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Sodium Density Associates with Nighttime Systolic Blood Pressure in Young Healthy Adults

Michael R. Axler, Andrea J. Lobene, Kathryn E. Kaseman, Yasmine Awayes, Shannon L. Lennon. University of Delaware, Newark, DE

High sodium diets can lead to increased blood pressure (BP), arterial stiffness, and subsequent cardiovascular disease (CVD). Sodium recommendations aimed at lowering CVD risk are given in absolute amounts and do not account for total energy intake, making it difficult for individuals with greater energy intakes to meet daily recommended targets. Dietary sodium density (i.e. mg sodium/kcal energy) has been suggested to be a stronger determinant of BP than absolute sodium intake; however, the relation between sodium density and vascular health has yet to be studied in normotensive adults. **PURPOSE:** To examine the association between sodium density and ambulatory BP and arterial stiffness in young, normotensive, healthy adults. **METHODS:** Sixty-two participants (23M/39W, age 27±6 years, BMI 23.4±2.7 kg/m², BP 115±10/67±7 mmHg) recorded their habitual diet for three days and wore an ambulatory BP monitor to assess 24-hour, daytime, and nighttime BP. Arterial stiffness was assessed by pulse wave velocity (PWV) and wave reflection with augmentation index (AIx). Associations between absolute sodium intake and sodium density with BP and stiffness measures were assessed using bivariate and partial Pearson correlations. **RESULTS:** On average, participants consumed 2029±547 kcals and 3250 ± 1231 mg sodium. Sodium intake ($r=0.312$, $p=0.027$) and sodium density ($r=0.349$, $p=0.013$) both correlated with nighttime systolic BP but not nighttime diastolic BP nor daytime or 24 hr systolic or diastolic BP. After controlling for age and sex, both sodium intake ($r=0.436$, $p=0.014$) and sodium density ($r=0.564$, $p<0.001$) remained significantly associated with nighttime systolic BP. There were no significant correlations between sodium intake or sodium density and PWV or AIx (all $p>0.05$). **CONCLUSION:** These data suggest sodium density is associated with elevated BP, specifically nighttime systolic BP in healthy young men and women suggesting it relates to BP as strongly as absolute sodium intake.

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Blood Flow Restricted Electrical Stimulations to Prevent Symptoms of Muscle Damage

Tyler D. Baer, Kevin A. Rice, Scott J. Dankel. Rowan University, Glassboro, NJ.

Both electrical stimulations (E-STIM) and blood flow restriction (BFR) have been shown to attenuate symptoms of muscle damage when applied after damaging exercise. We are aware of no studies that have tested whether performing E-STIM and BFR simultaneously can produce even greater effects than one individual mode. **PURPOSE:** To determine if performing E-STIM under BFR would result in a greater protective effect by attenuating or preventing the onset of muscle damage. **METHODS:** Individuals completed one set of eccentric elbow flexion exercises to induce muscle damage. Immediately after the bout of exercise, and 24h post-exercise, individuals completed a low frequency E-STIM protocol on both arms. The amplitude was set to the minimal amplitude required to observe a muscle contraction. One arm completed this protocol without BFR while the other had 2-minute bouts of complete occlusion separated by 1-minute deflation periods throughout the 20-minute protocol. Measurements of discomfort (Borg CR10+) and isometric strength of the elbow flexors were taken 24h and 48h after the damaging exercise, while muscle thickness was measured 48h post. Bayesian repeated measures ANOVAs with uninformed priors were used to compute Bayes Factors (BF_{10}) for ($BF_{10}<0.33$) or against ($BF_{10}>3$) the null hypothesis. **RESULTS:** A total of 18 individuals (9 females) completed the study. There were main effects of time for muscle thickness (pre: 3.5 cm; 48h post: 3.8 cm; $BF_{10}=88.476$), discomfort (pre: 0.0 au; 48h post: 4.2 au; $BF_{10}=241.996$), and isometric strength (pre: 278 N; 48h post: 232 N; $BF_{10}=10{,}289.894$) which were all changed as a result of the damaging exercise protocol, but there were no differences between conditions (all $BF_{10}<0.28$). **CONCLUSION:** While BFR itself may have utility for preventing the onset of muscle damage, it does not appear to have any additive effect when combined with low frequency E-STIM. Future studies may wish to examine alternative E-STIM and/or BFR protocols aimed at preventing the onset of muscle damage.

