Curcumin supplementation has been suggested to acutely blunt delayed onset muscle soreness (DOMS), while reducing inflammation.

**PURPOSE**: To determine if sub-acute curcumin supplementation between repeated downhill runs alters human adaptation to exercise induced stress and muscle damage considering cardiovascular and muscular variables.

**METHODS**: Twenty-one (11m/10f) recreationally active volunteers (24±16.2 y, 48.9±7.6 mT/kg/min) completed 2 downhill runs (60% VO2max, -12 grade). At baseline, then 24h, 48h, and 72h post exercise, measures of muscle damage (CK, DOMS) (1000p visual analogue scale), inflammation (hs-CRP, IL-6), blood pressure, vascular stiffness (PWV), and reactive hyperemia (RHI) were taken. The procedure was repeated for phase 2, using a double blind allocation for supplementation with either 200mg curcuminoids (CUR) or a placebo (PLA) for 7d.

**RESULTS**: DOMS and CK levels were elevated following downhill run 1 in both groups (p<0.001). At the initiation of run 2, CK levels had returned to baseline in the CUR group, but not the PLA (p<0.05). Following run 2 the CK response was blunted in the CUR group (304; 81 vs 197; 86, p=0.02), but not PLA, and peak DOMS was higher in the CUR group versus the control at 24h (PLA 170±129 CUR 322±188, p=0.046) and 48h (PLA 245±147 CUR 476±228, p=0.01). No significant alterations were observed for any cardiovascular indices including blood pressure, PWV, or RHI following run 1 or 2. Non-significant elevations (p>0.06) were observed for hs-CRP and IL-6, with no difference following supplementation.

**CONCLUSIONS**: The sub-acute use of curcumin for 7d after the first 72hr of recovery affected physiological response and perceived pain resulting from a repeated downhill run 1 week following the first. Decreases in creatine kinase (CK) suggest supplementation was effective for altering delayed recovery properties, as well as peak damage. DOMS revealed curcumin supplementation between bouts led to a greater level of discomfort following the second exposure. This may be indicative of alterations to the natural adaptive process and could have implications for repeated training.
Peppermint oil has traditionally been used for its analgesic, anti-inflammatory, antispasmodic, antioxidant, and vasoconstrictor effects. Evidence relating to the use of peppermint oil as an ergogenic aid is limited with some studies demonstrating that supplementation has significant effects on exercise performance and only one study to date examining the effect of peppermint oil on strength. Purpose: The aim of this study was to investigate the use of peppermint oil as an ergogenic aid for strength performance.

Methods: Resistance trained men (n = 10) were randomized in a crossover design with either peppermint oil or placebo. Following a familiarization week and appropriate warm-up exercises were performed on a total of 10 training sessions. 15 mins before training session subjects were asked to consume the test supplement (50µl pure peppermint oil in 500 mL water) or the placebo (50µl peppermint flavoring in 500 mL water).

Results: The results from this study indicated that peppermint oil significantly increased strength performance when compared to placebo (p<0.05). Lower body strength measured using the 3RM bench press significantly increased from 122 ±22 to 129 ±26 Kg in response to peppermint oil (t(9)=−3.354, p<0.008). Upper body strength measured using the 3RM bench press significantly increased from 99 ±21 to 112 ±27 Kg in response to peppermint oil (t(9)=−3.754, p<0.005).

Conclusion: In conclusion the results from this suggests a small but significant ergogenic effect of peppermint oil in resistance trained men.

Consumption of a carbohydrate (CHO) beverage during prolonged exercise has been shown to maintain plasma glucose levels. Coconut water is a new sport beverage on the market which contains more electrolytes as well as fewer preservatives than the traditional carbohydrate-containing (CHO) sport beverages, providing athletes with a healthier option. Purpose: To examine the effects of a coconut electrolyte beverage (CW), water (W), and a CHO beverage on blood glucose and lactate levels. METHODS: Twelve physically active, healthy male runners aged 18-45 (No relationships reported) with a healthier option. PURPOSE: To examine the effects of a coconut electrolyte beverage during prolonged exercise has been previously demonstrated. The prevalence of GE (and whether PRO strategies minimise gastrointestinal (GI) symptoms) relating to multi-day ultra-marathons is less known. Understanding if nutritional periodization strategies confer similar GI benefits also warrants investigation.

PURPOSE: To assess the impact of probiotic supplementation and caloric periodization prior to an extreme ultra-marathon on GI symptoms and race performance.

METHODS: Thirty-eight healthy participants were recruited from entrants of the 2015 Marathon Des Sables (age: 42±9yrs; weight: 77.7±10.3kg; VO2max: 52.58±8.66ml kg⁻¹min⁻¹), and randomly assigned to either: PRO (100mg L. acidophilus); CP (caloric periodization of 500kcal above habitual intake on alternate days) or control (CON) for 12 weeks pre-race. Plasma lipopolysaccharides (LPS) via Limulus Amebocyte Lysate chromogenic endotoxin quantification were determined at baseline, pre and post race. Participants graded duration and severity of GI symptoms through daily questionnaires. Performance times were obtained from actual race timing. Presented as mean±SE.

RESULTS: Race times (hrs:mins) were 41:28±2:31, 45:12±2:05 and 50:43 ±4:38 for PRO, CP and CON respectively (p<0.05). Overall LPS significantly increased from baseline (10.08±0.53mg ml⁻¹) to pre-race (13.12±0.74mg ml⁻¹; p<0.001). Delta LPS pre-race was not different between groups (PRO: 2.94±1.11 pg.ml⁻¹; CP: 3.71±1.28 pg.ml⁻¹; CON: 2.32±1.69 pg.ml⁻¹; p>0.05). Similarly, delta LPS post-race was not different, despite greater reductions in both intervention groups (PRO: -4.57±1.93pg.ml⁻¹; CP: -6.95±1.34pg.ml⁻¹; CON: -2.16±2.1pg.ml⁻¹; p>0.05). GI symptom count favoured PRO (21.8%) compared with CP (41.6%) and CON (36.6%) respectively (p<0.001), although no differences for GI symptom index were reported between groups (p>0.05).

CONCLUSIONS: Moderate GE was evident in a UK cohort undertaking a multi-day ultra-marathon. PRO use did not significantly impact on GE prevalence, despite evidence of reduced GI symptoms. Caloric periodization appeared to favour GE recovery post-race, but was not deemed significant.

Intake: Successful utilization of a large-volume recovery drink in elite athletes can be technically difficult due to travel, training schedules, and athlete compliance. Tart cherry juice (TCJ) 1xoz twice daily in controlled research settings is beneficial, however a 1 oz TCJ concentrate (TCJc) taken only on training days has yet to be investigated. Purpose: To determine the feasibility of TCJc recovery “shock” in two Olympic volleyball athletes in preparation for a 2015 World Cup Tournament. Methods: Two males (average age 29yrs, 4.5yrs on team) took 1oz TCJc once daily after training for 3 wks prior to 2015 FIVB World Cup Volleyball Tournament. Average “lifting day” training (3 days/wk): 90min weightlifting session + 2-3hr court session. Non-lifting day training (2 days/wk): 3 hour court session + 1-2hr medium of specific training. Non-lifting days: 90min court + 2hr medium of specific training. Sleep quality, muscle soreness, modality & NSAID use were measured at baseline and daily for 3 weeks and weekly comparison analyzed with unpaired two-tailed t-tests. Results: Athletes took TCJc 14 times in 21 days (4.67 times/wk). There were no adverse events or side effects. Muscle soreness significantly reduced from baseline 3 (Likert scale 1-5) to 2.67, 1.4, 1.67 at wks 1, 2, and 3 respectively. Sleep hours increased from baseline 7.75h to 8.13, 7.75, 9.47 at wks 1, 2, and 3 but were not significant. Sleep quality was not adversely affected and there was no increase in modality/NSAID use. By author observation some athletes responded more than others (also noted by athlete self-report recovery logs). Athlete #1 reached PR on jump height during study, and received the Best in Position tournament award. Athlete #2 reported on multiple occasions how beneficial TCJc was, how much “it liked me and woke up with less soreness than expected when lifting heavy.” Conclusions: Intermittent TCJc improves muscle soreness and may improve sleep hours. It was well tolerated, had good athlete compliance, and by anecdotal reports may improve performance. Larger scale data
analysis currently underway and future studies considered in other Olympic sports. Twice-daily non-concentrate TCJ has shown improvements in the literature however this may not be feasible in the real world. An intermittent TCJ “shot” appears to be both practical and beneficial in athletes.

Board #192 June 1, 2:00 PM - 3:30 PM
Effect Of Rhodiola Mixture Supplementation And Exercise Training On Body Composition And Physical Activity In Rats
JUI-CHOU CHANG1, Yi-Hung Liao2, Chung-Yu Chen3, Ching-Hung LIN1. 1University of Taipei, Taipei, Taiwan. 2National Taipei University of Nursing and Health Science, Taipei, Taiwan. 3Yuan Ze University, Taoyuan, Taiwan. (Sponsor: Chia-Hua Kuo, FACSM)
Email: tu01002@gmail.com

PURPOSE: The purpose of this study was to investigate the effect of Rhodiola mixture supplementation and exercise training on body composition and physical activity in rats.

METHODS: Twenty-eight male Sprague-Dawley (SD) rats (200-250 g) were randomly assigned into 4 groups: Control (C, n=7), Rhodiola mixture (RC, n=7), Exercise training (E, n=7), and Exercise training + Rhodiola mixture (RCE, n=7). All groups were received either Rhodiola mixture (124 mg/kg) or distilled water, 5 days/ week, during the eight weeks intervention.

RESULTS: E and R groups significantly increase the percent of muscle mass compared to C and RC groups after 8 wk treatment. In addition, the percent of fat mass in E and RE groups also significantly lower than in C and RC groups. The serum testosterone level was observed significantly higher in E and RE groups than in C and RC groups, no significant difference was found in IGFBP-1 level in these four groups. Standing time in RC group was longer than in C and RC groups. Also, the number of times in RC group was significantly more than in the other 3 groups.

CONCLUSIONS: Eight weeks Rhodiola mixture supplementation and exercise training exhibits greater benefit in increasing percent of muscle mass and reducing percent of fat mass. These beneficial effect of Rhodiola mixture supplementation and exercise training might be associated with elevate the testosterone concentration during the eight weeks treatment.

Board #193 June 1, 2:00 PM - 3:30 PM
Lactobacillus Helveticus L10 Supplementation Modulates Immunity Parameters In Elite Athletes
Brizita Djordjevic1, Danica Marinovic1, Rajna Minic2, Nevena Ivanovic1, Nenad Dikic1, Marija Andjeljkovic2, Ivan Zivkovic2, Ivan Stankovic2. 1Faculty of pharmacy, Belgrade, Serbia. 2Institute of Virology, Vaccines and Sera, Tordak, Belgrade, Serbia. 3Anti-doping Agency of Serbia, Belgrade, Serbia.

PURPOSE: To investigate the effect of probiotic strain L. helveticus L10 can be used on immunity parameters in elite athletes.

METHODS: Twelve male Sprague-Dawley (SD) rats (200-250 g) were randomly assigned into 4 groups: Control (C, n=7), Probiotic group (P, n=7), Exercise training (E, n=7), and Exercise training + probiotic group (PPE, n=7). All groups were received either probiotic strain L. helveticus L10, 2 x 1010 CFU per day. The athletes filled in training diaries weekly, while the resting blood samples were collected at baseline and after 14 weeks of supplementation. Before and after the standing time in RC group was longer than in C and RC groups. Also, the number of times in RC group was significantly more than in the other 3 groups.

RESULTS: Probiotic group (P) significantly increased the body mass and percent of fat mass in all rats and significantly increased the body mass and percent of fat mass in all rats. Also, the percent of fat mass in E and PPE groups also significantly lower than in C and RC groups. The serum testosterone level was observed significantly higher in E and PPE groups than in C and RC groups, no significant difference was found in IGFBP-1 level in these four groups. Standing time in RC group was longer than in C and RC groups. Also, the number of times in RC group was significantly more than in the other 3 groups.

CONCLUSIONS: Eight weeks probiotic strain L. helveticus L10 can be beneficial nutritional supplement for immunity maintenance in elite athletes.

Board #194 June 1, 2:00 PM - 3:30 PM
The Effects Of Peppermint Oil on the Ventilatory Threshold of Endurance-Trained and Moderately Active Men
David F. Salas, Chi-An W. Emhoff. Saint Mary's College of California, Moraga, CA.

PURPOSE: To determine whether a single supplementation of one milliliter of peppermint oil would raise the ventilatory threshold in endurance-trained and moderately active men.

METHODS: Six male participants (3 endurance-trained, 3 moderately active) performed two maximal oxygen consumption (VO2max) tests on a cycle ergometer under randomized, single-blind trials of peppermint oil and placebo. For each exercise test, ventilatory threshold was determined through the ventilatory equivalent method (VE/VO2 and VE/VO2 vs. time), ventilation method (VE vs. time), and the VC02 vs. VO2 method to validate the point at which the ventilatory threshold occurred.

RESULTS: Supplementation of peppermint oil resulted in the ventilatory threshold occurring at a significantly higher percentage of VO2max compared to placebo (71 ± 2 % of VO2max vs. 65 ± 2 % of VO2max, p < 0.05). Additionally, VO2max values were not different between the two conditions.

CONCLUSIONS: Peppermint oil supplementation may have a positive impact on the ventilatory threshold of both endurance-trained and moderately active men by raising the percentage of VO2max at which the ventilatory threshold occurs. Though further research is needed to determine the mechanism, it appears that the cooling and the smooth muscle relaxing properties of peppermint oil may acutely contribute to improved aerobic performance.

Board #195 June 1, 2:00 PM - 3:30 PM
Jeffrey S. Martin1, Cody T. Haun2, Wesley C. Kephart3, Angela M. Holland4, Christopher B. Mobley5, Anna E. McCloskey2, Joshua J. Shake6, Michael D. Roberts7. 1Edward Via College of Osteopathic Medicine, Auburn, AL. 2Auburn University, Auburn, AL.

PURPOSE: To determine if a red spinach extract (RSE) rich in nitrate content improved exercise economy during graded exercise testing (GXT).

METHODS: Twelve (6 males, 6 females) recreationally trained subjects (aged 22.9 ± 2.0 years) participated in this double-blind, placebo (PBO) controlled, crossover study. For each visit (separated by > 1 week), subjects reported at least 2 h post-prandial, had followed a low-nitrate diet for at least 48 hours and abstained from exercise, caffeine and alcohol for at least 24 hours. Procedures included baseline venipuncture, supplementation with RSE (1000mg) or PBO, passive rest for 90 minutes, GXT (Bruce protocol) and immediately post-GXT venipuncture.

RESULTS: Humoral concentrations of nitrates were significantly elevated from baseline with RSE (from 10.2 ± 4.1 to 36.9 ± 8.2 μM; p<0.001) but not PBO (from 10.1 ± 2.4 to 9.1 ± 2.6μM). Neither GXT time-to-exhaustion nor VO2 peak were significantly different between conditions (9.5 ± 1.7 vs. 9.2 ± 1.3 min and 40.8 ± 7.1 vs. 41.1 ± 7.6 mL/kg/min for RSE and PBO, respectively). However, the ventilatory threshold was significantly higher with RSE compared to placebo (71 ± 2 % of VO2max vs 65 ± 2 % of VO2max, p < 0.05). Additionally, VO2max values were not different between the two conditions.

CONCLUSIONS: Peppermint oil supplementation may have a positive impact on the ventilatory threshold of both endurance-trained and moderately active men by raising the percentage of VO2max at which the ventilatory threshold occurs. Though further research is needed to determine the mechanism, it appears that the cooling and the smooth muscle relaxing properties of peppermint oil may acutely contribute to improved aerobic performance.
Cinnamon supplementation has been touted as a ‘fat burner’ and metabolism booster yet there is no scientific research identifying the results of supplementation on body composition and fat oxidation (FOX) at rest or during exercise in healthy populations. This study looked at the effects of a 4-week cinnamon supplementation on body composition and FOX rates during rest and submaximal exercise in a treatment (T) and control (C) group. PURPOSE: To determine the effects of cinnamon supplementation on body composition and FOX rates within a healthy, normal population. METHODS: Thirteen volunteers completed a three-day dietary recall, dual energy x-ray absorptiometry (DXA) scan, resting metabolic rate (RMR) analysis and a graded exercise test (GXT) prior to random group assignment: (T=3M, 4F; 23.1 ± 3.2 yr) and (C=3M, 3F; 21.5 ± 3.3 yr). The T group ingested 3 grams per day of Cinnamonum Zeylanicum, in capsule form, for 4-weeks while the C group ingested 3 grams per day of placebo. FOX testing procedures were repeated after the 4-week treatment trial and then again after a 2-week washout post treatment. RESULTS: Body fat % (T=26.2 ± 5.27 vs. 26.0 ± 5.8%; C=27.8 ± 5.78 vs. 28.3 ± 5.8%), RMR (T=1895.6 ± 344.89 vs. 2111.6 ± 445.26 kcal; C=2103.1 ± 316.8 vs. 2368.6 ± 448.6 kcal), resting FOX (T=0.09 ± 0.042 vs. 0.07 ± 0.021 g/min; C=0.07 ± 0.029 vs. 0.06 ± 0.057 g/min), and submaximal exercise FOX (T=0.61 ± 0.169 vs. 0.58 ± 0.181 g/min; C=0.62 ± 0.182 vs. 0.59 ± 0.223 g/min) were not different post treatment (P>0.05). In addition, no significant differences were seen post 2-week washout in either group. Diet was similar at all time points for both groups. CONCLUSION: Cinnamon supplementation does not alter FOX rates or body composition measures after a 4-week supplementation period in normal healthy populations. Supported by a Georgia College Faculty Research Grant.

OUTCOME: Medicinal plants are widely used by traditional Brazilian communities for several purposes, including the performance improvement. There is a lack of studies that evaluate the pharmacological profile of Heteropterys tomentosa A. Juss., an aphisdiac and stimulant Brazilian plant. This study evaluated the acute and chronic toxicity of its extract (HEHt).

METHODS: On the first stage, 54 young male mice and 54 young female mice were submitted to acute toxicity evaluation (6/group) and received a single dose of HEHt: vehicle, 400 mg/kg; 1000 mg/kg; 2000 mg/kg. From that moment, the animals were criteriously observed. On the second stage, 24 female Wistar rats (6/group for each dose of HEHt: Vehicle, 50 mg/kg, 200 mg/kg or 1000 mg/kg) were subjected to the chronic toxicity test. After 30 days, the determination of serum uric acid, alkaline phosphatase, gamma-GT, Total cholesterol, triglycerides, albumin, total proteins, ALT, AST, urea, creatinine, globulin and glucose was performed. On the third stage, HEHt was subjected to in vitro cytotoxicity test on toxicity specific cells (CHO-K1) which received culture media (growth control) or HEHt. RESULTS: First stage: we noted that animals treated with vehicle or 400 mg/kg suffered no alterations, whereas the doses of 1000 mg/kg and 2000 mg/kg caused an increase in urination and evacuation, mainly within the first two hours, with subsequent mortality. At these same dosages, we observed increased cornal and joint reflex within the first hour, lasting for four hours in both sexes. There were no deaths in any doses. Second stage: there was alteration only in AST, being lower in the animals which received HEHt 1000mg/kg; there were no deaths in any of the tested doses. Third stage: the test showed no alteration of CHO-K1 cell viability by HEHt 24 and 72h after the treatments.

CONCLUSIONS: HEHt did not present acute or chronic toxicity as well as being non-cytotoxic on in vitro analysis. Furthermore, we suggest that the 1000mg/kg dose promoted hepatoprotection, which does not exclude the need of more specific studies to confirm this hypothesis. Thus, the intended fourth stage (physical performance; swimming exercise) can be performed, futurly, with no eminent risks to the animal’s health, which will allow us to verify their possible stimulating properties.

THE EFFECTS OF PRE-EXERCISE CORINTHIAN CURRANTS SUPPLEMENTATION ON ANTIOXIDANT RESPONSES Athanasios Z. Jamurtas1, Chariklia Deli2, Ioannis Fatouros2, Maria Selemekou3, Alexandros Papoutsis4, Yiannis Koutedakis5, Vaios Karathanos1
1Department of Physical Education and Sport Science, University of Thessaly, Greece; 2Kinesiology Department, Institute for Research and Technology Thessaly (IRETH), Center for Research and Technology – Hellas (CERTH), GREECE; 3Department of Biochemistry & Biotechnology, University of Thessaly, Greece; 4Department of Nutrition & Dietetics, Harokopio University, Athens, Greece

The use of nutritional supplements before and during a sporting event, especially of a prolonged nature, is very common among competitors and routinely advised by exercise professionals. Corinthian currants have a high carbohydrate content making them a potentially ideal carbohydrate source for prolonged exercise. However, their effectiveness as an ergogenic aid has never been studied. PURPOSE: The aim of the present study was to investigate the effectiveness of currants as an ergogenic aid during prolonged exercise. METHODS: Twelve (10 males, two females) healthy individuals (Body Weight: 75 ± 10 kg, Height: 172.8 ± 3.1 cm, VO2max: 45.4 ± 9.9 ml/kg/min) participated. Participants were asked to perform in random order one of the following three conditions: 1. Corinthian currants, 2. Glucose, 3. Water. In each condition, participants were asked to cycle for 90min at an intensity corresponding to 70-75% of their predetermined VO2max followed by an effort to exhaustion. Blood samples were collected before exercise, at 30, 60 and 90 min of exercise, at exhaustion and 1h post exercise. Blood was analysed for total antioxidant status (TAC), serum total antioxidant activity (SOD), Catalase (CAT), Superoxide dismutase (SOD), Reduced glutathione (GSH) levels. RESULTS: TAC was significantly (p<0.05) increased due to time in all three conditions without a significant interaction being observed. Furthermore, GSH was also significantly (p<0.05) increased due to time in all three conditions without a significant interaction being observed. Conclusions: These results indicate that pre-exercise supplementation with currants does not result in significant perturbations in the antioxidant system during and following an exhaustive aerobic exercise.

Panax ginseng has been widely used as a herbal medicine to improve health and physical stamina for centuries in East Asia and has recently become a popular supplement in Western countries. Little is known about the chronic effect of Korean ginseng drink (KGD) on fatigue recovery. PURPOSE: The purpose of the study was to investigate the effects of 7 days KGD supplementation on fatigue recovery. METHODS: The study used double-blind, placebo-controlled, crossover design. Twelve healthy adult males (age = 31 ± 6.86 yrs) were randomly assigned to either KGD or placebo trials. All subjects conducted the exercise consisted with 30 minutes cycling at 70-75% of VO2 max followed by 16 km time trial, with 30 minutes resting periods. After pre-test, subjects in both trials took 280 ml of KGD contained 5.88 mg of ginsenosides or placebo drink for 7 days. During the recovery, the blood sample was drawn for IL-6, myoglobin, and total antioxidant capacity immediately after time trial, as well as 2, 24, 48, and 72 hours. After 2 weeks of wash-out period, the subjects were crossed over into the opposite condition and performed the same protocol of chronic intake of KGD supplementation on blood samples was analyzed using repeated measures ANOVAs. An alpha of .05 was used, and the Greenhouse-Geisser (G-G) adjusted F and degrees of freedom were reported. RESULTS: The 7 days of KRG supplementation significantly reduced the serum myoglobin concentration across time in all three conditions without a significant interaction being observed. Furthermore, GSH was also significantly (p<0.05) increased due to time in all three conditions without a significant interaction being observed. Conclusions: These results indicate that pre-exercise supplementation with ginseng does not result in significant perturbations in the antioxidant system during and following an exhaustive aerobic exercise.
reduces serum myoglobin, which is considered as a reliable muscle damage indicator, during recovery period. The KGD supplement could be possible a ergogenic aid for recovery from fatigue.

Supported by Korea Food Research Institute Grant.

Ginseng is widely used for its promising healing and restorative properties as well as for its possible tonic effect in traditional medicine and has recently become a popular supplement in western countries. However, there are only a few studies investigated the acute effects of ginseng Supplementation on exercise performance. PURPOSE: The purpose of the study was to investigate the acute effect of ginseng supplementation (GS) on exercise performance, cognitive function, and fatigue. METHODS: This study is a double-blind, placebo-controlled crossover experiment. Twelve healthy adult males (age=31±6.86 years) were randomly assigned to either GS or placebo groups with 2 weeks wash-out period. The subjects took GS (280 ml containing 5.88 mg of ginsenosides) or placebo 90 min before exercising. The trials were consisted of 30 mins cycling exercise at 70-75% of VO2 max followed by 10 miles time trial with 30 mins resting periods. All subjects were tested for muscular power, strength, endurance, cognitive function, and fatigue. The total antioxidant capacity (TAC), myoglobin, and IL-6 concentration were measured at baseline, during, and after experimental trials. Repeated measures ANOVAs were used to examine the effect of acute intake of ginseng on dependent variables by GS and placebo trials. An alpha of .05 was used, and the Greenhouse-Geisser (G-G) adjusted F and degrees of freedom were reported. RESULTS: In a placebo trial, peak power and mean power levels were significantly decreased across time, F (1,47, 13.24) > 4.63, G-P = .039 and F (1,46, 13.13) > 5.31. G-P = .028 while no differences were found in a GS trial (G-G p = .166 and .162, respectively). In a placebo trial, average reaction time (ART) was significantly delayed across time, F (1,29, 11.63) > 10.81, G-P = .005, but in a GS trial, no difference in ART was found across time (G-G p = .051). There was a significant increase in TAC across time in a GS trial, F (1,42, 11.37) > 5.07, G-P = .035 while no difference was found in a placebo trial (G-G p = .326). No significant differences were observed in other variables from GS and ginseng trials (G-G p > .05). CONCLUSIONS: The GS shows positive effect on muscular power, reaction time, and TAC indicating prospective candidate for ergogenic aids. Supported by Korea Food Research Institute Grant.

Official Journal of the American College of Sports Medicine

Vol. 48  No. 5  Supplement  S191

WEDNESDAY, JUNE 1, 2016

884 Board #200  June 1, 2:00 PM - 3:30 PM  Acute Effects of Ginseng Supplementation on Exercise Performance, Cognitive Function, and Fatigue Recovery
Sukho Lee1, Hyun Chul Jung1, Nan Hee Lee1, Gina OK, Young Chan Kim1, Minsoo Kang, FACSM1, Texas A&M University-San Antonio, San Antonio, TX. 1Korea Food Research Institute, Songnam, Korea, Republic of. 1Middle Tennessee State University, Murfreesboro, TN.
Email: slee@tamu.tamus.edu

(No relationships reported)

885 Board #201  June 1, 2:00 PM - 3:30 PM  The Effect of Tart Cherry Concentrate on Oxidative Stress and Salivary Immunoglobulins Post- Exercise
David Bellar1, Kaitlyn Moody1, Greggyroy R. Davis1, Ellen L. Glickman, FACSM1. 1University of Louisiana at Lafayette, Lafayette, LA. 1Kent State University, Kent, OH. (Sponsor: Ellen L. Glickman, FACSM)
Email: davidbellar@mac.com

Reported Relationships: D. Bellar: Contracted Research - Including Principle Investigator; Cherry Capital Services Inc.

Aerobic exercise is known to increase oxidative stress and effect salivary IgA. Substances rich in antioxidants can reduce oxidative stress post-exercise, however; little is known regarding the effects on mucosal immunity. PURPOSE: The present study examined the effects of 7 days of tart cherry concentrate on slow component VO2 during vigorous exercise as well as salivary IgA and oxidative stress post-exercise. METHODS: The study was a single-blind repeated measures crossed-over design. The participants were 13 college age males (Age: 21±1±2 years, Height: 164.1±7.4 cm, Weight: 68.4±10.7 kg, BF%: 13.5±6.3, VO2 max: 39.8±3.4 ml*kg-1*min-1). Subjects then consumed 7 days of treatment (TCC or P) prior to returning to the lab for a 20 min exercise at 70% VO2 max. Saliva was collected pre and post exercise, and urine was captured for 2 hours post exercise. Salivary IgA was quantified, and the urine was analyzed for 80Hdg, 8-isoprostane and Creatinine via ELISA. RESULTS: For IgA (controlled for flow rate) repeated measures ANOVA did not reveal a significant difference (F=1.13, p=0.2989) main effect treatment (TCC vs P), or a significant interaction (F= 0.0412, P = 0.8411) effect for treatment by time (pre and post ex). Paired samples t-tests examining post exercise 80Hdg by treatment (controlled for Creatinine level) did not reveal as significant difference (TCC: 0.813±0.446 ng/ml, P: 0.758±0.631 ng/ml) by treatment (t=0.518, p=0.304). Analysis of 8-isoprostane (controlled for Creatinine) again did not reveal a significant difference (TCC: 469.43±575.86 pg/ml, P: 409.19±454.26 pg/ml) by treatment (t=0.051, p=0.480). A paired samples t-test comparing the slow component VO2 did reveal a difference (t=1.90, p=0.03) between TCC and placebo. TCC resulted in nearly a 5x reduction in slow component VO2 (TCC: 57.23±260.33 ml*min-1, P: 260.58±283.78 ml*min-1). CONCLUSION: Seven days of TCC was not effective in reducing post exercise oxidative stress, or enhancing IgA levels. However, the reduced slow component suggests potential for TCC as an ergogenic aid. Further research is needed to clarify the effect of TCC on exercise oxygen kinetics.

886 Board #202  June 1, 2:00 PM - 3:30 PM  Effect of Noni Fruit Pre-supplementation on Fatigue after Long-distance Running in Male Middled Age Athletes
Szu-Hsien Yu1, Yi-Jun Huang2, Chieh-Wen Hou1, Shih-Chang Cheng1, Shueh-I Lin1, Chia-Hua Kuo1, 1National Ilan University, Ilan, Taiwan. 1Soochow University, Taipei, Taiwan. 1University of Taipei, Taipei, Taiwan. (Sponsor: Chia-Hua Kuo, FACSM)
Email: meek168@hotmail.com

(No relationships reported)

PURPOSE: The present study was aimed to investigate the influence of noni fruit juice pre-supplementation on long-distance running-induced oxidative stress, inflammation, tissue damage and anaerobic/catabolic balance in middle aged long-distance runners. METHODS: In this randomized cross-over study, 10 male subjects (age=50.6 ± 3.0 years) were asked to complete an acute 3 hour endurance running at 85% of personal best marathon running speed. Subjects ingested either noni fruit juice (200 ml/day) or control (cranberry juice) for 7 days before the acute running. Subjects were taken blood samples for biochemical analysis before, immediately after, and 2 and 12 hours after exercise. Blood samples were analyzed for superoxide dismutase (SOD), malondialdehyde (MDA), interleukin 6 (IL-6), creatine kinase (CK), aspartate transaminase (AST), alanine transaminase (ALT), testosterone and cortisol. RESULTS: Exercise caused significantly increased in MDA, IL-6, CK, cortisol, and decreased in testosterone and testosterone/cortisol ratio (T/C). Before exercise, noni group had higher SOD activity than control group. However, MDA in noni group was higher, but IL-6, testosterone and T/C were lower compared to control group after exercise. CONCLUSIONS: In conclusion, relative to cranberry, Noni pre-supplementation causes an increase in circulating SOD activity but did not counter exercise-induced oxidative stress, muscle damage or catabolism.

887 Board #203  June 1, 2:00 PM - 3:30 PM  Using Seaweed As Supplement After Eccentric Muscle Contraction
Chi-Hong Lu1, Chien-Wen Hou1, Hsiao-Chuan Pai1, Yi-Ming Yeh1, Li-Ching Chou1, Ching-Hung Lin2, 1University of Taipei, Taipei, Taiwan. 2Hsin Sheng College of Medical and Management, Taoyuan, Taiwan. 1Ming-Chuan University, Taoyuan, Taiwan. 2Hsuan Ze University, Taoyuan, Taiwan. (Sponsor: Chia-Hua Kuo, FACSM)
(No relationships reported)

PURPOSE: The purpose of present study was aimed to investigate whether algae which was cultivated in deep ocean water supplementation could change the process of muscle recovery. METHODS: Eight healthy male adults were recruited in this cross-over trial. All participants were asked to complete an eccentric exercise challenge on biceps brachii (6 sets of 10 repetitions at 70% of 1 RM). An acute Algae supplementation was given immediately after eccentric exercise. Muscle blood flow, serum creatine kinase level, pain threshold and isokinetic muscle strength were measured at the time points of immediately, 24-hour and 48-hour after the eccentric exercise challenge. RESULTS: The data showed that an acute algae supplementation significantly increased the changes of total hemoglobin, oxyhemoglobin and deoxyhemoglobin 24-hour after eccentric exercise challenge (p<0.05). However, the pain threshold was decreased 24-hour after exercise (p<0.05). CONCLUSIONS: Our results imply that deep ocean water cultivated algae might cause muscle regeneration.
Whilst evidence of increased gastrointestinal endotoxemia (GE) has been previously demonstrated during single-day ultra-endurance events, less is known on the prevalence of GE following extreme ultra-endurance events such as the Marathon Des Sables (MDS). The potential benefit of probiotic formulas on gut integrity during ultra-endurance events also requires further investigation.

**METHODS:** Thirty-four healthy participants from the 2015 MDS UK cohort volunteered for a 12 week pre-race intervention and were randomly assigned to either: probiotic (PRO; 100mg-d-1 lacticobacillus acidophilus) (age 40 ±3 yrs., weight 79.9 ±2.0 kg, VO2max 4.2 ±0.1 L.min-1), probiotic with glutamine (PROGlut; 40mg-d-1 lacticobacillus acidophilus and 900mg-d-1L-glutamine) (age 39 ±2 yrs., weight 70.6 ±4.8 kg, VO2max 4.0 ±0.2 L.min-1) and control (CON) (age 42±3 yrs., weight 79.1 ±3.8 kg, VO2max 4.0 ±0.3 L.min-1). Plasma lipopolysaccharides (LPS) (via Limulus Amebocyte Lysate chromogenic endotoxin quantification) were assessed at weeks 0, 12, post-race and 7 days post-race. Performance data was collated from official timing chips. Data presented as mean ±SE.

**RESULTS:** Mild to moderate GE was prevalent in all groups at baseline (PRO 9.71 ±0.85 pg.ml-1, PROGlut 9.89 ±1.43 pg.ml-1, CON 9.60 ±0.57 pg.ml-1; p=0.05). Whilst LPS, post intervention, was lower in PROGlut there was no significance between groups (9.81 ±1.74 pg.ml-1 vs 12.80 ±0.93 pg.ml-1 (PRO) vs 11.72 ±0.8 pg.ml-1 (CON); p=0.05). LPS were evidently reduced 6hrs post-race, but not different between groups (9.81 ±1.74 pg.ml-1 vs 12.80 ±0.93 pg.ml-1 (PRO) vs 11.72 ±0.8 pg.ml-1 (CON); p=0.05). There were no significant condition*time and condition*category interactions. Significant condition*time interaction (p<.01) and time (p<.01) main effects on the endurance performance in untrained subjects. Second, we sought to investigate dose-response relationships of probiotics on performance in trained cyclists.

**METHODS:** Two different oral doses of calcium lactate (L120, 300 mg lactate ∙ kg bm-1 and L300, 600 mg lactate ∙ kg bm-1) were assessed immediately prior to consumption of the treatments (PreCon) and 70 min post consumption (PostCon). Immediately following PreCon, subjects performed the IPT consisting of 4, 1-min intervals at 100% of MPO, followed by a fifth effort at 100% MPO to exhaustion. Intervals were separated by 1-min of recovery at 25% of MPO.

**RESULTS:** Compared to PreCon, PostCon HCO3- increased in L120 by 10%, (P = 0.74). No significant change in HCO3- was seen following consumption of PL (-0.1%, P = 0.98). TTE in PL was 134 ± 30 and increased significantly in L120 (153 ± 25, P = 0.004) and in L300 (169 ± 37, P = 0.001) with no significant difference between L120 and L300 (P = 0.09).

**CONCLUSIONS:** Consumption of 120 or 300 mg lactate ∙ kg bm-1 increases blood HCO3- and improves exercise performance during high-intensity exercise bouts of approximately 120 - 180 s. However, consuming 300 mg lactate ∙ kg bm-1 provides no clear ergogenic effect when compared to consuming 120 mg lactate ∙ kg bm-1.

**PURPOSE:** The purpose of this study was to examine the acute effects of a weight loss supplement on endurance, heart rate, and respiratory exchange ratio (RER). METHODS: Thirty-one (athletic and non-athletic) male and female subjects (male=15, female=16), between the ages of 18 and 40, were familiarized with the study protocol and performed the Bruce protocol on the first day. The study utilized a randomized, double-blind, crossover, in which a subject would be given a placebo or supplement on two separate days. Each condition began with the subject reaching a hydration status at or below 1.010. Once the hydration levels were reached, the subject would receive an envelope, containing either supplement or placebo, to open and ingest 3 capsules. 30 minutes after the subject ingested the capsules, they would run on a treadmill, at 80% VO2 Max, until volitional fatigue. HR and RER were collected and monitored every three minutes during the running session. When the subject reached volitional fatigue, running time was recorded.

**RESULTS:** There were no significant condition*time and condition*category interactions, but there were significant condition (p=0.03) and time (p<0.01) main effects for RER. There were also significant condition (p=0.03) main effects on the endurance for non-athletic females. Significant condition*category interaction (p<0.01) and time main effects (p<0.01) were observed for HR.

**CONCLUSIONS:** The results showed that the weight loss supplement caused a significantly higher RER during the first 15 minutes of exercise. This may have been caused by the ingestion of caffeine resulting in vasconstriction of the blood vessels surrounding the adipose tissue, causing a decrease in fatty acid mobilization, and therefore eliciting an increase in glycogen use. The non-athletic females may have had a greater response, which could be due to the greater caffeine to body weight ratio when compared to males and a lower daily caffeine ingestion than their athletic counterparts.

**PURPOSE:** The purpose of this study was to examine the acute effects of a weight loss supplement on arterial compliance and blood pressure. METHODS: Thirty-one (athletic and non-athletic) male and female subjects (male=15, female=16), between the ages of 18 and 40, were familiarized with the study protocol and performed the Bruce protocol on the first day. The study utilized a randomized, double-blind, crossover in which a subject would be given a placebo or supplement on two separate days. Each condition began with the subject reaching a hydration status at or below 1.010. Once the hydration levels were reached, the subject would receive an envelope, containing either supplement or placebo, to open and ingest 3 capsules. 30 minutes after the subject ingested the capsules, they would run on a treadmill, at 80% VO2 Max, until volitional fatigue. HR and RER were collected and monitored every three minutes during the running session. When the subject reached volitional fatigue, running time was recorded.

**RESULTS:** There were no significant condition*time and condition*category interactions, but there were significant condition (p=0.03) and time (p<0.01) main effects for RER. There were also significant condition (p=0.03) main effects on the endurance for non-athletic females. Significant condition*category interaction (p<0.01) and time main effects (p<0.01) were observed for HR.

**CONCLUSIONS:** The results showed that the weight loss supplement caused a significantly higher RER during the first 15 minutes of exercise. This may have been caused by the ingestion of caffeine resulting in vasconstriction of the blood vessels surrounding the adipose tissue, causing a decrease in fatty acid mobilization, and therefore eliciting an increase in glycogen use. The non-athletic females may have had a greater response, which could be due to the greater caffeine to body weight ratio when compared to males and a lower daily caffeine ingestion than their athletic counterparts.

**PURPOSE:** The purpose of this study was to examine the acute effects of a weight loss supplement on arterial compliance and blood pressure. METHODS: Thirty-one (athletic and non-athletic) male and female subjects (male=15, female=16), between the ages of 18 and 40, were familiarized with the study protocol and performed the Bruce protocol on the first day. The study utilized a randomized, double-blind, crossover in which a subject would be given a placebo or supplement on two separate days. Each condition began with the subject reaching a hydration status at or below 1.010. Once the hydration levels were reached, the subject would receive an envelope, containing either supplement or placebo, to open and ingest 3 capsules. 30 minutes after the subject ingested the capsules, they would run on a treadmill, at 80% VO2 Max, until volitional fatigue. HR and RER were collected and monitored every three minutes during the running session. When the subject reached volitional fatigue, running time was recorded.

**RESULTS:** There were no significant condition*time and condition*category interactions, but there were significant condition (p=0.03) and time (p<0.01) main effects for RER. There were also significant condition (p=0.03) main effects on the endurance for non-athletic females. Significant condition*category interaction (p<0.01) and time main effects (p<0.01) were observed for HR.

**CONCLUSIONS:** The results showed that the weight loss supplement caused a significantly higher RER during the first 15 minutes of exercise. This may have been caused by the ingestion of caffeine resulting in vasconstriction of the blood vessels surrounding the adipose tissue, causing a decrease in fatty acid mobilization, and therefore eliciting an increase in glycogen use. The non-athletic females may have had a greater response, which could be due to the greater caffeine to body weight ratio when compared to males and a lower daily caffeine ingestion than their athletic counterparts.
Cerebral oxygenation (CeOx) increases during acute, moderate-intensity exercise, but may decrease at higher intensity. Reduction in CeOx may affect performance in sports requiring high-intensity interval training (HIIT) such as hockey shift work. Recently, personalized oxygen canisters (POC) containing 95% oxygen have become available and promoted as improving blood oxygenation, aerobic and anaerobic exercise performance. Whether the POC’s can maintain CeOx during the HIIT has not been studied.

**PURPOSE:** To determine if administration of 95% POC immediately prior to HIIT on a skating treadmill maintains CeOx in junior elite hockey players.

**METHODS:** Fourteen junior hockey players (14.6 ± 0.5 yr) were included in this study. The participants performed a physiological challenge (fatigue-inducing) test that consisted of 5 separate high-intensity intervals, each lasting 45 seconds, separated by 45 second rest periods. HIIT was performed on a skating treadmill (Harvarderg Corporation). The increased workload was up to 1 km/hr every minute after 30 min, and then the running speed was increased by 1 km/hr every minute after 90 sec. After exhaustion, fatigue onset time was also recorded.

**RESULTS:** Decreased blood lactate levels and RPE score and increased running time (34.8 ± 2.8 vs. 34.1 ± 1.8 min, p=0.288) were found by herbal cream use but the difference was not statistically significant between two cream treatments. There was significant decrease in muscle tone (before vs. after: 14.9 ± 1.3 vs. 14.3 ± 1.1 Hz, p<0.002), stiffness (247.7 ± 15.8 vs. 241.1 ± 23.9 N/m, p<0.003) and elasticity (1.42 ± 0.18 vs. 1.34 ± 0.20 D log, p<0.04) after applying herbal cream, however, no significant change between two creams was observed during and after exercise.

**CONCLUSION:** Findings from this study indicated that herbal cream may not be an ergogenic and anti-fatigue agent.

---

**RESULTS**

**Purpose:** Citrulline-malate (CM) increases exercise performance purportedly via increased nitric-oxide (NO) production. NO production decreases with age and the ability to augment production in aging individuals may provide competitive benefits for masters athletes (MA). The purpose of this investigation was to examine the acute effects of exogenous CM supplementation on lower body isokinetic (ISO) muscular strength and endurance in female MA tennis players. **METHODS:** Five MA females (50 ± 8 years) completed two randomized, double blind trials consuming CM (8 g dextrose + 8 g CM) and a placebo (8 g dextrose). Sixty minutes after consumption, participants performed 5 repetition (muscular strength) and 50 repetition (muscular endurance) ISO protocols. For each protocol, relative peak torque, work completed, fatigue index, average power, and average peak torque were evaluated. **RESULTS:** During 5 repetition ISO extension, subjects completed significantly more total work (p = .03) when consuming CM compared to placebo (762.0 ± 219.3 and 714.5 ± 162.3, respectively); however, no significant differences were observed for relative peak torque (p = .35), fatigue index (p = .71), average power (p = .09), or average peak torque (p = .13). When examining flexion during the 5 repetition ISO, no significant differences were observed between supplement trials. For extension of the 50 repetition ISO, total work completed (p = .02; 3717.0 ± 957.2 and 3472.7 ± 813.8), relative peak torque (p < .01; 129.6 ± 20.2 and 122.9 ± 17.9), average power (p = .02; 101.9 ± 23.3 and 95.5 ± 20.6), and average peak torque (p = .02; 53.9 ± 9.9 and 52.5 ± 9.6) were significantly greater when consuming CM compared to placebo, respectively. During 50 repetition ISO flexion, significant increases existed for total work completed (p = .04; 1605.4 ± 557.7 and 1369.6 ± 639.3), average power (p = .02; 43.2 ± 14.8 and 38.8 ± 15.9) and average peak torque (p = .03; 28.0 ± 7.3 and 25.7 ± 8.6) when consuming CM compared to placebo, respectively. **CONCLUSIONS:** CM supplementation appears to increase performance during lower-body ISO in female MA tennis players. These data indicate MA may improve performance via CM supplementation.

---

**Results**

**Purpose:** Both D-aspartate (DAA) and a commercial supplement containing zinc magnesium aspartate (ZMA) have been proposed to enhance anabolic hormonal profiles and reduce catabolism in human by two distinct mechanisms. However, whether the combination of DAA and ZMA has an additive effect on the release of the anabolic hormones is not known.

**METHODS:** Four groups of 10 rats each drank a solution containing 104 mg DAA (DASP), 77 mg ZMA, 104 mg DAA and 77 mg ZMA (MIX) or a placebo (PLA) for 28 days. Blood samples were collected from carotid arteries and analyzed for serum DAA, total testosterone (TT), free testosterone (FT), luteinizing hormone (LH), estradiol (ES), GnRH, D-aspartate oxidase (DDO), IGF-1, growth hormone (GH) and cortisol. DAA accumulation was determined in the pituitary, the pineal, the adrenal, the thyroid, the testis. Data were analyzed using independent-samples t tests.

**RESULTS**

Serum testosterone (TT), total testosterone (TT), free testosterone (FT), luteinizing hormone (LH), estradiol (ES), GnRH, D-aspartate oxidase (DDO), IGF-1, growth hormone (GH) and cortisol. DAA accumulation was determined in the pituitary, the pineal, the adrenal, the thyroid, the testis. Data were analyzed using independent-samples t tests.

**Purpose:** Caffeine may have induced increased catecholamine release leading to vasoconstriction of large arteries, thereby increasing MAP and VR. Data indicates that consumers should be aware of the effects of ingredients in any supplements that can have negative impacts on other physiological systems.
on them. DAA accumulation was not changed in all groups except that testicular DAA was increased in DASP (0.036±0.002 vs. 0.027±0.001 nmol/g tissue, p<0.001), and MIX further increased at 45% when there was a drop in HEL after 4 h. ZMA, compared with PLA. ZMA significantly decreased serum LH (8.4±0.5 vs. 11.1±1.0 ng/ml, p=0.047) and MIX further suppressed it (7.9±0.9 vs. 11.1±1.0 ng/ml, p=0.039), compared with PLA. Serum Es, GnRHI, DDO and cortisol were unchanged with DAA and/or ZMA treatments.

CONCLUSIONS: The present data suggest that DASP increased the accumulation of DAA in testis and has potential to stimulate the release of TT, FT and GH in rats. ZMA did not appear to affect serum anabolic hormone levels. On the contrary, the combination of ZMA and DASP suppressed the anabolic effects of DASP in rats.

**EFFECT OF ACUTE CITRULLINE - MALATE SUPPLEMENTATION’S EFFECT ON MUSCULAR POWER**

Austen Jensen1, Jordan Glenn2, Matt Stone3, Michelle Gray1
1University of Arkansas, Fayetteville, AR 2Louisiana Tech University, Ruston, LA

Email: asj010@ark.edu

(No relationships reported)

**METHODS:** At the beginning of the test period, participants were randomly assigned to the treatment groups (PL, HEL, DASP, HEL-DASP, and PL-HEL-DASP). Each group was instructed to limit their physical activity 24 hours prior to testing, to be present, and to be instructed to maintain a constant diet throughout the experiment.

**RESULTS:** Throughout the 5 repetition ISO, participants performed a protocol consisting of four exercises designed to assess muscular power. Tests included vertical jump, lower-body isokinetic exercise (ISO), 5 repetition and 5 repetition protocols), and a standard Wingate cycling test. RESULTS: The Wingate cycling test found subjects significantly increased average power (p<0.05), anaerobic capacity (p<0.02), and total work completed (p<0.02). CONCLUSION: Acute CM supplementation in females increased power and total work while mitigating fatigue. These data indicate athletes experienced significantly less fatigue (p<0.05), compared to PL. Serum Es, GnRHI, DDO and cortisol were unchanged with DAA and/or ZMA treatments.

CONCLUSIONS: The present data suggest that DASP increased the accumulation of DAA in testis and has potential to stimulate the release of TT, FT and GH in rats. ZMA did not appear to affect serum anabolic hormone levels. On the contrary, the combination of ZMA and DASP suppressed the anabolic effects of DASP in rats.

896 Board #212 
June 1, 3:30 PM - 5:00 PM
**The Effects of Beetroot Juice Supplementation on Simulated Team Sports Performance**

Mohamad Haiyum Jaafar, Joel Wei Maejic, Tan Si En Trina, Tan Si Hui Tracy. Republic Polytechnic Singapore, Singapore, Singapore

Email: mohamad_haiyum@rp.edu.sg

(No relationships reported)

**Title:** The Effects of Beetroot Juice Supplementation on Simulated Team Sports Performance

**Institution:** School of Sports, Health and Leisure, Republic Polytechnic, Singapore

**Purpose:** This study investigated whether dietary nitrate supplementation, in the form of a BR beverage, would improve athletic performance in a simulated team-game circuit protocol.

**Methods:** In a randomized crossover design, 12 well-trained male team sports players consumed 100ml of concentrated beet root juice (BR; containing 0.6gram of nitrate) or placebo (PL) daily for 6 d. After supplementation, participants completed two 30 minutes simulated team sport activity circuit with a 10 minutes half-time recovery period. A 7-d washout period separated the 2 trials. Sprint Time (ST), Vertical Jump (VJ), Rate of Perceived Exertion (RPE), Heart Rate (HR), blood glucose and lactates were collected for analysis at pre- and post-performance.

**Results:** BR resulted in a faster ST for the first-half (3.91±0.05 vs. 4.13±0.02, P<0.05) and overall mean ST (3.96±0.28 vs. 4.14±0.63, P<0.05). BR VJ height was significantly higher for the first-half (54.1±1.0 cm vs. 51.5±0.6 cm, P<0.05), second-half (52.8±1.0 vs. 53.5±0.4 cm, P<0.05) and the overall VJ (53.1±1.0 vs. 51.6±0.5 cm, P<0.05). BR Mean Power was significantly greater when Citrulline Malate was consumed (672.96±159.5 watts) as compared to the Placebo (651.96±148.77 W).

**Conclusions:** Increased plasma nitrate concentrations from dietary sources of nitrate have proven to benefit exercise performance. Beetroot (BR) contains relatively high levels of nitrate (NO3–), which increases nitric oxide stores. However, it is presently unknown whether it may enhance athletic performance during simulated team-game protocol.

897 Board #213 
June 1, 3:30 PM - 5:00 PM
**The Effect of Citrulline Malate on Wingate Anaerobic Power Test Performance**

Michele R. Monaco, Susan Kang, Robert Otto, John Wygand, John Petrizio. Adelphi University, Garden City, NY

Email: michelemonaco21@gmail.com

(No relationships reported)

**Purpose:** To determine if Citrulline Malate has an effect on anaerobic power performance, as measured by the Wingate Anaerobic Power test (WAPT). Several parameters will be tested: peak power, mean power and percentage of fatigue along with Lactate measurements. Evidence of beneficial effects of CM may help athletes who participate in high intensity activities or sports.

**Methods:** For this investigation, 21 healthy participants (mean±SD: 23±3 years of age; 172.2±10.6 cm tall; with a body weight of 79.9±17.7 kg) participated in this study. Subjects were instructed to limit their physical activity 24 hours prior to testing, to be consistent in their dietary intake during the test period. Participants were instructed to refrain from consuming Citrulline or Glutamine or any dietary supplements that contain the aforementioned ingredients during the test period. Each Subject reported three times to the laboratory facilities each separated by at least 48 hours. Each subject was fitted for the optimal seat height on the Lode Excalibur cycle ergometer.

**Results:** Statistical analysis was completed by a Dependent T-test. The statistics revealed that the Mean Power was significantly greater when Citrulline Malate was consumed (672.96±159.5 watts) as compared to the Placebo (651.96±148.77 W).

As for the Peak Power and Fatigue Index, there was no significant differences. A significant decrease was seen in the Lactic Acid sample taken immediately after the WAPT with the consumption of CM (9.4±2.7mmol) compared to the placebo (10.4±2.4mmol). However, no significance was seen when comparing the accumulation of Lactic Acid 3 minutes post WAPT.

898 Board #214 
June 1, 3:30 PM - 5:00 PM
**The Effects of Beetroot Juice Supplementation on Simulated Team Sports Performance**

Mohamad Haiyum Jaafar, Joel Wei; Tracy Tan, Trina Tan

Email: mohamad_haiyum@rp.edu.sg

(No relationships reported)

**Title:** The Effects of Beetroot Juice Supplementation on Simulated Team Sports Performance

**Institution:** Concordia University Wisconsin, Mequon, WI

**Purpose:** To determine if beet root juice (BR) has a significant effect on VO2 max, ventilatory threshold (Vtvent), and regional muscle oxygen response (rMO2) following 3 weeks of HIIT in collegiate soccer players.

**METHODS:** 15 collegiate soccer players (19.4 ± 1.1 yrs) completed a treadmill VO2 max test to establish peak VO2, Vtvent and rMO2. Near-infrared spectroscopy (NIRS) was used to monitor rMO2 in the vastus lateralis identifying changes in oxygenated hemoglobin (O2HB). Participants were randomly assigned to BRJ (n=8) or placebo (PLA, n=7). BRJ consisted of 70 ml of concentrated BR containing 0.4 grams dietary nitrate while PLA consisted of a caloric equivalent of black currant juice. BRJ or PLA was consumed 1-4 hrs prior to exercise to a blinded design. HIIT was 20 min duration 3x/wk on a treadmill consisting of 10 intervals each lasting 30 seconds at an intensity >90% HR max from the initial VO2 test, interspersed with 1 minute of moderate
intensity (<70% HR max). A 1-10 visual analog scale (VAS) was used to rate fatigue during HIT. 48 hrs following the final HIT session, another VO2 max test (Post1) was completed on their BRJ or PL. Participants then completed an additional VO2 max test (Post2) 2 days later without their BRJ or PL. Data analysis was run using an ANCOVA with VO2 as a covariate (p<0.05), effect size calculation with Partial Eta Squared, n2.

RESULTS: A significant decrease in rating of fatigue based on the VAS was noted in BRJ compared to PL (p<0.05). Both BRJ and PLA showed a significant increase in VO2 from PRE to Post1 (BRJ 57.1 ± 7.84 to 56.34 ± 5.66 vs PLA 50.65 ± 5.49 to 51.95 ± 6.69 ml.kg-1.min-1; p<0.05) and a drop from Post1 to Post2 (BRJ 56.34 ± 5.66 to 51.06 ± 4.69 vs PLA 51.95 ± 6.69 to 57.50 ± 9.05 ml.kg-1.min-1; p<0.05). Both groups increased Tvent from PRE to Post1 with a statistically greater (p = 0.04; n2=0.033) in BRJ vs PLA (2.25 ± 0.42 to 2.81 ± 0.40 vs 2.25 ± 0.34 to 2.42 ± 0.54; L.min-1). Tvent was reduced from Post1 to Post2 with no statistical difference between BRJ and PLA. There was no significant difference in the change in RPP between groups from Pre to Post1 and Post2.

CONCLUSION: The addition of BRJ to 3 weeks of HIT in collegiate soccer players demonstrated a reduction in ratings of fatigue during the HIT and a statistically significant increase in Tvent when compared to PLA but no difference in VO2 or RPP.

**Muscle Sentry® Has No Effect On Estimated Cardiac VO2 After A Bout Of Resistance Training.**

**Abstracts were prepared by the authors and printed as submitted.**
Recently it has been suggested that molecular hydrogen could attenuate performance decrement during high intensity, short duration interval exercise. Antioxidant properties of molecular hydrogen indicate that it might be beneficial for reducing oxidative stress induced muscle performance decrements.

**PURPOSE:** To examine the effects of molecular hydrogen supplementation on multiple sprint running performance.

**METHODS:** Using a randomized, double-blind, crossover design, 15 physically active men ingested either molecular hydrogen-rich water (400 mg of molecular hydrogen) or a placebo, prior completing an indoor multiple sprint running (12 X 30 m, departing at 35-s intervals). Mean sprint time, fastest time, and fatigue index were recorded throughout the tests, with RPE recorded after every second sprint.

**RESULTS:** Relative to placebo, molecular hydrogen resulted in a 0.08-s (2%) reduction in fastest time (p < 0.01, 95% likely range = 0.05-0.06s), which corresponded in a 1% improvement in fastest time (p < 0.05, 95% likely range = 0.8-1.1%). Molecular hydrogen supplementation also resulted in a 1-bpm increase in mean heart rate (169 ± 17 versus 170 ± 17; p < 0.01, 95% likely range = 0.3-3.58mm). There was an increase in blood lactate over the course of each sprint trial (p < 0.01) which was greater in molecular hydrogen group (p < 0.05; 0.6 mMol·L⁻¹·s⁻¹). Rating of perceived exertion (RPE) showed a significant group effect (p < 0.01, 95% likely range = 0.9-1.6).

**CONCLUSIONS:** Results of this pilot study indicate some ergogenic potential of molecular hydrogen supplementation on multiple sprint running performance. Further studies are needed in order to determine the dose response and the potential mechanisms of action for this intervention.

The results suggest that deep ocean mineral liquid concentrate has beneficial effects on muscle hemodynamic after eccentric exercise.

**PURPOSE:** To examine the effects of molecular hydrogen supplementation on multiple sprint running performance.

**METHODS:** Using a randomized, double-blind, crossover design, 15 physically active men ingested either molecular hydrogen-rich water (400 mg of molecular hydrogen) or a placebo, prior completing an indoor multiple sprint running (12 X 30 m, departing at 35-s intervals). Mean sprint time, fastest time, and fatigue index were recorded throughout the tests, with RPE recorded after every second sprint.

**RESULTS:** Relative to placebo, molecular hydrogen resulted in a 0.08-s (2%) reduction in mean sprint time (p < 0.05, 95% likely range = 0.04-0.09s) as well as 0.04-s (1%) reduction in fastest time (p < 0.01, 95% likely range = 0.05-0.06s), which corresponded in a 1% improvement in fastest time (p < 0.05, 95% likely range = 0.8-1.1%). Molecular hydrogen supplementation also resulted in a 1-bpm increase in mean heart rate (169 ± 17 versus 170 ± 17; p < 0.01, 95% likely range = 0.3-3.58mm). There was an increase in blood lactate over the course of each sprint trial (p < 0.01) which was greater in molecular hydrogen group (p < 0.05; 0.6 mMol·L⁻¹·s⁻¹). Rating of perceived exertion (RPE) showed a significant group effect (p < 0.01, 95% likely range = 0.9-1.6).

**CONCLUSIONS:** Results of this pilot study indicate some ergogenic potential of molecular hydrogen supplementation on multiple sprint running performance. Further studies are needed in order to determine the dose response and the potential mechanisms of action for this intervention.

**RESULTS:**

<table>
<thead>
<tr>
<th>Knee Peak Torque (J)</th>
<th>Knee Total Work (W)</th>
<th>CK (U/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td><strong>EXP</strong></td>
<td><strong>ES</strong></td>
</tr>
<tr>
<td><strong>Base-line</strong></td>
<td>103.6 ± 10.4</td>
<td>105.2 ± 20.1</td>
</tr>
<tr>
<td></td>
<td>499.1 ± 106.8</td>
<td>493.5 ± 132.6</td>
</tr>
<tr>
<td></td>
<td>76.6 ± 12.0</td>
<td>70.5 ± 12.7</td>
</tr>
<tr>
<td><strong>24h after</strong></td>
<td>99.7 ± 9.2</td>
<td>108.2 ± 24.8</td>
</tr>
<tr>
<td></td>
<td>453.0 ± 62.3</td>
<td>514.8 ± 139.4</td>
</tr>
<tr>
<td></td>
<td>225.3 ± 37.7</td>
<td>170.4 ± 30.8</td>
</tr>
<tr>
<td><strong>48h after</strong></td>
<td>98.8 ± 9.1</td>
<td>107.6 ± 24.9</td>
</tr>
<tr>
<td></td>
<td>477.4 ± 42.0</td>
<td>505.1 ± 140.2</td>
</tr>
<tr>
<td></td>
<td>209.7 ± 58.5</td>
<td>152.7 ± 79.2</td>
</tr>
</tbody>
</table>

*p < 0.05

**CONCLUSIONS:** FDG could mitigate DOMS by reducing CK after training, so as to maybe improve fatigue resistance and exercise performance of individuals. Study was supported by Independent scientific research plan of Ministry of Education (20121088023)

**THE EFFECTS OF CITRULLINE MALATE SUPPLEMENTATION ON MUSCLE SORENESS AND CONTRACTILE FUNCTION**

**PURPOSE:** To examine the effects of CM supplementation on muscle soreness, pressure pain threshold (PPT), and contractile function.

**METHODS:** Thirty Chinese college male athletes (21.6±1.4 yr., Height: 179.4±6.1 cm, Mass: 75.1±11.2 kg; 10 master-level and 20 level-one) volunteered for the experiment. They were randomly assigned into the experimental or control group. Before and after a training program, 24 hours, 36 hours, and 48 hours later, the experimental group consumed 15g FDG while the control group consumed 15g of a placebo. The training included leapfrog 20 times ≥7 group. The knee peak torque, knees total work, and serum creatine kinase (CK) were measured before, 24 hours and 48 hours after the training. The difference between groups determined using independent sample t-test and corresponding effect size (ES, Cohen’s d).

**RESULTS:** Compared with the control group, the experimental group significantly increased knee peak torque, knees total work, and reduced CK by using FDG.

**THE EFFECTS OF CITRULLINE MALATE SUPPLEMENTATION ON MUSCLE SORENESS AND CONTRACTILE FUNCTION**

**PURPOSE:** To examine the effects of CM supplementation on muscle soreness, pressure pain threshold (PPT), and contractile function.

**METHODS:** Thirty women participated in this study. This study used a double-blind, matched-pairs design. Participants were randomly assigned to a CM or a placebo (PL) group. The participants completed four sessions. On day 1, participants completed an informed consent, a muscle soreness questionnaire (MSQ) focusing on their right calf, were assessed for pressure pain threshold (PPT) of the calf, and were assessed for plantar flexion (PF) contractile function using a Biodex isokinetic dynamometer at 1.05 rad/sec and at 3.14 rad/sec. Participants then consumed either 7g CM or a PL. One hour after consuming the supplement, participants completed a step protocol to induce muscle soreness. The protocol involved seven sets of stepping lasting 5 minutes each with a 1 minute rest between sets. Sessions 2-4 occurred at 24, 48, and 72 hours post-stopping. Sessions 2-4 were identical. Participants completed a MSQ, were assessed for PPT, and were measured for plantar flexion contractile function. Gain scores were calculated and analyzed using an ANOVA.

**THE EFFECTS OF CITRULLINE MALATE SUPPLEMENTATION ON MUSCLE SORENESS AND CONTRACTILE FUNCTION**

**PURPOSE:** To examine the effects of CM supplementation on muscle soreness, pressure pain threshold (PPT), and contractile function.

**METHODS:** Thirty Chinese college male athletes (21.6±1.4 yr., Height: 179.4±6.1 cm, Mass: 75.1±11.2 kg; 10 master-level and 20 level-one) volunteered for the experiment. They were randomly assigned into the experimental or control group. Before and after a training program, 24 hours, 36 hours, and 48 hours later, the experimental group consumed 15g FDG while the control group consumed 15g of a placebo. The training included leapfrog 20 times ≥7 group. The knee peak torque, knees total work, and serum creatine kinase (CK) were measured before, 24 hours and 48 hours after the training. The difference between groups determined using independent sample t-test and corresponding effect size (ES, Cohen’s d).

**RESULTS:** Compared with the control group, the experimental group significantly increased knee peak torque, knees total work, and reduced CK by using FDG.

**THE EFFECTS OF CITRULLINE MALATE SUPPLEMENTATION ON MUSCLE SORENESS AND CONTRACTILE FUNCTION**

**PURPOSE:** To examine the effects of CM supplementation on muscle soreness, pressure pain threshold (PPT), and contractile function.

**METHODS:** Thirty women participated in this study. This study used a double-blind, matched-pairs design. Participants were randomly assigned to a CM or a placebo (PL) group. The participants completed four sessions. On day 1, participants completed an informed consent, a muscle soreness questionnaire (MSQ) focusing on their right calf, were assessed for pressure pain threshold (PPT) of the calf, and were assessed for plantar flexion (PF) contractile function using a Biodex isokinetic dynamometer at 1.05 rad/sec and at 3.14 rad/sec. Participants then consumed either 7g CM or a PL. One hour after consuming the supplement, participants completed a step protocol to induce muscle soreness. The protocol involved seven sets of stepping lasting 5 minutes each with a 1 minute rest between sets. Sessions 2-4 occurred at 24, 48, and 72 hours post-stopping. Sessions 2-4 were identical. Participants completed a MSQ, were assessed for PPT, and were measured for plantar flexion contractile function. Gain scores were calculated and analyzed using an ANOVA.
RESULTS: Differences were seen for peak torque (CM: 12.7±1.2% vs. PL: -29.9±9.1%; p<0.01); for average power (CM: 45.8±21.7% vs. PL: -72.1±17.5%; p<0.05); and for total work (CM: 28.3±24.4% vs. PL: -31.7±10.1%; p<0.04) at 3.14 rad/sec at 72 h post-stopping. No differences were seen in contractile function between CM and PL at 1.05 rad/sec (p>0.05). No differences were seen for MSQ and PPT between CM and PL (p>0.05).

CONCLUSIONS: While it appears that CM supplementation in this dosing may not attenuate muscle soreness, it may be an effective strategy to recover muscle contractile function following the onset of mild DOMS. The reported vasodilating capabilities of CM may have facilitated muscle recovery by allowing nutrients to reach the muscle more effectively.

907 Board #223 June 1, 3:30 PM - 5:00 PM Effects of Beetroot Juice on Recovery and Performance Between Bouts of Repeated Sprint Exercise

Tom Clifford,1 Bram Berntsen,2 Gareth Dave Wadsworth, FACSFM,2 Daniel J. West,3 Glyn Howatson, FACSFM,2 Emma J. Stevenson,4 Northumbria University, Newcastle upon Tyne, United Kingdom. 2Maastricht University, Maastricht, Netherlands. 3University of Ulster, Northern Ireland, United Kingdom. 4Newcastle University, Newcastle upon Tyne, United Kingdom. Email: tom.clifford@northumbria.ac.uk

(No relationships reported)

Functional foods that contain antioxidant properties, such as beetroot, might attenuate exercise-induced muscle damage. PURPOSE: To examine the efficacy of beetroot juice on recovery between two bouts of muscle damaging repeated-sprint exercise. METHODS: Using a double blind, independent groups design, 20 male team-sports players were randomly allocated to receive either beetroot juice (BTJ) or a placebo (PLA) (2 x 250 ml) immediately, 24, 48 and 72 h after an initial bout of repeated sprints (20x30m, RS1) and immediately after a second bout of repeated sprints (RS2). To assess recovery, maximal isometric voluntary contractions (MVIC), countermovement jumps (CMJ), reactive strength index (RI), pressure-pain threshold (PPT) and creatine kinase (CK) were measured pre, immediately post, 24, 48 and 72 h following RS1, and immediately and post 24 and 72 h following RS2. Group differences in mean sprint time, fastest sprint time, fatigue index and perceived exertion (RPE) (PPT) and creatine kinase (CK) were measured pre, immediately post, 24, 48 and 72 h after RS1 (BR1) and RS2 (BR2). RESULTS: CMJ, RI and MVIC were reduced in both groups; however, a group effect (p<0.05) showed the magnitude of decline in CMJ and RS1 was less in BTJ than the placebo throughout the recovery period. Pre-RS2 (+72 h), CMJ and RS1 recovered quicker (relative to baseline) in BTJ (91±6.6% vs. 95±8.9%, respectively) vs. PLA (91±4.2 and 92±1.9%, respectively) (p<0.05). There were no group differences in PPT after RS1 but 24 h post RS2, PPT was 10.4% higher in BTJ compared to PLA (p<0.01). Average sprint time, fastest sprint time, fatigue index and RPE were not different between trials. No group differences were detected for any sprint variable, RPE, MVIC or CK (p>0.05). CONCLUSION: BTJ reduces the decrement of some performance indices following damaged repeated sprint exercise and could be considered a useful means of restoring neuromuscular function between bouts of repeated sprints.

908 Board #224 June 1, 3:30 PM - 5:00 PM Oral Nutritional Supplement Effects on Urine Color

Lindsay Ellis, Brandon A. Yates, Amy L. McKenzie, Colleen X. Muñoz, Douglas J. Casa, FACSFM, Lawrence E. Armstrong, FACSFM, University of Connecticut, Storrs, CT. (Sponsor: Lawrence E. Armstrong, FACSFM)

Email: lindsay.ann.ellis@gmail.com

(No relationships reported)

PURPOSE: To determine the efficacy of urine color (Ucol) as a hydration status biomarker after nutritional supplementation with beetroot (880 mg), vitamin C (1000 mg) and riboflavin (200 mg). METHODS: Twenty males (Mean ± SD: age, 21 ± 2 years; BMI, 26.4 ± 1.7 kg/m²) consumed a standardized breakfast and collected all urine voids on one control day (CON) and one nutritional supplementation day (SUP). This was repeated for each supplement, randomized one per week across three weeks. This investigation was double-blinded; participants replicated diet and exercise one day before CON, and throughout CON and SUP. Uosm, urine specific gravity (Usg), urine volume and Ucol were measured in single samples (excluding the first morning void). RESULTS: Single sample Uosm was a significant predictor of single sample Ucol after all supplements (all p<0.05). Additionally, whereas 24 h Uosm was a significant predictor of 24 h Ucol and Usg (all CON and SUP) after beetroot and vitamin C supplementation (all p<0.05), 24 h Usg was not a significant predictor of 24 h Ucol and Uosm on the riboflavin SUP day (p=0.20, p=0.12). No difference existed (p>0.05) between CON and SUP for 24 h Ucol after beetroot and vitamin C supplementation, though there was a significant difference (p=0.05) after riboflavin supplementation. CONCLUSION: This investigation suggests that riboflavin supplementation should be considered when classifying hydration status via Uosm and that a combination of urinary biomarkers (i.e., Uosm, Ucol) should be utilized over the course of 24 h.

909 Board #225 June 1, 3:30 PM - 5:00 PM The Effect of Beet Root Juice Supplementation on Markers of Oxidative Stress and Inflammation

Lori D. Wilson1, Talia Roth2, Deborah Fraser2 (Northern Arizona University, Flagstaff, AZ. 2California State University, Long Beach, CA. (Sponsor: J. Richard Coast, FACSFM)

Email: Lori.Wilson@NAU.edu

(No relationships reported)

High levels of nitrates and antioxidants in beetroot juice BRJ are presumed to be a primary contributor to cardioprotective effects in hypertensives and increased exercise efficiency in athletes. Most of BRJ benefits are considered increases in NO and its vasodilatory action. PURPOSE: The study compared a single dose versus 7 days of BRJ on markers of oxidative stress and inflammation including nitrates; Superoxide Dismutase (SOD) antioxidant activity, Thiobarbituric Acid Reactive Substances (TBARS), a marker of lipid peroxidation; and expression and protein levels of 3 inflammatory cytokines IL-6, TNF-A, and IL-1B. METHODS: Participants were randomized to either: (BR7) 7 days BRJ; (BR1) 1 dose BRJ; or Control (CON). A dose of BRJ contained 140 ml of BR (0.8 g nitrate), CON contained decaffeinated chocolates (8 g sugar). Blood was collected before and 5 mins after VO2max testing on cycle ergometry. Significance was set at p<0.05. RESULTS: After BRJ consumption and before exercise, BRJ had significant increase in nitrate, BR7 and BR1 had increased SOD activity; and BR7 showed decreasing TBARS. IL-6 was downregulated 42% in BR7 and 25% in BR1. IL-1B expression more than doubled in BR7. Resting IL-6 protein levels were lower in BR7, but showed similar increases with exercise. Post exercise SOD activity decrease after BRJ consumption. Exercise regulation of TNF-A appeared to reverse direction following BRJ. See Table 1. No differences in VO2max with BRJ were observed (F (2, 29)-0.05, p=0.95). CONCLUSIONS: BRJ consumption appeared to increase antioxidant activity and down-regulate IL-6, without reducing IL-6 protein levels. Exercise SOD activity and TBARS decrease after 7-days of BRJ. IL-6 expression was lower, but protein levels higher following BRJ.

910 Board #226 June 1, 3:30 PM - 5:00 PM Dietary Nitrate Reduces Blood Pressure And Improves Walking Economy And Cognitive Function In Older People

Anni Vanhatalo, FACSFM, James Kelly, Paul G. Winyard, Jonathan Fulford, Andrew M. Jones, FACSFM, University of Exeter, Exeter, United Kingdom. (No relationships reported)

Nitric oxide (NO), produced by the enzyme nitric oxide synthase (NOS), is a signalling molecule that regulates vascular tone, neurotransmission and mitochondrial function. NOS activity declines in older age contributing to increased morbidity and reduced exercise capacity. Increasing the intake of dietary inorganic nitrate (NO3−) might elevate NO bioavailability via an alternative NOS - nitrite (NO2−) - NO reduction pathway and therefore compensate for NOS dysfunction. PURPOSE: To determine whether dietary supplementation with nitrate-rich (BR), compared to nitrate-depleted (PL), beetroot juice in healthy older adults will reduce blood pressure (BP), lower pulmonary O2 uptake (VO2) during walking and improve cognitive function. METHODS: 30 participants (age 73±5 yrs. BMI 27±3 kg/m²) underwent 10-day supplementation periods with BR (~0.6 g NO3−) and PL (negligible NO3−) separated by a 10-day wash-out in a double-blind randomised cross-over design. The speed and accuracy of components of cognitive function were assessed via a computer-based Rapid Visual Information Processing (RVIP) test. Pulmonary VO2 was measured during three 6-min bouts of walking at 80% of gas exchange threshold. RESULTS: Plasma [NO3−] and [NO2−] were greater after BR (361 ± 55 μM and 969 ± 687 nM) than PL (34 ± 26 μM and...
Dietary Nitrate Reduces Ventilatory Demands and Increases VO₂peak in Patients With Systolic Heart Failure

Andrew R. Coggan, FACSM, Kiran Mahmood, Deana Mikhailova, Indra Dole, Soo Park, Joshua Leibowitz, Ana Kadkhodayan, Deepak Thomas, Dakotta Thies, Linda R. Peterson. Washington University School of Medicine, St. Louis, MO.

(no relationships reported)

Patients with heart failure (HF) due to systolic dysfunction exhibit reduced efficiency, dyspnea, and diminished peak O₂ uptake (VO₂peak) during exercise. Dietary nitrate (NO₃⁻), an important source of nitric oxide (NO) via the entero-splanchnic pathway, has been reported to improve these measures in some, but not all, studies of other populations. PURPOSE: To determine the effects of acute dietary NO₃⁻ intake on exercise efficiency, ventilatory responses, and VO₂peak in patients with systolic HF. METHODS: Five patients with stable, documented NYHA class I-III HF were studied using a randomized, double-blind, placebo-controlled, crossover design. On one occasion, subjects were tested 2 h after ingesting a concentrated beetroot juice (BRJ) supplement containing 11.2 mmol NO₃⁻. On another, they were tested 2 h after ingesting BRJ depleted of NO₃⁻ (placebo). Breath NO was measured periodically, and respiratory gas exchange was determined during steady-state (i.e., 6 min each at 20, 40, and 60 W) and incremental (i.e., 10 W/min) semi-recumbent cycle ergometer exercise tests. RESULTS: Dietary NO₃⁻ intake increased (P<0.05) breath NO levels by 8.5 ppb, or 44.34%. This increase in NO bioavailability did not alter gross or delta efficiency, but reduced the ratio of ventilation (Ve) to VO₂ (i.e., Ve/VO₂; P=0.01) or Ve to CO₂ production (VCO₂) (i.e., 31.2±4.4 vs. 31.9±4.4 L/L; P=0.06), during steady-state exercise. This was accompanied by increases in both ventilatory threshold (VT) (16.5±4.7 vs. 14.7±5.5 mL·min⁻¹·kg⁻¹; P<0.05) and VO₂peak (25.3±7.2 vs. 23.4±6.1 mL·min⁻¹·kg⁻¹; P=0.05) and efficiency but reduces ventilatory demands and increases VO₂peak (an important predictor of survival) in patients with mild-to-moderate systolic HF. In conjunction with our recent data demonstrating comparable dietary NO₃⁻-induced improvements in maximal muscle speed and power in systolic HF patients, these data suggest that dietary NO₃⁻ supplementation may be a valuable adjunctive treatment for exercise intolerance in this population.

Dietary Nitrate Supplementation and 3-weeks Sprint Interval Training Improves Flow Mediated Dilation in Healthy Males

David J. Muggeridge¹, Nicholas Sculthorpe², Philip E. James², David J. Muggeridge³, Nicholas Sculthorpe⁴, Philip E. James⁵, David J. Muggeridge⁶, Nicholas Sculthorpe⁷, Philip E. James⁸. ¹University of the West of Scotland, Hamilton, ²Cardiff University, Cardiff, United Kingdom. (Sponsor: Yannis Pitsiladis, FACSM)

Email: david.muggeridge@uws.ac.uk

(no relationships reported)

Dietary nitrate supplementation (DN) enhances intermittent high-intensity exercise and may therefore improve the adaptations to sprint interval training (SIT). Given that exercise training can augment basal production of nitric oxide, decrease mean arterial blood pressure (MAP) and increase flow-mediated dilation (FMD), combining these interventions may result in a synergistic improvement in these measures. PURPOSE: To investigate whether DN ingested prior to SIT can increase basal plasma nitrate, reduce MAP and increase FMD beyond SIT alone. METHODS: 19 healthy males (29 ± 7 yrs) completed an initial baseline assessment of plasma nitrate, and resting MAP and FMD (n=15). Participants were subsequently randomly assigned to a SIT + placebo (PLA) group (n=10) or a SIT + DN (NIT) group (n=9). Participants then underwent 3-weeks of SIT consisting of 4-6 repeated 15 s all out sprints on a cycle ergometer, interspersed with 4 min active recovery. Participants consumed either a DN or PLA dose 2.5 h prior to each training session. The dose consisted of 2 x 60 ml nitrate gels (29.6 ± 8.1 mmol nitrate) or nitrate-depleted PLA. After 48-72 hs following completion of the SIT protocol all participants returned for re-assessment of baseline and post-SIT measures. Differences between groups, time points and their interaction were established by 2 x 2 repeated measures ANOVA. RESULTS: There were no differences in plasma nitrate (PLA: 188 ± 78; NIT: 174 ± 51 mL, P=0.662), MAP (PLA: 92 ± 4; NIT: 92 ± 9 mmHg, P=0.871) or FMD (PLA: 8.6 ± 4; NIT: 7.8 ± 3.0; P=0.657) between groups, prior to training. Following training, plasma nitrate was not different from pre-training in either group (PLA: 213 ± 63; NIT: 168 ± 50 mL, P=0.545). MAP decreased pre - post training (P=0.004). Post-hoc analysis revealed MAP reduced by a similar extent in both PLA (87 ± 6 mmHg, d=0.98, P=0.015) and NIT (87 ± 12 mmHg, d=0.47, P=0.016) groups. FMD increased pre - post training (P=0.004). Post-hoc analysis revealed a significant increase only in NIT (11.2 ± 1.8; d=1.37, P=0.008) but not the PLA group (10.3 ± 4.5; d=0.39, P=0.111). CONCLUSIONS: Results from the current study suggest NIT may enhance some of the cardiovascular adaptations to 3-weeks SIT. This finding is not supported by changes in basal plasma nitrate and the mechanism(s) underpinning this response is currently unknown.

The Effects of an Acute Dose of Dietary Nitrate on Running Performance

Steven Vitti¹, Christa Winter¹, Richard Wood¹, Michael Bruneau Jr.¹, Vincent Paolone, FACSM.

¹Springfield College

Sponsor: Vincent Paolone, FACSM

Email: snvitt1@gmail.com

(no relationships reported)

Ischemic preconditioning (IPC) and dietary nitrate supplementation (DN) have both been shown to modulate nitric oxide (NO) availability. Despite the possibility of a synergistic response, the combined effects of IPC and DN during exercise have yet to be explored. PURPOSE: To determine the effects of IPC alone and in combination with DN on the physiological adaptations to submaximal cycling and time trial (TT) performance. METHODS: Following an initial maximal exercise test, nine competitive male cyclists (34 ± 6 Yr, VO₂peak: 55 ± 4 mL/kg/min) completed a baseline trial (BASE), and two experimental trials in a double-blind randomized cross-over

MEDICINE & SCIENCE IN SPORTS & EXERCISE® Vol. 48 No. 5
design. Exercise trials comprised 6 min of cycling at 80% of the ventilatory threshold, followed by a 16.1 km TT. In the experimental trials participants received either 500 mg of DN (chard gel) or a NO - depleted placebo (PLA) 90 min before completing three cycles of bilateral lower limb IPC at 180 mmHg.Venous blood samples were collected pre- and post-IPC to determine changes in plasma nitrite [NO2-], VO2 and HR were continuously monitored during submaximal exercise. RESULTS: Full arterial occlusion was confirmed via coloured Doppler in all trials. Prior to IPC, plasma [NO2-] was higher in DN (774 ± 179 nM, P<0.047) than BASE (576 ± 170 nm) and PLA (544 ± 126 nm, P=0.752). Following IPC plasma [NO2-] increased in PLA (Δ104 ± 149 nM, d=0.70) and DN (Δ42 ± 90 nM, d=0.47), but not significantly (both P>0.2). In the DN trial, resting VO2 was significantly lower compared to BASE (314 ± 69 vs. 367 ± 30 mL/min, P<0.02) and tended to be lower during exercise (P=0.066). Resting VO2 was also lower in PLA than BASE (323 ± 62 mL/min, P=0.01) and during exercise (278 ± 262 vs. 3013 ± 342 mL/min, P<0.04). HR was not significantly different in submaximal exercise (P=0.842). Completion time of TT was not different between conditions (BASE: 1336 ± 73 s, PLA: 1344 ± 88 s, Δ=76 s, P=0.69). Compared to BASE (171 ± 4 bpm), HR was lower following DN (166 ± 4 bpm, d=0.02) but was not different in PLA (169 ± 4 bpm, d=0.60). CONCLUSION: In the present study, IPC with or without DN, altered a number of physiological responses during rest and submaximal exercise, potentially mediated by an increase in plasma [NO2-]. Despite this, there was no evidence for an additive effect and neither intervention altered TT performance.

**B-35 Free Communication/Poster - Exercise and Cardiovascular Disease**

**June 1, 2:00 PM - 3:30 PM**

**Board #232**

**June 1, 2:00 PM - 3:30 PM**

**Resisting Blood Pressure and Muscle Strength in Healthy Men and Women**

Adam R. Blanchard1, Beth A. Taylor1, Paul D. Thompson, FACSM2, Amanda L. Zaleski1, Jeffrey A. Capizzi2, C. Michael White1, Linda S. Pescatello, FACSM1. *University of Connecticut, Storrs, CT; Hartford Hospital, Hartford, CT.*

(Sponsor: Linda S. Pescatello, FACSM)

Email: adam.blanchard@uconn.edu

(No relationships reported)

Limited evidence suggests that hypertension is associated with derangements in muscle structure and function at rest and in response to exercise. Yet, the influence of resting blood pressure (BP) status on muscle strength has not been established. Thus, the relationship between BP and measures of muscle strength has not been established. METHODS: Participants (n=420; 49% men) were part of the Effects of Statins On Skeletal Muscle Function and Performance (STOMP) study (R01HL081893) and had a mean age of 44.1 ± 16.7 years and body mass index (BMI) of 26.4 ± 4.8 kg/m2. Muscle strength of the arms and legs was measured using an isokinetic dynamometer and handgrip strength with a static dynamometer. Analysis of covariance (ANCOVA) tested between-group differences in BP and measures of muscle strength controlling for age, gender, and BMI. RESULTS: Approximately 44.5% of the sample had normal BP (107.7 ± 7.3 / 68.3 ± 6.3 mmHg) and 55.5% had pre- to established hypertension (127.8 ± 9.8 / 80.8 ± 8.1 mmHg). Subjects with high BP had greater muscle strength than those with normal BP for handgrip (39.9 ± 6.6 vs. 38.9 ± 6.6 kg; p=0.004), knee isometric extension (197.8 ± 3.2 vs. 184.1 ± 3.6 kg; p=0.032), knee isometric extension 180°/sec (193.2 ± 197 °sec; p=0.011), and elbow isometric extension 60°/sec (180°/sec; p=0.075). CONCLUSION: Our findings indicated healthy individuals with pre- to established hypertension have greater baseline muscle strength than those with normal BP. Mechanisms for this finding are not clear, but they may be due to exaggerations in the skeletal muscle reflex sympathoexcitation and exercise pre-response associated with hypertension in humans. Supported by: NIH Grant R01HL081893-01A2

**B-36 Free Communication/Poster - Exercise and Cardiovascular Disease**

**June 1, 2:00 PM - 3:30 PM**

**Board #233**

**June 1, 2:00 PM - 3:30 PM**

**Feasibility and Intensity of Recumbent Stepper in High Intensity Interval Training (HIT) in Chronic Stroke**

Daniel L. Carl1, Pierce Boyne1, Colleen Meyrose1, Jennifer Westover1, Dustyn Whitesel1, Jane Khoury2, Myron Gerson1, Brett Kissela3, Kari Dunning2. *University of Cincinnati, Cincinnati, OH.*

(Sponsor: Linda S. Pescatello, FACSM)

Email: daniel.carl@uc.edu

(No relationships reported)

For the 7 million survivors of stroke in the US, reduced aerobic capacity is a limiting factor in recovery. High Intensity Interval Training (HIT) is a promising method to improve aerobic capacity and motor recovery after stroke because higher training intensity has been associated with better improvements in both of these outcomes. To date, all HIT protocols involving stroke survivors have been conducted on a treadmill (TM). However, walking impairment may limit the feasibility or intensity of HIT-TM for some persons with stroke. Purpose: Therefore, the purpose of this study was to assess the feasibility and intensity of HIT on a Recumbent Stepper (HIT-RS), compared to HIT-TM and moderate-intensity TM (Mod-TM).

Methods: Using a single session cross over design, 16 subjects (57.4 ± 9.7 yr; post stroke, 6.5 ± 4.1) performed one 20 minute session each of Mod-TM, HIT-TM and HIT-RS in random order. Measures of intensity included blood lactate (BLA), hematocrit, HR and VO2 were taken at multiple time points during and after each protocol. Mixed effects models were used to examine changes between protocols, accounting for the design, using an alpha of 0.05. Results: Within the first 9 subjects to complete HIT-RS, two subjects exhibited symptomatic hypotension and near syncope during recovery. The HIT-RS protocol was then modified to include max HR limitations and the final 7 subjects completed the new protocol without complications. BLA response to the original HIT-RS was.

Abstracts were prepared by the authors and printed as submitted.
significantly higher than HIT-TM (11.31 vs 5.89 mM/L; p<0.0001). BLA response to the revised HIT-RS was not significantly different from HIT-TM (4.58 vs 5.99 mM/L; p=0.48) and both HIT-RS and HIT-TM were significantly elevated over Mod-TM (1.27 mM/L; p<0.0001 and p=0.001 respectively). The heart rate response to the original HIT-RS was significantly greater than HIT-TM (p=0.035) while the revised HIT-RS was not significantly different than HIT-TM and Mod-TM (p=0.51; p=0.12). Conclusion: The original HIT-RS allowed persons with chronic stroke to achieve a higher BLA and heart rate (plasma shifting) than HIT-TM, which likely contributed to 2 hypotensive responses. Enforcing a HR limit during the revised HIT-RS made BLA and heart rate similar to that of HIT-TM with a significantly higher BLA than Mod-TM and no further hypotensive responses.

INTRODUCTION:

The bicuspid aortic valve (BAV) is the most common congenital cardiac malformation. However there is a lack of studies relating the effect of high performance training and the size of the aortic root in elite athletes with BAV.

PURPOSE:

Evaluate the impact of BAV on aortic root remodeling in elite male athletes.

METHODS:

A retrospective cross-sectional study including 28 Spanish elite male athletes with BAV diagnosed by transthoracic echocardiography (age 23.2 ± 5.6 years, BSA 1.96 ± 0.16 m2, 8.7 ± 4 years/training and 17.2 ± 8.5 hours/day of training) were studied to assess end-diastolic aortic diameters in the parasternal long axis at: aortic annulus (AA), sinus of Valsalva (SV), sinotubular junction (SJ) and the maximum diameter of the proximal ascending aorta (AsPx); using the inner edge-to-inner edge (I-I) convention. The values were compared with a control group composed of 2041 healthy Spanish elite male athletes with normal tricuspid aortic valve (TAV) (age 24.1 ± 5.8 years, BSA 1.9 ± 0.2 m2, 9.6 ± 5.1 years/training and 19.2 ± 8.7 hours/day of training). Also the control group was used to establish the physiological limits of aortic remodeling associated to exercise training in elite athletes.

RESULTS:

BAV was associated with increased aortic dimension in comparison to the TAV at the level of AA (28.6 ± 4.8 mm vs 25.5 ± 3.3 mm; p=0.001), SV (35.6 ± 5.7 mm vs 31.6 ± 3.6 mm, p=0.0001), SJ (29.7 ± 5.2 vs 26.4 ± 3.4 mm, p=0.0001) and AsPx (31.9 ± 6.9 mm vs 26.9 ± 3.6 mm, p=0.0001). Indexed aortic diameter was also increased in BAV at the level of AA (14.6 ± 2.5 mm vs 13.1 ± 1.7 mm/m2, p=0.002), SV (18.3 ± 3.2 mm vs 16.1 ± 1.9 mm/m2, p=0.001), SJ (15.2 ± 2.9 mm vs 13.6 ± 1.8 mm/m2, p=0.003) and AsPx (16.4 ± 3.8 mm vs 13.9 ± 1.9 mm/m2, p=0.001). The dimensions of the aortic root in male elite athletes with BAV exceeded the upper normal range limit based on control group measurements were observed in 11 athletes at AA (39.3%), at SV (39.3%), 8 at SJ (28.6%) and 8 at AsPx (28.6%). From this cohort, 7 elite male athletes with BAV (25%) had an aortic diameter greater than 40 mm at any level of measurement.