Effects of High Functional Resistance Training on Parameters of Arterial Stiffness- Pilot Study

Collin B. Barnett, Masoud X. Moghaddam, Brent F. Fedorko, Jessica M. Walter, Lisa M. Marquette, Tim J. Werner. Salisbury University, Salisbury, MD

Arterial stiffness is a strong predictor of cardiovascular disease risk. Identifying and characterizing stimulants and developing therapeutic strategies has become an important undertaking in recent years. It is correlated with age, smoking, alcohol abuse, sleep deprivation, inactivity, and dietary patterns among other things. Additionally, aerobic activity has consistently shown to attenuate markers of arterial stiffness in otherwise healthy adults. What is less understood is the overall impact of high functional resistance training on vascular compliance. There is a void in the literature with only one cross-sectional study conducted on the topic. **PURPOSE:** To determine the effects of an 11-week high functional resistance training program on indices of arterial stiffness. **METHODS:** 12 participants (18-40 years old) were control were recruited from the surrounding community and placed in the habitual training (HT) group (n = 5; >2 years of CrossFit experience), or control (CON) group (n = 7; <6 months of CrossFit experience). Participants in the CON group were asked to refrain from exercise during the study period. All participants completed a series of tests including body composition, arterial tonometry, blood pressure acquisition, and dynamic endurance and muscular strength assessments at baseline and follow-up. Repeated measures analysis of variance was used to examine the effects of treatment and the treatment-order interaction on arterial stiffness. **RESULTS:** There were no significant group effects in carotid-femoral pulse wave velocity (cfPWV) (-4.5 ± 20.7 vs. -11.2 ± 15.7 percent change; $p = 0.17$), carotid-radial PWV (crPWV) (-10.4 ± 23.5 vs. -17.8 ± 13.4 percent change; $p = 0.06$), beta-stiffness index (14.4 ± 3.7 vs. 14.9 ± 18.2 percent change; $p = 0.35$), and arterial compliance (AC) (13.7 ± 7.5 vs. 18.8 ± 19.8 percent change; $p = 0.27$) in the CON and HT groups, respectively. **CONCLUSION:** Our findings indicate high functional resistance training does not augment arterial stiffness in habitual participants.

Impact of Caloric Restriction and Exercise on Trimethylamine N-oxide Metabolites in Women with Obesity

Daniel J. Battillo and Steven K. Malin, FACSM, Rutgers University, New Brunswick, NJ 08901

Trimethylamine N-oxide (TMAO) has been linked to cardiovascular disease (CVD) through, in part, arterial stiffness and altered central hemodynamics. While a low-calorie diet (LCD) is considered primary in lowering plasma TMAO, the impact of exercise is unclear. **PURPOSE:** Examine if LCD+interval exercise (LCD+INT) reduces TMAO more than LCD in relation to hemodynamics, prior to clinical weight loss. **METHODS:** Women with obesity (n=23; 48.0±2.4y; 37.9±1.4kg/m^2) were randomized to either LCD (n=12; mixed meals of ~1200 kcal/d) or LCD+INT (n=11; 60 min/d supervised INT at 90% HRpeak for 3 min and 50% HRpeak for 3 min) for 2-wks. A 350kcal shake was provided post-INT to equate energy availability between groups. A 180min 75g OGTT was performed pre- and post-intervention to assess fasting TMAO and precursors (carnitine, choline, betaine, and trimethylamine (TMA)). Pulse wave analysis (applanation tonometry) including augmentation index (AIx75), brachial (bBP) and central blood pressure (cBP), pulse pressure amplification (PPA), forward (Pf) and backward pressure (Pb) waveforms, and reflection magnitude (RM) at 0, 60, 120, and 180min was also analyzed. Subgroup analysis was performed on responders and non-responders to treatments. **RESULTS:** LCD and LCD+INT comparably reduced weight (P<0.01), fasting insulin (P=0.03), glucose (P=0.05), and choline (P<0.01), as well as Pf (P=0.04). Only LCD+INT increased VO_2peak (P=0.03). Despite no overall treatment effect, higher baseline choline and TMAO associated with greater reductions in choline (r=-0.63, P<0.01) and TMAO (r=-0.45, P=0.03). As such, LCD and LCD+INT responders comparably reduced TMAO (P=0.03), TMA (P<0.01), carnitine (P<0.01), choline (P<0.01), and betaine (P<0.01). Reduced TMAO associated with increased PPA (r=-0.48, P=0.03). Reductions in TMA correlated with reduced 120min Pf (r=0.68, P<0.01) and greater 0min RM (r=-0.64, P<0.01). Similarly, reduced carnitine related to lowered 120min Pf (r=0.68, P<0.01) and increased 0min RM (r=-0.59, P<0.01). **CONCLUSION:** LCD and LCD+INT did not differentially improve TMAO and related precursors. Yet, reduction in TMAO metabolites favored aortic waveforms. This highlights caloric restriction as a key mechanism impacting TMAO metabolism.

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The Acute Effects of a Caffeine-based Multi-ingredient Energy Drink Compared to Caffeine on Muscular Endurance

Morgan E. Blanchflower, Jacob D. Eger, Mariah M. Francis, Joseph L. Kolb, Hannah M. Smith, Jeffery D. Buxton, Phillip J. Prins. Grove City College, Grove City, PA