CONCLUSIONS:

Diameters of the aortic root in elite male athletes with BAV are greater than athletes with TAV at all levels of measurements. Almost two fifths of the athletes with BAV are Diameters of the aortic root in elite male athletes with BAV are greater than athletes not speak comfortably, until the highest intensity allowing comfortable speech was reached. The Talk Test (TT) has been studied as an alternative method of exercise intensity. Methods: Healthy-sedentary volunteers (n=20) and athletes with BA V at all levels of measurements. Almost two fifths of the athletes with BA V are associated with increased aortic dimension in comparison to the TA V at the AA (39.3%), 11 at SV (39.3%), 8 at SJ (28.6%) and 8 at AsPx (28.6%). From this conclusion: The original HIT-RS allowed persons with chronic stroke to achieve a higher BLA and heart rate (plasma shifting) than HIT-TM, which likely contributed to 2 hypotensive responses. Enforcing a HR limit during the revised HIT-RS made BLA and heart rate similar to that of HIT-TM with a significantly higher BLA than Mod-TM and no further hypotensive responses.

918 Board #234

June 1, 2:00 PM - 3:30 PM

Aortic Root Size in Elite Male Athletes with Bicuspid Aortic Valve

Francisco Morales, Araceli Borarita, Maria Eugenia Heras, Alicia Canda, Manuel Marina-Breyssy. Spanish Sports Health Protection Agency, Madrid, Spain. Email: f.morales.acuna@gmail.com

(No relationships reported)

919 Board #235

June 1, 2:00 PM - 3:30 PM

The Talk Test as a Sole Guide to Exercise Prescription

John P. Porcari, FACSM, Katharine J. Doro, Mallory R. Engen, Theresa Eber-Lee, Maria L. Cress, Carl Foster, FACSM. University of Wisconsin-La Crosse, La Crosse, WI. Email: jporcari@uwlax.edu

(No relationships reported)

Introduction: The Talk Test (TT) has been studied as an alternative method of exercise intensity. In both healthy, sedentary subjects and patients in a rehabilitation program, advice to maintain an exercise intensity that just allows comfortable speech during near steady state exercise training, results in conventional markers of exercise training intensity that fall within ACSM guidelines.

Aging is a complex, dynamic and progressive process characterized by morphological, functional, biochemical and social age-related changes. Resistive exercise (RE) is recommended for elderly people as a promising intervention to prevent or reverse, at least partially, the effects caused by this process. An attenuated heart rate recovery (HRR) immediately after dynamic non-resistive exercise is theorized to be a marker of reduced parasympathetic activity and an independent predictor of all-cause mortality. However, the HRR behavior after RE in elderly people is not clear yet. PURPOSE: The aim of this study was to investigate the HRR after RE at high intensity (90% of maximum repetition) in elderly subjects. METHODS: Twenty subjects were evaluated, 10 young (25.4±3.9 years) and 10 elderly (67.4±4.5 years). Volunteers underwent two visits: 1) one 1 Maximum Repetition (RM) test and 2) a test at an intensity of 90% of 1RM, on the Leg Press 45° device until fatigue. The heart rate (HR) was collected throughout the tests with the Polar S810. The HRR indices were calculated by subtracting the first (HRR-1), second (HRR-2) and third-minute (HRR-3) heart rate from the maximal HR. The student t test was applied with a significance level of p<0.05. RESULTS: Significant differences were found between elderly and young volunteers, respectively: HRR-1: 90% (25.7± 6.5 bpm) vs (34.7 ± 9.8 bpm); HRR-2: 90% (30.7± 9 bpm) vs (40.1 ± 7.1 bpm); HRR-3: 90% (34.1± 8.7 bpm) vs (45.3 ± 8.1 bpm). CONCLUSION: These results support the hypothesis that the heart rate recovery after resistive exercise at high intensity is attenuated in the elderly when compared to young individuals. (Financial support by CNPq - process n 468365/2013-1).
GXT, a RS 3min test at maximal power output was performed. Heart rate (HR) was recorded using an ECG. The number of subjects achieving target HR and HR ranges were compared between protocols using general estimating equations. RESULTS: The RS 3min test had a significantly higher rate of achieving target HR compared to the RS GXT (9/14 vs 4/14, p=0.01) and was not significantly different from the TM GXT (9/14 vs 5/14, p=0.09). Odds ratios (95% CI) of achieving a higher heart rate range with a difference ≥ 10 bpm were: RS 3min vs RS GXT, 10.53 (1.92-57.9) p=0.01; RS 3min vs TM GXT, 2.1 (0.54-13.2) p=0.43; TM GXT vs RS GXT, 5.03 (1.12-22.8) p=0.04. CONCLUSION: Adding a 3min ‘all-out’ test after a RS GXT protocol enabled a significantly greater number of persons with stroke to achieve target HR. HR results from this 3min test were also not significantly different from a TM GXT protocol with this sample size, possibly due to lack of power. These findings indicate that the RS 3min test may increase the sensitivity of stress testing after stroke while eliminating test dependence on walking ability.

Mechanistic developments have proposed vagally-derived acetylcholine deactivates macrophages, inhibiting the release of TNF-alpha via the choleteric anti-inflammatory pathway, prompting interest in its association with reducing cardiovascular risk. PURPOSE: To determine the associations between non-invasive heart rate derived autonomic measures and inflammatory biomarkers in apparently healthy young-to-middle aged males and females. METHODS: 160 apparently healthy males (47 ± 8yrs) and 61 females (44 ± 9yrs) provided fasted venous blood samples for ELISA analysis of white blood cell count (WBC), high-sensitivity C-reactive protein (hs-CRP), TNF-alpha and interleukin-6. Resting heart rate (RHR) was recorded with exercise heart rate. Cardiac autonomic index (CAI) was calculated by HRR1/HRR2. RESULTS: Age and fitness-adjusted partial correlations were performed separately for males and females. RESULTS: Descriptive results reported males to have a statistically longer exercise duration, slower HRR2 and higher TNF-alpha (P<0.05), no other notable sex differences were identified. In males, only WBC correlated with HRR1, HRR2 and CAI (r=0.194, -0.174 and 0.254, respectively; P<0.05). HRR1, HRR2 and CAI were inversely associated with hs-CRP in females only (r=-0.319 and 0.334, respectively; P<0.05). Once adjusted for age and fitness, all relationships weakened yet CAI and hs-CRP remained independently associated in females only (r=-0.264, P=0.05), whilst HRR1 and CAI remained associated in males (r=-0.170 and 0.196 respectively, P<0.05). CONCLUSION: HR derived autonomic measures, in particular the novel CAI, are associated with stable inflammatory biomarkers in healthy young to middle-aged adults. The relationships weaken following adjustments suggesting age and fitness play a mediating role. There is a possibility the anti-inflammatory pathway could be another cardio-protective mechanism, particularly in females that warrants further investigation.
The aging process can determine changes such as reduced functional capacity and altered cardiac autonomic modulation (CAM); resistance exercise (RE) may have an important role in mitigating these effects and RT at “critical load” (CL) intensity is progressively gaining attention in exercise prescription as an innovative, promising training strategy. PURPOSE: The purpose of this study was to test the hypothesis that elderly and young subjects present different CAM behavior during RE performed at CL. METHODS: 10 young (25.2±4.17 yrs) and 10 healthy elderly (67.9±4.13 yrs) subjects participated in the study. Evaluations and tests were performed during 5 visits consisting in: test of 1 repetition maximum (1RM); 3 RE at constant load (70, 80 and 90% 1RM) and intermediate load calculated by linear regression using the exercise time (Tlim) at 70 and 90% 1RM; RE test at CL obtained by linear regression (load versus inverse Tlim) using Tlim of 4 RE tests at 1RM, on a Leg Press 45° equipment. Heart rate (HR) and R-R intervals (R-Ri) were measured at rest and at CL. Heart rate variability (HRV) was analyzed by linear methods (RM mean, HR mean, STDRR, RMSDD, RRtri, TINN) and nonlinear methods (SD1, SD2, correlation dimension (CD)) using the program Kubios HRV Analysis. The paired t-test was applied, with a significance level of p<0.05. RESULTS: Significant differences between young and elderly were observed. Elderly subjects presented significantly lower CAM values (exercise - rest) at CL for the indices: RMSDD (-0.3±0.2 ms vs -0.03±0.2 ms); TINN (-0.9±0.2 ms vs -0.2±0.09 ms); SD1 (0.2±0.1 ms vs -0.03±0.1 ms) and CD (-0.02±0.01 ms vs 0.001±0.02 ms). CONCLUSION: These findings suggest that the cardiac autonomic response to RE at CL is attenuated in the elderly. The present study was supported by CNPq (process n. 486365/2013-1).
Hematologic biomarkers are increasingly used to assess health and readiness of athletes. However, reference values for specific and unique populations are not readily available. This could be crucial for properly interpreting results and optimizing performance.

**PURPOSE:** To determine hematologic, biochemical and nutritional status in young male Turkish in-season basketball players.

**METHODS:** Various blood-based biomarkers were assessed in N=13 trained young male basketball players (Mage=17.46 ± 0.66 yrs, Mheight=194.2±4.6 cm, Mweight=83.79±9.12 kg, Mtraining=6.3±2.3 yrs). Seven-day dietary records were used to evaluate nutritional status. Standard clinical panels utilizing serum, urine and capillary samples were assessed. The descriptive study was carried out pre-practice during the midpoint of the basketball season. Values are expressed as means ± SD for all results.

**RESULTS:** Subjects presented the following values for the clinical panel: RBC (5.3±0.25 x10^6/μL), WBC (9.05±2.81 x10^3/μL), Hct (6.0±0.56 g/dL), Hb (15.1±6.6 µg/dL), MCV (92.05±4.34 fL), ALT (16.2±5.4 U/L), AST (21.1±3.82 U/L), urea (15.8±3.2 mg/dL), total protein (7.43±0.3 g/dL), albumin (5.3±0.22 g/dL), TSH (1.72±0.66 mIU/L), T4 (15.17±2.63 μg/dL), MCH (23.7±3.2 U/L), MCHC (32.52±15.58 g/dL), LDB (370±256.4 IU/L), CK (308.6±199.8 U), Ca (103.0±3.3 mg/dL), P (6.4±4.0 mg/dL), K (4.2±3.2 mEq/L), and urine density (1025.4±14.8). Subjects’ daily energy, protein and carbohydrate intakes were 3430±168 kcal, 114.1±29.1 g/day (1.4 g/kg/day), and 360±69 g/day, respectively.

**CONCLUSION:** Our data indicated that Hb and Hct values were in normal range in comparison with population references. CK levels, though elevated, were within clinical norms. Overall, the values were expected for a healthy, active population, though the cumulative effects over the course of the season may differ. Additional endocrine assessments may provide more useful information on physical readiness and training status.

**REFERENCES:***

*Ozlem Tok, Alp Bayramoglu, Shawn M. Arent, FACSM. *Rutgers University, New Brunswick, N.J. *Acibadem University, Istanbul, Turkey.* (Sponsor: Shawn M. Arent, FACSM) Email: ozlemtok@hotmail.com (No relationships reported)
Athletes strive for a competitive edge through proper management and monitoring of training. Biomarkers are emerging as a potential tool for optimally assessing player health, recovery, and readiness. 

**PURPOSE:** To evaluate changes in various biomarkers associated with breakdown, recovery, and nutritional status in female collegiate soccer players in the first half of a competitive season.

**METHODS:** Division I female collegiate soccer players (N=29; M age = 21 ± 1.3 yrs; M height = 64.7 ± 6.3 cm; M weight = 66.8 ± 7.2 kg; M%BF = 22.0 ± 3.9 %) participated in blood draws at the start of preseason (T1) the first quarter of the season (T2) and at the midpoint (T3). The athletes arrived fasted and euvolemic the morning after a game. Hematocrit (HCT), IL-6, creatine kinase (CK), total cortisol (CORT), iron (Fe), Vit-D, omega-3 fatty acids (OMG36), and prolactin (PRL) were assessed. All players were monitored for training load using the Polar Team2 System.

**RESULTS:** There were significant changes across T1, T2, and T3 in all biomarkers except HCT and Vit-D. CK levels at diagnosis ranged from 561 – 157,700 U/L. Non-functional overreaching (NFO) and overtraining Syndrome (OTS) result in impaired performance. Using biomarkers, it may be possible to detect early indications of these before deteriorations occur.

**CONCLUSION:** Evaluation changes in predictive biomarkers of NFO & OTS in female collegiate power-endurance athletes during the season and relate these changes to preseason fitness. 

**Sponsored by Quest Diagnostics**

**June 1, 3:30 PM - 5:00 PM**

**Changes In Markers Of Recovery, Readiness, And Nutritional Status In Division I Female Soccer Players Over The First Half Of The Competitive Season**

Alan J. Walker, Sean P. Conway, Morgan L. Hofacker, Meaghan M. Rabideau, Bridget A. McFadden, Anthony N. Poyssick, Nick S. Mackowski, Joseph K. Pellegrino, Christopher E. Ornday, Marissa L. Bello, Ozlem Tok, David J. Sanders, Michael A. Goldstein, Shaw M. Arent, FACSM. Rutgers University, New Brunswick, NJ. (Sponsor: Dr. Shawn Arent, FACSM)

Email: alanwalk12@gmail.com

(No relationships reported)
RESULTS: CK levels were 725.2 ± 641.8 U/L (normal laboratory reference range up to 250U/L) for T1, 1187.7 ± 827.1 for T2, 992.2 ± 453.8 U/L for T4. The percentage of players with CK levels more than 1,000 U/L were 15%, 43.9%, 29.3% and 25% for T1, T2, T3 and T4 respectively.

CONCLUSIONS: These results suggest that there is considerable degree of muscle damage in football players during pre-season as well as during season, which could result in a decrease in performance and increased injury risk. The standard deviations observed in the four analyses are remarkable, suggesting an important range in variability to the response to training and competition among football players of a same team which could be due to individual differences in assimilation of workload and competition. Our data shows that individualization and monitoring of training is important in college football and that monitoring for CK could be a useful method to monitor and prevent muscle injuries in NCAA football players.

TREATMENT AND OUTCOMES:
3. No drills or contact sport involvement until full clearance
2. No high impact activity until full clearance

DIFFERENTIAL DIAGNOSIS:
1. Liver injury
2. Spleen injury
3. Pancreatic injury
4. Rib injury
5. Pulmonary contusion
6. Hemotorax

TEST AND RESULTS:
1. Point-of-care-troponin:
   - Within normal limits
2. Chemistry panel:
   - Sodium 141, Potassium 3.5, Chloride 105, Bicarbonate 26, BUN 1, Creatinine 1.6, Glucose 102, Calcium 9.7, Total protein 7.8, Albumin 4.6, Total bilirubin 0.9, Alkaline phosphatase 73, AST 65, ALT 52, Lipase 137
3. Abdominal CT scan:
   - Intraparenchymal laceration in the liver with probable length of about 5 to 6 cm
   - No subcapsular extension

FINAL WORKING DIAGNOSIS:
1. Grade II liver laceration
2. Blunt abdominal trauma
3. Mild acute kidney injury

TREATMENT AND OUTCOMES:
1. Non-operative management
2. No high impact activity until full clearance
3. No drills or contact sport involvement until full clearance
4. Participated in strength training of upper and lower extremities 1 week post injury
5. Diet as tolerated, low residue diet when experiencing abdominal discomfort
6. A CT at 2 and 4 weeks post injury showed normal healing
7. Routine visits with trauma surgeon at 2 and 5 weeks revealed no new findings
8. Full clearance to return to sport began at 5 weeks post injury

Abdominal Injury - Football
Jared Williams, Clint Haggy, Jeffrey Holloway. University of South Carolina, Columbia, SC.

(No relationships reported)

HISTORY: A 20-year-old male collegiate football linebacker was inadvertently contacted by another player in the abdomen with the crown of their helmet during practice. The subject laid on the athletic field immobile, until medical staff ran onto the field and evaluated him immediately.

PHYSICAL EXAMINATION: Alert and responsive but in obvious distress with diffuse moderate tenderness in bilateral upper quadrants of their abdomen with guarding. No change of mental status was present. Difficult and labored respiration, as well as vomit with blood was observed. The patient denied neck pain, back pain, headache or visual changes. One time emergency personnel were contacted and the patient was transported. Initial vitals included: temperature 98 degrees, pulse 81 bpm, 20 rpm, blood pressure 130/79 and a pulse oximetry of 95 percent.

Changes in Lower Body Functional Strength after Physical Activity Intervention in Sedentary Low Income Breast Cancer Survivors
Carol A. Harrison, Lizette Martínez, Stacie Scruggs, George Baum, Karen Basen-Engquist. University of Texas M. D. Anderson Cancer Center, Houston, TX.

(No relationships reported)

Studies show physically active breast cancer survivors (BCS) can reduce risk of breast cancer (BC) recurrence and BC-related mortality. Physical activity (PA) can help reduce many quality of life (QOL) concerns reported by BCS. Reviews of PA for cancer survivors report interventions improved aerobic fitness, body strength, BMI, and QOL.

PURPOSE: Examine changes in lower body functional strength (LBFS) after a 16 week PA intervention in inactive, low-income BCS. Consideration of LBFS is imperative in establishing an active lifestyle which can lead to greater QOL and reduce risk of breast cancer recurrence. METHODS: Participants (PTS) were low-income, underinsured BCS from the Houston, TX area with less than 150 minutes of moderate PA a week. An in-person PA program was delivered in 12 group sessions over 16 weeks. This included 10 minutes of PA to instruct on intensity, resistance training use and PA safety. PTS were asked to complete 30 minutes of moderate or greater intensity PA 5 or more days a week, and include 2 days resistance training weekly. The short International Physical Activity Questionnaire (IPAQ) (baseline, BL) was used to measure if PTS met PA criteria. The 6 minute walk test (6MWT) and 30 second sit-to-stand (Rikli and Jones Senior Fitness Test Manual) were used at BL and F/U to assess lower body physical function (LBFS). RESULTS: We examined 35 PTS, mean age 59, median education some college. IPAQ results show significant increase in PA between BL and F/U in all categories of intensity: walk (p = .018), moderate (p = .007), vigorous (p = .009). We observed significant increase in 30 second sit-to-stand count (p = .045) but not 6MWT (p = .141). Paired t-tests were used between BL and F/U. CONCLUSION: Results suggest PA including guidance in increasing PA can produce positive changes in PA on all intensity levels. Initial gains LBFS may be attributed to newly introduced resistance activity and resulting muscle adaptation. While no significant results were seen in 6MWT, gains in LBFS show potential for gains in overall (LBFS) with a well-planned PA program involving progressive overload for aerobic conditioning leading to more PA and better QOL.

Funded by the Cancer Research Institute of Texas (CRIPT).

Acknowledgements: Center for Energy Balance in Cancer Prevention and Survivorship, Kelsey Research Foundation
examined the effect of training load on male libido status. METHODS: A cross-sectional survey design was utilized to collect data, and was distributed to ~300 training groups via email. Respondents completed an online survey portal. A total of 1366 individuals responded, however, only the respondents meeting the study criteria of being male and 18 years or older (n=1077) were included in the analyses. Validity checks were conducted on the data. Data were reduced to age categories (<40, 41-55, >56) and tertiles for testing intensity (INT) and training duration (years training at the current intensity, DUR). Total libido score was categorized into high/normal vs. low libido status. Univariate relationships between age, concussion history, INT and DUR were examined. Multivariate binary logistic regression was utilized to determine adjusted odds ratios for libido status (high/normal vs. low). RESULTS: Only age, INT and DUR had significant univariate relationships (p<0.05) with libido status and were included in the multivariate model. For the multivariate model, INT (p=0.000) and DUR (p=0.002) were significantly associated with libido status. Participants with the lowest (OR: 6.9; 95% CI: 2.6-17.9) and mid-range INT (OR: 2.8; 95% CI: 1.4-5.3) had greater odds of high/normal libido status than those with the highest INT. Participants with the shortest (OR: 4.1; 95% CI: 1.6-10.0) and mid-range training DUR (OR: 2.5; 95% CI: 1.3-4.8) also had greater odds of high/normal libido status than those with the highest DUR. CONCLUSIONS: This study indicates a relationship does exist between exercise training load and male libido status. High levels of chronic endurance training and high volumes of intense training in males may contribute to decreased libido levels.

B-37 Free Communication/Poster - Military Physiology

Wednesday, June 1, 2016, 1:00 PM - 6:00 PM
Room: Exhibit Hall A/B

941 Board #257 June 1, 2:00 PM - 3:30 PM
The Impact Of Military Operations In The Brazilian Amazon Jungle In Muscular Strength Parameters
Adriano T. Pereira1, Eduardo C. Martínez2, Luis H.C. Doreca2, Antenor C. Silva2, Runer A. Marson1, 1Brazilian Army Research Institute of Physical Fitness, Rio de Janeiro, Brazil. 2Jungle Warfare Instruction Center, Manaus, Brazil.
Email: adriano.ocale@hotmail.com
(No relationships reported)

The muscular strength is one of the physical fitness’s components for the maintenance of the physical performance that can be altered during tiring activities and physical exercises. The Jungle Warfare Instruction Center – Centro de Instrução de Guerra na Selva (CRGS) is the military unit responsible for the qualification of jungle warriors, fighters prepared to carry out missions in the most barren of the Brazilian amazon jungle. During the course of jungle warfare, the military undergo intense and continuous physical demands which can decrease the physical performance of the warrior, such as load carrying through the jungle and the transposition of water courses in the amazon environment.

PURPOSE: To verify the change of muscular strength after 11 (eleven) weeks of continuous operations in the jungle. METHODS: 60 military male aged 28 ± 4 yrs took part in this study. The sample was similar anthropometric characteristics (total body mass 75±8 Kg, Height 173±6 cm, %Fat 14.2±3%). Load cells were used (EMG system do Brasil), to measure the parameters of muscular strength of the scapular (SCP), lumbar (LMB), lower limbs (LL) and hand grip (HG). The muscular strength tests were performed before (T1) and after (T2) the eleven weeks of military operations in a jungle environment. The values were assessed in terms of average and standard deviation and was used the t paired test (Statistica 7.0).

RESULTS: The strength tests SCP [T1 (37.2 ± 7.9) and T2 (33.3 ± 6.7)], LMB [T1 (146.4 ± 29.1) and T2 (68.7 ± 14.4)] and LL [T1 (155.5 ± 30.7) and T2 (75.6 ± 13.9)] showed a significant difference (p<0.05). The strength test HG [T1 (33.9 ± 4.3) and T2 (33.8 ± 5.4)] did not show a significant difference. CONCLUSION: This study suggests that the continuous and intense physical demands applied during the eleven weeks of military operations in the Brazilian Amazon Jungle signaled a decrease in muscular strength when compared to the scientific literature, mainly in lumbar area and lower limbs.

The best indication of an individual’s ability to perform a physically demanding task is to perform the actual task. However, this is not always safe or practical when selecting an individual for a job. A physical employment test (PET) consisting of basic physical ability tests may be a safer alternative. PURPOSE: The purpose of this study was to use common physical fitness tests (PFTs) to predict Soldier performance of a simulated casualty drag task (CD).

METHODS: 608 male and 230 female soldiers were timed (sec) dragging a 123 kg dummy 15 meters as fast as possible, while wearing a fighting load with a weapon (~38 kg total load). The CD was performed on a rubber floor and the final score was the speed of dragging in m/sec. Soldiers also performed 14 PFTs wearing shorts, t-shirts and athletic shoes. PFTs included: standing 9 kg overhead medicine ball throw (OT), isometric lifting strength (IL), dumbbell squat lift (SL), seated 2 kg medicine ball put (MBP), 20 m sled drag (SD), standing long jump (LJ), handgrip, 300 m sprint, pushups, sit-ups, isometric biceps curl, deep test, arm ergometer endurance and Illinois agility test. Stepwise multiple linear regression procedures were used to predict CD performance.

RESULTS: The model obtained using all possible predictors was: CD (m/sec)= -0.831 + (0.058)(OT m) + (0.002)(IL kg) + (0.005)(SL kg) + (0.060)(MBP m) + (0.130)(SD m/sec) + (0.120)(LJ m), R2=0.72 (p<0.01), SEE=0.23 m/sec. The amount of variability in the prediction accounted for with the addition of each variable was as follows: OT→61%, IL→6.6%, SL→2.5%, MBP→1.4%, SD→0.6%, and LJ→0.6%. Measuring 6 variables to predict one task may not be practical. Examination of the stepwise R2 values revealed that the first two PFTs entered (OT and IL) achieved an acceptable R2 of 0.68.

CONCLUSIONS: The use of a whole body power test (OT) and isometric lifting test (SL) provide a reasonable estimate of a person’s ability to perform a heavy CD. In pre-employment screening testing, where it is impractical and unsafe to test an employees’ ability to perform this task, performance can be predicted using simple measures of physical fitness with an acceptable level of accuracy.

The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

943 Board #259 June 1, 2:00 PM - 3:30 PM
Predicting Soldier Performance of the Casualty Evacuation
Jan E. Redmond, Stephen A. Foulis, Peter N. Frykman, Bradley J. Warr, Marilyn A. Sharp, Edward J. Zambraski, FACSM. USARIEM, Natick, MA. (Sponsor: Dr. Edward Zambraski, FACSM)
Email: jan.e.redmond.civ@mail.mil
(No relationships reported)

Casualty evacuation from a wheeled vehicle is a common and life-saving Soldiering task that requires high levels of muscular strength and endurance. While completing a simulated casualty evacuation would be the best method for assessing a new recruit’s potential to perform the task, the use of physical fitness tests to predict their potential is more time efficient and may mitigate injury risk. PURPOSE: To determine the effectiveness of physical fitness tests (PFT) to assess an individual’s physical capabilities to perform a casualty evacuation. METHODS: While wearing a fighting load weighing approximately 71 lbs, 608 men and 230 women Soldiers evacuated a weighted haul bag through a simulated tank hatch on a platform. Weights for the haul bag started at 50 lbs and increased to 210 lbs by 10, 20 or 30 lb increments. Soldiers were stopped when they could no longer safely lift the bag or reached 210 lbs. Soldiers also performed 14 PPT while wearing shorts, t-shirts and athletic shoes. The PFTs included: dumbbell squat lift (SL), handgrip (HG), Upright Pull (UP), Illinois Agility test (IA), arm ergometer (AE), 9 kg powerball throw (PBT), isometric biceps curl (IBC), 2 kg medicine ball put (MBP), 20 m sled drag (RP), standing long jump (LJ), 300 m sprint (300), Deep test (BT), push-ups, and sit-ups. RESULTS: A stepwise multiple regression was used to develop the following equation (SEE = 21.1 lbs): 82.182 + 0.473 (SL-lbs) + 0.083 (HG-lbs) + -136.0 (IA-min) + 0.064 (UP-lbs) + 0.083 (AE-PM). Approximately 62 percent of the variability in the prediction accounted for with the addition of each variable was as follows: SL→61%, HG→6.6%, IA→-1.4%, UP→1.4%, and AE→0.6%. The amount of variability in the prediction accounted for with the addition of each variable was as follows: SL→61%, HG→6.6%, IA→-1.4%, UP→1.4%, and AE→0.6%. Measuring 6 variables to predict one task may not be practical. Examination of the stepwise R2 values revealed that the first two PFTs entered (OT and IL) achieved an acceptable R2 of 0.68.

CONCLUSIONS: A Soldier’s potential to complete the casualty evacuation can be
CONCLUSION: The results depict poor methodological agreement in percent body fat agreement and 12/13 (92%) were systematically under-predicted by the taping method to DXA. However, no cadet was over the compliance threshold (20–22% fat) using the agreement. RESULTS: 7 of 23 cadets (30%) were body fat non-compliant according with ±2–4% body fat established as a zone of agreement to evaluate between method men = 179.06 ± 6.60 cm; 81.43 ± 10.34 kg) between the ages of 18–24 were taped (neck dual-energy x-ray absorptiometry (DXA). METHODS: Male ROTC cadets (N=23; 179.06 ± 6.60 cm; 81.43 ± 10.34 kg) between the ages of 18–24 were taped (neck & waist sites) according to Army protocol and body fat was predicted (% body fat = [86.01 * LOG(weight) – (waist – neck)] – [70.041 * LOG(height)] + 36.76). This % body fat prediction was then compared to that determined by DXA via a Bland-Altman Plot with ±2–4% body fat established as a zone of agreement to evaluate between method agreement. RESULTS: 7 of 23 cadets (30%) were body fat non-compliant according to DXA. However, no cadet was over the compliance threshold (20–22% fat) using the tape method. 13 of the 23 body fat comparisons (57%) fell outside the ± 2% zone of agreement and 12/13 (92%) were systematically under-predicted by the taping method. CONCLUSION: The results depict poor methodological agreement in percent body fat between taping and the DXA as taping generally underestimates % body fat. Therefore, circumference taping should be used with caution as it provides a relatively poor estimate of a cadet’s true percent body fat.

PURPOSE: To compare physical and physiological changes in male Army recruits in response to alternate physical conditioning regimen through basic military training. METHODS: All recruits participating in the study were undertaking the Australian Army 12-week basic recruit training course. The control group (CON, n=22, age 21.3 ± 3.2 y, height 179.1 ± 5.2 cm, mass 79.7 ± 13.5 kg) undertook the extant physical conditioning program. The experimental group (EXP, n=21, age 22.2 ± 4.3 y, height 180.2 ± 6.6 cm, mass 79.7 ± 10.7 kg) undertook an alternate, periodised physical training program emphasising muscular strength development (higher load, lower volume). All other aspects of recruit training were the same between groups, including total training time (41 h) and training frequency (41). Muscular strength (1RM squat and bench press), hormones (IGF-1, cortisol and testosterone) and body composition (% body fat, lean mass) were measured at weeks 1 and 12. Significant interactions (p<0.05) are reported as the mean change (± SD) between weeks 1 and 12 for each group. RESULTS: EXP increased 1RM squat whilst CON showed no change (EXP 27.9 ± 11.3 kg, CON -1.7 ± 15.7 kg). Both EXP and CON increased 1RM bench press however EXP showed significantly (p<0.05) greater improvements (EXP 19.5 ± 6.9 kg, CON 11.6 ± 9.2 kg). CON showed a significantly (p<0.05) greater decrease in IGF-1 from week 1-12 (EXP 2.4 ± 7.1 nmol/L, CON -7.1 ± 8.1 nmol/L), whilst EXP showed a significantly (p<0.05) greater change in Cortisol (EXP -102.3 ± 92.0 nmol/L, CON -18.7 ± 125.6 nmol/L). No change (p>0.05) in testosterone, total fat mass or lean mass was observed. CONCLUSIONS: Despite modest changes in the hormonal milieu and no change in body composition, the current investigation has shown greater upper- and lower body strength gains in Army recruits performing higher-load, lower-volume resistance training when compared to traditional military training biased towards local muscular endurance. A high intensity, low volume resistance training regimen is therefore beneficial considering the importance of muscular strength in many military tasks.

PURPOSE: To determine the efficacy of a high load and intensity experimental physical training regimen to improve recruit performance within the Australian Army. METHODS: Military recruits were assigned to either a 12-week Experimental (EXP n = 68, 21.7 ± 4.2 y), Military (MIL n = 60, 21.1 ± 4.1 y) or civilians act as a control group (CON n = 11, 25.5 ± 4.5 y) and were assessed at Weeks 1, 6 and 12, in military tests for 3.2 km 22 kg load carriage, 1RM 1.5m box lift, 20 m multistage fitness test, and 2 min push-up test. A random sub-sample of recruits (EXP n = 33, MIL n = 38) also performed physiological tests (DEXA, VO2peak, 1RM squat and bench press, vertical jump and 30 s Wingate). Total training time (41 hours) and frequency (41) was match between EXP and MIL. However, compared to MIL the EXP had 50% lower physical activity count (triaxial accelerometer), but higher heart rate reserve (heart rate monitor, EXP >70%, MIL 15RM). Significant interactions (P<0.05) are reported as the mean change between Weeks 1 and 12, ± SD. RESULTS: No changes were observed for CON. EXP significantly reduced total body fat (EXP -2.7 ± 2.2 kg, MIL -1.7 ± 2.2 kg) whilst total lean mass was observed to increase in both groups (EXP 2.1 ± 1.9 kg, MIL 2.4 ± 2.2 kg). EXP showed superior improvement in load carriage time (EXP -155.1 ± 122.4 s, MIL -160.4 ± 123.8 s), 1RM box lift (EXP 48.8 ± 6.0 kg, MIL 1.0 ± 5.5 kg), 20 m multistage fitness test (EXP 5.3 ± 4.1 mL.kg-1.min-1, MIL 3.4 ± 4.0 mL.kg-1.min-1), 2-min push-up (EXP 10.8 ± 7.1 reps, MIL 8.0 ± 7.4 reps), 1RM bench press (EXP 18.0 ± 6.7 kg, MIL 9.2 ± 18.6 kg), 1RM squat (EXP 27.8 ± 10.5 kg, MIL -6.1 ± 27.6 kg) and VO2peak (EXP 2.7 ± 4.1 mL.kg-1.min-1, MIL -1.2 ± 6.3 mL.kg-1.min-1). MIL had a significantly greater decline in vertical jump power (EXP -36.8 ± 127.7 W, MIL -72.1 ± 139.4 W). In contrast, no mean power declined in both groups after training (EXP -24.5 ± 53.7 W, MIL -250.7 ± 107.7 W). CONCLUSION: Despite a significant reduction in training volume, recruit performance in basic military, occupational and physiological tests of physical fitness were superior. Our results suggest that high resistance training loads and exercise endurance intensity can be successfully implemented within a mass military recruit training environment.

While the majority of concussion/TBI studies focused on injured athletes, accident victims and military personnel in theater, recent studies suggest that repetitive undiagnosed or sub-concussive events may also lead to significant long term health issues (e.g. early onset dementia, CTE). Military personnel in a variety of occupations are consistently and repetitively exposed to low level blast and report the same symptoms as seen in studies of un-injured explosive entry personnel (e.g. memory issues, headache & fatigue) yet little information on the level and quantity of exposures exists.

Purpose: To quantify blast OP exposure in military personnel who are consistently and repetitively exposed to low level blast. Methods: Artillery (105 mm Howitzer, N = 20, Ft Still, OK) and mortar team (120 mm, N = 5, Ft Benning, GA) crew members were instrumented with multiple blast pressure gauges (Black Box Biometrics, model B3-H) during operational training. Artillery crew (active training unit) fired 30-100 rounds per day at 3 different charge levels on 4 separate days while the mortar crew (Infantry Mortar Leader Course) fired 10 rounds at 2 different charge levels. The blast OP exposure per round ranged from 0.6-1.1 psi with the highest exposure (average & peak) observed in the crew chief and assistant gunner. Mortar crew OP exposure ranged from 0.5-3.5 psi with the highest exposure experienced by the squad leader and range officer. An evaluation of unit shot sheets identified a minimum exposure of 4200 rounds/year for artillery crew and ±500 rounds/year for mortar crew instructors. Additional data on Grenade Range Instructors will also be presented. Conclusion: Considering the growing evidence that long term blast injury may be occurring in the absence of overt TBI symptoms, it is important to quantify the number and magnitude of OP exposures in military personnel. Follow on studies will include cognitive and physiological tests in these same populations.

Abstracts were prepared by the authors and printed as submitted.
Operational military duties are characterized by prolonged low intensity physical activity interspersed with shorter bouts of higher intensities. However, in the literature there is a lack of research-based information concerning the amount of objectively measured physical activity during military operations. PURPOSE: To investigate changes in volume and intensity of physical activity during a 6-month crisis management operation in the Middle East. METHODS: 46 male soldiers used a 3-dimensional accelerometer during their waking hours for ten days on three different deployment occasions (pre-mid-post). The physical activity data were analyzed by using mean amplitude deviation according to previously published validation.

RESULTS: Soldiers spent 10 hours and 30 minutes (10:30±01:54) at a very low physical activity level (MET<1.5) during the pre-measurement. This type of inactivity decreased at the mid-measurement (10:00±01:48, p<0.05) but increased back to the initial level at the post-measurement (10:30±02:00, p<0.05). No changes were observed in sitting (7:00±1:36 vs 6:42±1:18 vs 6:54±1:18) or laying times (1:36±1:06 vs 1:36±1:06 vs 1:54±1:30). No changes were observed in the average time spent doing vigorous physical activity between the measurements (MET>6:0; 10:00±00:09 vs. 10:00±00:07 vs. 10:00±00:09). The average number of daily steps remained below 10,000 at all measurement phases. In terms of steps, the highest activity was observed at the pre-measurement (9229±2540 steps/day) as compared to the mid-measurement (7905±2448, p<0.01) and post-measurement (8339±2488, p<0.05). Of these steps, 1055±817, 921±835 and 1052±1005 involved running at the pre-, mid- and post-measurement phases, respectively. CONCLUSION: The present soldiers were not exposed to prolonged physical activity during their crisis management operation. On the contrary, the total volume and intensity of physical activity was rather low and did not exceed population-wide recommendations. However, soldiers are required to maintain a high level of readiness for suddenly changing security situations. The present study highlights the importance of the maintenance of physical performance by both independent and guided exercises during deployment.

Supported by the Scientific Advisory Board for Defence, Finland.

**Board #265**

**June 1, 2:00 PM - 3:30 PM**

A Periodised, Low Volume High Training Load Regimen Reduces The Rate Of Recruit Injury Within Basic Military Training

Herbert Groeller1, Simon D. Burley1, John A. Sampson1, Bradley C. Nindl, FACSM2, Jace Drain3. 1University of Wollongong, Wollongong, Australia. 2University of Pittsburgh, Pittsburgh, PA. 3Defence Science and Technology Group, Melbourne, Australia.

Email: hgroell@uow.edu.au

(No relationships reported)

PURPOSE: To monitor the effect of a low volume high training load and intensity basic military training regimen on recruit injuries METHODS: Military recruits were assigned to either a 12-week Experimental (EXP n = 118, 21.8 ± 4.3 y), or basic Military (MIL n = 98, 21.5 ± 4.1 y) training regimen. A randomly selected sub-sample of recruits EXP (10M, 9F) and MIL (12M, 7F) were instrumented with a triaxial accelerometer and heart rate monitor for 15 hours each day over seven consecutive days, during Weeks 1, 6 and 9 of the training regimen to record physical activity counts (PAC), cumulative number of steps (STEP) and relative heart rate reserve (HRR) of each participant. Recruit injury data was collected using the existing physical training protocol.

RESULTS: The number of injuries reported during the physical training was significantly lower in EXP (4, 3.4%) compared to MIL (18, 18.4%). CONCLUSION: Exposing recruits to high resistance training loads and exercise endurance intensity does not appear to influence risk of musculoskeletal injury. Our results suggest the associated reduction in physical training volume may assist in reducing the rate of injuries suffered during recruit training.
Previous studies have examined changes in physical fitness and incidence of musculoskeletal injuries during military operations, whereas cardiovascular health has gained less attention. PURPOSE: To determine changes in cardiovascular risk factors (blood pressure, total cholesterol, HDL, LDL, triglycerides, glucose) before, during and after a 6 month crisis management operation (UNIFIL). METHODS: 98 male soldiers (age 29.8±8.0 yrs., body mass 78.2±9.3 kg, BMI 24.4±2.4) participated.

Blood pressure was measured in 78 soldiers, and blood samples were drawn after an overnight fast in 59 soldiers in three measurement sessions in the operation: at week 1 (PRE), 9 (MID) and 19 (POST). RESULTS: 5 % of the soldiers were hypertensive (>140/90 mmHg), and systolic (PRE: 118.1±9.0, MID: 117.7±9.6, POST: 121.6±12.5 mmHg) and diastolic (PRE: 75.0±7.6, MID: 74.7±8.3, POST: 76.7±8.2 mmHg) blood pressure increased (p<0.05) at POST compared to PRE and MID values. Total cholesterol and triglycerides were above the recommended values (5.0 mmol/l and 2.0 mmol/l) in 3 % and 10 % of the soldiers, respectively. No changes were observed during the operation. HDL concentration was below the recommended value (1.00 mmol/l) in 20 % and LDL above (3.00 mmol/l) in 35 % of the soldiers. HDL increased (p<0.05) at POST (1.29±0.29 mmol/l) compared to PRE (1.23±0.30 mmol/l) and MID (1.23±0.31 mmol/l) values, and LDL at POST (2.89±1.00 mmol/l) compared to MID (2.73±0.89) (p<0.05). Glucose concentration was above the recommended value (5.0 mmol/l) in 3 % of the soldiers, and it decreased at MID (4.86±0.46 mmol/l) but increased (p<0.05) at POST (5.11±0.45 mmol/l) compared to PRE value (4.98±0.49 mmol/l). CONCLUSION: The majority of the soldiers exhibited recommended values in cardiovascular risk factors, however, even up to one third had values above the recommended level, especially, regarding to lipids and lipoproteins. The changes in selected cardiovascular risk factors during the operation were, however, rather small and indicate a little clinical significance. Nevertheless, it would be important to screen and monitor cardiovascular risk factors in soldiers also on operational settings. Thereby, further risk reduction programs could be used for those soldiers at higher risk. (Supported by the Scientific Advisory Board for Defence, Finland.)

## Cardiovascular Risk Factors in Soldiers During a 6-Month Crisis Management Operation

### Methods

- **Participants:** 98 male soldiers (age 29.8±8.0 yrs., body mass 78.2±9.3 kg, BMI 24.4±2.4) participated.
- **Procedures:**
  - Blood pressure was measured in 78 soldiers.
  - Blood samples were drawn after an overnight fast in 59 soldiers.
- **Measurements:**
  - Blood pressure measured in 78 soldiers.
  - Blood samples drawn after an overnight fast in 59 soldiers.

### Results

- **Blood Pressure:**
  - Total systolic pressure increased significantly at POST compared to PRE and MID values.
  - Diastolic pressure showed a significant increase at POST compared to both PRE and MID values.
- **Lipids and Lipoproteins:**
  - Total cholesterol and triglycerides were above the recommended values.
  - HDL increased significantly at POST compared to PRE and MID values.
  - LDL showed a significant increase at POST compared to MID.
- **Glucose:**
  - Glucose concentration was above the recommended value at POST but decreased at MID.

### Conclusion

The study demonstrated that during a 6-month crisis management operation, significant changes in cardiovascular risk factors were observed, particularly for total cholesterol, LDL, and glucose. These changes highlight the need for ongoing monitoring and intervention to maintain optimal cardiovascular health in military personnel.
In a recent report, we characterized the awakening responses and daily profiles of the catecholamine stress hormone cortisol in elite military men (n = 58, mean ± SD age 33.6 ± 1.0 years, body mass index 27.5 ± 0.9 kg/m², years of military service 12.1 ± 0.9 years). Anabolic hormones follow a similar daily pattern and are crucial mediators of resistance training outcomes, and may counteract the catecholamine effects of cortisol.

PURPOSE: This companion report is the first to characterize the daily profiles of the anabolic hormones dehydroepiandrosterone (DHEA) and testosterone in this population.

METHODS: One salivary sample was taken five times per day for 2 days, for a total of 10 samples. The samples were self-collected by subjects in a free-living setting with oral swabs. Samples were assayed in duplicate. Sampling time compliance was evaluated with actigraphy.

RESULTS: As a group, these men displayed normal, uncompromised anabolic hormone profiles comparable to that of young, athletic populations. Consistent with the cortisol findings from our prior report, summary parameters of magnitude (hormone output) within the first hour after awakening displayed superior stability versus summary parameters of pattern for both DHEA (r value: 0.77-0.82) and testosterone (r value: 0.61-0.68). Summary parameters of evening function were stable for both hormones (both p = 0.001), while the absolute decrease in testosterone across the stable proxy of dawn function (p = 0.001). Removal of noncompliant subjects did not appreciably affect concentration estimates or either hormone at any time point, nor did it alter the repeatability of any summary parameter.

CONCLUSIONS: Despite continuous, intense stress exposure, these men possess anabolic hormone profiles resembling young, resistance-trained populations. These findings enable accurate estimations of anabolic balance and the resultant effects upon health and human performance in this highly resilient yet chronically stressed population.

The sympathetic nervous system (SNS) facilitates bodily adjustments needed to accommodate exercise. Electrodermal activity (EDA), a measure of skin conductance mediated by sweat, has been widely used by psychologists as an effective tool to explore SNS-mediated responses to external stimuli. Surprisingly, this technology has been underutilized by exercise physiologists. Because EDA is relatively independent of parasympathetic nervous system regulation, it is a promising surrogate marker for SNS activity during exercise.

PURPOSE: The objectives of this exploratory study were to (1) use EDA to detect the presence and/or magnitude of SNS activity during exercise, and (2) examine the moderating effects of fitness on EDA responses. METHODS: Eleven U.S. Navy active-duty men (mean ± SD age, 36.0 ± 6.8 years) participated in a graded exercise test (GXT) to assess maximal oxygen consumption (VO₂max) using the Bruce protocol. EDA electrodes were placed on the volar surface of the middle and index phalanges. EDA was recorded at baseline, during GXT, active recovery, and seated recovery. Relative changes for each stage were compared with each other stage. EDA was recorded at baseline, during GXT, active recovery, and seated recovery. Relative changes for each stage were compared with each other stage.

RESULTS: For the total sample, mean changes in VO₂max, 43.9 ± 2.3 mL·kg⁻¹·min⁻¹). A 2 (group) x 6 (stage) ANOVA evaluated EDA changes across stages and between higher- and lower-fit groups.

CONCLUSIONS: Dose-dependent increases in SNS activity was detected. The blunted EDA response of less fit individuals during a maximal GXT.

In this highly resilient yet chronically stressed population, there is a certain improvement that occurs with experience and training. While many studies have characterized the responses of hormones and inflammatory indicators to resistance and cardiovascular exercise, few have evaluated the immediate effects of a graded exercise test (GXT) on these biomarkers. To date, no reports have revealed how cortisol, dehydroepiandrosterone (DHEA), testosterone, and C-reactive protein (CRP) are altered in response to a GXT in a military population.

PURPOSE: To evaluate Marines' stress levels during the shoot-house exercise by monitoring heart rate (HR) and heart rate variability (HRV) measures. METHODS: Nine male Marines (age = 25.7 ± 2.2 years, mass = 87.1 ± 5.0 kg, height = 182.0 ± 4.7 cm) participated in close quarter battle during a school housing training session. A single channel electrocardiogram was worn during CQB activities to collect HR and HRV. Five minute resting HR/HRV measures (Rest) were recorded with the subject supine. The HR/HRV measures were also recorded during a waiting phase (Wait) immediately prior to the start of the activity as well as during the CQB. Mean HR and root mean square of the mean squared differences of successive RR intervals (RMSSD) were assessed to ascertain physiological stress levels.

CONCLUSIONS: The increased HR and decreased RMSSD found in this study are physiological indicators of increased physical demands and stress levels. Since the current investigation is one of the first studies to quantify the HR/HRV during CQB training, future studies should examine their baseline physiological characteristics and tactical proficiency score in relation to their HR/HRV data. Additionally, future research could track their HR/HRV data and determine if there is a certain improvement that occurs with experience and training.
observed changes in cortisol were consistent with the increased energy demands, and physiological recovery, from aerobic exercise. The rise in testosterone was comparable to that observed following acute anaerobic training. CRP was surprisingly unaffected, indicating that the physiologic demands of a GXT may be too brief to provoke a response.

**Background:** The highest injury rates in the U.S. Army are among new recruits during basic training (BCT), ranging from 16-26 per 100-person-months (p-mos) for women. Following BCT, soldiers attend advanced individual training (AIT) for training in their military occupational specialty (MOS). Injury rates and risk factors have not been reported for any of these MOS training courses. This evaluation focused on two logistic/supply MOSs designated 92A and 92Y. **PURPOSE:** Determine the injury rate and fitness-performance risk factors for women who trained from 1 October 2012 to 30 September 2014 in the 92A and 92Y MOSs. **Methods:** Soldier fitness was based on Army Physical Fitness Test (APFT) events (push-ups, sit-ups, 2-mile run) during AIT. APFT performance was linked to demographic and personal characteristics (i.e., Army component, education, race, rank, and Body Mass Index (BMI) [weight/(height)]^2) and medical encounters for injuries that occurred during AIT. Injury rates (per 100-person-months of training) were calculated in each MOS. Women were categorized by quartiles of age, and performance on push-ups, sit-ups, and 2 mile run, and quintiles of BMI. Logistic regression was used to evaluate potential injury risk factors among women and was reported with odds ratios (OR) and 95% confidence intervals (CI). **Results:** There were 4,255 women who were trained in this period. Injury rates were 13.5/100-mos and 11.7/100-mos for the 92Y and 92A MOS, respectively. After adjusting for age, race, component, BMI and APFT, women older than 25 years had a 1.3 times higher odds of injury compared to women 19 years and younger (OR=1.3; 95% CI: 1.06, 1.58). For women in this study BMI was not a significant risk factor. Compared to women in the highest quartile for sit-ups, women in the lowest quartile had a 1.4 times higher odds of injury (OR: 1.4; 95% CI: 1.2 – 1.8). Women in the slowest quartile for 2-mile run had a 1.8 higher odds of injury than women in the fastest quartile (OR: 1.8; 95% CI: 1.5-2.2). **Conclusion:** While wearing ~46.7 kg load, 553 male and 230 female soldiers performed 4 times prior to testing. During training Soldiers performed 3 separate 5 round LMG tasks as fast as they could safely perform, with 10 min. of rest between these tasks. The mean of the Soldiers’ two fastest LMG times were used for scoring. Soldiers also performed 14 PFTs while wearing shorts, t-shirts and athletic shoes. The PFTs included: dumbbell squat lift (SL), handgrip (HG), Upright Pull (UP), Illinois Agility test (IA), arm ergometer (AE), 9 kg powerball throw (PBT), isometric bicep curl (IBC), 2 kg medicine ball put (MBP), 20 m sled drag (RP), standing long jump (LJ), 300 m sprint (300), Beep test (BT), push-ups, and sit-ups. **RESULTS:** The average time (mean ± SD) to complete the LMG task was 20.39 ± 5.87 sec. A stepwise multiple regression was used to develop the following equation (SEE = 3.59 sec): 28.155 -.043 (AE-RPM/2 min) -.161(SL-kg) +38.845 (IA-min) -.092 (HG-kg), (p ≤ 0.025). Approximately 64 percent of the variability in the prediction (i.e. R^2) of LMG performance can be explained by the combination of the 4 PFTs. **Conclusions:** A Soldier’s potential to complete the LMG task can be predicted by the combination of the 4 PFTs in this model. Using these simple PFTs to assess an individual’s physical capabilities for LMG, a physically demanding task, is less equipment intensive, more feasible and safer.

---

**Official Journal of the American College of Sports Medicine**

**Board #277**

**June 1, 2:00 PM - 3:30 PM**

**Predicting Performance on a Military Manual Handling Task**

Peter N. Frykman, Stephen J. Fouls, Jan E. Redmond, Bradley J. Warr, Marilyn A. Sharp, Edward J. Zambraski, FACSM. USARIEM, Natick, MA.

Email: peter.n.frykman.civ@mail.mil

(No relationships reported)

Loading the main gun of an M1 Abrams tank is a Soldiering task requiring high levels of muscular strength while maintaining a significant risk of injury for untrained individuals. To mitigate these issues a simulated interior of the tank turret was built to provide a safe environment for testing and training. Using a simulated tank turret may be the best method for assessing a new recruit’s potential to perform the task, however the use of physical performance tests to predict their potential may be more efficient and mitigate injury risk. **PURPOSE:** To determine the effectiveness of physical fitness tests (PFTs) to assess an individual’s physical capabilities to perform the task of loading a tank main gun (LMG). **METHODS:** While wearing protective equipment weighing approximately 27.3 kg, 96 men and 93 women Soldiers picked up 5 (25 kg ea.) inert tank rounds from a rack and loaded them as rapidly as possible into a simulated gun breach. To learn the LMG task Soldiers practiced 4 times prior to testing. During testing Soldiers performed 3 separate 5 round LMG tasks as fast as they could safely perform, with 10 min. of rest between these tasks. The mean of the Soldiers’ two fastest LMG times were used for scoring. Soldiers also performed 14 PFTs while wearing shorts, t-shirts and athletic shoes. The PFTs included: dumbbell squat lift (SL), handgrip (HG), Upright Pull (UP), Illinois Agility test (IA), arm ergometer (AE), 9 kg powerball throw (PBT), isometric bicep curl (IBC), 2 kg medicine ball put (MBP), 20 m sled drag (RP), standing long jump (LJ), 300 m sprint (300), Beep test (BT), push-ups, and sit-ups. **RESULTS:** The average time (mean ± SD) to complete the LMG task was 20.39 ± 5.87 sec. A stepwise multiple regression was used to develop the following equation (SEE = 3.59 sec): 28.155 -.043 (AE-RPM/2 min) -.161(SL-kg) +38.845 (IA-min) -.092 (HG-kg), (p ≤ 0.025). Approximately 64 percent of the variability in the prediction (i.e. R^2) of LMG performance can be explained by the combination of the 4 PFTs. **Conclusions:** A Soldier’s potential to complete the LMG task can be predicted by the combination of the 4 PFTs in this model. Using these simple PFTs to assess an individual’s physical capabilities for LMG, a physically demanding task, is less equipment intensive, more feasible and safer.
963 Board #279 June 1, 3:30 PM - 5:00 PM RealiThe Site of Perceived Discomfort when Walking with Different Blood Flow Restriction Pressures in Young Adults

Charity Cavazos, Alexa Martinez, Mai Vangsgaard, Bianca Galletti, Brian Johnson, Michael G. Bemben, FACSM. University of Oklahoma, Norman, OK. (Sponsor: Dr. Michael G. Bemben, FACSM)

(No relationships reported)

Previous studies using blood flow restriction (BFR) with low intensity aerobic exercise report increases in muscle hypertrophy, strength, and aerobic capacity without muscle damage; however, BFR exercise can be uncomfortable. PURPOSE: To assess the reliability of perceived discomfort when walking with BFR at different restrictive pressures. METHODS: Seventeen men and 15 women (aged 24.09 ± 4.14 yr) visited the laboratory 8 times. On the first and 24th visit, subjects completed paperwork, screening and completed a familiarization session which included pre and post MVC of the right quadriceps and walking on a treadmill for 10 min at 3.5 mph and at 50% of total occlusion pressure. During the 3rd - 24th visits, each separated by 24 hrs, subjects performed pre MVC and immediate post MVC following 20 min of treadmill walking using BFR cuffs at a randomized pressure of 40%, 50%, or 60% total occlusion pressure. RPE and perceived discomfort were assessed at the end of treadmill walking. RESULTS: There were no significant day (1 vs 2), time (pre vs post) and condition (40%, 50%, 60%) effects for interactions for MVC (repeated measures ANOVA) and RPE (Wilcoxon Signed Ranks Test). Additionally, intraindividual correlation coefficients between days were only moderate and ranged from 0.64 -0.79 for RPE and from 0.69-0.85 for discomfort across occlusion pressures. CONCLUSION: 20 min walking exercise with BFR at 40%, 50%, or 60% elicited no changes in MVC and RPE, however, only discomfort at the highest pressure was different between days, suggesting that subjects could not distinguish differences in occlusion pressure between 40% and 60% of total occlusion.

964 Board #280 June 1, 3:30 PM - 5:00 PM Dynamic Balance Performances: Effect of Visual Biofeedback

Cristina Cortis1, Carlo Varalda2, Giuseppe F. Giancotti1, Giuseppe Di Micco1, Andrea Fusco1, Laura Capranica1

1University of Cassino e Lazio Meridionale, Cassino, Italy. 2Italian Weightlifting Federation FIPF, Rome, Italy. (University of Rome Foro Italico, Rome, Italy. (Sponsor: Carl Foster, FACSM)

Email: c.cortis@unicas.it

(No relationships reported)

Effective balance requires an integrative use of visual, vestibular, and somatosensory systems, aiming at maintaining the projection of the center of gravity within the base of support. However, scarce information is available about the effects of visual feedback on dynamic balance performance.

PURPOSE: To evaluate the influence of visual biofeedback in dynamic balance performances.

METHODS: 28 (15 female, 13 male) subjects (age: 25.5±3.3 years; weight: 64.0±12.7 kg; height: 167.4±10.3 cm; BMI: 22.6±2.4) volunteered to participate in the study. Dynamic balance performance was assessed on a wobble board (Balance Board WSB, GSI Service, Rome, Italy; diameter=40cm) as the time spent in the target zone (TZ, diameter=6.3cm) displayed on a screen and the length of center of gravity trajectory (CoG). Participants were asked to stand barefoot on the wobble board with a comfortable double leg stance, keeping their hands on their hip. After a 3-minute familiarization, three 30-second trials were performed with 1-min sitting recovery in between during two randomized conditions (BF, looking at the screen showing real time performance) and without (BF, looking at a black wall) visual biofeedback. Differences between performances (p<0.05) were assessed by repeated measures ANOVA.

RESULTS: Differences (p<0.01) emerged in TZ and CoG with better performances in the BF condition (TZ: Female=11.4±4.6s; Male=8.5±6.4s; Total=10.1±5.6s; CoG: Female=893.8±1182.7cm; Male=977.1±425.3cm; Total=932.5±315.4cm) with respect to the NBF (TZ: Female=6.3±2.8s; Male=3.8±3.2s; Total=5.1±3.2s; CoG: Female=1023.1±262.9cm; Male=1156.2±469.3cm; Total=1084.9±371.9cm). CONCLUSIONS: Results highlight that BF may improve dynamic balance performances assessed on a wobble board with respect to NBF condition, by facilitating accuracy and goal directedness of postural control. This could impact training and evaluations protocols especially when special populations (i.e., athletes, children, elderly and people with balance disorders) are involved.

965 Board #281 June 1, 3:30 PM - 5:00 PM A Survey of Quality of Life of College Students in China

Chunxia Miao, Xuzhou Medical College, Xuzhou, China. (Sponsor: Weimo Zhu, FACSM)

Email: jumpinghorse@szmc.edu.cn

(No relationships reported)

Quality of life (QOL) of college students is defined as college students’ perception on their learning, living and things in relation to one’s all-round development in societal backgrounds and it consists of five domains, i.e., physical, psychological, behavior, environment and social support.

PURPOSE: To survey QOL of college students in China so that lifestyle intervention for this population can be better designed.

METHODS: Through a multistage and random sampling, a total of 2,100 college students in Jiangsu, China were surveyed by a validated five-domain QOL questionnaire.

RESULTS: A total of 1,950 (male% =43.2%; age in yr. =21.1±1.15) questionnaires were collected effectively, representing a response rate of 92.86%. The mean±SD of five domains (the score range of each domain is from 1 to 100) are: Physical=59.5±12.95, Social support=59.3±18.05, Environment=55.28±15.54, Psychological=57.66±8.97, and Behavior=57.36±10.74, respectively. The correlations among domains are summarized below:

<table>
<thead>
<tr>
<th>Domain</th>
<th>Psychological</th>
<th>Psychological</th>
<th>Psychological</th>
<th>Psychological</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.305</td>
<td>0.277</td>
<td>0.303</td>
<td>0.321</td>
<td>0.266</td>
</tr>
<tr>
<td>Behavior</td>
<td>0.277</td>
<td>0.583</td>
<td>0.266</td>
<td>0.201</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>0.169</td>
<td>0.293</td>
<td>0.321</td>
<td>0.201</td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td>0.107</td>
<td>0.255</td>
<td>0.266</td>
<td>0.201</td>
<td></td>
</tr>
</tbody>
</table>

According to the evaluation criterion developed for this questionnaire (i.e., 0~37.5= Poor, 37.6~62.5= Normal, 62.6~87.5= Good, & 87.6~100= Very good), most of the students in Jiangsu, China were surveyed by a validated five-domain QOL questionnaire.

CONCLUSION: While the survey scores college students in Jiangsu, China are in the normal range, their perceived QOL was lower than expected, indicating that targeted intervention to this population, such as participating more physical activities, getting more support from their schools, and etc. can be better designed.

966 Board #282 June 1, 3:30 PM - 5:00 PM Effects of External Counterpulsation in Healthy Adults: From Physio-Psychological Perspectives

Govindasamy Balasubkan, FACSM1, Dianna Thor1, Masato Kawabata1, Jason McLaren2, Anthony Berti1, Fang Jia Bin3, Phillis Teng2, Michael G. Bemben, FACSM. (University of Southern California, CA. (Sponsor: Weimo Zhu, FACSM)

Email: jumpinghorse@szmc.edu.cn

(No relationships reported)

External counterpulsation therapy (ECP) is a non-invasive treatment to relieve symptoms related to cardiovascular diseases. Research has shown positive effects of ECP in patients with coronary heart diseases. However, the benefits of ECP in the general population remain unknown. PURPOSE: To investigate the effects of ECP on healthy middle-age adults from physio-psychological perspectives.

METHODS: 25 participants underwent 30 half-an-hour ECP sessions two to three times a week. They were randomly allocated to either a high- (H: 3.0 psi) or low-pressure (L: 0.5 psi) condition. All participants performed a submaximal treadmill exercise trial before ECP (Pre), Post 15 ECP (Post-15) and after 30 ECP (Post-30) sessions. Predicted maximal oxygen uptake (VO2max), ventilatory breakpoint (Vt), and lactate threshold (LT) were...
measured in each trial. During each ECP session, participants reported their perceived exertion levels were below the easy level (L: 0.5 ± 0.8; H: 1.1 ± 1.3) and their average HR was decreased from Pre to Post-30 (L: 123.8 ± 12.9 to 121.7 ± 11.3; H: 133.2 ± 15.9 to 126.5 ± 11.1 mmHg, p < 0.05). As for psychological variables, both groups’ perceived exertion levels were below the easy level (L: 0.5 ± 0.8; H: 1.1 ± 1.3) and their perceived comfort levels remained positive (L: 6.1 ± 4.2; H: 2.8 ± 3.7) throughout the 30 ECP sessions; however, significant differences were observed in perceived comfort between the groups. CONCLUSIONS: ECP sessions had no negative effects on participants’ feelings such as perceived exertion and comfort. Cardiorespiratory fitness of both groups improved over the ECP sessions. A minimum of 30 sessions of ECP may be necessary to induce physiological changes for this population.

Supported by a grant from Renown GFP, Singapore.

967

Board #283

June 1, 3:30 PM - 5:00 PM

Manipulation of Attention Focus in Long Jumpers to Enhance Performance and Coaching Instructions

Jacquelyn E. Mendes, Jeffrey C. Ives, Deborah L. King. Ithaca College, Ithaca, NY.
Email: mendesj@merrimack.edu

(No relationships reported)

Focus of visual attention has been shown to be an important component in a number of different athletic activities. In the long jump, several different focus of attention strategies, external focus on the runway, the take-off board, and various locations in and around the sand pit, are used. PURPOSE: To investigate two different distal external focus of attention targets, local distal target (LDT) and global distal target (GDT), on long jump performance. METHODS: Ten female division III long jumpers (19.20 yrs ± 0.71, 165.0 cm ± 7.1, 58.1 kg ± 3.6) completed four conditions (Control 1, Treatment 1 (LDT) Treatment 2 (GDT), and Control 2) consisting of three jumps each. LDT was a target on the ground at the end of the sand pit, GDT was a target high in the air at the end of the pit, and the control conditions were the jumper’s normal focus. Each athlete completed an attention focus questionnaire at the end of each condition. Photocell timing gates were positioned to collect approach speed. A high speed video camera (200 Hz) recording a sagittal view of the take-off was used to determine horizontal velocity at take-off, vertical velocity at take-off, and take-off angle. Jump distance was measured using standard NCAA procedures using markings in the sand. An 4 x 3 condition by trial repeated measures ANOVA was performed to investigate the influence of distal external focus of attention targets, local distal target (LDT) versus high distal target (HDT), on long jump performance. RESULTS: The increase in MT was higher in the 40LI group (9.6 ± 4.7 %) than in the 60SI (4.7 ± 3 %, p < 0.05), 60LI (4.7 ± 3.3 %, p < 0.05), or 80CON (3.3 ± 1.9 %, p < 0.01) group. No difference in RPE was found among the groups performing protocols to failure (8-9 ± 3 %, p < 0.05), 60LI (4.7 ± 3.3 %, p < 0.05), or 80CON (3.3 ± 1.9 %, p < 0.01) group. No difference in RPE was found among the groups performing protocols to failure (8-9 ± 3 %, p < 0.05). The average BLa during sessions was higher in the 40LI (8.4 ± 1.2 mmol/l) than in the 60SI group (5.9 ± 1.2 mmol/l, p < 0.05). The average HR was higher in the 40SI (146.3 ± 12 bpm) and 60SI (149.4 ± 13 bpm) groups than in the 80CON (122.9 ± 16 bpm) and 40CON (117 ± 15.9 bpm). The increase in MT was higher in the 40LI group (8.6 ± 4.7 %) than in the 60SI (4.7 ± 3 %, p < 0.05), 60LI (4.7 ± 3.3 %, p < 0.05), or 80CON (3.3 ± 1.9 %, p < 0.01) group. No difference in RPE was found among the groups performing protocols to failure (8-9 ± 3 %, p < 0.05). The more time spent on emphasising proper technique to prevent injuries in training, the more important players rated ‘own safety’ (tau-b = 0.21, moderate, z=3.1, p < 0.01), ‘going for the ball only’ (tau-b = 0.27, moderate, z=6.4, p < 0.001), and ‘staying safe’ (tau-b = 0.23, moderate, z=4.6, p < 0.001) in their match attitudes and behaviours. The relationships between training attitudes and behaviours were tested using the chi-squared test (z) Cramer’s V, and tau-b.

RESULTS: The more time spent on emphasising proper technique to prevent injuries in training, the more important players rated ‘own safety’ (tau-b = 0.21, moderate, z=3.1, p < 0.01), ‘going for the ball only’ (tau-b = 0.27, moderate, z=6.4, p < 0.001), and ‘staying safe’ (tau-b = 0.23, moderate, z=4.6, p < 0.001) in their match attitudes and behaviours. The relationships between training attitudes and behaviours were tested using the chi-squared test (z) Cramer’s V, and tau-b.

CONCLUSIONS: The intensity and RI in resistance training to failure is independent of RPE, but is associated with acute physiological responses, such as average Bla, HR, and MT.

969

Board #285

June 1, 3:30 PM - 5:00 PM

The Relationships Between Rugby Players’ Tackle Training Attitudes and Behaviour and Their Match Tackle Attitudes and Behaviour

Sharief Hendricks, Steve den Hollander, Nicholas Tam, James Brown, Michael Lambert. University of Cape Town, Cape Town, South Africa. (Sponsor: Pierre L Viviers, FACSFM)
Email: sharief.hendricks01@gmail.com

(No relationships reported)

Purpose: The tackle event in rugby is a technical and physical contest between opposing opponents. A player’s ability to tolerate and contest during a tackle is a prerequisite for safe participation and success in rugby. Little is known about the relationship between tackle training and tackling in matches in rugby union. Therefore, we investigated the relationships between players’ training attitudes and behaviour and their match attitudes and behaviour for tackling in rugby union.

Method: A questionnaire was designed to assess attitude (importance) and behaviours (frequency and quantity) among junior (under 19) players on a 5-point Likert Scale. Questionnaires were handed out to 220 players (10 schools) at a tournament and 75% (9 schools, n = 164) were returned for analysis. Associations between training attitudes and behaviours were tested using the chi-squared test (z) Cramer’s V, and tau-b.

RESULTS: The time more spent on emphasising proper technique to prevent injuries in training, the more important players rated ‘own safety’ (tau-b = 0.21, moderate, z=3.1, p < 0.01), ‘going for the ball only’ (tau-b = 0.27, moderate, z=6.4, p < 0.001), and ‘staying safe’ (tau-b = 0.23, moderate, z=4.6, p < 0.001) in their match attitudes and behaviours. The relationships between training attitudes and behaviours were tested using the chi-squared test (z) Cramer’s V, and tau-b.

CONCLUSIONS: The intensity and RI in resistance training to failure is independent of RPE, but is associated with acute physiological responses, such as average Bla, HR, and MT.

970

Board #286

June 1, 3:30 PM - 5:00 PM

The Role of Functional Fitness in the Relationship between Age and Perceived Health

Giancarlo Condello1, Caterina Pesce1, Roberta Forte1, Simone Falbo2, Livvia Manoni3, Simone Ciaccioceri4, Angela Di Baldassarre5, Laura Caprarin6. UNIVERSITY OF ROMA FORO ITALICO, ROMA, Italy. 2UNIVERSITY "G D'ANNUNZIO", CHIETI-PESCARA, Italy. 1Sponsor: Carl Foster, FACSFM
Email: giancarlo.condello@gmail.com

(No relationships reported)

Purpose: To investigate the relationship of flexibility, strength, coordination, and endurance on perceived health in old adult (55-64 yrs: n=51) and young old (75-84 yrs: n=41) individuals.

Methods: A functional fitness test battery (chair sit-and-reach, SR; 30+ s chair stand, CS; in-phase and anti-phase inter-limb coordination, IP and AP; and 3-min walking, W) and the SF-12 questionnaire (Component Summaries: Physical-PCS, and Mental-MCS) were administered. A 3 x 3 x 3 factorial ANOVA was performed on each of the test scores (19.20 yrs ± 0.92, 165.0 cm ± 7.1, 58.1 kg ± 3.4) completed four conditions (Control 1, Control 2, LDT, HDT). CONCLUSION: Changing an athlete’s focus of attention is not an effective strategy to improve long jump performance. Athletes performed best when using a specific focus of attention while jumping. Future studies may consider training athletes to use a specific focus of attention to improve performance in training, the more important players rated ‘own safety’ (tau-b = 0.21, moderate, z=3.1, p < 0.01), ‘going for the ball only’ (tau-b = 0.27, moderate, z=6.4, p < 0.001), and ‘staying safe’ (tau-b = 0.23, moderate, z=4.6, p < 0.001) in their match attitudes and behaviours. The relationships between training attitudes and behaviours were tested using the chi-squared test (z) Cramer’s V, and tau-b.

CONCLUSIONS: The intensity and RI in resistance training to failure is independent of RPE, but is associated with acute physiological responses, such as average Bla, HR, and MT.

Abstracts were prepared by the authors and printed as submitted.
INTRODUCTION: Previous studies have suggested that blindfolded testing conditions may limit muscle power production and dynamic balance detection. Few studies, if any, have evaluated the effect of blindfolding on YMCA sit-and-reach test outcomes. PURPOSE: To compare YMCA sit-and-reach test results between blindfolded (BF) and non-blindfolded (NBF) participants. METHODS: Forty-two (42) participants completed a total of 4 sets of traditional sit-and-reach tests: one BF and one NBF on Day 1, and one BF and one NBF on Day 2 (at least one week after Day 1). The order of the tests on Day 1 was randomized, and the participants performed the tests in the opposite order on Day 2. Before each test, participants performed a 5-minute walking or cycling warm-up. Each test contained 3 trials, with 15 seconds of rest between each trial. A 10-minute rest period was given before warming up for the second test on each day. A total of 252 tests were conducted. Paired t-Tests were used to compare means differences between conditions. RESULTS: Mean scores for the BF condition (30.7 ± 9.2 cm) was significantly higher than the BF condition (29.9 ± 8.8 cm). CONCLUSION: As it pertains to the current study, using a non-blindfolded testing condition increases the score’s positivity. This result suggests that individuals may be willing to put forward more effort to reach higher scores when they are aware of their surroundings. This visual motivation, in turn, may influence the outcome of the test.

CONCLUSION: The better perceived mental health of 75-84 yrs individuals with respect to their younger counterparts might indicate that they positively negated the decline of their functional fitness. Furthermore, the mediating effects of coordination and endurance on the relationship between age and perceived mental health highlighted that these capabilities play a role with advancing age by acting independently and in association with flexibility and strength.

RESULTS: No difference emerged for IP and PCS. The 55-64 yrs individuals showed better values (p=0.05) for SR (2.9±1.24cm), CS (15.9±3.5n), AP (85.8±7.3s), and W (321.4±40.0cm) with respect to their older counterparts (SR: -3.8±10.8cm; CS: 14.0±3.5n; AP: 15.2±34.7s; W: 280.0±45.8cm). Conversely for MCS, 75-84 yrs individuals showed higher values (48.7±10.7pt) with respect to their younger counterparts (53.5±7.7pt). A negative total (-4.8, p=0.02) and direct effect (-8.4 p=0.01) of age on the MCS component emerged, mediated by the indirect effects of SR:AP (0.5), SR-CS-W (0.2), AP (2.1), and W (1.6).

CONCLUSION: The better perceived mental health of 75-84 yrs individuals with respect to their younger counterparts might indicate that they positively negated the decline of their functional fitness. Furthermore, the mediating effects of coordination and endurance on the relationship between age and perceived mental health highlighted that these capabilities play a role with advancing age by acting independently and in association with flexibility and strength.
and two different surfaces (floor and Airex Balance Pad 2.5 inches height). Subjects performed all tests with eyes closed and hands on their hips. The tester counted the number of errors (opening eyes, taking a step, hands off hips, etc.). These summed errors were compared across the 4 conditions using a repeated measures ANOVA. RESULTS: The hypothesis testing resulted in a non-significant main effect (P < 0.02). The True Positive had 18.1 ± 5.7 errors; the True Negative had 18.5 ± 6.0 errors; The False Positive had 17.1 ± 6.9 errors; and the False Negative had 17.6 ± 9.6 errors. CONCLUSION: The data indicate that there was not improvement from the enhanced clothing, and no improvement due to the expectation of clothing-enhanced performance.

975 Board #291 June 1, 3:30 PM - 5:00 PM
Mindfulness Components And Interactions Leading To The Performance During A Competition Amongst University Cross-country Runners
Vincent G. Boucher, Jean P. Bou, FACSM, Alain Steve Comtois. University of Quebec in Montreal, Montreal, QC, Canada. (Sponsor: Jean P Boucher, FACSM)
Email: vincent.gosselin.boucher@gmail.com
(No relationships reported)

The performance during a competition among endurance athletes may be distress by psychological parameters. PURPOSE: To measure the effect of the components of competitive anxiety and mindfulness on the performance of a 3000m race.

METHODS: A varsity distance runner group (University of Quebec at Montreal) were invited to participate at the recruiting time and to be part of the cross country varsity team. A total of 20 runners participated, 10 women (25.9 ± 7.0 years old, 22.2±1.8 BMI) and 10 men (23.2±2.4 years old; 22.6±1.6 BMI). The recruitment trial was a 3000m foot race on the offside track. Two groups were formed by randomized distribution for each gender group. Before warm-up, participants completed the French versions of the Competitive State Anxiety Inventory (CSAI-2R) and Five Facets Mindfulness Questionnaire (FFMQ). Participants for the time trials were equipped with a biomonitor (Biofames 3; Zephyrs Technology Corp., Annapolis, Md.) that measured heart rate, respiratory rate and running speed. The total time and the time split for each 400m were noted. After the 3000m trial, the participants rated their perception of effort during the race (modified Borg Scale).

RESULTS: The average time of the 3000m race for men and Pearson correlation analysis revealed a significant positive link between the self-esteem score (CSAI-2R) and the mindfulness (FFMQ) score (r=0.27; p<0.05) and the experience description (FFMQ) factor (r=0.33; p<0.01). Additionally, the number of running years’ experience was positively correlated with self-confidence (CSAI-2R) and negatively to non-responsiveness (FFMQ) to private events (r=0.28; p<0.05; r=0.33, p<0.05 respectively). In addition, the number of running practice hours per week was negatively correlated with competitive anxiety (CSAI-2R), observation factors (FFMQ) and non-responsiveness (FFMQ) to private events (r=0.43, p<0.01; r=0.27, p<0.05; r=0.30, p<0.05 respectively).

CONCLUSIONS: A connection between anxiety of competition and the components of mindfulness seem interesting for an intervention by mindfulness to modify psychological factors before, during and after competitive events and training sessions.

976 Board #292 June 1, 3:30 PM - 5:00 PM
Novel Functional Beverage Potentially Influences the Perception of Pain and the Perception of Effort
Sandra Morales, Vincent G. Boucher, Martine Mallette, , Christian Soto-Catalán, André-Anne Parent, Jean P. Boucher, FACSM, Alain Steve Comtois. University of Quebec in Montreal, Montreal, QC, Canada. (Sponsor: Jean P Boucher, FACSM)
Email: xandra.morales.s@gmail.com
(No relationships reported)

A variety of products are available on the market with the aim to improve physical performance. Recently, a new product (JustBio Inc, CA) has shown in vitro that it allows ATP resynthesis, preserves mitochondria structure and protects cells against cell death. Furthermore, on, athletes during prolonged exercise are often confronted to an increase in pain perception. PURPOSE: Measure the effect of three different beverages on perception of pain and effort after high intensity exercise.

METHODS: Participants were randomly assigned to 3 groups: group A (n = 9; 4F 5H; 27 ± 4 years), group B (n = 9; 4F 5H; 28 ± 7 years) and group C (n = 9; 4F 5H, 27 ± 5 years). They were instructed to consume the beverage respective to their group four days, one beverage per day (200 ml), preceding the event and the fifth beverage one hour before the test. The beverage A, B and C contained respectively: blueberry concentrate; blueberry concentrate with a biological extract; and juice (without blueberry) with a biological extract that accelerated ATP release. The study was double blind. The French version of the BPI-SF “Brief Pain Inventory-Short Form” was used to identify the perception of pain. Participants answered the questionnaire after a 30s Wingate test and an endurance exercise (EE) on ergocycle 24, 48 and 72 hours post. In addition, the perception of effort was measured using a modified Borg scale (Borg R-20).

RESULTS: A significant difference was noted in the group without blueberry concentrate (C) 24, 48 and 72 hours after the event for average pain (p <0.001) and the worst pain felt (p <0.01). In addition, the group containing blueberry and an additive (B) perceived a greater reduction (28.93±7.49%) in pain 24h-72h after tests that was significant (p<0.05), when compared to the other two groups (A: 19.96±28%; C: 0.25±14.66%). The perceptions of the effort, however, seemed generally lower for the C group.

CONCLUSIONS: Consumption of a juice containing blueberry concentrate/extract appears to attenuate the perception of pain and effort.
Exercise Induced Bronchoconstriction (EIB) is the narrowing of airways due to exercise, making it difficult to move air in and out of the lungs. It is estimated that between 11-50% of elite athletes have exercise induced bronchoconstriction and that >10% of the general population also suffers from this condition. The American Thoracic Society (ATS) defines EIB as a ≥10% decline in FEV1, from baseline measurement after an appropriate exercise provocation test, rather than symptoms alone. For an adequate test to be completed, ventilation (VE) needs to reach at least 17.5-21 times the baseline FEV1 over a 2-4 minute period. PURPOSE: The aim of this study was to determine if a simple 3-min step test could be performed in a group of college students in order to elicit the same cardiopulmonary response as a treadmill (TM) to evoke EIB. METHODS: 20 College students 18-22 y, BMI=23.9±5.4 kg/m² completed both a treadmill test and 3-min step test in random order 5-14 days apart. RESULTS: Comparing TM to step test, mean VE L m⁻¹ were significantly different 108.57±37.27, 54.84±15.50 respectively (p<0.001). ATS minimum ventilation guideline was reached by one person on the step test and by all 20 on the treadmill test. 7 subjects experienced a ≥10% decline in FEV1 post TM test (35%) and 5 subjects in the step test (25%). CONCLUSION: Based on the data collected, a step test does not meet ATS qualifications to determine EIB. However, even though the ventilation guideline was not reached during the step test, 5 subjects tested positive for EIB.

The pulmonary arterial bed dilates with exercise in response to changes in right ventricular blood output. Patients with cystic fibrosis (CF) have reduced exercise capacity, likely due to impaired pulmonary diffusing capacity, but this may also be related to other central and peripheral hemodynamic effects. Prior research has demonstrated that patients with CF have evidence for pulmonary hypertension, which is likely secondary to mild chronic hypoxia and inflammation. Previous work has utilized the relationship between exhaled CO2 (PETCO2) and stroke volume (SV) to non-invasively estimate pulmonary pressure changes with exercise. We have demonstrated that estimated pulmonary arterial capacitance (PAC) using PETCO2 alone. For an adequate test to be completed, ventilation (VE) needs to reach at least 17.5-21 times the baseline FEV1 over a 2-4 minute period. PURPOSE: The aim of this study was to estimate PAC with a more direct measure of the pulmonary blood flow using pulmonary capillary blood volume (Vc) and SV in patients with CF (n=19) compared to healthy subjects (n=31). METHODS: Subjects completed a subject-specific maximal exercise test on a cycle ergometer. Measurements for diffusing capacity of the lungs were collected for both carbon monoxide (DLCO) and nitric oxide (DLNO) at rest and peak exercise and used to determine Vc. Heart rate (HR) was measured continuously during testing and acetylecine re-breath was used to determine Q. Stroke volume was calculated using the equation Q/HR. RESULTS: There were no differences in PAC (Vc/SV) at rest or at peak exercise between healthy and CF subjects. PAC at rest=0.0000 vs 0.0004, peak=0.0011±0.0003 vs 0.0010±0.0004, for healthy and CF, respectively. There was a non-significant difference for a greater percent increase in PAC in healthy subjects compared to CF (29.29±40.50 vs 13.58±46.43, p=0.232). Interestingly, there was a
significant positive relationship between PAC and PETCO2 in healthy subjects (r = 0.415, p = 0.023) but not in CF (r = 0.186, p = 0.475). CONCLUSION: These results suggest that estimates of pulmonary arterial pressure using PETCO2 may be valid in healthy subjects, but may not be valid in CF patients due to pulmonary vascular dysfunction. Supported by NIH Grant 5R01 – HL 108962-05

983 Board #299 June 1, 2:00 PM - 3:30 PM Exercise Training and Work Economy in Patients with Pulmonary Hypertension

Zoe Williams1, Lisa M.K. Chin1, Leighton Chan2, Randall Keyser, FACSM1,2. 'George Mason University, Fairfax, VA. 2National Institutes of Health Clinical Center, Bethesda, MD. (Sponsor: Randall Keyser, FACSM)

No relationships reported

EXERCISE TRAINING AND WORK ECONOMY IN PATIENTS WITH PULMONARY HYPERTENSION.

Zoe Williams1, Lisa M.K. Chin1, Leighton Chan2 and Randall E. Keyser, FACSM1,2

George Mason University, Fairfax, VA, National Institutes of Health Clinical Center, Bethesda, MD.

Current research suggests that aerobic exercise training may reduce the deleterious effects of pulmonary hypertension on cardiorespiratory function, allowing for improved work economy. PURPOSE: The purpose of this study was to characterize changes in cardiorespiratory work economy following 10 weeks of supervised aerobic exercise training in patients with pulmonary hypertension (PH). METHODS: Subjects were 21 participants (20 females, 1 male; age 55±10 years; BMI 31.7±7 kg/m2) enrolled in the National Institutes of Health Exercise Therapy for Advanced Lung Disease Trials. The subjects were randomized to either a 10-week exercise group (EXE) or a non-exercise control group (CON). Participants in EXE completed 24-30 supervised treadmill walking exercise sessions, over 10 consecutive weeks. During each of these sessions, exercise training lasted 30-45 minutes at an intensity of 70% to 80% of heart rate reserve. Treadmill cardiopulmonary exercise tests were completed before and after the 10-week training and non-training regimens and the results were compared statistically within and between the groups. RESULTS: Randomization resulted in groups matched closely for age and BMI, with no significant intergroup differences in peak work rate (WR), oxygen consumption (VO2) or WR/VO2 slope at baseline. After 10 weeks, a significant increase in peak VO2 compared to baseline was not observed in either EXE or CON group (EXE: 18.09±7.82 ml/kg/min vs 18.72±8.85 ml/kg/min; CON: 14.50±4.92 ml/kg/min vs 14.67±5.27 ml/kg/min). However, the WR/VO2 slope was steeper in the EXE group after 10 weeks of training (Prev: 9.11±5.17, Post: 12.22±8.84, p = 0.011), while a significant change in WR/VO2 slope was not observed in the CON group (Prev: 9.59±4.41, Post: 10.49±4.82). CONCLUSION: In these subjects with PH, vigorous aerobic exercise training appeared to have improved exercise economy, allowing those completing the aerobic exercise training regimen to accomplish more work at any given level of oxygen consumption.

Funding NIH IRP 1 01 CL060068-05 CC

984 Board #300 June 1, 2:00 PM - 3:30 PM Fatigue And Functional Aerobic Impairment In Patients With Advanced Lung Disease

Donal Murray1, Lisa M.K Chin1, Leighton Chan2, Randall E. Keyser, FACSM1,2. 'George Mason University, Fairfax, VA. 2National Institutes of Health Clinical Center, Bethesda, MD. (Sponsor: Randall Keyser, FACSM)

No relationships reported

Introduction: The Human Activity Profile (HAP) quantifies patient-reported physical activity (PA) whereas the Fatigue Severity Scale (FSS) examines patient-perceived fatigue severity. When assessed in confinence, these measures provide an indication of overall patient-reported fatigueability. Functional aerobic impairment (FAI) is a measure of etiological decline in cardiorespiratory function below levels associated with physiologic deconditioning (clinical significance ≥ 27% below expected values). Patients with Advanced Lung Disease (ALD) frequently report increased fatigue and often present with very poor cardiorespiratory capacity. PURPOSE: To examine the relationship between fatigueability and FAI in patients with ALD. METHODS: Subjects were 26 patients with ALD (pulmonary hypertension n = 17 or interstitial lung disease n = 9) participating in the National Institutes of Health Exercise Therapy for Advanced Lung Disease Trial (ALD group; age: 54 ± 10 years; BMI: 30 ± 6 kg/m2 and 39 sedentary but otherwise healthy controls (CON group; age: 46 ± 9 years; BMI: 29 ± 6 kg/m2). All subjects performed a treadmill cardiopulmonary exercise test (CPET) and completed FSS and HAP questionnaires. FAI was calculated as a percent deviation in peak VO2 measured by CPET, from a predicted peak VO2 based on age and gender for persons with a sedentary lifestyle. Patients with ALD were categorized as having none (<26%), mild (27-40%), moderate (41-54%), marked (55-67%) or extreme (>68%) FAI. Student’s t-tests were used to compare ALD vs CON group means and Pearson’s correlations were used to assess the relationship between all variables. RESULTS: Compared to CON, patients with ALD had significantly lower HAP scores (MAS: 66.7 ± 7.8 vs 84.9 ± 9.8, p<0.001; AAS: 56.0 ± 11.9 vs.81.0 ± 13.9, p<0.001), higher FSS (3.8 ± 1.6 vs 2.4 ± 1.2, p<0.001) and higher FAI (41.1 ± 16.6 vs. 8.4 ± 21.4, p<0.001). There was no significant correlation between FAI severity and HAP or FSS scores. CONCLUSIONS: Patients with ALD appeared to have both increased fatigueability and clinically significant functional aerobic impairment compared to healthy controls. However, the severity of these FAI did not predict their level of fatigability.

Funding NIH IRP 1 01 CL060068-05 CC

Muscle quality, muscle strength and the appendicular lean mass index (ALMI) have all been shown to predict physical function in older adults and those with chronic diseases. PURPOSE: The purpose of this investigation was to compare which of these measures best predicted physical function in a group of older adults with chronic obstructive pulmonary disease. METHODS: Patients with moderate (n = 58), severe (n = 42) and very severe (n = 16) COPD performed strength test of the lower extremity. Arm and leg muscle volume were determined via DEXA scan. Muscle quality was defined as muscle strength per unit of lean mass. ALMI was defined as the appendicular lean mass divided by height-squared. Physical function was determined from scores on the short physical performance battery (SPPB) and six-minute walk (6MW) distance. Stepwise multiple regression analysis was used to determine the role of strength, muscle quality and ALMI in predicting physical function. RESULTS: ALMI was significantly (p = 0.001) correlated (r = 0.32) with and predictive of scores on the SPPB (standardized beta coefficient = 0.317). Neither left or right leg strength nor left or right leg muscle quality were significant predictors of scores on the SPPB (beta in = 0.07, 0.109 and 0.113, respectively). ALMI was significantly (p = 0.001) correlated (r = 0.32) with and predictive of 6MW distance (standardized beta coefficient = 0.317). Neither left or right leg strength nor left or right leg muscle quality were significant predictors of 6MW distance (beta in = 0.072, 0.160, -0.108 and 0.087, respectively). CONCLUSIONS: These results demonstrate that ALMI is more closely associated with and a better predictor of physical function in COPD patients than muscle strength or muscle quality.

986 Board #302 June 1, 2:00 PM - 3:30 PM Relationship Between Self-Report and Performance Based Measures of Physical Function Following an ICU Stay

Nathan J. Love1, Peter E. Morris2, Larry D. Case1, James Lovato1, Michael J. Berry, FACSM1,2. 'Wake Forest University, Winston-Salem, NC. 1University of Kentucky, Lexington, KY. 2Wake Forest University School of Medicine, Winston-Salem, NC. (Sponsor: Michael J Berry, FACSM)

Email: lovej14@wfu.edu

No relationships reported

PURPOSE: The relationship between self-report and performance based measures of physical function (PF) has not been addressed in ICU patients. The purpose of this study was to examine this association in these patients. METHODS: 300 ICU patients were randomized into an exercise program (Exp) or standard of care (SoC). Self-report (SF-36 Physical Function inventory (SF-36), Functional Performance Index (FPI)) as well as performance (Short Physical Performance Battery (SPPB), skeletal muscle strength (SM)) measures were taken at hospital discharge, 2, 4, and 6 months post-enrollment. Partial correlations between self-report and performance based measures of PF in each group were calculated. Covariates included age, APACHE II score, and gender. Alpha was set at p<0.05. RESULTS: At hospital discharge, a significant, but weak, correlation (r=0.32) was found between SF-36 and SPPB in the SoC group. At 2 months, weak to moderate correlations were found between self-report and performance measures in both groups. In the SoC group, the SF-36 was significantly correlated with the SPPB (r=0.47) and MS (r=0.34); the FPI was significantly correlated with the SPPB (r=0.64) and MS (r=0.52). In the Exp group, the SF-36 was significantly correlated with the SPPB (r=0.61) and MS (r=0.42); the FPI was significantly correlated with the SPPB (r=0.54) and MS (r=0.28). A similar pattern was seen at 4 and 6 months in both groups. CONCLUSION: Self-report and performance based measures of PF appear to assess different constructs at hospital discharge. Following recovery from an ICU stay, these measures become complementary, but indicate different constructs are being assessed.

Abstracts were prepared by the authors and printed as submitted.
INTRODUCTION
We have recently described that patients with cystic fibrosis (CF) exhibit a reduced skeletal muscle oxidative metabolism at rest which may contribute to exercise intolerance in this population. Alterations in muscle oxidative metabolism may reduce the capacity of the lungs in CF. However, CF patients have been shown to require less oxygen for a given relative submaximal workload than healthy individuals. Factors relating to enhanced cardiovascular efficiency (i.e. blood delivery) or oxygen extraction may contribute to this economy. PURPOSE: To evaluate the relationships between exercise efficiency and cardiovascular factors in healthy subjects and CF patients.

METHODS: Thirty healthy and 18 CF subjects performed a graded maximal exercise test on a cycle ergometer to determine VO2peak. Oxygen uptake (VO2) and SpO2 were continuously measured, and systolic and diastolic blood pressure (SBP and DBP, respectively) were measured at each test stage. Pulse pressure (PP = SBP - DBP) and muscular efficiency (ME = workload/energy expenditure) were calculated.

RESULTS: CF subjects reached lower absolute and relative workloads at VO2peak, but there was no difference in muscular efficiency between healthy and CF subjects (for healthy and CF, respectively, watts = 185±66 v. 101±35; watts/kg = 2.6±0.9 v. 1.6±0.7; efficiency = 14.6±2.3 v. 14.6±7.6; p > 0.05 for each comparison). Healthy subjects showed a positive, nonsignificant relationship between SpO2 and ME (r=0.34, p=0.151). CF patients showed a positive statistically significant correlation (r=0.72, p=0.003) between PaO2 and ME. A significant negative relationship between ME and VO2peak (r=-0.12, p=0.52) was identified.

CONCLUSIONS: CF patients have a lower absolute and relative maximal workload but do not differ from healthy subjects in their ME during graded exercise. Given the inverse relationship between SpO2 and efficiency, it is possible that CF patients have enhanced O2 extraction, which yields similar O2 usage for a given workload despite diminished lung diffusion. Supported by NIH grant 108962-05

Poor exercise capacity in patients with chronic obstructive pulmonary disease (COPD) has been highlighted as an important prognostic marker. Conversely, heart rate (HR) is a non-invasive, widely available measure that has been investigated as a potential new non-invasive HRV analysis at the rest to submaximal exercise transition, it may be possible to infer important clinical information regarding exercise induced ventilatory and hemodynamic limitations in COPD patients. Supported by National Research Council (CNPq-Brazil) and the São Paulo Research Foundation (FAPESP)
**Board #306**  
**June 1, 2:00 PM - 3:30 PM**  
**Ascorbate Attenuates the Development of Fatigue During Exercise in Patients with Chronic Obstructive Pulmonary Disease**  
Tyler S. Mangum1, Thomas J. Hureau1, Joshua C. Weavil1, Simranjit K. Sidhu2, Taylor S. Thurstorn3, Ashley D. Nelson1, Russell S. Richardson1, Markus Amann1.  
1University of Utah, Salt Lake City, UT. 2University of Adelaide, Adelaide, Australia.  
Email: t.mangum@utah.edu  
*(No relationships reported)*

**PURPOSE:** COPD is characterized by systemically elevated oxidative stress, functionally limiting dyspnea, and compromised fatigue resistance during exercise. We examined the effects of intravenous ascorbate administration (VitC), a potent antioxidant, and oxidative stress on fatigue and endurance capacity in COPD patients.  

**METHODS:** Six patients (GOLD I-II) performed constant load cycling exercise to exhaustion and isotime trials after intravenous VitC (2.0 g) and saline (PL) infusions. Exercise-induced locomotor muscle fatigue was quantified after isotime trials via pre to post exercise changes in quadriceps twitch force (So) evoked by electric femoral nerve stimulation. Determinants of dyspnea (SpO2, respiratory muscle work (W)), expiratory flow limitation (EFi) induced hyperinflation (increase in expiratory reserve volume, ERV, above rest) and dyspnea were quantified during exercise. Venous blood samples taken pre and post isotime exercise and were analyzed for oxidative stress and inflammatory markers. RESULTS: Although VitC increased antioxidant capacity (superoxide dismutase: 1.9 ± 0.3 vs 4.5 ± 0.4 U/mL, P < 0.05), the exercise-induced increase in the plasma electron paramagnetic resonance spectroscopy free radical signal (~250% increase), and plasma malondialdehyde (MDA; ~5% increase) were not different from PL (P > 0.4). End-exercise levels of C-reactive protein were lower following VitC vs PL (1757.5 ± 384 vs 2782 ± 660 ng/mL, P < 0.05). VitC attenuated exercise-induced increase (ΔQtw: -23 ± 6% vs -29 ± 5%, P < 0.05), but did not alter end-exercise time to exhaustion (~8.1 min, P = 0.5). Furthermore, during exercise, SpO2 (~91%), W (~640 cmH2O s−1), FEl (~73%), and ERV (~93% increase above rest), and the severe degree of dyspnea (~9 on modified Borg 10 scale) were not altered by the VitC (P > 0.3).  

**CONCLUSION:** Despite apparently unremarkable effects of the VitC on free radical concentration, oxidative stress, and dyspnea, VitC attenuated the development of fatigue during exercise in patients with COPD. However, this attenuated fatigue development did not translate to an improvement in endurance time. This might be attributed to the lack of an effect of VitC on key determinants of dyspnea which is considered the key symptom limiting exercise in patients with COPD.

---

**Board #307**  
**June 1, 3:30 PM - 5:00 PM**  
**Cross Validation Of A Figure Skating Blade Instrumented To Measure Figure Skating Impact Forces.**  
Cody Stahl1, Deborah King1, Noelle Tuttle2, Steven Charles2, Chris Adair2, Blake Harper2, Sarah Ridge2.  
1Ithaca College, Ithaca, NY. 2Brigham Young University, Provo, UT.  
Email: cstahl1@ithaca.edu  
*(No relationships reported)*

Competitive figure skating requires a vast amount of athleticism with an artistic touch. Skaters spend hours each day on-ice mastering jumps, spins, and footwork. The high workload may be related to overuse injuries, which are very common in figure skating, especially at the elite level. To better understand the relationships between on ice training and injuries, it is important to understand the loading patterns acting on skaters.  

**Purpose:** To validate an instrumented figure skating blade that is designed to measure impact forces while skating.  

**METHODS:** Seven subjects (Age: 21.3±2.8 yrs, Ht: 166.9±2.5 cm, Mass: 64.7±7.9 kg) performed 20 landings each onto artificial ice while landing on the instrumented blade from heights of 17.5cm, 25cm, and 33cm. A custom instrumented blade calibrated to measure forces in Newtons (N) was used to measure impact forces (1000Hz) during landings. These forces were compared to forces obtained while subjects landed on AMTI force plates located underneath the artificial ice surface. Boot angle (250Hz) and force plate data (1000Hz) were collected using Vicon Nexus. Custom LabVIEW programs were used to determine peak force, loading rate, impulse, and the correlation between the blade force data and the force plate data. Paired T-tests were used to compare peak force, loading rate, and impulse between the blade and force plate data. Alpha = 0.05.  

**Results:** Correlations between the blade force data and force plate data were good to excellent: mean r (±SD) = .86 ± .08. No significant differences were found for peak force and impulse between the blade and force plate data. Peak force means (±SD) were 1353.7 ± 352.2 N for the blade and 1361.2 ± 309.7 N for the force plate (p=.86). The means (±SD) for impulse were 44.99 ± 21.2 Ns for the blade and 48.1 ± 17.7 Ns for the force plate (p=.125). Loading rate, calculated from impact to time of peak force, was significantly higher (p = 0.0004) for the blade data (28.8 ± 22.8 N/ms) as compared to the force plate data (9.77 ± 7.5 N/ms).  

**Conclusion:** The custom instrumented blade is a valid tool for measuring peak forces and impulse during landings. Current research is focused on increasing the gain of the instrumented blade to improve loading rate accuracy. Supported by US Figure Skating, Sports Science and Medicine Grant 2011.

---

**Board #309**  
**June 1, 3:30 PM - 5:00 PM**  
**Leg Compression Tights and Turning Direction Influence Alpine Skiing Mechanics and Dynamic Balance.**  
Mike Decker1, Craig Simons1, John Seifiert2, Kevin Shellburne1, William Sterett1, Bradley Davidson1.  
1University of Denver, Denver, CO. 2Montana State University, Bozeman, MT. 3Vail Summit Orthopaedics, Vail, CO.  
Email: mike.biomech@gmail.com  
*(Reported Relationships: M. Decker: Consulting Fee. Opedix.)*

Leg compression tights have been found to influence the neuromuscular performance of professional alpine skiers but the effects on skiing mechanics and dynamic balance are unclear.  

**PURPOSE:** To determine the influence of leg compression tights on skiing mechanics and dynamic balance during alpine skiing.  

**METHODS:** Foot pressure insoles captured the ground reaction force (GRF) and the trajectory of the COP during slalom race simulations from 9 collegiate alpine ski racers. Peak GRF, maximum anterior-posterior (AP), minimum medial-lateral (ML) COP, COP area and COP velocity were measured from the downhill leg during 18 turns (9 right; 9 left) while wearing either directional compression (DCP) or standard compression (SCP) tights. The order of DCP and SCP conditions was balanced. A 3-way mixed-factor, repeated measures ANOVA compared the effects of turn direction and compression type across the 18 turns. RESULTS: Results indicated that the main effect of turn direction was not significant. However, there was a significant effect of compression type (SCP > DCP) on peak GRF (right, 1270.0 ± 26.7 N; left, 1200.2 ± 32.2 N; p<0.005). The maximum AP COP was 2% more anterior during the DCP condition (DCP, 173.1 ± 1.3 mm; SCP, 170.4 ± 1.4 mm; p<0.005) and 3% more anterior for the left leg (right, 169.0 ± 1.4 mm; left, 174.4 ± 1.6 mm; p<0.001). The minimum ML COP was 3% more medial during the DCP condition (DCP, 32.3 ± 5.5 mm; SCP, 33.4 ± 5.5 mm; p<0.025) and 3% more medial for the left leg (right, 33.4 ± 5.5 mm; left, 32.3 ± 4.4 mm; p>0.011). The COP area was 12% greater for the left leg (right, 43. ± 0.11 mm2; left, 48. ± 0.1 mm2; p<0.001). The COP velocity was 14% lower during the DCP condition (DCP, 30.5 ± 17.3 mm/s; SCP, 42.2 ± 30.1 mm/s; p<0.023) and 9% higher for the left leg (right, 37.0 ± 22.6 mm/s; left, 41.0 ± 23.4 mm/s; p<0.025). CONCLUSION: The DCP tights influenced the skier to adjust the COP forward and toward the inner edge of the downhill ski which reduced the peak GRF and improved dynamic balance but differences between the right and left legs persisted.
RESULTS: Average turn duration was 4% longer for the left leg (right, 94 ± 2; left, 98 ± 2 s; p = 0.039). Average knee position was 3% more flexed during the DCP condition (DCP, 117.5 ± 1.3 degree; SCP, 120.8 ± 1.3 degree; p = 0.010) and the right leg was 4% more flexed (right, 116.5 ± 1.5 degree; left, 121.3 ± 1.1 degree; p = 0.020). Average hip position was 5% more flexed during the DCP condition (DCP, 145.5 ± 1.5 degree; SCP, 153.5 ± 1.2 degree; p<0.001) and the right leg was 3% more flexed (right, 147.6 ± 1.3 degree; left, 151.3 ± 1.2 degree; p = 0.012). Average GM, RF and VL activations were 26%, 17% and 17% lower for the DCP condition, respectively (GM: DCP, 2.7 ± 1.9 mV; SCP, 3.7 ± 2.6 mV; p<0.001; RF: DCP, 3.0 ± 2.0 mV; SCP, 3.6 ± 2.7 mV; p=0.020; VL: DCP, 2.4 ± 1.5 mV; SCP, 2.9 ± 2.1 mV; p = 0.20).

CONCLUSION: The DCP tights demonstrated an alpine skiing turn technique with greater hip and knee flexion and reduced VL, RF and GM muscle activations, which may indicate a mechanism of reduced fatigue for these muscles.

Board 310
June 1, 3:30 PM - 5:00 PM
Submaximal Cycling Power Using Noncircular Chainrings: A Comparison of Different Quantification Approaches
Choe Hoi Leong1, James C. Martin, FACSM1, Central Connecticut State University, New Britain, CT. 1University of Utah, Salt Lake City, UT. (Sponsor: James C. Martin, FACSM)
Email: c.leong@ccsu.edu

RESULTS: Calculated power (P1: 110±22 W; P2: 110±22 W) did not differ for C chainring condition. P1 (117±21 W) for NC chainring condition was 4±1% higher than P2 (112±21 W) for C chainring condition. P1 (117±21 W) for NC chainring condition was 4±1% higher than P2 (112±21 W) for C chainring condition.

METHODS: Eight healthy participants (age=35±8 yr, mass=75±7 kg, height=1.8±0.1 m) performed a constant speed protocol at 80 rpm for 5 min and repeated the protocol with a C chainring after a 30 min rest period. Power and angular velocity (ω) within the pedal cycle were calculated using Method 1: P = ∑N n=1(Tn ωn)/N and Method 2: P = ∑N n=1(Tn ωn) and Method 2: P = ∑N n=1(Tn ωn) where T is the instantaneous force and ω is the instantaneous angular velocity within the pedal cycle. Mixed findings from previous comparisons of circular and noncircular chainrings may be related to different approaches in quantifying cycling power. One approach common to power meters is to calculate power as the product of average ω and torque (T) for the pedal cycle. This assumption might overestimate power with NC chainrings. PURPOSE: To determine the extent to which the assumption of constant ω overestimates power values during submaximal cycling.

CONCLUSIONS: For the NC chainring condition, respectively (GM: DCP, 2.7 ± 1.9 mV; SCP, 3.7 ± 2.6 mV; p<0.001; RF: DCP, 3.0 ± 2.0 mV; SCP, 3.6 ± 2.7 mV; p = 0.020; VL: DCP, 2.4 ± 1.5 mV; SCP, 2.9 ± 2.1 mV; p = 0.20).

Board 311
June 1, 3:30 PM - 5:00 PM
Injury Risk In Athletes With And Without A History Of Lower Extremity Injury
Eleanor M. Beltz1, Hayley J. Root1, Jessica L. Martinez2, Samantha E. Scarneo1, Lindsay J. DiStefano1. 1University of Connecticut, Storrs, CT. 2Northern Illinois University, DeKalb, IL. (Sponsor: Douglas J. Casa, Ph.D, ATC, FACSM)
Email: e.beltz@uconn.edu

RESULTS: Forty athletes reported history of LE injury (131±1 yr, 167.5±9.8 cm, 75.4±13.9 kg), of which 20 reported history of knee injury (142±2 yr, 167.5±8.8 cm, 61.8±15.7 kg) and 24 reported history of ankle injury (145±3 yr, 167.5±10.0 cm, 60.6±15.7 kg). Twenty-five athletes reported no history of LE injury (12±2 yr, 161.3±9.9 cm, 52.6±12.5 kg). No significant differences in LESS score were observed between athletes with (5.2±1.8 errors) and without (5.3±2.2 errors) history of LE injury (p = 0.05, mean difference = 0.12±0.65 errors, 95%CI [−0.9, 1.1]) No significant differences in LESS score were observed between athletes with history of knee injury and with no history of LE injury (p = 0.05, mean difference = −0.12±0.70 errors, 95%CI [−1.4, 1.2]) as well as athletes with history of ankle injury and no history of LE injury (p = 0.05, mean difference = 0.5±0.6 errors, 95%CI [−1.7, 1.6]).

CONCLUSION: History of LE, knee or ankle injury did not increase injury risk compared to athletes with no LE injury history. Our results do not support previous findings that prior LE injury increases risk of subsequent injury. Further research is needed to evaluate the impact of LE injury history on injury risk in at-risk populations.

Board 312
June 1, 3:30 PM - 5:00 PM
Relationships Between Muscle Architecture And Measures Of Strength And Power In Collegiate Volleyball Players
Jacob R. Goodin, Caleb D. Bazyler, Satoshi Mizuguchi, Michael H. Stone. East Tennessee State University, Johnson City, TN.
Email: jacobrgoodin@gmail.com

RESULTS: Forty athletes reported history of LE injury (131±1 yr, 167.5±9.8 cm, 75.4±13.9 kg), of which 20 reported history of knee injury (142±2 yr, 167.5±8.8 cm, 61.8±15.7 kg) and 24 reported history of ankle injury (145±3 yr, 167.5±10.0 cm, 60.6±15.7 kg). Twenty-five athletes reported no history of LE injury (12±2 yr, 161.3±9.9 cm, 52.6±12.5 kg). No significant differences in LESS score were observed between athletes with (5.2±1.8 errors) and without (5.3±2.2 errors) history of LE injury (p = 0.05, mean difference = 0.12±0.65 errors, 95%CI [−0.9, 1.1]). No significant differences in LESS score were observed between athletes with history of knee injury and with no history of LE injury (p = 0.05, mean difference = −0.12±0.70 errors, 95%CI [−1.4, 1.2]) as well as athletes with history of ankle injury and no history of LE injury (p = 0.05, mean difference = 0.5±0.6 errors, 95%CI [−1.7, 1.6]).

CONCLUSION: History of LE, knee or ankle injury did not increase injury risk compared to athletes with no LE injury history. Our results do not support previous findings that prior LE injury increases risk of subsequent injury. Further research is needed to evaluate the impact of LE injury history on injury risk in at-risk populations.
Dynamic control was assessed during a speed and accuracy target acquisition task (targets displayed on a monitor). Directional control (DC; mm, COP path to target) and precision control (measured around target area to acquisition (PC; CEA mm2)) were measured. Variables were averaged across 3 trials. Trunk muscle capacity was assessed by trunk flexor (FLEX; s) and extensor endurance (EXT; s) and double-leg lowering (DLL; °). MANOVA (effect size Eta) and t-tests (effect size Cohen’s d) were used to assess group differences, p < .05 considered significant.

RESULTS: Core stability did not significantly differ between groups. Data presented as mean ± stdev (No Pain/Pain), v-value, effect size: Static control- CEA 183 ± 129/131 ± 85 and MYEL 5.7 ± 3.0/6.6 ± 2.6, p = 0.38, Eta = .33; Dynamic Control- DC 49:9/46:4 ± 6, p = 0.49, d = .39 and PC 143 ± 72/93:2 ± 25, p = 0.051, d = .93; Muscle Capacity: FLEX 77 ± 38/99 ± 32, EXT 74 ± 22/69 ± 28, p = 0.22, Eta= .40 and DLLT 14 ± 10/16 ± 11, p = 0.92, d = .05

CONCLUSIONS: Our data do not provide clear evidence of diminished core stability in collegiate football players with a non-traumatic shoulder injury. There is a trend toward differences in DC; however mean group differences do not exceed our MDCv (73 mm2). This may be because players were from the same DI football team and adhered to the same strength and conditioning program.

Single-sport athletes have higher rates of lower extremity injuries than athletes that participate in multiple sports. This may be because athletes who specialize in one sport are subjected to a specific set of repetitive movement demands, ultimately resulting in overuse injuries, whereas multi-sport athletes are exposed to a larger variety of movement stimuli. Differences in high-risk biomechanics, such as lower extremity valgus, between single- and multi-sport athletes may provide further insight into the incongruity in injury rates.

PURPOSE: To identify differences in lower extremity biomechanics between multi-sport compared to single-sport athletes.

METHODS: Ninety-eight adolescent athletes participated in the study and were grouped based on the number of organized sports they participated in during the previous academic year into single-sport (SS) (n=55), age=15±1.3 years, height=1.7±6.2 m, mass=59.9±18.9 kg) and multi-sport (MS) (n=43, age=15±1.1 years, height=1.7±7.2 m, mass=61.1±10.9 kg) groups. Established 3D motion analysis techniques were utilized to collect three trials of a single-leg broad jump with a subsequent maximal vertical jump on the left leg. Independent t-tests were used to identify significant differences in measures of lower extremity biomechanics (hip adduction and internal rotation, knee abduction and external rotation peak angles, excursions and normalized external moments) between groups (p<0.05).

RESULTS: Significant differences were identified during the single-leg task, such that SS athletes exhibited greater peak hip adduction (SS: 10.6±5.4°, MS: 8.5±4.5°, p=0.04), and knee external rotation (SS: 19.4±5.7°, MS: 16.6±5.0°, p=0.02) angles, greater frontal plane hip excursion (SS: 12.1±4.1°, MS: 9.8±3.3°, p=0.003) and greater knee abduction moments (SS: -0.085±0.16 Nm/kg*m, MS: -0.035±0.07 Nm/kg*m, p=0.049) than MS athletes.

CONCLUSIONS: SS athletes exhibit higher levels of dynamic lower extremity motion and moments during single-leg landing tasks than MS athletes, which have been shown to increase risk of injury. These findings may help explain why higher injury rates have been observed in athletes that specialize in one sport. Further study of the possible deleterious effects of sport specialization is warranted.

Mechanical Load Comparison Between Different Kettlebell Swing Styles

Jason M. Shutt1, Garrett S. Bullock1, Maggie M. Selzer1, Abigail C. Schmitt1, Grey Cook2, Robert J. Butler1. "Duke University, Durham, NC; 1Functional Movement Systems, Inc, Chatham, VA. (Sponsor: Dr. William Garrett Jr., FACSAM)" (No relationships reported)

Kettlebell and Indian club swings have a diverse use in developing strength and power. It has been proposed that multiple swing techniques can be used interchangeably to elicit similar adaptations within performance training. To date, the different mechanical demand of these exercises has not been researched.

PURPOSE: To analyze the mechanical demands imposed by the shoulder height (SKS) and overhead (OKS) kettlebell swings, and Indian club swing (ICS).

METHODS: Fifteen healthy subjects underwent 3D biomechanical analysis that included ground reaction force data collection. Subjects performed two maximal exertion trials of ten repetitions for each swing in a randomized order using a standard set of Indian clubs and gender specific kettlebells (Female = 12 kg, Male = 20 kg). Data were collected while subjects performed swing patterns with each foot on a separate force plate. Lower extremity sagittal plane kinematics and kinetics on the right leg were analyzed for peak values during the down and up portion of the swing patterns. Statistical analyses were carried out utilizing one-way ANOVAs (p<0.05).

RESULTS: Cycle time for the OKS was 34% longer than the IKS and ICS (p<0.01). Hip flexion excursion during the movement was 4.1 degrees greater in ICS compared to OKS and SKS (p<0.02). Hip extension velocity was similar for the ICS and SKS; which were both greater than the OKS (p<0.02). Peak hip extension moment and peak vertical ground reaction force was similar between the OKS and SKS which were both greater than the ICS (p<0.01). The vertical impulse during the down portion of the swing was greater in the OKS than the SKS and ICS, which were comparable (p<0.01).

CONCLUSIONS: Although these swings are mechanically similar, differences were observed for cycle time, hip extension moment, and vertical impulse. The differing mechanical demands of these exercises may be important in selecting the right training modality for specific strength and power training.

Lower Limb Segment Contribution to Total Turnout in Collegiate Dancers

Katherine Spitzley, Renee Jackson, Britte Nielsen, Karen Clippinger, James Becker. "California State University, Long Beach, Long Beach, CA." (No relationships reported)

Turnout (TO) is an essential skill in many forms of dance. Theoretically, ideal TO is marked by 90 degrees of external rotation in each leg, with the rotation being generated primarily at the hips. However, previous studies have reported TO is not...
CONCLUSION: Lacrosse players may consider golf as a secondary sport to help transfer rotational skills to shooting, by enhancing early peak segmental angular velocities and ball speed.

Injury prevention programs (IPP) reduce lower extremity injury rates and improve movement-based risk factors, but many coaches and players do not adopt these programs. The time required to perform these programs is a roadblock to program adoption. It is not known if a shorter duration IPP can improve movement technique in a manner thought to reduce the risk of injury. PURPOSE: To examine if a shorter duration IPP is able to elicit improvements in movement technique similar to the FIFA F1+1 program in female, high school athletes. A secondary aim was to assess high-risk girls’ (Landing Error Scoring System [LESS] ≥ 5) participants’ response to the warm-up intervention. METHODS: Seventy-six healthy, females (Age=15 ± 1 yrs, Mass: 58 ± 10.4 kg, Height: 166.4 ± 6.3 cm) were stratified by team (Field Hockey=21, Soccer=31, Volleyball=24) and randomized into one of three warm-up interventions: 10-minute IPP focused on movement quality (n=25), 20-minute F1+1 program (n=24) or a 10-minute program of dynamic activity Control (n=27). Participants completed a test session before (PRE) and after (POST) their 2014 Fall season (8-10 weeks). At each session they performed three trials of a jump-landing task. Each jump was scored using the LESS. Participants performed their assigned warm-up program prior to sport practices. A 3x2 mixed model ANOVA was used to evaluate for differences in LESS scores between groups or test sessions. A secondary analysis, utilizing an ANOVA, was used to examine how high-risk participants responded to the programs from PRE to POST. RESULTS: LESS scores improved from PRE (5.4 ± 1.9) to POST (4.3 ± 1.4) (p = .002), but no differences were observed between groups (p>.05). High-risk participants reduced their LESS scores by nearly 2 errors (PRE: 7.0 ± 1.24, POST 5.06 ± 1.74, p<.001). CONCLUSIONS: All warm-up groups had lower LESS scores at POST, suggesting a reduced risk of sustaining a lower extremity injury. Participants with a LESS score ≥ 5 demonstrated large, clinically important improvements that occurred during the season regardless of the warm-up protocol. Further research is needed regarding the optimal protocol for high-school athletes but these data suggest that shorter programs, which may increase buy-in and potential adoption of IPPs by high school coaches, are effective.

Research has suggested that limited hip range of motion (ROM) may contribute to the reporting of low back pain (LBP) among golfers. Particular attention has been paid to the lead hip ROM (i.e. left hip for a right handed golfer), as a large amount of hip internal rotation (IR) is required to complete the golf swing. PURPOSE: To determine if a relationship exists between a golfer’s maximal passive hip IR ROM, and the amount of IR that occurs during the golf swing. METHODS: Ten pain-free male golfers with a current playing handicap of less than 5 were recruited (age = 29.6 ± 5.6 years, height = 1.81 ± 0.05 m, mass = 86.1 ± 13.9 kg, handicap = 0.97 ± 2.3). Three-dimensional kinematics of the feet, shanks, thighs, pelvis, and thorax were recorded (Optotrak Certus, Northern Digital Inc., Waterloo, ON) during passive IR ROM tests, and during 10 golf swings with a driver. All kinematic data were processed using Visual3D (C-Motion Inc., Germantown, MD). Peak IR of the lead hip was extracted from the passive ROM trial, and each golf swing trial. The Pearson product-moment correlation between the peak lead hip IR that occurred during the passive ROM test, and the 10-swing average of the peak hip IR that occurred during the golf swings was assessed using SPSS (SPSS Corporation, Chicago, IL). RESULTS: On average, golfers used 95.4 ± 14.4% of their passive ROM in IR during the golf swing. A significant positive correlation was observed between the passive ROM for the lead hip in IR and the amount of IR on the same hip during the golf swing (r = 0.854). The slope and intercept for the line-of-best-fit were 0.93 and 1.20 respectively.

ACSM May 31 – June 4, 2016
Boston, Massachusetts
CONCLUSION: Our data demonstrated a very strong positive relationship between a golfer’s passive hip ROM in IR and the amount of IR used during the golf swing. During the golf swing, participants in this study also approached their physical capacity for lead hip IR. Golfers with limited hip IR may compensate by using more lumbar spine motion to perform the golf swing, which may be related to the occurrence of LBP. These findings support the need for a comprehensive physical examination and screening of the hip to investigate the potential causes and consequences of LBP in golfers. Therapeutic intervention aimed at improving lead hip IR ROM, lumbar spine/leg stance modifications may help prevent and manage LBP experienced by golfers.

Differences In Lower Extremity Joint Motion With Increased Midsole Basketball Shoe Stiffness

Emma F. Zuk, Nicholas S. Pritchard, Anh-Dung Nguyen, Jeffrey B. Taylor, Kevin R. Ford, FACSFM, High Point University, High Point, NC. (Sponsor: Kevin Ford, FACSFM)

Email: zuke15@highpoint.edu

(No relationships reported)

First metatarsophalangeal (MTP) joint sprain is a debilitating injury that is likely the result of excessive dorsiflexion of the hallux. Stiffening the footwear to restrict MTP joint motion is a typical treatment for this injury and has been proposed prophylactically for injury prevention. However, restricting motion at one joint may influence adjacent joints during dynamic movements. PURPOSE: To determine the effects of midsole stiffness on lower extremity sagittal plane kinematics during single and double leg tasks. METHODS: Twenty high school and collegiate basketball players volunteered to participate (height 185.9 cm, mass 80.6 kg, age 18.0 yrs). Subjects were fitted with appropriately sized basketball shoes with one pair modified with a fiberglass plate to increase midsole stiffness. The shoe conditions were blinded and randomly assigned to each subject. Lower extremity sagittal plane kinematics (in shoe first MTP, ankle, knee, hip) were captured during three trials of a single leg side drop jump (SDJ) and double leg drop vertical jump (DVJ) from a 30cm box. Separate repeated measures analysis of variance (ANOVA) determined the kinematic differences between stiffness conditions (p<0.05). RESULTS: First MTP joint motion was decreased in the stiff footwear during the DVJ (stiff: 13.5±3.6°, control: 15.2±3.7° p=0.047), but not the SDJ (p=0.05). Peak dorsiflexion was greater in the stiff conditions during the SDJ (stiff: 23.8±13.6°, control: 18.1±7.8° p=0.008) and DVJ (stiff: 27.4±12.5°, control: 22.9±7.9° p=0.02). Greater hip motion (stiff: 56.3±11.8°, control: 53.3±8.9° p=0.046) and knee (stiff: 73.6±6.7°, control: 72.2±8.4° p=0.042) motion were found during single leg SDJ with the stiff footwear, while no differences during the double leg DVJ (p>0.05). CONCLUSIONS: These findings indicate that increased shoe stiffness increases the magnitude of ankle dorsiflexion during double and single leg tasks. Furthermore, increased shoe stiffness results in compensatory motions at the hip and knee when performing single leg tasks. Whether compensatory motions at the ankle, knee, and hip increases the risk of injuries to these joints requires further study. The authors would like to acknowledge funding support from adidas International, Inc.

Accuracy and Velocity Comparing Instep And Pass Kicks In Collegiate Male Soccer Players

Lorenzo J. DiPace¹, Matthew D. DeLang², Paige Medley¹, Danielle Arsenault¹, Zachary Colesa¹, Tamara Hew-Buter, FACSFM,¹ 2Oakland University, Rochester, MI; ¹Duke University, Durham, NC. (Sponsor: Tamara Hew-Buter, FACSFM)

Email: ljdpacie@oakland.edu

(No relationships reported)

Comparing two prevalent types of soccer kicks, instep kick (dorsum of foot, at laces) and pass kick (medial foot, at longitudinal arch), can highlight functionality and effectiveness during play. PURPOSE: Identify biomechanical differences between instep kick and pass kick during soccer play, comparing dominant (D) and non-dominant (ND) kicking foot. METHODS: 17 male NCAA D1 collegiate soccer players (age 19.6±1.5 years; BMI 23.1±1.4 kg/m²) performed 3 instep and 3 pass kicks with each foot aimed at a 1.2x1.2m target with center 9m away, raised 0.3m from ground. Maximal kick of each type was used. Self-reported footedness determined D and ND. Ball velocity was captured via motion analysis (Simi Akitisys 2D) and accuracy quantified in two measures: distance from center target and angle of deviation from target. RESULTS: Instep kicks (D and ND combined) demonstrated higher velocity than pass kicks (25.6±2.8 m/s; 23.4±2.3 m/s; p<0.001). D foot kicks had greater instep velocity (27.0±2.1 m/s) than pass kick velocity (24.2±2.2 m/s; p<0.001), but ND footed kicks did not demonstrate significance (24.1±2.7 m/s; 22.6±2.2 m/s; p=0.09). Accuracy by angle of deviation demonstrated pass kicks (D and ND combined) were more accurate than instep kicks (4.1±2.0°; 6.2±3.7°; p<0.005), with significance in accuracy also noted in ND kicks (4.3±2.2°; 6.8±4.0°; p=0.05). D foot kicks were nearly significant (3.9±1.8°; 5.6±3.4°; p=0.07). Accuracy by distance from center (D and ND combined) showed pass kicks (0.9±0.5 m) were significantly more accurate than instep kicks (1.1±0.7 m; p=0.05). Neither D (1.1±0.7 m; W:0.8±0.5 m; p=0.14) nor ND foot (1.2±0.6 m; 0.9±0.5 m; p=0.18) alone demonstrated differences between instep versus pass kick accuracy. CONCLUSIONS: Instep kicks function for shooting; pass kicks for precision. Instep kicks have greater velocity than pass kicks, but not in ND limb, which may be harder to develop and thus disparities are not achieved. Pass kicks have greater overall accuracy than instep kicks, but not necessarily dependent on D or ND: more even distribution of pass kicks between D and ND may be exhibited due to their high prevalence of use during play. D versus ND limb capabilities should be further examined.

Effects Of Fifa 11+ Training Program Over The Lower Limbs Neuromuscular Control In Professional Soccer Players

Rodrigo Argothy¹, Adriana Gutiérrez-Galvis¹, Rodrigo Pérez-Rodriguez¹, Yesica Moreno¹, Kely Puerta¹. Universidad Manuela Beltrán, Bogotá, Colombia. ¹Universidad Nacional de Colombia, Bogotá, Colombia

Email: rodrigo.argothy@docentes.umb.edu.co

(No relationships reported)

FIFA 11+ is an injury prevention training program whose structure contemplates both plyometrics and exercises focused on the strengthening of the lower limbs. These two aspects can contribute to enhance neuromuscular control of de lower limbs.

PURPOSE. To determine the effect of FIFA 11+ on the neuromuscular control related to the lower limbs muscle power in professional soccer players (Colombia’s 2nd division).

METHODS. Twenty subjects belonging to the same team participated in this study: ten were allocated to the FIFA 11+ group (age 18.6±1.17 years, weight 65.9 ± 8.50 kg; height 1.76±0.06 m; body index mass 21.16±1.86) and the remaining ten to the control group (age 19.4±0.97 years; weight 68.1±5.65 kg; height 1.75±0.07; body index mass 22.04±1.12). FIFA 11+ training was performed three times per week during two months; every session had a duration of twenty minutes (additional to the normal routine). Control group training was the same than the players were used to (just the normal routine). Vertical jumps used to evaluate the effect of FIFA 11+ in the muscle power were the counter movement jump (CMJ), squat jump (SJ) and Abalakov jump (ABK). BTS P-6000 force platform was used for the experiment (Area = 60cm x 40cm; sample = 1kHz). Ground reaction force (GRF) was measured and the following variables were calculated for both the dominant and non-dominant
limbs: a) maximum landing force, b) maximum impulse force, c) flight time and d) time to stabilization after landing. Three trials were carried out for every jump (CMJ, SJ and ABK) and for each player (Martin Whaley test) were used to analyze the registered data. RESULTS. Obtained results indicate a statistically significant reduction of the non-dominant limb maximum landing force for SJ (FIFA 11+ group 2579.69±902.19 N; control group 2976.45±1273.49 N; p=0.05) in the FIFA 11+ group. CONCLUSION. To determine if previous history of injury in collegiate athletes; however, this P: Inter-rater Agreement of a Tackling Performance Assessment Scale in Youth American Football. Eric Schussler, Dan Clifton, Meghan M. Miller, James A. Onate. The Ohio State University, Columbus, OH. Email: schussler.eric@gmail.com

Conclusions have been made regarding appropriate tackling form to reduce the risk of head injury, including the USAFootball Heads-Up tackling program. Providing feedback on technique is an essential part of improving performance and decreasing injury risk. PURPOSE. Establish inter-rater agreement of a Tackling Performance Assessment Scale to be used for delivering feedback to youth football players. METHODS. Twenty videos of youth football athletes performing a football tackle on a dummy were presented to two Certified Athletic Trainers (ATC). These ATCs were provided with training regarding the desired tackle performance, as recommended by USA Football. Participants completed a self-test with a minimum score of 80%. After completion of rater training, participants were asked to identify correct performance of six criteria on a dichotomous scale. The videos could be slowed to half speed or advanced frame by frame, if desired. Criteria include the following measures upon contact: cervical extension >45°, trunk inclination between 35° and 55°, head placement on far side of target, and pelvic height less than 75% of standing pelvis height. Criteria upon approach include: shoulder extension >45° and step length <70% of standing pelvis height. Cohen’s Kappa statistics were calculated to assess inter-rater agreement for each of the six components of the scale. RESULTS. Cohen’s Kappa measures found substantial agreement in cervical extension (k=0.694), head placement (k=0.608), pelvic height (k=0.737), and shoulder extension (k=0.700). Step length has moderate agreement (k=0.494) and trunk inclination has fair agreement (k=0.241).

Conclusions. Inter-rater agreement of the six critical components range from fair to substantial. While visual estimation is not considered the most accurate or reliable mechanism to measure movement, this strategy is utilized regularly by clinicians and coaches and requires little or no additional equipment. Results of this study indicate trained personnel are able to achieve moderate to substantial agreement in four of six assessment areas, indicating the raters are capable of identifying the appropriate feedback to be provided. By establishing a feedback mechanism that is easily utilized by clinicians and coaches we can begin to provide a pathway to improve tackling performance.

The Functional Movement Screen (FMS) assesses seven fundamental movement patterns to determine potential injury risk. A recent report demonstrated that low FMS scores were associated with previous history of injury in collegiate athletes; however, this relationship has yet to be examined across lower levels of competition. PURPOSE: To determine if previous history of musculoskeletal injury (MSKI) affected FMS performance in high school (HS) and middle school (MS) football players. METHODS. Sixty-five HS (15.3±1.1yrs; 180.9±6.8cm; 83.2±15.9kg) and 29 MS (12.7±0.7yrs; 166.2±10.2cm; 54.6±12.4 kg) football players completed an injury history questionnaire with primary assistance and underwent FMS prior to the start of the 2015 season. FMS composite scores (CS) were dichotomized as ≥14 (low risk) or <14 (high risk). Each individual FMS test was scored as high (score of 2 or 3) or low (score of 0 or 1). Mean FMS CSs for HS and MS players were compared using an independent t-test. Chi-square statistics were used to evaluate the relationships between previous history of injury and high and low risk FMS CSs, presence of pattern asymmetry, and high and low individual FMS test scores. RESULTS: No difference was found between HS and MS players in FMS CS (12.8±2.3 vs. 12.9±1.9; p=0.836). The majority (71 of 94; 75.5%) of participants scored ≤14. More than half (50 of 94; 53.2%) of participants reported a history of any MSKI with 43.6% reporting prior lower extremity (LE) injury. Having an FMS score ≤14 was not associated with prior MSKI (χ²=2.08; p=0.773), nor MS LEKI (χ²=0.05; p=0.820). Pattern asymmetry on the shoulder mobility (SM) test was significantly associated with history of any MSKI (χ²=2.36; p=0.047, OR=2.61, 95%CI=1.04-6.83) and LE MSKI (χ²=2.35; p=0.025, OR=2.87, 95%CI=1.13-7.30). Low score on the push-up (PU) test was associated with history of any MSKI (χ²=5.55; p=0.018, OR=0.36, 95%CI=0.16-0.85) and MS LEKI (χ²=2.99; p=0.002, OR=0.25, 95%CI=0.10-0.60). CONCLUSION: Previous history of injury did not affect FMS CS. Although pattern asymmetry on SM and low PU scores were associated with prior history of MSKI, their influence on future injury risk remains uncertain. Lastly, 75% of players scored below the previously reported injury threshold of 14, suggesting this score may not be the ideal cutoff for all populations.

Several youth football organizations have recently issued guidelines for limiting full contact (FC) activities in practice to reduce players’ head impact exposure (HIE). These recommendations were created without the availability of HIE data collected in the field during various FC practice activities. Knowing impact frequency and severity distributions in different practice activities could inform more effective guidelines. PURPOSE. To assess HIE of youth football players during FC practice activities and games. METHODS. Twenty middle school football players (12-14 yrs) were helmets outfitted with a Head Impact Telemetry (HIT) System impact sensor array during one season (30 practices, 10 games). The HIT System uses six single-axis accelerometers to measure head impact frequency, severity (linear and rotational acceleration), and location. All practice activities were coded and recorded by a research observer. FC activities were categorized as either Live Action Drills (LAD) or Live Action Plays (LAP). RESULTS. There were 7391 total head impacts (4431 in practices, 2960 in games) registered during the study period. LAD made up 17.3% of overall practice time and accounted for 42.5% of all practice impacts, whereas 24.1% of practice time and 33.6% of practice impacts occurred during LAP. The median linear acceleration of head impacts was significantly greater during LAP (23.4 g) than in LAD (20.9 g) (P<0.0001) and games (22.2 g P<0.001). The median rotational acceleration of head impacts was significantly greater during both LAD (1579 rad∙sec⁻²) and games (1531 rad∙sec⁻²) than during LAP (1482 rad∙sec⁻²) (P<0.001). There was no difference in median rotational acceleration between LAD and games (P>0.05). Head impacts occurred more frequently during LAD (41.1%), side (27.9%), top (16.0%) and back (15.0%) of the helmet during LAD, and to the front (57.9%), side (15.6%), back (15.6%) and top (10.9%) of the helmet during LAP. CONCLUSION: During FC practice activities in youth football, head impacts occurred at a disproportionately higher rate and were greater in severity in LAD versus LAP. Thus, it is inappropriate to categorize all FC activities into one group with regards to HIE. Player contact guidelines that are intended to reduce HIE in youth football should be focused on limiting time spent performing LAD.
RESULTS: Categorization of factors and the Eigen values (EV) of factors in each group are as follows: In Caucasian males, the first factors (EV: 1.78) are ND [factor loading (FL): .84], and TF (FL: .69); the second factors (EV: 19.90) are PA (FL: .77), QA (FL: .74), and TT (FL: .46); the third factors (EV: 16.17) are GR (FL: .75), AT (FL: .63) and RF (FL: .56). In Caucasian females, the first factors (EV: 1.70) are ND (.80) and GR (.71); the second factors (EV: 1.70) are TT (FL: .73), RF (FL: -.63), QA (FL: .63) and AT (FL: .63); the third factors (EV: 1.51) are PA (FL: .79) and TF (FL: .73). In Korean males, the first factors (EV: 1.95) are PA (FL: .79), QA (FL: .65), TF (FL: .58) and GR (FL: -.53); the second factors (EV: 1.45) are RF (FL: -.87) and ND (FL: .65); the third factors (EV: 1.39) are AT (FL: -.77) and TT (FL: .71). In Korean females, the first factors (EV: 1.78) are ND (FL: -.82), RF (FL: .77) and TT (FL: .66); the second factors (EV: 1.66) are QA (FL: .88) and TF (FL: .82); the third factors (EV: 1.50) are AT (FL: -.78), GR (FL: .55) and PA (FL: .54).

CONCLUSIONS: Similar categorization characteristics in QA, TF, ND, and RF in Korean males and females indicate that Korean males and females demonstrated similar LEA characteristics. These results were not found in Caucasian males and females. Therefore, it is suggested to consider ethnic differences to investigating the relationship between LEA and risk of injury.

Female Soldiers have a significantly higher rate of injury, specifically low back and lower extremity (LB/LE) injuries, compared to male Soldiers. Despite return to full activity following an injury, LE biomechanical asymmetries may persist, likely leading to an increased risk for recurrent injuries.

METHODS: To assess musculoskeletal and biomechanical asymmetries that may relate to the development of injury in female Soldiers.

METHODS: Female 101+ Airborne Division (Air Assault) Soldiers’ (n=77; age=27.1±5.59) LE strength (% body weight) and LE biomechanics were collected with 3D motion analysis during a drop landing task. Paired samples t-tests compared bilateral strength and landing biomechanics in female Soldiers. SPSS v.23 was utilized for analysis (p<0.05).

RESULTS: Among all female Soldiers, 15.6% (12/77) reported at least one LB/LE injury within the last year, with half of those with injuries reporting a knee injury. The majority of all injuries and specifically knee injuries occurred on the right side. Significant asymmetries were found in knee extension strength (R:186.8±39.0 %BW vs L:171.9 ± 39.5 %BW, p<0.001), knee flexion strength (R:90.9±22.3 %BW vs L:86.5±21.1 %BW, p<0.001), knee flexion at initial contact (IC) (R:19.9±6.9° vs L:21.2±6.7°, p<0.03), knee flexion excursion (R:69.5±11.8° vs L:67.5±12.0°, p=0.004) and peak vertical ground reaction force (PvGRF) (R:350.3±88.6 %BW vs L:327.2±84.8 %BW, p<0.001).

CONCLUSION: Female Soldiers demonstrated asymmetrical landing strategies, including decreased right knee flexion at IC and increased right PvGRF, potentially placing an increased load on the right limb, which was also the most injured limb. This stiffened landing position and greater PvGRF were found despite greater knee strength and increased knee flexion excursion on the right. These results suggest that in female Soldiers, shock absorption strategies at the knee may be influenced by mechanisms other than maximal knee strength. Further research is needed to determine the interaction between sagittal and frontal plane mechanics during landing in female Soldiers. With the expanded role of women in the military, understanding the mechanisms associated with these asymmetrical movement patterns and increased risk of injury should be a priority in military medicine.

Ventricular threshold (VT) provides accurate indexes of individuals’ aerobic fitness but is impractical for daily use. Heart rate at the VT (HRVT) has thus been widely used as an alternative to the VT. PURPOSE: The purpose of this study was to evaluate the validity of a new HR parameter in predicting HRVTs. The parameter is defined as HR at the maximal distance point between linearly- and quadratically-approximated HR trends. METHODS: HR and ventilatory gas data for 105 subjects (53 males, 52 females; 38.26 ± 12.06 yrs; 166.62 ± 8.21 cm; 65.31 ± 11.10 kg) of varying aerobic fitness were simultaneously collected during an incremental treadmill test. VTs were manually evaluated from the ventilatory gas data using the three established ventilatory methods - the ventilatory equivalent method, the V-slope method, and the ventilation curve method. Reference HRVTs were then identified as HR values at the VT points and compared to those estimated by the HR parameter. Two conventional HR parameters were also employed as comparable variables to demonstrate the validity of the new HR parameter. RESULTS: A strong positive correlation (r=0.69, p<0.001) and a reasonable HR difference of 10.40 ± 7.06 bpm were obtained between the reference and estimated HRVTs, as compared to the conventional HR deflection points extracted by three linearly approximated HR trends (r=0.35, p<0.001) and three-point HR slopes (r=0.26, p=0.011). The parameter further improves its detection accuracy (r=0.72, p<0.001; 9.91 ± 6.75 bpm) by combining with subject’s age. CONCLUSIONS: The proposed HR parameter, particularly with subject’s age, is highly applicable to predicting HRVTs in terms of the detection accuracy and the noise-robustness due to the use of approximated HR trends.

**WEDNESDAY, JUNE 1, 2016**

**B-41** Free Communication/Poster - Training Assessment- Cardiovascular

**Wednesday, June 1, 2016, 1:00 PM - 6:00 PM**

**Room: Exhibit Hall A/B**

**1014 Board #330** June 1, 2:00 PM - 3:30 PM Predicting Heart Rate at a Ventilatory Threshold Using Two Approximated HR Trends

Dae-Geun Jang1, Byung-Hoon Ko1, Sub Sunoo2, Sang-Seok Nam2, Hun-Young Park1, Sang-Kon Bae1.1. Samsung Advanced Institute of Technology, Suwon-si, Republic of Korea; 2. Kyunghee University, Yongin-si, Korea, Republic of. Email: daegeun.jang@samsung.com

(No relationships reported)

Ultra-short term heart rate recovery (UST-HRR) after exercise discriminates healthy and sick subjects but is impractical for daily use. Heart rate at the maximal distance point between linearly- and quadratically-approximated HR trends is used as an alternative to the VT. The estimated HRVTs, as compared to the conventional HR deflection points extracted by three linearly approximated HR trends, are highly applicable to predicting HRVTs in terms of the detection accuracy and the noise-robustness due to the use of approximated HR trends.
HRR drop at 10 s post-exercise was significantly different among groups (P = 0.04), with recovery in women with high risk of an acute cardiovascular event was slower as compared to the medium and low risk counterparts (65.4 ± 1.6 vs. 60 ± 0.7, P = 0.02). AUC analysis for UST-HRR revealed similar results between groups during the 60 s post-exercise (P = 0.60).

CONCLUSION: It seems that individuals with high risk for heart disease have blunted post-exercise heart rate dynamics immediately after exercise. This project was supported by the Serbian Ministry of Education, Science and Technological Development (Grant No. 175037), and the Faculty of Sport and Physical Education, University of Novi Sad (2015 Annual Award).

Keywords: Cardiovascular event, Submaximal exercise; Heart rate; Recovery

Method: 22 female collegiate varsity runners completing testing immediately before and after their competitive fall season. Lean body mass (LBM) and body fat percentage (BF%) were determined by dual-energy x-ray absorptiometry (DXA). VO\textsubscript{max} and time to exhaustion (T\textsubscript{max}) were determined during maximal rowing ergometer testing followed by 3 minutes of active recovery at 70W. Heart rate was measured continuously and HRR was expressed absolutely at 1, 2, and 3 minutes after test completion (HRR\textsubscript{1min}, HRR\textsubscript{2min}, HRR\textsubscript{3min}, respectively). Pre- and post-season variables were compared using paired t-tests. Multivariable regression models were used to predict in-season changes in HRR at each time point using in-season changes in VO\textsubscript{max} and BF% as covariates.

RESULTS: Compared to pre-season, post-season VO\textsubscript{max} (3.98±0.42 v 3.78±0.35 ml/kg/min, p<0.001) and LBM (50.6±5.5 v 52.3±6.0kg, p<0.001) decreased, while increases were noted in T\textsubscript{max} (11.7±1.3 v 12.6±1.3 minutes p=0.002) and LBM (50.6±5.5 v 52.3±6.0kg, p<0.001). There were increases in HRR\textsubscript{1min} (22.0±5.6 v 25.4±7.0bmp, p=0.008), HRR\textsubscript{2min} (52.1±5.8 v 54.8±7.3bmp, p=0.001) and HRR\textsubscript{3min} (37.7±5.1 v 35.1±7.5bmp, p=0.001). After inclusion in the multivariable model, VO\textsubscript{max} was not independently associated with HRR\textsubscript{1min} (p=0.40), HRR\textsubscript{2min} (p=0.31), or HRR\textsubscript{3min} (p=0.24), while independently related to T\textsubscript{max} (p=0.07), but not HRR\textsubscript{1min} (p=0.56) or HRR\textsubscript{2min} (p=0.99). BF% was independently related to HRR\textsubscript{1min} in both models (p=0.041 and p=0.023, respectively), but not HRR\textsubscript{2min} or HRR\textsubscript{3min} in either model (p=0.05 for all). Conclusions: HRR is faster postseason and HRR\textsubscript{1min} is related to increases in T\textsubscript{max}. On the other hand, in-season changes in HRR do not reflect changes in VO\textsubscript{max} and should not be used as an indirect measure of aerobic capacity in collegiate runners.

Method: 50 NCAA Division 1 soccer and hockey athletes (male=32, soccer=24) completed testing immediately before and after their competitive seasons. Lean body mass (LBM) and body fat percentage (BF%) were determined by dual-energy x-ray absorptiometry (DXA). Maximal aerobic capacity (VO\textsubscript{max}), and maximal respiratory exchange ratio (EREmax) were determined during maximal treadmill testing followed by 3 minutes of active recovery. Heart rate recovery (HRR) was calculated as the absolute decrease from maximal HR at 1 (HRR\textsubscript{1min}), 2 (HRR\textsubscript{2min}) and 3 minutes (HRR\textsubscript{3min}) after test completion. Pre- and post-season fitness and HRR variables were compared using paired t-tests. Multivariable regression analysis was used to identify independent predictors of in-season changes in HRR at each time point using gender and in-season change in VO\textsubscript{max}, BF%, LBM, and gender and body composition as covariates.

RESULTS: Compared to pre-season, post-season VO\textsubscript{max} (4.31±0.87 v 4.08±0.85, p<0.001) and BF% (19.4±6.5 v 19.1±6.8%, p=0.057) was lower, while RERmax (1.13±0.1 v 1.21±0.1, P=0.001) and LBM (56.3±9.8 v 56.7±10.4kg, p=0.002) were higher. In-season changes showed faster HRR\textsubscript{1min} (27.6±9.4 v 30.4±8.4 bpm, p=0.027), but HRR\textsubscript{2min} (71.9±5.3 v 71.9±5.3, p=0.87) and HRR\textsubscript{3min} (65.3±4.5 v 65.3±4.5, p=0.78) were not. After inclusion in the multivariable model, VO\textsubscript{max} was not related to HRR\textsubscript{1min} (p=0.34), HRR\textsubscript{2min} (p=0.85), or HRR\textsubscript{3min} (p=0.72). Gender and in-season changes in VO\textsubscript{max}, BF%, LBM or RERmax were not related to in-season changes in HRR at any time point (p=0.05 for all).

Conclusions: In Season changes in HRR are not related to changes in aerobic fitness, gender or body composition. This study demonstrated faster HRR\textsubscript{1min} in collegiate soccer and hockey athletes from pre- to post-season. However, this improvement was unrelated to changes in VO\textsubscript{max} and body composition. Based on these findings, HRR is not a useful indicator of aerobic fitness in this population.

Method: 15 subjects (21 ± 1 years) were noted in T\textsubscript{max} (11.7±1.3 v 12.6±1.3 minutes p=0.002) and LBM (50.6±5.5 v 52.3±6.0kg, p<0.001). There were increases in HRR\textsubscript{1min} (22.0±5.6 v 25.4±7.0bmp, p=0.008), HRR\textsubscript{2min} (52.1±5.8 v 54.8±7.3bmp, p=0.001) and HRR\textsubscript{3min} (37.7±5.1 v 35.1±7.5bmp, p=0.001). After inclusion in the multivariable model, VO\textsubscript{max} was not independently associated with HRR\textsubscript{1min} (p=0.40), HRR\textsubscript{2min} (p=0.31), or HRR\textsubscript{3min} (p=0.24), while independently related to T\textsubscript{max} (p=0.07), but not HRR\textsubscript{1min} (p=0.56) or HRR\textsubscript{2min} (p=0.99). BF% was independently related to HRR\textsubscript{1min} in both models (p=0.041 and p=0.023, respectively), but not HRR\textsubscript{2min} or HRR\textsubscript{3min} in either model (p=0.05 for all). Conclusions: HRR is faster postseason and HRR\textsubscript{1min} is related to increases in T\textsubscript{max}. On the other hand, in-season changes in HRR do not reflect changes in VO\textsubscript{max} and should not be used as an indirect measure of aerobic capacity in collegiate runners.

Method: 50 NCAA Division 1 soccer and hockey athletes (male=32, soccer=24) completed testing immediately before and after their competitive seasons. Lean body mass (LBM) and body fat percentage (BF%) were determined by dual-energy x-ray absorptiometry (DXA). Maximal aerobic capacity (VO\textsubscript{max}), and maximal respiratory exchange ratio (EREmax) were determined during maximal treadmill testing followed by 3 minutes of active recovery. Heart rate recovery (HRR) was calculated as the absolute decrease from maximal HR at 1 (HRR\textsubscript{1min}), 2 (HRR\textsubscript{2min}) and 3 minutes (HRR\textsubscript{3min}) after test completion. Pre- and post-season fitness and HRR variables were compared using paired t-tests. Multivariable regression analysis was used to identify independent predictors of in-season changes in HRR at each time point using gender and in-season change in VO\textsubscript{max}, BF%, LBM, and gender and body composition as covariates.

RESULTS: Compared to pre-season, post-season VO\textsubscript{max} (4.31±0.87 v 4.08±0.85, p<0.001) and BF% (19.4±6.5 v 19.1±6.8%, p=0.057) was lower, while RERmax (1.13±0.1 v 1.21±0.1, P=0.001) and LBM (56.3±9.8 v 56.7±10.4kg, p=0.002) were higher. In-season changes showed faster HRR\textsubscript{1min} (27.6±9.4 v 30.4±8.4 bpm, p=0.027), but HRR\textsubscript{2min} (71.9±5.3 v 71.9±5.3, p=0.87) and HRR\textsubscript{3min} (65.3±4.5 v 65.3±4.5, p=0.78) were not. After inclusion in the multivariable model, VO\textsubscript{max} was not related to HRR\textsubscript{1min} (p=0.34), HRR\textsubscript{2min} (p=0.85), or HRR\textsubscript{3min} (p=0.72). Gender and in-season changes in VO\textsubscript{max}, BF%, LBM or RERmax were not related to in-season changes in HRR at any time point (p=0.05 for all).

Conclusions: In Season changes in HRR are not related to changes in aerobic fitness, gender or body composition. This study demonstrated faster HRR\textsubscript{1min} in collegiate soccer and hockey athletes from pre- to post-season. However, this improvement was unrelated to changes in VO\textsubscript{max} and body composition. Based on these findings, HRR is not a useful indicator of aerobic fitness in this population.
Regular physical activity is recommended for overall cardiovascular health. For improvement, 40 minutes of moderate-to-vigorous activity on 3–4 days per week is recommended, which can be facilitated by regular participation in CrossFit. CrossFit is a form of high intensity functional training that can be adapted to each individual according to age and ability level and has ~6000 affiliates nationwide. PURPOSE: To identify associations between regular CrossFit participation and resting blood pressure (BP), heart rate (HR), and perceptions of improved health. METHODS: Participants included 20 individuals (18–66 yrs, 50% male) who attended CrossFit during the entire 12-month program evaluation study through K-State CrossFit. Health assessments were conducted at baseline, 2-, 6-, and 12-months and included measurements of resting BP and resting HR after 5-minutes of rest. Surveys completed at baseline and 12 months gauged intentions and perceptions of CrossFit participation to reduce BP and risk for coronary heart disease (CHD). Survey responses were assessed on a scale from 1 (strongly disagree) to 5 (strongly agree). SPSS 20 was used to analyze changes in resting BP and HR using repeated measures ANOVA, and t-tests for survey responses. RESULTS: Mean values for systolic BP decreased from 123.8±14.6 mmHg at baseline, to 119.4±15.5-16.2 mmHg at 2- and 6-months, and 115.9±17.4 mmHg at 12 months. There was a significant main effect for systolic BP, (F(3,1) = 4.585, p<.006. Mean diastolic BP decreased from 75.5±8.6 mmHg at baseline to 71.9±10.8 mmHg at 12 months but there was no significant main effect, (F(3,1) = 1.612, p>.197. Mean values for resting HR from 2 months (61.7±8.2 BPM) to 12 months (65.8±9.3 BPM) were not significant (p=.13). Survey responses were not significant for reduced BP (p=.19) and reduced risk for CHD (p=.24). CONCLUSION: Results indicate that regular CrossFit participation can significantly decrease resting systolic BP and diastolic BP in healthy adults. However, participants did not express BP or CHD reduction as an intention or perceived outcome of doing CrossFit. Future studies should examine the effects of CrossFit participation on individuals at risk for heart disease by examining their motivational factors and additional indicators of heart health such as blood cholesterol and lipid levels.

Faster heart rate recovery (HRr) is associated with individuals who are trained and healthy, whereas a slower HRr is associated with those who are untrained, over-trained, or have a high risk of morbidity and mortality. PURPOSE: To assess the influence of physiological and psychological parameters on HRr in overweight/obese and fit individuals. METHODS: Participants (n = 26) were divided into two groups: a sedentary overweight/obese group (SED, n = 11) and a normal weight fit group (FIT, n = 15). Groups were separated by body mass index, body composition, and maximal oxygen consumption (VO2max). All participants completed a body composition analysis (InBody 570), a survey to assess current mood state (Profile of Mood States, POMS), and a maximal graded exercise test (GXT) on a treadmill. Heart rate (HR), blood pressure, and VO2max were measured throughout the GXT, and HR was measured through two minutes post-exercise. HRr was calculated as peak HR achieved during the GXT minus 2-min post-exercise HR.

RESULTS: There were significant differences between groups for weight (p < .001), body composition (p < .001), resting HR (p < .001), and body mass index (p < .001). There were significant differences between groups for 2-min HRr (SED: 39.9±14.4 bpm, FIT: 59.3±9.2 bpm, p < .001) and relative VO2max (SED: 24.6±8.6 ml/kg/ min, FIT: 45.0±7.0 ml/kg/min, p < .001). There was no significant difference between groups for any of the mood states as measured by the POMS. Multiple regression analyses indicated that there were no significant physiological or psychological correlations related to HRr for the FIT group (R = .627, p = .627), while resting HR (p = .033) and maximal HR (p = .008) were both significant correlates with HRr in the SED group (R = .987, p = .004).

CONCLUSIONS: The data indicate that fit individuals have better HRr than unfit individuals. At lower levels of fitness and/or higher total mass and fat mass, a low resting HR and high maximal HR achieved during exercise are associated with an improved ability to recover. Thus, tracking HRr could be used to track improvement in fitness through training, instead of regularly completing GXTs.

**Heart Rate Response and Activity Level In Division I Football Players During Pre-Season Scrimmage Play**

Kate S. Early,1 Nathan P. Lemoine,1 Annie B. Sfmonoeux1, Matthew C. Scott,1 Shelly Mullenix,1 Jack Marucci,1 Andrew Barker,1 Michael MacLellan1, Ray R. Castle,1 Tim S. Church,1 Conrad P. Earnest, FACSM3, Neil M. MacLellan1, Louisian State University, Baton Rouge, LA. 2Pennington Biomedical Research Center, Baton Rouge, LA. 3Texas A&M, College Station, TX. (Sponsor: Conrad Earnest, FACSM)

PURPOSE: To compare the estimates of maximal oxygen consumption (VO2max) by a fitness test from a popular heart rate monitor to criterion values obtained within the laboratory. METHODS: Ten college-aged men (n = 4) and women (n = 6) participated in this study. Each subject wore a heart rate monitor with a built-in algorithm that predicted VO2max based upon the total distance covered and average heart rate during the 10-minute run. RESULTS: The observed and predicted VO2max values were 41.95 ± 7.79 ml/kg/min and 43.00 ± 5.87 ml/kg/min, respectively, which were not significantly different (p = 0.35). Pearson product correlation procedure showed that there was a significant relationship between the observed and predicted values (r = 0.93, p < 0.001). In addition, predicted VO2max displayed a standard error of the estimate of 3.24 ml/kg/min. CONCLUSION: The results of this study suggest that the exercise test employed by the heart rate monitor provides an accurate estimate of VO2max with a reasonable range of error. However, follow-up study utilizing a larger sample size is needed.

**Heart Rate and Blood Pressure Responses During a Set of 3ccs in Division 1 Women's Soccer**

Belinda A. Martin, FACSM,1 Elizabeth A.西班牙,1 Jessica L. Croteau,1 Jennifer M. Betts,1 Olivia C. Choice,1 Celine O. Davis,1 Chantel L. Newlin,1 Jamie L. Tull,1 and Rob L. Hay,1 Louisiana State University, Baton Rouge, LA.

PURPOSE: To examine the cardiovascular response during a set of 3ccs in Division 1 women’s soccer. METHODS: Twenty-one Division 1 female soccer players (n = 21) were divided into two groups: a control group (CON, n = 9) and a 3ccs group (3ccs, n = 12). The CON group was tested on a treadmill at 1 session and the 3ccs group was tested on 3 consecutive days. The CON group rode a stationary bicycle at 40% of VO2max for 20 minutes, while the 3ccs group performed 5 sets of 3ccs at 40% of VO2max. RESULTS: The maximal HR during 3ccs was 186±23 bpm while the VO2max was 47±4 ml/kg/min. CONCLUSION: The 3ccs protocol elicited a large cardiovascular response in collegiate female soccer players.

**Accuracy Of A Heart Rate Monitor-based Exercise Test For Estimating Aerobic Power In College-aged Individuals**

Kimberly E. Allen, Bailey Welborn, Michael R. Esco, FACSM, University of Alabama, Tuscaloosa, AL. (Sponsor: Michael R. Esco, FACSM)

PURPOSE: To determine the accuracy of estimated maximal oxygen consumption (VO2max) from a heart rate monitor to criterion values obtained within the laboratory. METHODS: Ten college-aged men (n = 4) and women (n = 6) participated in this study. Each subject wore a heart rate monitor with a built-in algorithm that predicted VO2max based upon the total distance covered and average heart rate during the 10-minute run. RESULTS: The observed and predicted VO2max values were 41.95 ± 7.79 ml/kg/min and 43.00 ± 5.87 ml/kg/min, respectively, which were not significantly different (p = 0.35). Pearson product correlation procedure showed that there was a significant relationship between the observed and predicted values (r = 0.93, p < 0.001). In addition, predicted VO2max displayed a standard error of the estimate of 3.24 ml/kg/min. CONCLUSION: The results of this study suggest that the exercise test employed by the heart rate monitor provides an accurate estimate of VO2max with a reasonable range of error. However, follow-up study utilizing a larger sample size is needed.
Golf is a popular physical activity that may have the potential to elicit several health benefits for those who choose to participate. There are many formulas to predict HRmax, with the most commonly used being the Fox equation (220-age). The 2008 ACSM guidelines state that one must accumulate 150 minutes of moderate intensity PA per week to elicit health benefits. ACSM defines exercise intensity based off of %HRmax as the following: very light (≤57% HRmax), light (57-64%), moderate (64-76%), vigorous (77-95%), and near maximal to maximal (≥96%).

**Purpose:** The purpose of this study was to determine which exercise intensity classification was achieved based on %HRmax during a 9 hole round of golf.

**Methods:** Five men (20.8 y.o.) rode (R) nine holes of golf, while five men (21.2 y.o.) walked (W) nine holes of golf. Resting HR, blood pressure, body mass index, height, and weight were recorded before and after play. All wore an Actigraph accelerometer and a Polar HR/GPS monitor. Results: The average %HRmax reached by W was 61.08%, and 57.49% reached by R.

**Conclusion:** These results demonstrate that a SPA can provide a reasonably accurate measurement of HR during resting conditions. Users should exercise caution with SPA if a specific target heart rate is the goal of a moderate intensity bout of exercise.
improvements in cardiovascular health measures; including a decrease in total cholesterol (-10.45 ± 20.4 mg/dL), an increase in HDL levels (2.45 ± 7.3 mg/dL), a decrease in triglyceride levels (7.10 ± 14.1 mg/dL), a significant decrease in LDL levels (-8.4 ± 90 mg/dL, p = 0.01), an increase in percent FMD (2.36 ± 15%), a decrease in IMT measurements (-0.01 ± 0.03 mm), a decrease in fat mass (-1.46 ± 0.18), an increase in fat free mass (2.05 ± 4.18), and a decrease in body fat percent (-0.03 ± 3%).

CONCLUSION: Our results suggest improvements in cardiovascular health measures; however, additional data collection is necessary in order to see more significant results. Data collection is ongoing.

1028 Board #344 June 1, 2016 - 2:00 PM - 3:30 PM
An Evaluation of the Heart Rate Response to a Twenty Minute Suspension Training Exercise Session
Angela M. Kleitz1, Andrew Bosak2, Kevin Huel1, Elizabeth Croft3, Kayla Nix4, Jordan Otto4. 1University of Southern Mississippi, hattiesburg, MS. 2Liberty University, Lynchburg, VA. 3Kennesaw State University, Kennesaw, GA. 4Georgia Southern University, Statesboro, GA. 5Armstrong State University, Savannah, GA. 6Armstrong State University, savannah, GA. 7Savannah, GA. (Sponsor: Dr. Jim Schoffstall, FACC)

Email: angela.kleitz@eagles.usm.edu

No (relationships reported)

The TRX suspension training system (TRX-ST) is a relatively new fitness training device and little research has been conducted regarding its ability to provide both a resistance training and cardiovascular workout simultaneously. By utilizing this fitness tool in a circuit training manner, it may be possible to produce an efficient training stimulus to promote fitness gains in muscular and cardiovascular endurance. However, this suggested circuit training exercise protocol has not been previously evaluated.

PURPOSE: To determine if a 20 min TRX-ST circuit training session yields a HR response (HRr) that meets the ACSM guidelines for vigorous physical activity indicated by a HR intensity of 77.93-99% of HRmax.

METHODS: Thirty above average fit subjects (15 males and 15 females) completed a maximum treadmill performance (p < 0.001, Cohen’s d = 0.15) in the standing positions. The PS values showed a near significant difference in the supine position, 76.5 ± 8.2 via PS and 77.5 ± 8.2 via ECG (p = 0.007, Cohen’s d = 0.01) in the seated position, and 66.5 ± 9.2 via PS and 67.8 ± 9.1 via ECG (p < 0.001, Cohen’s d = 0.15) in the standing positions. The PS values showed a near perfect correlation in the ECG in all three positions (r values ranged from 0.98 to 0.99).

In addition, the limits of agreement (CE ± 1.98 SD) were -0.13 ± 2.83 for the supine values, -0.94 ± 3.47 for the seated values, and -1.37 ± 3.56 for the standing values.

CONCLUSIONS: The results of the study suggest good agreement between the PS and ECG for measuring lnRMSSD in supine, seated, and standing positions. Though significant differences were observed between the two methods in the seated and standing positions, the effect sizes were trivial (i.e., Cohen’s < 0.20). In addition, PS provided tight limits of agreement to the criterion method in all three positions. Therefore, the PS method appears to provide a suitable alternative to ECG for measuring ultra-short-term lnRMSSD.

1030 Board #346 June 1, 2016 - 2:00 PM - 3:30 PM
Determination Of IANT Via Heart Rate Variability In Overweight And Obese Subjects
Ruediger Reer1, Tobias Schmidt1, Sarah Wulf1, Serge P. von Duivillard1, FACSM2, Klaus-Michael Braumann3, FACSM1. 1University of Hamburg, Hamburg, Germany. 2University of Salzburg, Salzburg, Austria. 3Email: ruediger.reer@uni-hamburg.de

No (relationships reported)

Numerous studies reported that the heart rate variability (HRV) may be used to determine the anaerobic-aerobic thresholds (IANT) in healthy trained participants (Flioter et al. 2012; Karapetian et al. 2006). PURPOSE: The aim of this study was to assess if the IANT may also be determined in overweight and obese subjects utilizing the non-linear response of HRV. METHODS: 28 overweight and obese participants (age: 38.5 ± 13.1 yrs; Wt: 96.4 ± 16.7 kg; BMI: 30.9 ± 4.4 kg.m-2; %body fat: 29.2 ± 4.3; waist circumference: 107.8 ± 10.9 cm) performed a two stage incremental test on cycle ergometer (Braumann et al. 1990) followed by continuous performance test to determine and validate the lactate thresholds and IANT as described by Heck et al. 1985. The examination of individual HRV variables and associated HRV thresholds were determined via continuous 12-lead ECG monitoring and recordings (Flioter et al. 2012). The agreement of resulting power output thresholds expressed in Watts (W) in the region of IANT and those determined from HRV recordings were ascertained via Bland-Altman plots and correlation analysis. RESULTS: The calculated thresholds generated from HRV recordings were above those performed in IANT (W: 126 ± 30; utilizing the Pointcare Chart variability, SD1 of 144.8 ± 32.9 = standard deviation of the short-term RR interval variability of transverse axis; SD2 of 146.1 ± 30.5 = standard deviation of the long-term RR interval variability of longitudinal axis; SD1/SD2 ratio of 145.2 ± 27.8; SD1/HR ratio of 144.4 ± 32.2). The results revealed agreements in IANT determination that were confirmed via Bland-Altman Plots as well as significant correlation coefficients generated from the cycle ergometer power output (SD1 = 0.69; SD2 = 0.61; SD1/SD2 = 0.66; SD1/HR = 0.68). CONCLUSION: The results of this study yielded moderate to strong associations between HRV threshold data and results determined via IANT power output on cycle ergometer. In our overweight and obese participants, the response in HRV variability was present and possible only during the short-term analysis.

1031 Board #347 June 1, 2016 - 3:00 PM - 3:30 PM
Heart Rate and Breathing Rate Response During Maximal Graded Exercise Is Altered After Volitional Breath Training in Healthy Volunteers
Krishnukumar Radhakrishnan1, Vivek Kumar Sharma2, Senthil Kumar Subramanian3. 1All India Institute of Medical Sciences (AIIMS), New Delhi, India. 2Institute of Medical Technology, Pondicherry, India. 3Postgraduate Medical Education and Research (JIPMER), Pondicherry, India. 4Pondicherry Institute of Medical Sciences (PIMS), Pondicherry, India. 5Email: dr.krishnukumar@gmail.com

No (relationships reported)

PURPOSE: To investigate the effect of 6 weeks supervised pranayamic volitional breath training (PVBT) on heart rate and breathing rate response during maximal graded exercise treadmill test (GXTT) in healthy adult volunteers.

METHODS: Consecutive, consenting healthy adult volunteers of mean age 20.56 ± 2.49 years (n = 30), underwent baseline recording of resting heart rate (HR), blood pressure (BP) and respiratory rate (RR) followed by Bruce ramp protocol maximal GXTT until volitional exhaustion providing total test time (TT), derived VO2max achieved, heart rate and breathing rate response during maximal GXTT and drop in recovery HR data. After six weeks of observation, the participants underwent pre- and post-intervention recording followed by supervised PVBT intervention for 6 weeks, 30 minutes a day for 5 days a week, and post-intervention recording. Repeated measures ANOVA with pairwise t-statistical comparison was used to analyze the data.

RESULTS: The participants, after supervised PVBT, showed significant increase in TT (805.993 ± 99.04 vs. 806.00 ± 97.92 vs. 868.97 ± 97.48 seconds, p < 0.001), VO2max (53.37 ± 6.88 vs. 53.47 ± 6.75 vs. 57.77 ± 6.74 ml/kg/min, p < 0.001), and significant decrease in the heart rate and breathing rate response during maximal GXTT post intervention which is represented graphically (Figure 1). The significant decrease in heart rate and breathing rate response during maximal GXTT post intervention which is represented graphically (Figure 1). The significant decrease in heart rate and breathing rate response during maximal GXTT post intervention which is represented graphically (Figure 1).

CONCLUSIONS: After supervised PVBT, the participants showed improvement in maximal GXTT performance and altered heart rate and breathing response during...
exercise probably due to learnt behavior to control the breathing pattern improving the breathing economy, improvement in respiratory muscle aerobic capacity, increase in stroke volume and cardiac output and attenuation of respiratory muscle metabolism.

Red blood cell (RBC) deformability, necessary to pass small capillaries for the oxygen supply of tissue and organs, depends on nitric oxide (NO) availability. In RBC, NO is enzymatically produced by NO synthase (RBC-NOS) and it was recently demonstrated that sustainably increased RBC deformability and aerobic performance capacity. Methods: 38 healthy male subjects (27, 15 ± 4, 6) were randomly assigned to one of 3 training groups: High Volume Training (HVT; 120-140 bpm), High Intensity Training (HIT; 160-180 bpm) and Moderate Intensity Training (MIT; 140-160 bpm). The RBC count, hemoglobin concentration, hematocrit and mean cellular volume parameters were recorded by hemogram. The physical activity level was determined by spiroergometry. RBC deformability was measured by ektacytometry and RBC-NOS activation was measured by immunohistochemistry. All parameters were determined at rest before (TO) and after the 6-week intervention period (T1) using venous blood of overnight fasting subjects.

Results: The results revealed an increase in (P < 0.05) of maximum oxygen uptake for HIT 3 (x/week) program. El max significantly increased (P < 0.01) after HIT 3 program. Correlation/linear regression were calculated for HIT 3 and the R and R2 values were calculated to be 0.67 and 0.45, respectively, with a significant correlation of P < 0.005. The statistical analysis of gray values against phosphorylated RBC-NOSSer1177 for HIT 3 revealed significantly increased phosphorylation of the enzyme (P < 0.05) after the end of a 6 weeks training period.

Conclusion: High intensity training (3x/week) was the only training program that sustainably increased RBC deformability. This was attributed to increased RBC-NOS activation and associated to increased maximum oxygen uptake to the working muscles which might improve performance capacity. HIT therefore represents a time efficient training program resulting in improved RBC function consequently improving physical condition. Milon GmbH Grant
children. Systematic measurement would allow all stakeholders, from parents and schools to activity providers and public health agencies, to monitor changes in CRF over time and to evaluate the effectiveness of interventions. The primary purpose of this investigation was to examine the CRF of children at a number of UK primary schools over one academic year. Measures were CRF and body mass index (BMI). Secondary aims were to test the feasibility of CRF testing in primary schools more generally (previous studies have been administered by research teams, and whilst providing useful data relating to validity and reliability, provide little insight into the practicality and scalability of testing). Methods. Participants from 14 schools (n=463) aged between 8-9 (M:SD BMI 17.61±1.61) completed a 20 metre shuttle run test (20-mSRT) four times during a calendar year (Oct, Feb, June, Sep). This included data collection either side of the school summer break from July-Sep. CRF (VO₂max ml kg⁻¹ min⁻¹) was calculated using standardised prediction equations for children. To demonstrate both practicality and scalability of the protocol, testing sessions and data collection were conducted by appropriately trained and qualified personnel already operating in the schools and not by the research team, although the latter vetted this process. Results. Paired sample t-tests indicated a significant increase in CRF during the 1st quarter of the academic year (VO₂max 49.58±4.06-51.58±5.09 p<0.01). CRF continued to increase during the school year before decreasing significantly over the summer break (51.71±4.00-49.99±4.45 p<0.01). BMI remained level during the academic year but increased significantly during the summer break (17.91±3.13-18.35±3.31 p<0.01). Conclusions. Significant negative changes in CRF and BMI suggest children are less active in the summer break, a finding that should be used to inform future activity provision. Data also indicate that the delivery of CRF testing in primary schools is feasible and scalable.

**CONCLUSION:** Decreased coordination variability of ACLR thigh flexion-rotation and leg rotation foot eversion when cleared to run compared to controls suggests decreased function of the ACLR limb and may indicate increased injury risk.

### Table 1. Coordination variability means and standard deviations during late stance.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ACLR Visit 1</th>
<th>ACLR Visit 2</th>
<th>ACLR Visit 3</th>
<th>CTRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thigh-leg flexion/extension</td>
<td>45.85 (5.81)**</td>
<td>50.05 (6.45)</td>
<td>52.11 (3.70)</td>
<td>50.82 (4.56)</td>
</tr>
<tr>
<td>Thigh flexion-leg rotation</td>
<td>32.75 (5.30)**</td>
<td>36.05 (4.71)*</td>
<td>37.98 (4.71)*</td>
<td>42.58 (6.62)</td>
</tr>
<tr>
<td>Thigh-leg rotation</td>
<td>44.97 (6.23)**</td>
<td>48.24 (4.44)</td>
<td>50.45 (4.39)</td>
<td>51.01 (5.30)</td>
</tr>
<tr>
<td>Leg-foot flexion/extension</td>
<td>41.73 (6.18)**</td>
<td>47.82 (7.69)</td>
<td>49.77 (5.22)</td>
<td>50.18 (5.91)</td>
</tr>
<tr>
<td>Leg rotation-foot eversion</td>
<td>35.48 (5.18)**</td>
<td>40.17 (6.36)*</td>
<td>42.05 (5.58)*</td>
<td>46.27 (6.80)</td>
</tr>
</tbody>
</table>

### CONCLUSION: Side Bending Error Test Correlates with Frontal Plane Cutting Mechanics: Implications for ACL Injury Risk?

**Purpose**
Greater frontal plane trunk and knee angles have been implicated in non-contact ACL injury risk in females during jumping and cutting activities. However, proximal positioning is difficult to assess and few clinical tests exist to quantify this risk. The purpose of this study was to assess the relationship between errors in position sense during a new trunk positioning clinical test and 3D coronal plane trunk and knee mechanics during an unanticipated cutting task.

**Methods**
Female subjects without a history of significant lower extremity injury participated in this study. Subjects were recorded performing an instrumented unanticipated cutting task. While at a run, just prior to hitting a force plate, an indicator light would indicate which direction the subject was to cut. Kinematic variables were recorded for cuts from the planted right leg while cutting to the left. Subjects were then photographed performing a side-bending task while maintaining a single leg stance. The first picture was taken after they had bent to the side touching a prepositioned guide. Then, a second picture was taken as they attempted to position themselves in the same position without the guide. We then calculated the total side bending error by adding the differences between the bending angles to the right and left sides. Pearson product moment correlation coefficients were used to calculate the relationship between side bending error and frontal plane trunk and knee angles.

**Results**
Fourteen females completed the study. The subjects were 22.8±2.8 years old and had an average Tegner Score of 5.8±1.0. Subjects had an average side bending error of 4.6±1.7°, lateral trunk angle of 3.6±5.3° and knee abduction angle 4.0±4.0°. We found correlations of r=0.64 (p=0.014) and r=0.65 (p=0.012) between side bending error and knee abduction angle and lateral trunk lean respectively.

**Conclusion**
Female subjects with higher side bending errors were found to have higher knee abduction angles and higher ipsilateral trunk lean angles during an unanticipated cutting task. This study suggests that females who are poorer at accurately placing their body in space, find themselves in positions that put them at risk for ACL injury. The bending error test could be a useful clinical screening tool to identify those most at risk and in need of preventative strategies.

### Unilateral ACL Injury Does Not Affect Neuromuscular Function In The Non-injured Leg

**Purpose:** Several reports suggest that an ACL injury causes long-lasting neuromuscular changes not only in the injured but also in the non-injured leg. Such changes, however, were examined only for a selected number of neuromuscular measures. Therefore, we compared a broad array of neuromuscular functions between ACL patients’ non-injured leg and the legs of active and less-active healthy controls.

**Methods:** Thirty-two ACL patients (208 ± 145 days after injury, 23 ± 4 years) and 20 controls and ACLR individuals at 4 weeks, 12 weeks and when cleared to run post-injury were matched for age, sex, and activity level.

**RESULTS**
We found no significant differences between the ACLR and control groups in any of the neuromuscular function measures, including mean power, reaction time, and EMG activity.

**Conclusion:** Unilateral ACL injury does not appear to affect neuromuscular function in the non-injured leg.
active (22 ± 2 years) and 20 less-active (22 ± 1 years) healthy subjects were included in the study. The design allowed us to control for age, gender, leg dominance, and levels of physical activity for a comparison of variety of neuromuscular functions between the groups using a one-way ANOVA. In addition, the outcome on every measure was converted to a z-score and the mean z-score was calculated for each subject and used to test the overall difference in neuromuscular function between groups. Results: Levels of physical activity, expressed as weekly hours of sport activity, were similar between the ACL patients prior to injury and the active controls (6.9 hours) (p = 0.924) and these levels were also similar between ACL patients following the injury and the less-active controls (2.6 hours) (p = 0.983). Dynamic hamstring strength, measured at 120°/s, was higher for active than less-active controls (p = 0.047, d = 0.72), while dynamic balance, measured with the start-exursion balance test, was worse for ACL patients compared with active (p = 0.021, d = 0.80) and less-active controls (p = 0.014, d = 1.00). None of the other neuromuscular measures, including static single leg balance, single leg hop distance, maximal static and dynamic quadriceps and hamstring strength, quadriceps force accuracy and steadiness, and knee joint proprioception showed between-group differences (all p ≥ 0.173). Also, the overall index of neuromuscular function was not different between ACL patients (z-score: -0.13 ± 0.31), active controls (z-score: 0.04 ± 0.40), and less-active controls (z-score: -0.05 ± 0.50) (p = 0.306). Conclusion: Neuromuscular function of the ACL patients’ non-injured leg was not impaired despite the reduction in physical activity following an ACL injury. Therapists should focus on the injured leg in the rehabilitation process following an ACL injury.

Kinetic Asymmetries During A Vertical Jump Persist During Initial Year Post Acl Reconstruction

Joshua A. Choe, Mikel R. Stiffler, Bryan C. Heiderscheit. University of Wisconsin-Madison, Madison, WI.

Email: choejoshua@gmail.com

(No relationships reported)

Patients who are 18-36 months post-anterior cruciate ligament reconstruction (ACLR) have greater joint power asymmetries during a countermovement jump (CMJ), suggestive of residual neuromuscular deficits. Characterizing asymmetries in CMJ joint kinetics during the first year post-ACLR may provide insight into return to sport decision making.

Purpose: To identify between-limb differences in joint kinetics during a CMJ among athletes 4-12 months post-ACLR and determine if these differences are affected by time post-surgery.

Methods: Sixteen collegiate athletes within one year post-ACLR performed a CMJ while kinematics and ground forces were recorded. Sagittal plane work done at the hips and knees and work derived from jump power were calculated for each limb during the up and landing phases of the CMJ. Variables were compared between limbs (injured, INJ; non-injured, NON) and groups (4-8 months vs 8-12 months post-ACLR, n=8 for both) by 2-way ANOVAs.

Results: During the up phase, the between-limb difference in jump positive work was greater (p=0.008) in the 4-8 month group (INJ, 3.35 ± 0.75 J/kg; NON, 4.25 ± 1.10 J/kg) than the 8-12 month group (INJ, 3.26 ± 1.08 J/kg; NON, 3.74 ± 0.71 J/kg). Positive work done at the hip by the INJ limb (0.126 ± 0.050 J/kg) was less than the NON limb (0.147 ± 0.043 J/kg) for the 4-8 month group, but the opposite was true for the 8-12 month group (INJ, 0.119 ± 0.046 J/kg; NON, 0.105 ± 0.037 J/kg) (interaction, p=0.009). Positive work at the knee (INJ, 0.082 ± 0.050 J/kg; NON, 0.125 ± 0.048 J/kg) demonstrated a limb effect only (p<0.001). During the landing phase, between limb difference in jump negative work was greater (p=0.034) in the 4-8 month group (INJ, -2.58 ± 1.10 J/kg; NON, -3.61 ± 0.75 J/kg) than the 8-12 month group (INJ, -2.34 ± 0.71 J/kg; NON, -2.76 ± 1.08 J/kg). This was mainly reflected at the knee (p=0.034), where between limb difference in total negative work was greater in the 4-8 month group (INJ, -0.067 ± 0.065 J/kg; NON, -0.160 ± 0.062 J/kg) than the 8-12 month group (INJ, -0.070 ± 0.0313 J/kg; NON, -0.117 ± 0.038 J/kg).

Conclusions: Given the significant side-to-side deficits in jump power and joint kinetics evident in both groups, but were more pronounced in those 4-8 months post-ACLR. Between group differences during the up phase of the CMJ appeared most related to the hip, while the landing phase was most related to the knee.

Muscle Function at 3 Years Following ACL Injury Affects 5 Year Patient-Reported Outcomes

Vala Flosadottir1, Ewa M. Roos2, Eva Ageberg1. 1Lund University, Lund, Sweden. 2University of Southern Denmark, Odense, Denmark.

Email: vala.flosadottir@med.lu.se

(No relationships reported)

Consequences of ACL injury include worse patient-reported outcomes (PROs) and decrease in activity level. Muscle function, such as muscle strength, hop performance and postural orientation, is a modifiable factor improvable by targeted exercise.

Purpose: To investigate associations between extremity muscle function and PROs after treatment of ACL injury or reconstruction.

Methods: Fifty-four patients (15 women, mean 30 yrs, 36 randomized to ACL early reconstruction and 18 to delayed reconstruction if needed, all patients underwent supervised rehabilitation) constituted a subgroup from the CANON study (ISRCTN: 84752559). This subgroup underwent extensive testing of muscle function at mean 3 years (SD 0.85) after ACL injury. Patients performed two hop tests (vertical jump, side hop), two muscle power tests (knee flexion, knee extension) and Test for Substitution Patterns (TSP, a measure of postural orientation). PROs at follow-up 5 yrs after injury included Knee Injury and Osteoarthritis Outcome Score (KOOS) subscales Function in sport and recreation (KOOS Sport/recre) and Knee-related Quality of life (KOOS QoL).

Results: In the surgically reconstructed group, reduced knee extension power LSI was associated with worse KOOS QoL (r²=0.156, p=0.046) and reduced knee flexion power LSI was associated with lower TAS (r²=0.249, p=0.011). Worse TSP score for injured leg, and larger side-to-side difference in TSP was associated with worse KOOS Sport/recre and KOOS QoL scores (r²=0.207, p=0.015). In the group treated with rehabilitation only, reduced knee flexion power LSI and poorer side hop score for injured leg was associated with worse ARS (r²=0.426, p=0.020 and r²=0.355, p=0.049, respectively).

Conclusions: Lower extremity muscle function at 3 yrs after injury affects 5 yrs self-reported function, knee-related quality of life and activity level, regardless of treatment strategy. Treatment exercises aimed at reducing side-to-side differences in measures of muscle function, in the later phase of treatment, may improve future PROs after ACL injury or reconstruction.
Movement and loading asymmetry have been reported following anterior cruciate ligament (ACL) reconstruction during landing. Previous work has examined these asymmetric movement patterns using discrete measures and these asymmetries have been reported to be risk factors for secondary ACL injuries. PURPOSE: To examine the impact of functional brace wear on frontal and sagittal plane kinematic and kinetic inter-limb movement symmetry during landing in ACL-reconstruction (ACL-R) patients. METHODS: The study included 20 adolescent athletes (15.8 ± 1.2 years) (7 male and 13 female) 6 months following ACL reconstruction. Utilizing an 8-camera motion analysis system (240Hz) the first landing of a stop-jump task was analyzed. Ground reaction forces were determined using 2 embedded force plate frames (1200 Hz). A total of 5 successful jumping trials were collected during both a braced (B) and a non-braced (NB) condition. A custom fit functional knee brace (DJO, Vista, CA) was worn on the ACL reconstructed limb (AL) during the B trials. Mean curves were created for each limb (AL and unaffected limb (UL)) for the vertical (vGRF) and anterior-posterior ground reaction forces (apGRF), as well as knee angles and moments in the frontal and sagittal planes. Intersubject symmetry was analyzed by calculating the coefficient of multiple determination (CMD) between the AL and UL mean curves. Students’ t-tests were utilized to compare CMD values between B and NB conditions (p<0.05). RESULTS: No significant differences existed for inter-limb movement and loading symmetry between B and NB conditions among all subjects. Secondary analysis revealed significant differences in apGRF (p=0.014), vGRF (p=0.011) and sagittal knee angles (p=0.003) in subjects with improved sagittal knee angle symmetry in the B condition (responders). No differences existed in subjects with decreased symmetry in the B condition (non-responders). CONCLUSIONS: Brace wear improves loading symmetry in adolescent patients that also exhibit improved sagittal knee angle symmetry while braced 6 months following ACL-R. These results indicate that there are both responders and non-responders to brace wear following ACL-R. Therefore, future work to identify responders and non-responders to brace wear will allow for targeted brace wear interventions in ACL-R patients.

CONCLUSIONS: QSBM and QLSI demonstrated high and moderate accuracy, respectively, for identifying individuals with high self-reported function. These data support incorporating the QSBM cutoff score as part of clinical criteria for return to physical activity and encouraging patients to maintain a QSBM ≥ 3.10 Nm/kg following return to physical activity.

We previously demonstrated that 6 days of overnight intermittent hypoxic exposure (IHE) combined with normoxic interval training improved performance in the maximal anaerobic running test (MART) (ACSM 2014). However, it is unclear if overnight IHE affects MART to a greater degree versus intermittent hypoxic training (IHT) alone. PURPOSE: The purpose of the present study was to compare the physiological adaptations in well-trained 400m or 800m runners following either 7 days of overnight IHE or 7 days of IHT. METHODS: Twenty six well-trained female 400m or 800m runners were assigned to either a IHE group (n=9), a IHT group (n=8) or a Control group (n=9). IHE slept in a normobaric hypoxic room (2000m) and trained in natural normobaric normoxia (60m). IHT slept in natural normobaric normoxia (60m) and trained in a normobaric hypoxic room (3000m). Control slept and trained in natural normobaric normoxia (60m). Subjects trained for 7 days and performed MART and an incremental maximal running test before and after the 7-day training period. The training consisted of high intensity interval training (5 x 30s maximal effort) and endurance training (30min incremental running and 30min steady pedaling). Maximal power in the MART was calculated from the running velocity in the last completed bout and running time in the exhaustive test (Burke et al. 98). VO2max was measured in the incremental running test. RESULTS: Maximal power in the MART increased significantly (P<0.01) in IHT (109.5±1.4 vs. 111.7±2.8 ml/kg/min). On the other hand, there were no significant changes in IHE or Control (IHE: 111.0±4.2 vs. 111.6±4.0, Control: 112.1±3.0 vs. 112.0±3.5). VO2max in IHT and Control increased significantly (P<0.01) (IHT: 50.0±5.0 vs. 51.6±3.5, Control: 43.8±10.5 vs. 45.7±10.8 ml/kg/min), whereas there were no significant changes in IHE (47.1±15.4 vs. 46.9±16.0 ml/kg/min). CONCLUSIONS: These results suggest that 7 days of intermittent hypoxic training (300min), but not overnight hypoxic exposure (2000min) is effective for enhancing maximal aerobic and anaerobic capacity in 400m or 800m runners.

Quadriceps weakness is associated with disability in people with anterior cruciate ligament reconstruction (ACL-R). It remains unknown if quadriceps strength normalized to body mass (QSBM) or quadriceps strength limb symmetry index (QLSI) is the best indicator of high self-reported function. PURPOSE: To determine if QSBM and QLSI are able to discriminate which individuals with an ACL-R will report high function (≥ 90%) on the International Knee Documentation Committee Index (IKDC). Additionally, we determined cutoff scores and corresponding odds ratios for QSBM and QLSI that best predict high self-reported function in individuals with an ACL-R. METHODS: Ninety-six individuals (62 males, 34 females, 20±45 months post ACLR, and QLSI that best predict high self-reported function in individuals with an ACLR. Additionally, we determined cutoff scores and corresponding odds ratios for QSBM and QLSI that best predict high self-reported function in individuals with an ACLR. RESULTS: QSBM and QLSI demonstrated high and moderate accuracy, respectively, for identifying individuals with high self-reported function. These data support incorporating the QSBM cutoff score as part of clinical criteria for return to physical activity and encouraging patients to maintain a QSBM ≥ 3.10 Nm/kg following return to physical activity.
The effect of repeated sprint exercise in moderate hypoxia on performance response in female athletes remains unclear. PURPOSE: The purpose of the present study was to assess the effects of repeated sprint exercise in moderate hypoxia on metabolic and performance responses among female athletes.

METHODS: Seven female track and field athletes (height: 161.0 ± 2.3 cm, body weight: 58.2 ± 1.9 kg, BMI: 20.7 ± 0.2 kg/m²) participated in this study. They performed repeated sprint exercise twice under hypoxic condition (HYP, FiO₂: 14.5%, a simulated altitude of 3000m) and normoxic condition (NOR, FiO₂: 20.9%). The exercise consisted of two sets of repeated maximal sprints (8 × 6-s sprint) with a 30-s rest period between sprints. A 10-min rest period was allowed between sets. Resistance during pedaling corresponded to 6.0% of body weight. Respiratory responses were assessed via breath by breath method during exercise and post-exercise period. Time courses of changes in power output, blood lactate concentrations, percutaneous oxygen saturation (SpO₂) and score of subjective fatigue were evaluated.

RESULTS: Time course changes in mean power output during repeated sprint exercise (two sets of 8 × 6-s sprint) did not differ significantly between the HYP and NOR. No significant difference in fatigue index during repeated sprint exercise was observed between HYP and NOR. Blood lactate concentrations increased significantly (p < 0.05), but the response was not significantly different between the both trials. Accumulated VO₂ during exercise and recovery between sprints was significantly lower in the HYP compared with in the NOR (p < 0.05). However, accumulated VCO₂ did not show significant difference between the two trials. In the HYP, average RER values during exercise and recovery period were significantly higher than those in the NOR (p < 0.05). However, there was no significant difference between trials for any respiratory parameter during post-exercise period.

CONCLUSIONS: Repeated sprint exercise in moderate hypoxia did not cause further decrement for performance in female athletes. RER values during repeated sprint exercise remained significantly higher under moderate hypoxia, whereas respiratory responses during post-exercise period were similar between hypoxic and normoxic conditions.
To determine the relationships between a soldier’s type of motivation to complete the Army Physical Fitness Test (APFT) and their performance on the APFT.

METHODS: A 24-item survey was completed by 208 North Dakota Army National Guard members (185 male, 23 female, mean age 26.3 ± 6.46) regarding motivation behind performance on the APFT. Participants responded to statements regarding APFT performance motivation using a 7-point Likert scale ranging from 1 (statement corresponds not at all to me) to 7 (statement corresponds exactly to me). A Pearson’s Product-Moment Correlation was performed between self-determined scores and APFT performance outcomes. Significance was set at alpha <0.05. RESULTS: A moderate positive correlation was observed between MSD motivation scores and their current APFT score (r = 0.401, p < 0.01). Moderate negative correlations were observed in the following relationships: MSD motivation score and the number of APFTs they have failed (r = -0.377, p < 0.01); MSD motivation score and LSD motivation scores (r = -0.319, p < 0.01). Small positive correlations were observed in the following relationships: MSD motivation score and current APFT pass/fail status (r = 0.217, p < 0.01); LSD motivation score and whether or not they have ever failed an APFT (r = 0.290, p < 0.01). Finally, a small negative correlation was observed between LSD motivation score and current APFT score (r = -0.187, p < 0.01). Correlations between LSD motivation score and current APFT pass/fail status, number of APFT’s ever failed, and whether or not they had ever failed an APFT were not significant. CONCLUSIONS: Army National Guard members with higher levels of internal motivation towards the APFT show more positive outcomes on the APFT and are associated with less failed APFT’s. By promoting an environment that emphasizes internal motivation towards performance on the APFT, one may begin to see improved performance outcomes on the test.
RESULTS: Individuals walked at 0.86±0.04 m/sec at RPE 1 and 1.25±0.05 m/sec at RPE 5. There was no difference in walk speed between younger and older adults (p = 0.648, RPE 1: p = 1.000, RPE 5: p = 0.261). There were also no differences in the metabolic cost of walking between RPE 1 and RPE 5 for both young (p = 0.997) and old participants (p = 0.960). However, older adults VO2 was significantly lower than younger adults during both walking at RPE 1 (p = 0.024; 6.80±1.79 and 8.35±1.76 ml/min/kg, respectively) and walking at RPE 5 (p = 0.032; 6.84±1.90 and 8.35±1.78 ml/min/kg, respectively) despite having higher body mass (age main effect: p = 0.027).

CONCLUSIONS: Walking at perceptual efforts of “very weak” and “strong” resulted in similar metabolic costs in both young and older adults. Additionally, older adults had lower metabolic costs while walking at the same perceptual efforts as younger adults despite having similar walking speeds. These results have implications for the accuracy of producing a recommended effort for meeting the federal physical activity guidelines.

Purpose: To examine the associations of travel-related urban zones (see figure below), pedestrian and cycling network, and green space with commuting physical activity among employed Finns.

METHODS: Health 2011 study (population-based health examination study, sample of 4118 women and men aged 30-64 years, participation rate 73%), and geographical information system data (National CORINE Land Cover 2012, Urban Zones 2010, Digiroad 2014) were utilized. Survey logistic regression for commuting physical activity (active vs inactive) models and population participation rate 73%), and geographical information system data (National CORINE Land Cover 2012, Urban Zones 2010, Digiroad 2014) were utilized. Survey logistic regression for commuting physical activity (active vs inactive) models and population weights were applied and age, gender, education, occupational and leisure-time physical activity, and other environmental factors were adjusted. RESULTS: Home location in a pedestrian zone of a main centre (OR = 1.63; 95% CI = 1.06-2.51), a pedestrian zone of a sub centre (2.03; 1.09-3.80) and higher proportion of cycling and pedestrian networks (3.28; 1.71-6.31) contributed to a higher level of commuting physical activity in a fully adjusted model. Large proportion of green space contributed negatively to the levels of commuting physical activity (0.73; 0.57-0.94) in a fully adjusted model. Individuals with a large proportion of green space were more likely to live in car-oriented or public transport zones and have longer commuting distances to work compared to other groups. CONCLUSION: Pedestrian zone of a main centre and in a sub centre as well as a large proportion of cycling and pedestrian networks within the home neighbourhood may have a positive impact on commuting physical activity among working populations. Supported: The Academy of Finland (Tomi Mäki-Opas #266759, Sari Stenholm #273850 & #264944).

CONCLUSIONS: There was a significant (p = 0.001), negative (r = -0.41) correlation between physical activity and sedentary behavior in the low cell phone use group. The relationship was weaker but still negative (r = -0.26) and significant (p = 0.03) in the moderate use group. There was no significant relationship (p = 0.902, r = 0.98) in the high cell phone use group.

CONCLUSION: In the present study, the significant negative correlation between physical activity and sedentary behavior that is seen in the low cell use group weakens in the moderate use group and is non-existent in the high use group. This suggests that as cell phone use increases there may be a greater number of “active couch potatoes” weakening the relationship between physical activity and sedentary behavior.

CONCLUSIONS

RESULTS: Individuals walked at 0.86±0.04 m/sec at RPE 1 and 1.25±0.05 m/sec at RPE 5. There was no difference in walk speed between younger and older adults (p = 0.648, RPE 1: p = 1.000, RPE 5: p = 0.261). There were also no differences in the metabolic cost of walking between RPE 1 and RPE 5 for both young (p = 0.997) and old participants (p = 0.960). However, older adults VO2 was significantly lower than younger adults during both walking at RPE 1 (p = 0.024; 6.80±1.79 and 8.35±1.76 ml/min/kg, respectively) and walking at RPE 5 (p = 0.032; 6.84±1.90 and 8.35±1.78 ml/min/kg, respectively) despite having higher body mass (age main effect: p = 0.027).

CONCLUSIONS: Walking at perceptual efforts of “very weak” and “strong” resulted in similar metabolic costs in both young and older adults. Additionally, older adults had lower metabolic costs while walking at the same perceptual efforts as younger adults despite having similar walking speeds. These results have implications for the accuracy of producing a recommended effort for meeting the federal physical activity guidelines.

RESULTS: Individuals walked at 0.86±0.04 m/sec at RPE 1 and 1.25±0.05 m/sec at RPE 5. There was no difference in walk speed between younger and older adults (p = 0.648, RPE 1: p = 1.000, RPE 5: p = 0.261). There were also no differences in the metabolic cost of walking between RPE 1 and RPE 5 for both young (p = 0.997) and old participants (p = 0.960). However, older adults VO2 was significantly lower than younger adults during both walking at RPE 1 (p = 0.024; 6.80±1.79 and 8.35±1.76 ml/min/kg, respectively) and walking at RPE 5 (p = 0.032; 6.84±1.90 and 8.35±1.78 ml/min/kg, respectively) despite having higher body mass (age main effect: p = 0.027).

CONCLUSIONS: Walking at perceptual efforts of “very weak” and “strong” resulted in similar metabolic costs in both young and older adults. Additionally, older adults had lower metabolic costs while walking at the same perceptual efforts as younger adults despite having similar walking speeds. These results have implications for the accuracy of producing a recommended effort for meeting the federal physical activity guidelines.
Prior to recommending or prescribing exercise to individuals, it may be helpful to understand their anticipated affect response to exercise. An anticipated negative affective response to exercise in particular, may help to explain why an individual is not physically active. PURPOSE: To examine whether anticipated negative affect to exercise is associated with physical activity levels and fitness in obese adolescents. METHODS: Prior to beginning the REWARD Teens multi-disciplinary weight management program, a total of 45 obese (>95th BMI percentile) adolescents (17 males, 27 females, 14.0±1.9 years) were evaluated. Physical activity levels were assessed with the Godin Leisure-Time Exercise Questionnaire and fitness (VO2max) was determined with a graded treadmill test. Prior to the VO2max test, adolescents were asked how much discomfort they anticipated to experience during the test on a scale from 0-10 (0=none at all, 10-very much). In addition, physical activity attitudes were assessed including the anticipation of soreness the adolescents expected if taking part in physical activity. RESULTS: A significant correlation was observed between anticipation of exercise discomfort and soreness (r=.399, p<0.05). Significant, inverse correlations were observed between anticipation of soreness and Godin total activity scores (r=-.385, p<0.05) and anticipation of exercise discomfort and VO2max (r=-.376, p<0.05). Regression analyses indicated that anticipated soreness explained 14.9% of Godin total activity scores (R2=.149, p<0.01) while anticipation of exercise difficulty explained 14.1% of VO2max (R2=.141, p<0.05). Together, anticipated soreness and Godin total activity scores explained 23.3% of anticipation of exercise difficulty (R2=.205, p<0.05). CONCLUSION: Anticipated negative affect responses to exercise including soreness and discomfort may prevent obese adolescents from engaging in physical activity resulting in subsequent lower fitness levels.

**Abstracts were prepared by the authors and printed as submitted.**
4-hour recovery period (all p<0.01). Similarly, the increase in CTX during exercise was suppressed with Ca infusion (p<0.003) and remained below the saline condition through recovery (p<0.001). tCa was also a significantly higher during exercise (p<0.001) with Ca infusion, but values were similar during recovery (all p>0.10). There were no differences between conditions for PINP at any time points (all p>0.10).

CONCLUSIONS: The increase in bone resorption was attenuated when the exercise-related decline in serum iCa was prevented, suggesting a calcium-dependent relationship. There was no effect of Ca infusion on PINP, but the duration of post-exercise sampling may have been too short to capture any changes. The results are limited to young, trained, men during cyclic exercise. Future research should investigate sex- and age-differences and other exercise modalities.

Adequate vitamin D (25(OH)D) is required to maintain good bone health, yet many athletes are 25(OH)D deficient. Previous research indicates that the osteogenic effect of impactful weight-bearing exercise is sufficient to maintain markers of bone health, irrespective of 25(OH)D status. PURPOSE: To examine the relationship between serum 25(OH)D levels and markers of bone health, bone mineral density (BMD) & T score in a non-weight-bearing, Arabic athletic population.

METHODS: One hundred and two male athletes registered with the Qatar Olympic Committee (QOC) originating from the Gulf Cooperation Council (n=93) and the Middle Eastern (n=9), presented for pre-competition medical assessment in Aspetar. All athletes participated in non-load bearing sports (archery, billiards bowling, cycling, diving, equestrian sport, rowing, sailing, snowing, snooker, swimming and water polo). All undertook bone densitometry, body composition analysis by Dual-energy X-ray absorptiometry (DXA) and serum 25(OH)D evaluation.

RESULTS: From 102 athletes, 29.4% (n=30) demonstrated severe deficiency, 40.2% (n=41) deficiency, 23.57% (n=24) insufficiency and 6.8% (n=7) sufficiency. No difference in serum 25(OH)D was observed between athletes with clinically normal T-scores (n=76) and those presenting with osteopenia (-1 to -2.5 SD) (n=20) or osteoporosis (-2.5 SD) (n=6) in any locations (neck, hip, spine or total). Cyclists had higher serum 25(OH)D compared to equestrian, and other indoor athletes (P<0.006). No significant associations were observed between anthropometric measures and serum 25(OH)D, age, BMI, body fat % and skin exposure across sporting types. Mean body mass was lower in (P<0.05) athletes with a T-score suggestive of osteopenia or osteoporosis.

CONCLUSIONS: No association was observed between serum 25(OH)D levels and markers of bone health in non-weight bearing athletes. Lower body weight was associated with osteopenia or osteoporosis regardless of serum 25(OH)D level.

Habitual runners and military recruits often develop tibia stress fracture (TSF). Continuous repetitive impact loading is a risk factor of TSF. Load carriage is essential to performance, and fatigue is one of the main symptoms associated with TSF. The notion that bone and muscle communicate at the biochemical and molecular levels in ways beyond simple mechanical interactions is leading to new insight into how bone and muscles work together to maintain health. We studied how injury in the skeletal muscle impacts bone remodeling. PURPOSE: To determine osteoclast activity in the tibia following contraction-induced injury in the tibialis anterior muscle (TA).

METHODS: Using an established model, unilateral injury to the TA was induced by 15 lengthening contractions. Injury was confirmed by measuring changes in maximal dorsiflexor isometric torque before and after lengthening contractions. With the TA in situ, both tibias were harvested 2 or 7 days after injury, fixed, decalcified, paraffin embedded, and sectioned. We evaluated osteoclast number (Tartrate-resistant acid phosphatase staining) and assessed local muscle damage (labeling of cytoskeletal proteins). The contralateral, uninjured tibia served as a control.

RESULTS: Osteoclast number was similar at days 2 and 7 in injured tibia. Osteoclast number was markedly higher along the lateral surface of the diaphysis in injured tibia compared to control (osteoclast surface/bone surface ratios: 0.215 ± 0.03 in injured vs. 0.09 ± 0.02 in control). At day 2, there was a localized loss of desmin labeling in muscle fibers adjacent to increased osteoclast activity.

CONCLUSIONS: Our results indicate a time-dependent metabolic change of bone resorption in response to forceful lengthening contractions, a model of muscle strain injury. Future experiments include dynamic histomorphometry to assess bone formation and detailed analysis of muscle and bone progenitor cell proliferation (e.g., Ki-67 labeling) and myokine release and activity (e.g., FGF-2, IGF-1 expression) in bone, muscle and/or the interface following eccentric injury. An understanding of underlying mechanisms is essential for developing targets for therapeutic interventions of musculoskeletal injury and disease.

Supported by NIH grants to SRI (AR07932-20) and to RML (1R01AR059179).

The notion that bone and muscle communicate at the biochemical and molecular levels is important to determine if past physical activity results in different strain distributions during load carriage.

Purpose: To examine the effect of incremental load carriage on tibia strain distribution. Methods: Forty recreational runners (n=20, 21±2 yr) and basketball players (n=20, 21±2 yr) completed four tasks: walking with 0kg, 15kg, 25kg, and 35kg loads. Each task was performed on a force treadmill at 1.67 m/s. Participants’ tibia models from CT scans were combined with subject-specific musculoskeletal models for forward-dynamic simulations and finite element analyses. Strains of the tibia shaft were analyzed. One-way ANOVAs were performed. Results: Significant differences in strain distribution were found (P<0.0001). For the 15kg condition, peak compressive and shear strains were presented at the DT and the peak tensile strain was presented at the MT. Specifically, the means ± SEs of runner’s peak bone strains were 540±2 µs, 562±2 µs, and 1255±3 µs in compression, tension, and shear, respectively. Ball players’ peak bone strains were 803±2 µs, 519±2 µs, and 1185±3 µs in compression, tension, and shear, respectively. As load carriage was increased beyond 15kg peak bone strain shifted toward the MT from the DT. In particular, this pattern of shear strain redistribution was observed at 25kg and 35kg levels for runners and ball players, respectively.

Conclusion: Load carriage results in high compressive and shear strains in the DT and high tensile strain in the MT. Incremented load carriage leads to a shift of peak shear strain from the DT to the MT. Ball players’ tibias are resilient to load carriage with small strains exhibited and a delayed shift of the shear strain. This study supports the epidemiology that common TSF sites are at DT and MT. Preconditioning programs involved running may be less effective to prevent TSF than basketball. US ARMY #W81XWH-08-1-0587; #W81XWH-15-1-0066.
1134 Board #8
June 1, 3:15 PM - 5:15 PM
Sedentary Behavior is Negatively Associated with Hip Bone Mineralization in Youth with Prader-Willi Syndrome
Andrea T. Duran1, Jared M. Tucker2, Kathleen S. Wilson1, Diobel M. Castner3, Daniela A. Rubin.1 California State University Fullerton, Fullerton, CA. 1Western Michigan University, Kalamazoo, MI. 2Helen DeVos Children’s Hospital, Grand Rapids, MI. (Sponsor: Carol E. Garber, FACSM)
Email: att2127@tc.columbia.edu

Increased time in sedentary behavior (SED) negatively influences bone health in children. Youth with Prader-Willi Syndrome (PWS) engage in less ambulatory and high-intensity physical activity than their peers and prefer sedentary activities, possibly putting those with PWS at higher risk for fracture incidence and early onset of osteoporosis. PURPOSE: To evaluate the relationship between SED and bone parameters in youth with PWS.

METHODS: Participants included 23 youth with PWS (age: 11.0 ± 2.0 y, height: 142.3 ± 11.3 cm, lean mass [LM]: 29.0 ± 10.4 kg). SED was measured via accelerometry for eight consecutive days. Bone mineral content (BMC), density (BMD) and BMD z-score (BMDz) were measured at the hip and total body minus the head (body) by dual energy x-ray absorptiometry. Separate hierarchical regression models were completed for all bone parameters, SED (step 1) and select covariates (age [BMC models only], height and LM) added in step 2. RESULTS: SED and covariates explained 79.6% and 51.2% of the variance in hip BMC and BMD, respectively (p < 0.001 for both). SED was a significant predictor of hip BMD when adjusted for covariates (step 1: β = -0.404, p = 0.056; step 2: β = -0.375, p = 0.026). SED was a significant predictor of hip BMC, when adjusted for covariates (step 1: β = -0.520, p = 0.011; step 2: β = -0.484, p = 0.025), even when the model approached significance (p = 0.069). SED and covariates explained 63.3% and 66.6% of the variance in body BMC and BMD, respectively (p<0.001 for both). However, SED was not a significant predictor of body BMC or BMD, even when controlling for covariates (p = 0.050 for all). SED and covariates did not explain a significant portion of the variance in body BMC (p = 0.050 for all). Height was a significant predictor of hip and body BMC (β = -0.542, β = -0.753, respectively; p < 0.001 for both). LM was a significant predictor of hip and body BMD (β = -0.558, β = 0.759, respectively; p < 0.005 for both). CONCLUSION: LM explained most of the variance in BMC in this sample, indicating that muscle strengthening activities that build LM may benefit bone health in this population. SED was negatively associated with hip BMC and BMD, suggesting that reducing SED may benefit bone mineralization at the hip in youth with PWS.

Supported by USAMRAA Award W81XWH-09-1-0682

1135 Board #1
June 1, 3:15 PM - 5:15 PM
Left Ventricular Mechanics In Healthy Females Are Not Significantly Altered In Response To Isometric Handgrip
Victoria L. Meah, Karianne Backs, Rob Shave, Eric J. Stöhr. Cardiff Metropolitan University, Cardiff, United Kingdom.
Email: vimeah@cardiffmet.ac.uk

(Relationships reported)

Left ventricular (LV) mechanics characterize myocardial deformation across the cardiac cycle and are sensitive to changes in cardiac load. Previous research in a predominantly male cohort showed reduced LV mechanics in an afterload challenge mediated by isometric hand grip (IHG). There are known differences between male and female cardiac structure and function; it is possible that LV mechanics in females may differ in IHG. PURPOSE: To quantify LV mechanics in females during IHG.

METHODS: Healthy females (n=18, age 28±4 yrs) performed an IHG (30% maximal strength; 9±1 kg) for 5 min. Cardiac images were collected using echocardiography at REST, DURING and 5 min POST IHG and analyzed for longitudinal, circumferential and radial strain, rotation and twist. Blood pressure was measured continuously. Repeated measures ANOVA was used to detect significant differences.

RESULTS: Without significant change in heart rate or cardiac output, systolic blood pressure was significantly increased during IHG compared to REST and POST (SBP: 123±13 vs. 113±13 mmHg respectively, P<0.001). Similarly, systemic vascular resistance was increased during IHG compared to REST measurements (2306±361 vs. 2125±312 dynes⋅sec⋅cm⁻⁵, P<0.01, 224±6–274±6 dynes⋅sec⋅cm⁻⁵ confirming IHG augmented afterload. Except peak basal circumferential strain, there were no significant differences in LV mechanics from DURING to POST IHG (Table 1).

CONCLUSIONS: In contrast to previous investigations in a predominantly male cohort, LV mechanics in healthy females do not appear to be markedly altered in IHG. These findings suggest that LV mechanics in response to an acute afterload challenge may be different between sexes.

| Table 1. Peak LV mechanics in response to isometric hand grip. *P < 0.05 vs. POST. |
|-------------------------------|-------------------|-------------------|
|                             | REST              | DURING            | POST              |
| Longitudinal strain (%)     | -16.6 ± 3         | -15.3 ± 4         | -15.7 ± 3         |
| Basal circumferential strain (%) | -15.8 ± 2         | -13.9 ± 3         | -16.4 ± 4         |
| Apical circumferential strain (%) | -21.9 ± 5         | -20.4 ± 5         | -21.7 ± 5         |
| Basal radial strain (%)     | 48.6 ± 15         | 45.9 ± 14         | 48.6 ± 14         |
| Apical radial strain (%)    | 24.4 ± 10         | 25.0 ± 14         | 22.4 ± 9          |
| Basal rotation (°)          | -5.3 ± 3          | -6.0 ± 4          | -6.6 ± 3          |
| Apical rotation (°)         | 8.3 ± 5           | 8.3 ± 4           | 8.9 ± 4           |

1136 Board #2
June 1, 3:15 PM - 5:15 PM
Heart Rate Variability in Aerobically Trained Subjects vs. Untrained Subjects in Hypoxic and Normoxic Conditions
Shannon L. Wilson, Richard Bradley, Jennifer M. Shin, Brandon Trafton, Roberto Quintana, Daryl L. Parker. California State University, Sacramento, Sacramento, CA.
Email: shawlin2@gmail.com

(Relationships reported)

Heart Rate Variability (HRV) has been known to be greater in aerobically trained athletes due to an increase in parasympathetic tone. While high levels of aerobic training are generally associated with good cardiovascular responsiveness, it sometimes leads to suppressed responsiveness. PURPOSE: To examine the cardiovascular and autonomic changes that occur in trained population and untrained subjects exposed to hypoxic (H) and normoxic (N) conditions.

METHODS: 7 aerobically trained men (T) (6 trained cyclists, 1 runner; age: 29.14 ± 4.37 yrs, height: 72.1 ± 2.1 in, weight: 77.9 ± 7.2 kg, average training hours/week 14.6 ± 4.35) and 6 untrained men (UT; age: 28.3 ± 4.8 yrs, height: 69.41 ± 3.0 in, weight 81.43 ± 16.9 lbs)
Brachial artery flow-mediated dilation (FMD) is a nitric oxide-dependent measure of endothelial function, relative to a comparable amount of moderate-intensity HIIE on post-exercise brachial artery FMD and the relationship between FMD and steady state exercise (SSE) for up to an hour after exercise; however, it is unclear if changes in GSSG was -.254 (P =.403) which was inversely related, but not significant. Further study is needed with a larger cohort, more intense exercise in apparently healthy individuals has not been examined. PURPOSE: To determine plasma HIF-1α concentration in response to steady state exercise and examine its relationship to blood glucose status. METHODS: Apparently healthy male (N=7) and female (N=5) subjects (22.8 ± 3.0 yrs), non-smoking men and not on medication/supplements were recruited. Subjects reported between 7-9 A.M. in the post absorptive state (>10 hrs), rested 30 min and then ran on a treadmill to obtain VO2 max. They returned within 4 days, same time and conditions to run at 70-75% VO2max for 30 minutes. Blood was drawn at rest and post exercise. A portion of whole blood was immediately processed with a 10% salicylic acid to stabilize glutathione and the remaining blood centrifuged to obtain plasma. Samples were stored in aliquots at -80°C until analyzed. HIF-1 was measured by Elisa, (Thermo Sci.) and glutathione determined by HPLC obtaining both the reduced (GSH) and oxidized (GSSG) forms. All samples were determined in duplicate. A simple T-test was used to assess time differences and a Pearson correlation was determined with SPSS v21. RESULTS: HIF-1α at rest was (156.7 ± 17.1 pg/ml) and was not significantly different over time in MCAv (BASELINE: 57.3±2.4 cm/s, 2HRS: 53.9±2.4 cm/s). Between each measurement participants were randomly assigned treatment order. Subjects rested for one hour and then completed a submaximal exercise bout (1.5 watts/Kg BW) for 10 minutes. EKG (Hexoskin) was recorded as well as SaO2. After one hour BP was taken. Subjects then reported back to lab for a second test to receive the opposite treatment. Subject then reported back to lab for a second test to receive the opposite treatment. RESULTS: There was no change over time in MCAv (BASELINE: 57.3±2.4 cm/s, 2HRS: 53.9±2.4 cm/s). Between each measurement participants remained seated and were permitted to complete desk-based tasks. The Effect of Breaking up Prolonged Sitting on Cerebral Blood Flow Prolonged sitting has a detrimental effect on peripheral conduit endothelial function, whilst breaking up prolonged sitting time can prevent such impairments. The effect of prolonged sitting and breaking up sitting time on cerebral blood flow (CBF) is currently unknown. Importantly, decreased CBF is related to lower cognitive functioning and increased risk of cognitive impairment and dementia. PURPOSE: To determine the effect of uninterrupted sitting and breaking up sitting time with light intensity walking on CBF in healthy subjects. METHODS: Thirty healthy participants (8 male, 37.3±10.1 years old, BMI: 25.6±3.4 kg/m2) completed, on separate days, three 4 hr conditions in a counterbalanced order: a) uninterrupted sitting, b) sitting with 2-min light intensity walking breaks every 30 mins, or c) sitting with 8-min light intensity walking breaks every 2 hrs. Middle cerebral artery blood flow velocity (MCAv) was measured using transcranial Doppler in a supine position at BASELINE, 2HRS and 4HRS. Beat-to-beat blood pressure was assessed (Finometer), enabling the calculation of cerebrovascular conductance (CVC). Between each measurement participants remained seated and were permitted to complete desk-based tasks. RESULTS: There was no change over time in MCAv (BASELINE: 57.3±2.4 cm/s, 2HRS: 56.5±2.3 cm/s, 4HRS: 56.3±2.1 cm/s; p=0.77) or CVC (BASELINE: 0.71±0.04 cm/s/mmHg, 2HRS: 0.70±0.03 cm/s/mmHg, 4HRS: 0.67±0.03 cm/s/mmHg; p=0.18), or between the conditions (MCAv: p=0.18, CVC: p=0.11). Moreover, there was no interaction between condition and time for MCAv (p=0.56) or CVC (p=0.64). CONCLUSIONS: Contrary to previous findings which indicate that prolonged sitting can reduce peripheral endothelial function, our data suggest that neither CBF velocity nor CVC are altered following prolonged sitting for 4 hrs. Additionally, breaking up this sitting time with walking breaks did not further affect CBF velocity or CVC. Whilst our data indicate unaltered CBF following uninterrupted sitting, changes in cerebrovascular function may occur independent of changes in blood flow. Further research is needed to determine whether measures of cerebrovascular function, including autoregulation and reactivity, are influenced by prolonged sitting. Supported by BBSRC Grant BBL1/T2737/1.
treatment rewarming period. Previous findings in our laboratory have indicated that this cutaneous vasocostriction during cryotherapy is abolished following blockade of Rho Kinase. The Rho Kinase enhances vasoconstriction in part via down regulation of nitric oxide synthase (NOS). PURPOSE: To test the hypothesis that a reduction in nitric oxide (NO) bioavailability is involved in the pronounced and sustained cutaneous vasocostriction that occurs during a typical cryotherapy protocol.

METHODS: 8 healthy individuals (6 male) participated in this protocol. A cryotherapy unit with a water perfused bladder was used. The bladder was placed on the anterior portion of the calf. Four microdialysis membranes were placed in the skin underneath the bladder. One site was perfused with lactated ringers (CON); neuronal NOS (nNOS) was blocked in another site (NPLA); endothelial NOS (eNOS) was blocked in another site (NLO); and the last site received non-selective NOS blockade (LNAME). All solutions were dissolved in sterile lactated Ringers. Skin temperature (SKT) and skin vascular conductance (SKVC) was measured at each site. 0 °C water perfused through the cryotherapy bladder for 30 min, followed by passive rewarming (i.e. water shut off) for 1 hr, followed by direct heating with 46 °C water for 10 min. RESULTS: SKT fell from 34°C to 19°C during 30 min of cooling in all sites. SKVC at CON was reduced -25% after 30 min of cooling and was similar to LNAME, NPLA, and NLO (78, 75, 77%, reduction respectively; P>0.05). During passive rewarming SKVC remained blunted to a similar degree at all sites (Con: 87±1, LNAME: 85±2, NPLA: 87±2, NLO: 85±1 % reduction; P>0.05). SKVC during 10 min of active warming was also similar between sites (CON: 62%, LNAME: 65%, NPLA: 67%, and NLO: 68% reduction; P>0.05) CONCLUSION: The current data suggest that reductions in NO bioavailability do not contribute to pronounced and sustained vasoconstriction during cryotherapy.

Supported by the National Institute of Biomedical Imaging and Bioengineering; R01EB015522 (Multi PI: K.R. Diller & R.M. Brothers).

1144 Chair: David R. Bassett, FACSM. University of Tennessee, Knoxville, TN. (No relationships reported)

June 1, 3:15 PM - 3:30 PM
Room: 102

Objective Assessment Of Resistance Training Exercises Using A Wrist-worn Tri-axial Accelerometer
Scott A. Conger1, Jun Guo1, Scott M. Fulkerson1, Lauren Pedigo1, Hao Chen1, David R. Bassett, Jr., FACSM2. Boise State University, Boise, ID. 1University of Tennessee, Knoxville, TN. Email: scottconger@boisestate.edu (No relationships reported)

The 2008 Physical Activity Guidelines for Americans recommend that all adults perform muscle-strengthening exercises to work all of the major muscle groups of the body on at least two days per week, in addition to aerobic activity. Studies using objective methods of monitoring physical activity have focused primarily on the assessment of aerobic activity. To date, a method to objectively classify resistance training exercises has not been developed using a wrist-worn activity monitor. PURPOSE: The purpose of this study was to examine the use of a wrist-worn, tri-axial accelerometer-based activity monitor (ActiGraph GT3X+) for classifying upper- and lower-body dumbbell resistance training exercises. METHODS: Sixty participants performed 12 different dynamic dumbbell exercises. The exercises included: bench press, shoulder press, biceps curls, upright rows, lateral raises, triceps extensions, triceps kickbacks, bent-over row (standing), bent-over row (kneeling), squats, walking lunges, and calf raises. Algorithms for classifying the exercises were developed using two different methods: support vector machine (SVM) and cosine similarity (CS). Confusion matrices were developed for each method and inter-method reliability was assessed using Cohen’s kappa. RESULTS: The results indicated that SVM and CS accurately classified the 12 different resistance training exercises 78% and 85% of the time, respectively. METHODS: Subjects performed mild leg cycle exercise at different pedaling frequencies of 60 and 80 rpm (60EX and 80EX trials) while breathing a hypoxic gas mixture (inspired oxygen fraction = 0.12). The exercise workload of the 80EX trial was adjusted to get the same oxygen uptake as the 60EX trial. Stroke volume (SV) and cardiac output (CO) were measured non-invasively using impedance cardiography. MSNA was recorded via microencephrography of the right median nerve at the elbow. RESULTS: Changes in thoracic impedance, SV, and CO in the 80EX trial were greater than those in the 60EX trial. MSNA burst frequency during hypoxic exercise in the 80EX trial (39±4 bursts/min) did not differ from that in the 60EX trial (39±3 bursts/min). CONCLUSIONS: These results suggest that a cardiopulmonary baroreflex of sympathetic vasomotor outflow during dynamic exercise is modulated by hypoxia-induced heightened sympathetic nerve activity.

B-66 Free Communication/Slide - Advancing Physical Activity Assessment Methods - Part I

Wednesday, June 1, 2016, 3:15 PM - 5:15 PM
using a print version of the YAP however, we have developed an online version to facilitate assessment. This study compared the reliability and utility of the two different YAP versions (print and online) in groups of 5th, 7th and 9th grade classes. METHODS: A total of 8 schools in the Midwest U.S. were recruited to participate. Classes at these schools were randomly assigned to complete either the print or online version on two separate occasions (with a 2-3 week interval). The YAP includes a section (10 items) that asks about physical activity habits at different segments of the day/week (i.e., recess, physical education, transportation to and from school, lunch) and 5 additional items that capture sedentary time (e.g., time spent watching TV, computer usage). Scores from the first 10 items were aggregated to reflect overall activity levels while scores from the last 5 items were aggregated to reflect total sedentary activity. The first set of analyses examined the overall consistency (reliability) of the responses obtained in the two separate occasions. The second set of analyses tested if both activity and sedentary scores obtained from the online YAP and respective confidence intervals were within 10% of YAP print scores, using equivalence testing. RESULTS: Replicated YAP scores were available in 356 students’ aged 11-15y. The reliability analyses indicated that first week YAP scores were similar to YAP scores reported two weeks later (r = .74). The average YAP score at week 1 and week 2 was 2.9±0.8 and 3.0±0.8, respectively. YAP section-specific scores at week 1 for PA and Sedentary time obtained from the two versions were also similar and resulted in 2.9±0.8 and 2.6±0.8 for print, and 3.0±0.8 and 2.7±0.7 for online, respectively. Scores were also similar at week 2 (YAP PA Print = 2.8±0.8 and YAP Sed Print = 2.7±0.8; YAP PA Online = 3.0±0.8 and YAP Sed Online = 2.6±0.8). The equivalence analyses revealed that average YAP scores obtained from the two versions were within the 10% equivalence zone. CONCLUSIONS: The results show good agreement between the two forms and provide evidence that the two versions have similar utility.

1147 June 1, 3:45 PM - 4:00 PM
4-item Facial Affective Scale For Assessing Children'S Real-Time Enjoyment Of Physical Activity
Cheryl A. Howe1, Danielle S. McElhiney2, Kimberly A. Clevenger2, Moira A. Ragan1. 1Ohio University; ATHENS, OH. 2Michigan State University; East Lansing, MI.

Email: howe@ohio.edu

(No relationships reported)

PURPOSE: Validate a 4-item Facial Affective Scale (FAS) for measuring children’s real-time enjoyment of physical activity (PA) and assess variances in FAS scores by sex, weight status, PA type, and PA intensity. METHODS: Prior to resting metabolic rate (RMR) and anthropometric measures, children (7-12 y) completed a questionnaire to assess PA self-efficacy, attraction, and social and environmental influence on PA. Children completed 5-6 random sport, play and locomotive activities and indicated their enjoyment across the same 4 PA contexts (attraction, preference, and social and environmental influence) after each activity using a 4-item FAS. PA intensity was assessed via a portable metabolic analyzer (Child MET = total VO2/RMR). Two-way ANOVA assessed differences in questionnaire measures and FAS scores for all children and by sex and weight status. Repeated measures ANOVA assessed FAS scores by PA type and intensity by and individual activity. Rasch Rating Scale Modeling (RSM) assessed the validity of FAS responses.

RESULTS: Twenty-three children (15 boys; 17 healthy weight, 9.7±1.6 y) completed the study. No differences were noted in questionnaire-based PA self-efficacy, attraction, or social and environmental influence on PA by sex or weight status (p>0.05). Weight status, not sex, was found to effect real-time FAS scores for PA attraction only (p=0.002). Real-time locomotive FAS scores were lower for PA attraction (2.8±0.1), preference (2.7±0.1), and social influence (2.8±0.1) compared to sport and play activities (3.4±0.1 to 3.6±0.1; p<0.05). PA attraction (2.3±0.5 to 4.0±0.0) and preference (1.8±0.5 to 3.8±0.2) differed across individual activities (p<0.05). All FAS items fit the RSM with appropriate infit and outfit statistics for development (0.5-2.0). All response categories also fit the RSM. The 4 FAS response categories were ordered and each option was the most probable at some point across theta. The average ability agreement between the two forms and provide evidence that the two versions have similar utility.

1149 June 1, 4:00 PM - 4:15 PM
Sensor-Enabled Activity Recognition in Preschool Children: Hip versus Wrist Data
Stewart G. Trost1, Dylan Cliff1, Marcus Hagenbuchner2. 1Queensland University of Technology; Brisbane, Australia. 2University of Wollongong, Wollongong, Australia.

Email: s.trost@qut.edu.au

(No relationships reported)

Pattern recognition approaches to accelerometer data processing have emerged as viable and more accurate alternatives to traditional cut-point methods. However, few studies have explored the validity of pattern recognition approaches in preschool children; and none have compared supervised learning algorithms trained on hip and wrist data. PURPOSE: To develop, test, and compare activity recognition algorithms trained on hip (Hact), wrist (Wact), and combined hip and wrist (HWact) accelerometer data in preschool-aged children. Methods: 11 children aged 3 - 6 y (mean age 4.8 ± 0.9 y) completed 12 developmentally appropriate PA trials while wearing an Actigraph GT3X+ accelerometer on the right hip and non-dominant wrist. PA trials were categorised as sedentary (SED), light activity games (LG), moderate-to-vigorous games (MVG), walking (WA), and running (RU). Random forest (RF) and support vector machine (SVM) activity recognition models were trained using time and frequency domain features in the raw acceleration signal (vector magnitude). Features were extracted from 15 s non-overlapping windows. Classifier performance was evaluated using leave-one-participant-out cross-validation (LOOCV). Results: Cross-validation accuracy for the Hact, Wact, and HWact RF models was 0.80 (95% CI0.79 - 0.82), 0.78 (95% CI0.77-0.80), 0.82 (95% CI0.80 - 0.83), respectively. Accuracy for Hact, Wact, and HWact SVM models was 0.81 (95% CI0.80 - 0.83), 0.80 (95% CI0.79-0.80), 0.85 (95% CI0.84 - 0.86), respectively. Recognition accuracy was consistently excellent for SED (> 90%), moderate for LG, MVG, and RU (69-79%), and modest for WA (61-71%). Conclusions: Machine learning algorithms such as RF and SVM are useful for predicting PA type from accelerometer data collected in preschool children. While classifiers trained on hip or wrist data provided acceptable recognition accuracy, the combination of hip and wrist accelerometer yielded significantly better performance.

The Misfit™ Shine (MS) activity tracker estimates steps, energy expenditure. MS can be worn for up to 6 months, 24-hours/day and at multiple body locations. However, there is limited knowledge of the accuracy of the MS compared to the validated and widely used Actigraph GT3X+ (GT3X+) research-grade accelerometer. PURPOSE: To compare the Misfit Shine (MS) estimates of steps/min (SPM) worn on the hip, wrist and foot to an Actigraph GT3X+ worn on the hip during locomotion and activities of daily living (ADL’S). METHODS: Participants (N = 13) wore two GT3X+ accelerometers (hip and wrist) and three MS trackers (hip, wrist and foot) and performed the following activities for 4-min each: (1) Treadmill: 2.5, 3.5, 5.5 and 7.5 mph; (2) Overground locomotion: self-paced slow and brisk walking, and self-paced jogging; and (3) ADL’s (computer work, sitting, laundry and vacuuming). Paired t-tests were used to compare GT3X+ Hip SPM to MS Hip, MS Wrist and GT3X+ Wrist SPM. RESULTS: SPM were not significantly different for MS hip and MS foot compared to GT3X+ hip for any activities. MS wrist SPM was significantly different than GT3X+ hip for some ADL’S, but GT3X+ wrist was also significantly different than GT3X+ hip for these activities. Conclusions: MS provides similar SPM estimates to the widely used and rigorously validated GT3X+ hip worn device. MS wrist tended to produce higher estimates during some ADL’s compared to the GT3X+ hip, however MS wrist was similar to GT3X+ wrist for these activities. Notably, compared to GT3X+ hip SPM, MS wrist produced similar estimates during locomotion, while GT3X+ wrist significantly underestimated SPM during all locomotion activities. Improved ease of use, extended battery life and lower cost make MS a consumer activity tracker. Our findings promise alternative/supplement to research-grade accelerometers. This study provides evidence that Misfit Shine worn on the hip or foot, accurately estimates SPM compared to a GT3X+ hip worn device.
PURPOSE: Sedentary time (ST) is a risk factor in the development of chronic diseases. As with physical activity (PA), the use of valid measures is necessary to determine stronger associations between ST and health. Count-to-activity thresholds are commonly employed to determine ST in accelerometer-based activity monitors. This study examines the validity of ST determined from the ActiGraph GT3X (AG) in a free-living setting.

METHODS: Following ethical approval, 20 University students were recruited (10 M/10 F, Age =22.0±3.2yrs). The AG and the actiPAL3 (AP) were worn for 9 days on the hip and thigh respectively. Data collected between 9am and 10pm on each day was examined. ST and stepping time were computed directly from the AP output. The remaining time was categorized as stepping time. For the AG, a sedentary threshold of <150 counts/min defined ST. The remaining time was categorized as stepping time. Paired sample t-tests (Bonferroni correction α=0.01) examined differences between the AG and the AP. Mean bias and limits of agreement for ST between the AP (criterion measure) and AG were examined using a Bland-Altman plot.

RESULTS: Significant differences were observed for daily ST between the AP (8.74±1.34hrs) and the AG (8.05±1.27hrs; p<0.01). Both the AP determined stepping time (1.39±0.59 hours) and the AP determined standing+stepping time (4.26±1.58hrs) differed from the AG determined stepping time (4.95±1.44hrs; p<0.01). Bland-Altman analysis identified that the AG underestimated ST by 0.69 hrs (LoA -2.26 - 0.89) when compared to the criterion objective measure (AP).

CONCLUSIONS: The AG significantly underestimates time spent sedentary when compared to the AP. Approximately 6% of the time examined was misclassified as stepping time instead of ST from the AG. When examining the associations between ST and health, researchers must be aware of the potential for misclassification of ST and PA using sedentary count-to-activity thresholds.

It has been demonstrated that the Actigraph normal filter tends to overestimate steps/day of the individuals classified cross-sectionally by a pedometer as having a sedentary lifestyle (10,000 steps/day). No study has investigated the agreement between ActiGraph and pedometer step counts in an intervention study design.

PURPOSE: To determine agreement between ActiGraph accelerometer and NL-1000 pedometer-determined increases in steps/day following a pedometer-based walking intervention.

METHODS: This analysis was based on pre- and post- steps/day data collected using both instruments on 70 intervention participants in the WalkMore randomized control trial (Age=62.5±6.5 yrs, BMI=31.1±7.1 kg/m2). All participants were screened to take < 7500 steps/day as measured by the NL 1000 at baseline. This analysis re-organized the data into two groups defined by baseline pedometer-determined steps/day: 1) < 5,000 steps/day (n=20) and 2) 5,000-7,500 steps/day (n=51). Paired t-tests were used to test for differences between mean increase in steps/day detected in postures and number of transitions compared to DO. RESULTS: The TWA correctly classified sitting and stepping with higher accuracy than the WWA (98% vs. 96%, p<0.001; and 96% vs. 90%, p=0.05), but there was no difference in classifying standing (91% vs. 85%, p=0.10). The TWA had substantially better agreement with the second-by-second DO posture than WWA (95%; weighted k = 0.93 vs. 73%; weighted k = 0.65). Both the TWA and WWA (79% and 77% transitions) significantly overestimated the total number of true postural transitions (28 transitions). CONCLUSION: The TWA shows promise as a tool for measuring posture; however, both devices were too sensitive to motion to accurately capture transitions.
(7 heavy smokers, 8 light smokers) who viewed pictures containing emotionally evocative cues and smoking-related cues 1) prior to smoking a cigarette and 2) after conditions of rest. RESULTS: Compared to seated rest, cycling enhanced feelings of energy (F(3,39)=5.739, n2=0.360, p<0.01), reduced anger amongst resting recovery (F(3,39)=5.390, n2=0.293, p<0.01), and reduced DLPCF response to pleasant (F(1,14)=6.820, n2=0.328, p<0.05) and unpleasant scenes (F(1,14)=12.363, n2=0.469, p<0.01) relative to seated rest. Heavy smokers felt more fatigued at baseline (p<0.05) and less energetic during resting recovery (p<0.05) compared to light smokers, but the effects of exercise were independent of smoking status. CONCLUSIONS: Cycling for twenty minutes at a self-selected intensity after smoking improved mood and conferred a protective effect against DLPCF response to emotionally evocative scenes. Preferred-intensity exercise may be useful in mitigating acute emotional dysregulation which manifests shortly after smoking a cigarette and is a primary factor contributing to nicotine addiction among cigarette smokers.

Schizophrenia is a chronic mental illness characterized by positive (e.g. hallucination, delusion and thought disorders) and/or negative symptoms (e.g. avolition, apathy and social dysfunction). Although these primary symptoms of schizophrenia can be managed, cognitive impairment continues to be a core and consistent deficit. Schizophrenia is a chronic mental illness characterized by positive (e.g. hallucination, delusion and thought disorders) and/or negative symptoms (e.g. avolition, apathy and social dysfunction). Although these primary symptoms of schizophrenia can be managed, cognitive impairment continues to be a core and consistent deficit. Therefore, PA may be managed, cognitive impairment continues to be a core and consistent deficit. However, individuals with a more recent diagnosis who engaged in greater MVPA during the week had better performance in working memory. As working memory is essential for functioning and is known to be impaired in this population, experimental research is required in examining whether PA can improve this function in this population. Supported by Canadian Institutes of Health Research (operating grant).

Purpose: Given the staggering impact of dementia worldwide—and lack of effective treatment options—investigating non-pharmaceutical solutions to reduce dementia incidence are greatly needed. Increased moderate-to-vigorous physical activity (MVPA) and limited sedentary behavior (SB) are both pillars of healthy cognitive aging. However, it is unclear if changes in cognitive status—such as developing Mild Cognitive Impairment (MCI) which is a precursor to dementia—can affect the associations between MVPA, SB, and cognition. Thus, we investigated how MCI can affect the associations between MVPA, SB and cognitive function.

Methods: We observed MVPA and SB of adults aged 55+ (N=122) for 14 days using the MotionWatch®. Following observation, participants were screened for MCI using the Montreal Cognitive Assessment (MoCA) with a score of <26 indicating probable MCI. We measured cognitive function using Digit Span (DS; Forward - Backward), Trail Making Test (TMT; Trail B - Trail A), and Animal Fluency (AF). We conducted bivariate analyses—stratified by MCI status—for associations between MVPA, SB and cognitive function. Regression models were generated for each cognitive test stratified by MCI status while controlling for age, sex, and education.

Results: Participants (71.64 ± 7.25 years) were predominantly female (65.10%) and retired (84.90%). Participants spent an average 59.45% (SD=12.38%) and 10.26% (SD=6.74%) of the day in SB and MVPA, respectively. Bivariate analyses for adults without MCI indicated higher SB was associated with poorer performance on DS (r=0.47, p<0.01) and TMT (r=0.31, p<0.03); higher MVPA was associated with improved performance on DS (r=-0.45, p<0.01) and AF (r=0.29, p=0.04). However, no associations between SB or MVPA and cognitive function were found for individuals with MCI. For those without MCI, the regression model indicated both increased MVPA (r=0.33, p<0.02) and reduced SB (r=0.34; p<0.01) were associated with better DS performance, with both behaviours being the strongest contributors to DS performance. The models for MCI participants were not significant.

Conclusions: The influence of MVPA and SB on cognitive function may have the greatest effect on older adults prior to development of MCI. Encouraging regular MVPA and reducing SB may promote healthy cognitive aging.

Schizophrenia is a chronic mental illness characterized by positive (e.g. hallucination, delusion and thought disorders) and/or negative symptoms (e.g. apathy and social dysfunction). Although these primary symptoms of schizophrenia can be managed, cognitive impairment continues to be a core and consistent deficit. Physical activity (PA) has numerous physical and mental health benefits, including cognitive benefits among healthy and chronically-ill individuals. Therefore, PA may play a supportive role in mitigating cognitive impairments among individuals with schizophrenia. Purpose: The aim of this study was to analyse the relationship between moderate to vigorous PA (MVPA) and executive function (EF; speed processing and working memory) among individuals with schizophrenia. Methods: Seventy-eight participants with schizophrenia (33 women; range: 21-64 years) participated. Participants wore accelerometers for one week to measure PA. EF was evaluated using the Symbol Coding task for speed processing and the Letters-Numbers Span task for working memory. In order to analyse the relationship between total weekly MVPA and EF, correlational analyses were conducted followed by a Linear Regression controlling for clozapine dose equivalents. As there is some evidence to suggest that cognitive function declines with longer illness duration, the participants were first analysed together and then dichotomized based on the length of their illness duration (≤15 years [N=44] vs. >15 years [N=34]). Results: There was no significant association between total weekly MVPA and EF independent of the length of illness. For individuals with less than 15 years illness duration, there was a significant association between weekly MVPA and the Letters-Numbers Span task (r=0.34; p=0.299; p<0.05). Conclusion: PA does not appear to be associated with EF for all individuals with schizophrenia. However, individuals with a more recent diagnosis who engaged in greater MVPA during the week had better performance in working memory. As working memory is essential for functioning and is known to be impaired in this population, experimental research is required in examining whether PA can improve this function in this population. Supported by Canadian Institutes of Health Research (operating grant).
RESULTS: Aerobic and resistance exercise were unrelated to first block accuracies.

CONCLUSIONS: The findings suggest that an 8-week exercise program reduces symptoms of depression, possibly through improvements in ruminative thought patterns and physical activity. The non-significant effect on VO2 peak suggests other potential psychological mechanisms, and that incorporating a larger exercise dose may result in additional mental health benefits.

1159 June 1, 4:30 PM - 4:45 PM
Effects of Caffeinated Chewing Gum on Muscle Pain during Isometric Exercise in Individuals with Fibromyalgia
Masataka Umeda, Laura E. Kempka, Amy C. Weatherby, Brennan T. Greenlee, Kimberly C. Mansion. Texas Tech University, Lubbock, TX.
Email: masataka.umeda@ttu.edu

Fibromyalgia (FM) is a chronic, widespread musculoskeletal pain condition that is typically accompanied by several comorbid symptoms (e.g., depression, fatigue, sleep disturbance). Research demonstrates that regular exercise helps individuals with FM improve their symptoms and physical function; however, individuals with FM often experience augmented muscle pain during exercise compared to healthy controls, which may serve as a behavioral determinant that keeps them less physically active. Previous research shows that caffeine ingestion reduces an intensity of muscle pain during exercise in healthy adults; however, the hypoalgesic effects of caffeine on exercise-induced muscle pain have not been tested in individuals with FM. PURPOSE: This study examined the effects of caffeinated chewing gum on muscle pain during submaximal isometric handgrip exercise in individuals with FM. METHODS: This study was conducted with a double-blind, placebo-controlled design. Twenty-three adults with FM (43.57 ± 18.49 yrs) completed a caffeine session where they consumed 100 mg of caffeine, and a placebo session where they consumed a non-caffeinated chewing gum. During the sessions, they completed isometric handgrip exercise at 25% of their maximal strength for 3 minutes. RESULTS: The primary analyses indicated that MPR grew at a greater rate during exercise in both sessions (p = 0.001), but the caffeinated chewing gum did not attenuate the increase in MPR during exercise compared to the placebo gum (p > 0.05). However, the secondary analyses indicated that average MPR during exercise in the placebo condition was associated with a magnitude of the protective effects of the caffeinated chewing gum (r = 0.570, p = 0.005). CONCLUSION: The results suggest that the protective effects of the caffeinated chewing gum were limited to those who reported greater muscle pain during exercise in the placebo condition.

1160 June 1, 4:45 PM - 5:00 PM
Age, Exercise And Learning An Online Cognitive Task In 8,752 Men And Women Aged 13-89
Patrick J. O’Connor, FACSM, Phillip D. Tomporowski, FACSM, Rodney K. Dishman, FACSM. University of Georgia, Athens, GA.
Email: poconnor@uga.edu

PURPOSE: To examine whether people differed in change in performance across the first five blocks of an online flanker task and whether those trajectories of change were associated with self-reported aerobic or resistance exercise frequency according to age. METHODS: 8,752 men and women aged 13-89 completed a lifestyle survey and five 45-second games (each game was a block of ~46 trials) of an online flanker task. Accuracy of the congruent and incongruent flanker stimuli was analyzed using latent class and growth curve modeling adjusting for time between blocks, whether the blocks occurred on the same or different days, education, smoking, sleep, caffeinated coffee and tea use, and Lumosity training status (“free play” or part of a “daily brain workout”). RESULTS: Aerobic and resistance exercise were unrelated to first block accuracies. For the more cognitively demanding incongruent flanker stimuli, aerobic activity was positively related to the linear increase in accuracy (B = 0.577%, 95% CI, 0.112 to 1.25 per day above the weekly mean of 2.8 days) and inversely related to the quadratic deceleration of accuracy gains (B = −0.619% CI, −1.117 to −0.121 per day). An interaction of aerobic activity with age indicated that active participants younger than age 45 had a larger linear increase and a smaller quadratic deceleration compared to other participants. CONCLUSIONS: Age moderates the association between self-reported aerobic, but not self-reported resistance, exercise and changes in cognitive control that occur with practice among incongruent presentations across five blocks of a 45-second online, flanker task.

1161 June 1, 5:00 PM - 5:15 PM
Pyscical Fitness And Serum Vitamin D And Cognitive Function In Older Adults
Sang-Koo Woo1, Ji-Young Lee2, Haeryun Hong3, Hyun-Sik Kang1, 1Andong National University, Andong, Korea, Republic of; 2Gangneung-Wonju National University, Gangneung, Korea, Republic of; 3Sungkyunkwan University, Suwon, Korea, Republic of.
Email: hkang@skku.edu

Poor physical fitness and low serum vitamin D are known to be modifiable risk factors for cognitive declines with normal aging. In Korea, however, little is known regarding the relationship of physical fitness and serum vitamin D with cognitive function in older adults. PURPOSE: To investigate the association of cognitive performance with physical fitness and serum vitamin D levels in elderly Koreans. METHODS: In this cross-sectional study, a total of 412 older Korean adults (108 men aged 74.4±6.0 years and 304 women aged 73.1±5.4 years) completed the Korean version of Mini-Mental State Examination (MMSE) to assess global cognitive performance and the senior fitness test to assess strength, flexibility, agility, and endurance domains of physical fitness. Body mass index, percent body fat, serum vitamin D, geriatric depression scale (GDS), level of education, smoking, and history of cardiovascular or cerebrovascular disease were also assessed as covariates. RESULTS: Age (r = 0.212), sex (r = 0.187), GDS (r = 0.190), BMI (r = 0.138), and percent body fat (r = 0.249) were significantly associated with cognitive performance. Serum vitamin D (r = 0.250), arm curl (r = 0.257), chair stand up to 30s (r = 0.152), back scratch (r = 0.224), chair-site-and-reach (r = 0.262), 8-foot-up-and-go (r = 0.443), and the 6-min walk (r = 0.255) were significantly associated with cognitive linear performance. Linear regression analyses showed that ability (partial R² = 0.184, p = 0.029) and endurance (partial R² = 0.191, p = 0.022) domains of physical fitness along with serum vitamin D (partial R² = 0.210, p = 0.012) were significant predictors for cognitive performance after controlling for measured covariates such as age, sex, body fatness, GDS, education, smoking, and comorbidity index. Conclusion: The current findings of the study suggest that promotion of physical fitness and vitamin D supplementation should be key components of interventions to prevent cognitive decline in older adults, especially in Korea. Supported by The National Research Foundation Grant funded by the Korean Government (NRF-2014R1A1A2056473).

B-68 Clinical Case Slide - Knee II
Wednesday, June 1, 2016, 3:15 PM - 5:15 PM
Room: 202

1162 Chair: Daniel C. Herman. University of Florida, Gainesville, FL.
(No relationships reported)

1163 Discussant: Jim Swenson, FACSM. University of Rochester, Penfield, NY.
(No relationships reported)

1164 Discussant: Karl B. Fields. Sports Medicine Center, Greensboro, NC.
(No relationships reported)
**1165**

**June 1, 3:35 PM - 3:35 PM**

**Recurrent Knee Pain in a Teenage Dancer**

Sean C. Engel,1 Holly J. Benjamin, FACSM,1 University of Chicago-NorthShore, Glenview, IL.2 University of Chicago, Chicago, IL. (Sponsor: Holly J. Benjamin, FACSM) (No relationships reported)

**HISTORY:** A 13 y/o female was pivoting while playing with her friends and felt her right kneecap shift after a noncontact valgus stress. She had pain and swelling shortly after the injury, but was able to ambulate at that time with a limp. Anterior knee pain was minimal but persistent for several days. Use of a knee sleeve lessened the pain. At her initial clinic visit 5 days post-injury, she had a large joint effusion. She demonstrated full extension but flexion was limited to 95°. Tenderness was present at the medial patellar facet and over the retinaculum. Ligamentous and meniscal testing was negative. Radiographs obtained in the ED and clinic demonstrated a chronic appearing well corticated loose body suggestive of synovial osteochondromatosis. She was given a presumptive diagnosis of patellar subluxation, told to continue with brace use, and referred to physical therapy. PT gave her an HEP after one visit as her stability, strength, and range of motion were within normal limits.

The athlete was lost to follow up for four months, but presented again to clinic after an instability event left her with a painful, swollen, right knee, with limited ROM and an inability to ambulate without crutches. Further history revealed that she had been experiencing “shifting” in her knee once or twice monthly while playing sports with minimal pain.

**PHYSICAL EXAMINATION:**

Examination of knee revealed a 2+ effusion. No focal tenderness to palpation. ROM was painful ranging from -10° extension to 110° flexion. Negative valgus/varus stress tests, McMurray’s, apprehension and grind tests were noted. Lachman’s testing was asymmetric with L-2+ on the injured side but significant guarding and discomfort was noted by the patient who was somewhat uncooperative.

**DIFFERENTIAL DIAGNOSIS:**

1) Recurrent Patellar Subluxation
2) Loose Body
3) ACL Injury

**TESTS AND RESULTS:**

MRI demonstrated:

1) Ossified loose body in the anterior compartment
2) Complete rupture of ACL
3) Diminutive medial meniscus, possible chronic tearing

**FINAL DIAGNOSIS:**

1) ACL rupture with avulsion fx/loose body adherent to the ACL stump
2) Large bucket handle medial meniscus tear

**TREATMENT AND OUTCOMES:**

1) ACL reconstruction with hamstring autograft with allograft augmentation
2) Repair of medial meniscus
3) Removal of loose body with ACL debridement

---

**1166**

**June 1, 3:35 PM - 3:35 PM**

**Bilaterial Knee Pain—Soccer**

Eze Uzosike, Kaiser Permanente Fontana, Fontana, CA. Email: Eze2222@gmail.com (No relationships reported)

**AUTHORS:**

Eze Uzosike

Dennis Khalili-Borna

**INSTITUTION:**

Kaiser Permanente Fontana

9985 Sierra Avenue

Fontana, CA 92335

**HISTORY:**

A 16-year-old high school female soccer player presented with bilateral knee pain and swelling three weeks after initial injury to her left knee. During soccer camp, she sustained a varus load of her left knee while attempting to pivot with her leg in a planted position. This injury was re-aggravated the next day by a kick to the lateral aspect of the left knee during practice, with considerable afterwards. Her right knee had been bothersome for about six weeks prior to her left knee injury. She had tried to kick a soccer ball against an opposing player attempting to do the same thing. She developed inferior-posterior knee pain and low-grade effusion afterwards. Both knees felt unstable to ambulation.

**PHYSICAL EXAMINATION:**

Inspection: Skin Changes (-), + Genu Valgum of both knees, 2+ bilateral knee effusion, restricted range of motion bilaterally due to pain

**R Knee**

Patellar, Tenderness: Lateral joint facet, lateral joint line, and posterior knee, Special Test: Lachman (-), A/P Drawer test (+), Bounce test (+), Valgus / Vagus laxity (+), Patellar Apprehension (+), Ober (+), Tenderness along insertion of IT band: positive

**L Knee**

Patellar, Tenderness: Medial & lateral joint facet, lateral joint line, and insertion of IT band

Special Test: Lachman (-), A/P Drawer test (-), Bounce test (+), Valgus / Vagus laxity (-), Patellar Apprehension (+), Ober (+)

**DIFFERENTIAL DIAGNOSIS:**

Bilateral Osteochondral Lesion

Bilateral Discoid Meniscus

Rheumatoid Arthritis

Pigmented Villonodular Synovitis

**TEST AND RESULTS:**

Bilateral Knee X-ray: No underlying bone abnormality, misalignment or acute fracture is noted. Bilateral joint effusion present.

MRI Biarticular Knee: No high-grade chondrosis, intra-articular bodies or Baker’s cysts noted. Ligaments and tendons are intact. Menisci are normal.

LAB: Elevated ESR and CRP, 1+ Proteimuria, High ANA Titer

Synovial Fluid Evaluation: Notable for high PMN’s

**FINAL-WORKING DIAGNOSIS:**

Chronic Arthritis, Rheumatoid Arthritis

**TREATMENT AND OUTCOME:**

--NSAIDS course
--Ultrasound guided aspiration of knees with Cortisone injection
--Improvement in pain and knee swelling
--Care transferred to Rheumatology for further workup
--Patient has yet to return to active soccer

---

**1167**

**June 1, 3:55 PM - 4:15 PM**

**Noncontact Knee Injury-Football**

Francis P. Foti, II, LECOM, Erie, PA. (Sponsor: Patrick Leary, FACSM) Email: frankfoti11@gmail.com (No relationships reported)

**HISTORY:** 18-year-old Division-II football defensive back who sustained an injury after jumping into the air to catch a ball and then reportedly hyperextended his knee when he landed. He developed immediate onset of left knee pain and inability to bear weight. He had complaints of paresthesias along the dorsal aspect of his left foot and was unable to dorsiflex his left foot. He was sent to the emergency room by ambulance after brief evaluation by athletic training staff for further evaluation.

**PHYSICAL EXAMINATION:** Initial exam revealed positive Lachman test and Varus stress test at 0° and 30°. Evaluation in the emergency room revealed moderate effusion, tenderness to palpation over lateral joint line and tibial plateau, decreased sensation to light touch over dorsum of foot and inability to dorsiflex foot. Sensation was otherwise intact. Dorsals pedis and posterior tibial pulses were 2+. Thigh and leg compartments were soft.

**DIFFERENTIAL DIAGNOSIS:**

1. Single or Multi Ligamentous Injury
2. Fracture (Femur, Patella Tibia, Fibula)
3. Dislocation (knee or patella)
4. Neuromuscular Injury

**TESTS AND RESULTS:**

Xray

- Suprapatellar effusion; no acute fracture
- Computerized Tomography Angiography of Lower Extremities
- normal three vessel run-off
- Magnetic Resonance - Tear of ACL, PCL and LCL
- nondisplaced fracture tibial plateau

**FINAL DIAGNOSES:**

Knee Dislocation III L (ACL, PCL, LCL, PLC, Lateral Meniscus) Biceps Tendon Disruption Tibial Plateau Fracture

**Fibular Nerve Contusion TREATMENT AND OUTCOMES:**

1. Imaging performed (Xray, CTA, MRI).
2. Placed in a Knee immobilizer
3. Admitted for observation of neurovascular status and pain control.
4. Heparin was used for thrombosis prophylaxis during admission.
5. Transitioned to a Total Range of Motion brace locked at 20°, fitted for an Ankle Foot Orthosis and ordered a wheel chair.
6. Discharged on Xarelto and Percocet with plans for further evaluation at Allegheny General Hospital in Pittsburgh for surgical repair.
7. Arthroscopically assisted ACL reconstruction with allograft, PCL reconstruction, LCL reconstruction with hamstring tendon autograft, left biceps tendon repair, lateral meniscus open repair and major synovectomy.
8. Physical therapy was initiated 2 weeks postoperatively.
9. Discussion in regards to possible return to sports is pending.
Knee Injury – Recreational Runner
Brenda E. Castillo, MD, Isabel Rutzen, MD, Irma Valentín-Salgado, MD, Liza Hernandez-Gonzalez, MD. VA Caribbean Healthcare System, San Juan, PR. (Sponsor: William Micheo, MD, FACSM)
Email: brend00@yahoo.com (No relationships reported)

HISTORY: Case of a 41 year-old army soldier who had an acute bilateral knee giveaway weakness while jogging. After running for a mile, his left knee gave way and he fell to the floor. He stood up without difficulties and ambulated for a short distance when he fell again due to right knee weakness. He had difficulty ambulating, although he felt no pain. During his ER visit, he had a third fall resulting in a right lateral malleolar fracture. Orthopedics was consulted and performed bilateral patellar tendon repair and right lateral malleolus ORIF. He was discharged home with bilateral hinged knee braces locked at full extension and weight-bearing precautions. Two months post-op, he was admitted to the acute inpatient rehabilitation ward of the VA Caribbean Healthcare. No past medical history of systemic conditions or regular medications.

PHYSICAL EXAMINATION: Examination revealed bilateral knee valgus deformity, mild soft tissue swelling and bilateral pes planus. He had full knee extension and limited knee flexion to 90 degrees. Knee special tests were negative for meniscal, cruciate ligament or collateral ligament injury. Neurovascular exam was unremarkable.

DIFFERENTIAL DIAGNOSIS:
1. Patellar tendon rupture
2. Quadriceps tendon rupture
3. Anterior cruciate ligament sprain
4. Meniscal injury
5. Collateral ligament sprain

TEST AND RESULTS:
2. Bilateral Knee X-ray: Bilateral patella alta.
3. Labs: Essentially normal except for low vitamin D and positive qualitative ANA test.

FINAL/WORKING DIAGNOSIS:
Atraumatic bilateral patellar tendon rupture

TREATMENT AND OUTCOMES:
1. Outpatient-based physical therapy was provided with emphasis on ROM completion, progression of quadriceps strengthening and neuromuscular retraining.
2. He achieved full ROM in both knees and independence in ADL’s and ambulation.
3. Return to recreational sports recommendations included to avoid high impact activities, such as running, until 9-12 months post-op follow up.

Knee Injury - Football
Justin Yuch1, Andrew Reisman2, David Weisner1, Kevin DuPrey1. 1Cruzer-Keystone, Springfield, PA. 2University of Delaware, Newark, DE. (Sponsor: Thomas Kaminski, FACSM) (No relationships reported)

HISTORY: A 21 year old skill-position division I college football player presented for sideline evaluation during a game after feeling a pop in his LEFT knee while running (earlier in the game he had been struck in the left knee but had then been able to continue playing). Roughly 1 month prior to this injury, he had sustained a grade 2 PCL injury to the RIGHT knee that occurred during a practice when he landed awkwardly striking his knee into the turf for which he was treated non-operatively with PCL bracing and rehab and had passed functional testing.

PHYSICAL EXAMINATION: Physical exam of the LEFT knee was significant for positive posterior drawer with negative Lachman, negative anterior drawer, symmetrical dial test, negative tenderness, and preserved ROM. Left knee PCL laxity was less than that of the right knee. After several weeks of rehab subsequent exam showed the initially injured knee (RIGHT) had increased excursion as compared to the left and had increased translation with external rotation.

DIFFERENTIAL DIAGNOSIS:
PCL full tear
PCL partial tear
Partial ACL tear
Collateral ligament tear
Meniscal injury
Plantaris rupture
Posterior capsule injury
Posterolateral corner injury

TEST AND RESULTS:
MRI R knee:
- Abnormal signal and morphology of the PCL consistent with rupture. No other major pathology.
MRI L knee:
- Partial tear of PCL midportion with intact proximal and distal attachments
- Mild contusion of the medial meniscus posterior horn inferior portion
- Moderate posterior capsular strain

FINAL WORKING DIAGNOSIS:
Bilateral PCL partial tear (right higher grade than left)

TREATMENT AND OUTCOMES:
He began conservative treatment of the left knee with an immobilizer brace with progression to activity. He was unable to regain explosiveness and sprint speed due to the sense of bilateral knee laxity with mild left knee pain occurring at speed. Isokinetic dynamometer testing revealed left knee flexor strength of 90% compared to the right with equal knee extensor strength. His inability to fully progress was likely attributable to bilateral PCL injury: with one normal leg he was able to compensate for unilateral PCL laxity, whereas bilateral PCL laxity functionally eliminated his compensatory mechanism. He consequently underwent season-ending right PCL reconstruction after maximized rehab did not allow return of function.
1174 June 1, 3:15 PM - 3:35 PM
A Rare Cause of Progressive Paresthesias, Cramps, Fasciculations and Weakness in a Collegiate Volleyball Player
James Presley, Stephen Wisniewski. Mayo Clinic, Rochester, MN.
Email: Presley.James@mayo.edu
(No relationships reported)

HISTORY: A 21 year old female collegiate volleyball player presented with exertional paresthesias involving her cheeks, lips and chest. Her symptoms evolved to include twitching, stiffness and cramping of the thighs and calves, which forced discontinuation of participation in volleyball. She went on to develop upper extremity cramping and abnormal posturing of her hands, even at rest. She noticed symmetric hypertrophy of her calves and quadriceps muscles and increased sweating and salivation. Her cramping and leg stiffness worsened to the point that she needed aid of a walker for ambulation.

PHYSICAL EXAMINATION: General medical exam was unremarkable. Her quadriceps and calves seemed abnormally muscular for body habitus. Movements of the upper and lower limbs were slow and stiff with visible cramping of calf and quadriceps muscles with activation. Neurological exam showed diminished reflexes. Strength testing was difficult due to non-painful muscle cramps with isolated testing of muscles. Sensation was normal.

DIFFERENTIAL DIAGNOSIS:
1) Myotonia (DM1, DM2)/ Neuromyotonia
2) Diffuse Myopathy
3) Multiple Sclerosis
4) Peripheral Neuropathy

TEST AND RESULTS: MRI brain and cervical spine:
- No evidence of demyelination, inflammation, or infarction

EMG:
- Nearly persistent motor unit activity in upper and lower limb muscles with spontaneous, iterative, high frequency discharges consistent with neuromyotonia

Laboratory Testing:
- Blood tests for hereditary and acquired causes of myotonia/neuromyotonia were inconclusive

PET Scan/MRI:
- Showed focal, hypermetabolic activity in the thymus with two peripherally enhancing soft tissue nodules

FINAL WORKING DIAGNOSIS: Hodgkin’s Lymphoma with presentation of paraneoplastic neuromyotonia (Issac’s Syndrome)

OUTCOME:
1. Intravenous immunoglobulin was poorly tolerated with no clear benefit.
2. Gabapentin and mexiletine were started as membrane stabilizing agents with significant improvement in symptoms.
3. PET/CT/MRI showed resolution of thymic mass.
4. The patient recovered well from surgery, reports 80% improvement in symptoms and is exercising consistently

1175 June 1, 3:35 PM - 3:55 PM
Hamstring Pain In A 60 Year Old Runner
Steven Albrecht, James Borchers, FACSM. The Ohio State University, Columbus, OH. (Sponsor: James Borchers, FACSM)
(No relationships reported)

History: 60 year old female presents to Sports Medicine Clinic with right hamstring pain. She saw her primary care provider a month earlier and was noted to have a mass in her right posterior thigh. Reports 18 months prior, she tore her hamstring after slipping and catching herself from falling. She has noticed a “bulge” in the area. The pain resolved until about 6 weeks prior to presentation, she re-aggravated the leg while at the gym. She does not recall a specific injury but did have some pain in the area. Pain is rated 4/10 and described as achiness in her right hamstring. The pain has been improving but continues to bother her. She has been able to bear weight without problems, denies a loss of motion and denies numbness and tingling. Pain worsens with movement and sometimes while standing. Treatments tried include rest, OTC NSAIDs and ice, which have provided mild relief of her pain.

Physical: Vital signs are within normal limits. She has a normal gait. On inspection there is symmetric contour of the bilateral posterior thighs. The right proximal leg has no erythema, no scars and normal sensation. She has tenderness in her posterior hamstring and there is a mass palpated in the proximal hamstring. The proximal hamstring tendons are not palpable. Her range of motion is within normal limits. Her hamstring strength against resistance is 4/5 but her hip abduction, adduction and flexion are 5/5. Her FABER and Ober tests are negative.

OUTCOME:
1. Intravenous immunoglobulin was poorly tolerated with no clear benefit.
2. Gabapentin and mexiletine were started as membrane stabilizing agents with significant improvement in symptoms.
3. PET/CT/MRI showed resolution of thymic mass.
4. The patient recovered well from surgery, reports 80% improvement in symptoms and is exercising consistently

1176 June 1, 3:55 PM - 4:15 PM
Thigh Pain in a Soccer Player
Erin Morine, Deborah Light, Hamish Kerr. Albany Medical Center, Albany, NY.
Email: morine@email.amc.edu
(No relationships reported)

HPI: 15 year old male with 6 week history of left thigh pain that began with conditioning exercises for soccer. He continued training for upcoming JV soccer tryouts despite the pain. After tryouts he complained to his mom of difficulty keeping up with the team in scrimmages and sprints due to pain. He also had occasional pain with climbing stairs. Denied trauma, previous injury, back pain, numbness, weakness or paresthesias, nighttime awakening or constitutional symptoms.


IMAGING: AP and lateral views of the left femur: slightly expansile 8 x 3cm lucent lesion in the proximal L femoral diaphysis associated with lamellated peristomial reaction. MRI L femur: Mildly expansile peripherally enhancing fluid signal intensity lesion with layering debris in the L proximal femoral diaphysis.

WORKING DIAGNOSIS: Healing pathologic fracture with unicameral or aneurysmal bone cyst or fibrous dysplasia with cystic component.

TREATMENT: Referral was placed to a local orthopedic oncologist who performed an open biopsy for definitive diagnosis and operative stabilization of the stress injury. Intra-operative frozen section returned as fibrous dysplasia. Final pathology report revealed aneurysmal bone cyst with solid component.

OUTCOME: He tolerated the procedure well and was discharged on post-operative day 1. Plan is for return to weight bearing in 6-8 weeks. Given prophylactic plating of his pathologic fracture it is expected that once fully healed he will be able to return to playing soccer without limitations.

1177 June 1, 4:15 PM - 4:35 PM
Left Shoulder Pain - Elite Level Golfer
Ryan C. Kruse, Edward R. Laskowski, FACSM. Mayo Clinic, Rochester, MN. (Sponsor: Edward R. Laskowski, FACSM)
Email: kruse.ryan@mayo.edu
(No relationships reported)

HISTORY: A 57 year old male elite level golfer with a past medical history of an unprovoked lower limb deep vein thrombosis (on coumadin) presented to the Sports Medicine Clinic for evaluation of left shoulder and neck pain that began after a fall. Two days prior he tripped over his dog, falling down multiple stairs and landing on his left shoulder. Pain was worse over the left superior trapezius muscle and was exacerbated with left neck rotation. He denied left arm radicular symptoms, sensory
changes, or focal weakness. He denied significant changes in his left shoulder range of motion. Prior to presentation, left shoulder X-ray was obtained which was negative for any osseous pathology.

**PHYSICAL EXAMINATION:** Healthy appearing male in no acute distress. Mild swelling in the region of the left superior trapezius, supraclavicular fossa, as well as near the left carotid artery. Carotid pulse regular, prominent; no bruits. Palpation of spine and extremities was negative except for mild tenderness over the left superior trapezius. Spurling’s maneuver negative but there was left superior trapezius pain at the extreme of left neck rotation. Shoulder provocative maneuvers negative. Cranial nerves intact. Strength and sensation normal and symmetric in bilateral upper and lower limbs.

**DIFFERENTIAL DIAGNOSIS:**
1. Myofascial left trapezius strain
2. Traumatic left carotid artery injury
3. Mild left rotator cuff strain
4. Left upper limb deep vein thrombosis

**TESTS AND RESULTS:**
- 5. Impingement syndrome
- 4. Mass lesion
- 3. Bicipital tendon subluxation
- 2. Labrum tear
- 1. Rotator cuff injury

**HISTORY:** A 35 year old right hand dominant male presented with a 12 year history of intermittent anterior right shoulder pain with associated popping. He thought his pain started after he tried to catch a door from falling in a forced adduction injury at the age of 23. He stated he felt a shifting in his shoulder multiple times per day while working at a Goodyear Tire Warehouse. He had been seen by a physician 6 years later in which he had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse. He later had a MRI and was told he had tendinitis. At that time, the patient was given anti-inflammatories, steroid injections, and physical therapy. He had difficulty sleeping on his left side as his pain was worse.
An 18-year-old high school football defensive back presents to his primary care physician’s office for a hard lump on his left upper arm after being hit by a helmet to the area during a football game 2 weeks ago. Initially it was painful, but pain has been decreasing since the injury. Over the course of the two weeks however, the lump has grown bigger and denser. His physician unsuccessfully tried to aspirate the lesion in the clinic. He was sent to sports medicine clinic the same day for further evaluation.

PHYSICAL EXAMINATION:
4.5 x 5 cm hard nodule at the upper arm, lateral aspect of the biceps. Non-tender.

DIFFERENTIAL DIAGNOSIS:
1. Recurrent exertional rhabdomyolysis
2. Lipid or carbohydrate storage disorder
3. Mitochondrial disorder

TESTS AND RESULTS:
Ultrasound: hypechoic irregular density along the border of the mass
No evidence of fracture, bony lesion or periosteal reaction of humerus is noted. Very subtle hypodensity noted lateral to the humerus.

MRI:
A 32 x 21 x 61 mm cystic region is present about the anterior lateral aspect of the midshaft left humerus within the biceps brachii muscle. Given the provided history of trauma, this is most consistent with a hematoma and/or early myositis ossificans.

This lesion correlates with a subtle crescentic hyperdensity on recent humerus radiographs. No periosteal reaction is identified. There is adjacent edema within the left biceps brachii.

Follow up xray 5 days out:
5.5 x 2.5 cm calcific density identified at the lateral aspect of the midshaft of the left humerus.

FINAL DIAGNOSIS:
Myositis Ossificans Traumatica

TREATMENT AND OUTCOMES
Observation for resolution/improvement
May continue sports, keep the area protected

FINAL WORKING DIAGNOSIS: Recurrent exertional rhabdomyolysis affecting the upper extremities

TREATMENT AND OUTCOMES:
1. Activity as tolerated
2. Avoid exercises that causes arms to swell or be painful afterwards
3. Referral to Neurology for assessment of myopathy or related disorder
4. Subsequent muscle biopsy, myoglobinuria panel normal. Negative CPT2 genetic testing.

History: 14 year old, R-hand dominant, African-American football player initially presented with 2 weeks of constant, right, sharp, stabbing, suprarlateral shoulder pain and bruising, after receiving a light congratulatory hit on the shoulder by his coach. His pain was exasperated by any shoulder motion. He denied sleep disturbance, sensation changes, swelling, and mechanical symptoms. He did note pain with direct pressure laterally. He had a history of ankle injuries (sprains, fractures), as well as surgical drainage of a hematoma after a calf injury. He had never been hospitalized. He was taking Motrin for pain. He had no known allergies. His family history was unremarkable.

Exam:
General: WFSS

Exam:
Arm:
Calf:
Lower extremity:
Upper extremity:

Shoulder:

HISTORY: A 26-year-old female presented to clinic with bilateral arm swelling after exercise. Symptoms started 1 year prior after a crossfit workout that involved upper arm weight training exercises. She developed significant swelling of the upper arms 2 days later with difficulty extending her arms and an associated feeling of tightness in the upper arms. The swelling improved after 1 week with residual pain in the upper arms for about 2 weeks. She saw a physician and was noted to have an elevated C-reactive protein that resolved after several days. She resumed upper body workouts 2 months prior to her clinic visit and again developed swelling in bilateral arms 2 days later. She reported having a total of 4 episodes of swelling and pain in the arms, each occurring after upper extremity exercises and resolving with rest and NSAIDs after 1-2 weeks. She denied any swelling or pain in the lower extremities at rest or after exercise, and she ran regularly. No family history of myopathy or neuromuscular disorders.

PHYSICAL EXAMINATION:
Examination of the upper extremities revealed no visible ecchymosis, erythema or swelling over the bilateral upper extremities. There was normal muscle bulk of the arms. There was tenderness to palpation of the distal biceps muscle. There was full active and passive range of motion of the elbow and shoulder laterally. Strength was 4/5 with elbow extension lateral, otherwise full strength in the upper extremities. Sensation was intact to light touch and reflexes were equal and symmetric in bilateral upper extremities.

DIFFERENTIAL DIAGNOSIS:
1. Recurrent exertional rhabdomyolysis
2. Inflammatory Myopathy
3. Mitochondrial disorder
4. Lipid or carbohydrate storage disorder

TEST AND RESULTS:
EMG/Nerve Conduction Study: abnormalities in upper limbs consistent with myopathic process, with short duration, polyphasic motor units, early recruitment
CRP: 4.2
CPK: 5117 (day after upper arm resistance exercise routine)

CLINICAL CASE
HISTORY: A 16-year-old high school football defensive back presents to his primary care physician’s office for a hard lump on his left upper arm after being hit by a helmet to the area during a football game 2 weeks ago. Initially, it was painful, but pain has been decreasing since the injury. Over the course of the two weeks however, the lump has grown bigger and denser. His physician unsuccessfully tried to aspirate the lesion in the clinic. He was sent to sports medicine clinic the same day for further evaluation.

PHYSICAL EXAMINATION:
4.5 x 5 cm hard nodule at the upper arm, lateral aspect of the biceps. Non-tender.

DIFFERENTIAL DIAGNOSIS:
1. Recurrent exertional rhabdomyolysis
2. Lipid or carbohydrate storage disorder
3. Mitochondrial disorder

TESTS AND RESULTS:
Ultrasound: hypechoic irregular density along the border of the mass
No evidence of fracture, bony lesion or periosteal reaction of humerus is noted. Very subtle hypodensity noted lateral to the humerus.

MRI:
A 32 x 21 x 61 mm cystic region is present about the anterior lateral aspect of the midshaft left humerus within the biceps brachii muscle. Given the provided history of trauma, this is most consistent with a hematoma and/or early myositis ossificans.

This lesion correlates with a subtle crescentic hyperdensity on recent humerus radiographs. No periosteal reaction is identified. There is adjacent edema within the left biceps brachii.

Follow up xray 5 days out:
5.5 x 2.5 cm calcific density identified at the lateral aspect of the midshaft of the left humerus.

FINAL DIAGNOSIS:
Myositis Ossificans Traumatica

TREATMENT AND OUTCOMES
Observation for resolution/improvement
May continue sports, keep the area protected

FINAL WORKING DIAGNOSIS: Recurrent exertional rhabdomyolysis affecting the upper extremities

TREATMENT AND OUTCOMES:
1. Activity as tolerated
2. Avoid exercises that causes arms to swell or be painful afterwards
3. Referral to Neurology for assessment of myopathy or related disorder
4. Subsequent muscle biopsy, myoglobinuria panel normal. Negative CPT2 genetic testing.

History: A 16-year-old high school football defensive back presents to his primary care physician’s office for a hard lump on his left upper arm after being hit by a helmet to the area during a football game 2 weeks ago. Initially, it was painful, but pain has been decreasing since the injury. Over the course of the two weeks however, the lump has grown bigger and denser. His physician unsuccessfully tried to aspirate the lesion in the clinic. He was sent to sports medicine clinic the same day for further evaluation.

PHYSICAL EXAMINATION:
4.5 x 5 cm hard nodule at the upper arm, lateral aspect of the biceps. Non-tender.

DIFFERENTIAL DIAGNOSIS:
1. Recurrent exertional rhabdomyolysis
2. Lipid or carbohydrate storage disorder
3. Mitochondrial disorder

TESTS AND RESULTS:
Ultrasound: hypechoic irregular density along the border of the mass
No evidence of fracture, bony lesion or periosteal reaction of humerus is noted. Very subtle hypodensity noted lateral to the humerus.

MRI:
A 32 x 21 x 61 mm cystic region is present about the anterior lateral aspect of the midshaft left humerus within the biceps brachii muscle. Given the provided history of trauma, this is most consistent with a hematoma and/or early myositis ossificans.

This lesion correlates with a subtle crescentic hyperdensity on recent humerus radiographs. No periosteal reaction is identified. There is adjacent edema within the left biceps brachii.

Follow up xray 5 days out:
5.5 x 2.5 cm calcific density identified at the lateral aspect of the midshaft of the left humerus.

FINAL DIAGNOSIS:
Myositis Ossificans Traumatica

TREATMENT AND OUTCOMES
Observation for resolution/improvement
May continue sports, keep the area protected
History: A 17 year old male swimmer and water polo athlete presented with chronic bilateral forearm pain and swelling. Over one year the patient participated in a rigorous training regimen involving high intensity weight training and lap swimming. One such session involved performing 225 pull-ups within one hour, after which he experienced bilateral forearm swelling and pain for one week. He discontinued competitive swimming for several months until a swim meet, after which he re-experienced the same symptoms. He described the pain as sharp and non-radiating, exacerbated by arm exercise. He was seen in clinic for evaluation and was noted to have swelling and pain in forearms bilaterally, however more discomfort was in left forearm.

Physical Examination: Forearm and wrist examination (bilaterally) showed mild swelling at proximal forearm near flexor tendons, extensor carpi radialis. He had full passive pronation and supination of the forearm, normal active and passive ROM at the wrist. Neurovascular exam showed intact, normal sensation to light touch bilaterally. He was warm and well perfused with capillary refill < 2 seconds bilaterally, 2+ peripheral pulses.

Differential Diagnosis:
1. Chronic exertional compartment syndrome
2. Peripheral nerve entrapment
3. Extensor carpi radialis tendinopathy

Test and Results:
MRI of L forearm
1) Soft tissue edema associated with the common flexor tendon origin and flexor pronator muscles
2) Trace joint effusion
3) Mildly prominent superficial veins

Final/Working Diagnosis: Chronic exertional compartment syndrome, bilateral forearms

Treatment and Outcomes:
1. Refrain from upper extremity exertional activities
2. Referral to orthopedic surgeon confirmed diagnosis of chronic exertional compartment syndrome in bilateral forearms
3. Decompression fasciotomy of left flexor compartment, extensor compartment, and mobile wad compartment was performed without complications
4. Two months status post forearm compartment release, patient reports overall improvement in strength. He has returned to swimming with improvement in pain with some mild intermittent residual discomfort.
3. Delay in diagnosis because lost to follow-up
4. Thrombectomy and three months of anticoagulation
5. Right first rib resection and scalenectomy
6. Range of motion and scapular stabilizer strengthening
7. Two months post-operatively, persistent symptoms while swimming
8. Recurrent occlusion of right subclavian vein which improved with balloon angioplasty
9. Two weeks after angioplasty, recurrent occlusion of right subclavian vein when shoulder abducted 45°