Commercially manufactured energy drinks are heavily promoted as capable of enhancing performance (such as muscular endurance) due to the presence of a range of active ingredients including caffeine. However, evidence for the capacity of these additional ingredients (e.g., taurine), either alone or in combination with caffeine, to enhance performance is limited. **PURPOSE:** To compare the effects of a popular energy drink (ED) containing a moderate dose of caffeine (4 mg/kg BM) or an equivalent dose of anhydrous caffeine (CAF) with a noncaffeinated control beverage (PLA) on upper and lower body muscular endurance performance in trained participants. **METHODS:** Thirteen trained males (20.7 ± 0.8 yrs. old, 179.8 ± 9.1 cm, 82.3 ± 15.2 kg) participated in a double-blind, placebo-controlled, crossover-design study involving 3 experimental conditions. Participants were randomly administered a volume-matched ED (6.3 mL/kg body mass [BM] containing 4 mg/kg BM caffeine), CAF (4 mg/kg BM given in powder form), or a PLA 60 min before performance of 3 sets of bench press (BP) and squat (SQ) at 60% 1RM to failure. Blood lactate (BL) was assessed at baseline, after all BP sets and after all SQ sets. Session affect and RPE were assessed at the end of each trial. **RESULTS:** There were no significant differences between drinks in total repetitions completed for BP (CAF 41.8 ± 6.9, ED 40.1 ± 6.2, PLA 40.1 ± 8.1; $p>0.05$) and SQ (CAF 45.3 ± 11.4, ED 41.4 ± 11.7, PLA 42.8 ± 11.4; $p>0.05$). Additionally, there were no significant differences in BL, session affect, or RPE (p's>0.05). **CONCLUSION:** These results do not unequivocally support an ergogenic effect of a popular caffeine-based multi-ingredient ED above caffeine or a placebo with respect to upper and lower body muscular endurance in trained males.

The Reliability and Validity of an Accelerometer to Measure the Pop-Up Phase of Surfing

Richard J. Boergers[1], Jerry-Thomas Monaco[1,2], Thomas Cappaert[2], Michael Miller[2,3].
[1]Seton Hall University, Nutley, NJ, [2]Rocky Mountain University, Provo, UT, [3]Western Michigan University, Kalamazoo, MI.

Surfing athletes require upper-body strength to change from a prone paddling position to a standing position in one explosive movement often referred to as the pop-up. Therefore, high levels of upper-body force production and tactical skill within a short time constraint is critical for this motion to be successful. Force plates are considered the gold standard for measuring kinetic forces in relation to time, but they are also very expensive and not portable. Similarly, accelerometers measure the acceleration forces acting on an object and can monitor the object's movement in relation to time, but they are portable. **PURPOSE:** The purpose of this study is to assess the inter-trial reliability and criterion validity of using an accelerometer to measure time (s) during the pop-up phase of surfing. **METHODS:** We recruited 12 self-identified healthy and active adults (male=5; female=12) (age: 26.0±8.2 yrs; height: 172.25±13.93 cm; mass: 67.7±13.57 kg). Each subject was instructed by the primary investigator (PI) on how to perform the pop-up maneuver (the subjects performed 3 practice trials) on a flat surface over a yoga mat. The PI attached an accelerometer at the tibial tuberosity on the lead leg and asked to perform 5 trials of the pop-up over the force plate. A 15 second rest period was given after each trial. An accelerometer sensor (2.7 x 3.7 cm) was used to collect time data (s) on the subject performing the pop-up maneuver. The data from the wireless accelerometer sensor and force plates were synced by way of motion capture software. Interclass Correlation (ICC) was used to evaluate inter-trial reliability for the pop up. Pearson correlation coefficient (Pearson's *r)* was used to evaluate the relationship of time of the pop up for the accelerometer and force plate. **RESULTS:** There was good agreement (ICC=.889, p=.001) of pop-up times for all trials. There was very strong correlation (*r*=.810, p=.001) between the accelerometer (.63±.11 s) and force plate (.73±.13 s) pop up times. **CONCLUSION:** These findings suggest that an accelerometer is a reliable and valid measurement tool to assess time to pop-up for surfers.

Relationship Between Exercise Motivation, Exercise Enjoyment, and Daily Cognition of Collegiate Student-Athletes

Dinh Bui, Brooks Bear, Kyra Gerber, Jenna Lytle, Sarah Nealon, Samuel T. Forlenza. Shippensburg University, Shippensburg, PA

Exercise can have a profound effect on the levels of neurotransmitter in the brain following a workout, which can influence brain functions throughout the day, such as cognition. How much someone enjoys exercising and their motives to exercise can also have an impact on these benefits. Most research has focused on acute benefits to cognition, often executive functioning. However, less research has explored the benefits to general cognitive functioning throughout the day, including in the athletic population. **PURPOSE:** To investigate the relationship between exercise and cognitive functions, motivation, and exercise enjoyment in Division 2 student-athletes. **METHODS:** Fifty-seven Division 2 student-athletes (38 female, 19 male) between 18 and 25 yrs consented to participate in this study. Participants completed the following questionnaires: Behavioral Regulations in Exercise Questionnaire (BREQ-3), Physical Activity Enjoyment Scale (PAES), Attentional Function Index (AFI), and a demographic measure. Pearson correlations were performed to determine if any relationships existed between the various forms of motivation (BREQ-3), exercise enjoyment (PAES), and daily cognition (AFI). **RESULTS:** Results revealed that amotivation was positively correlated with attentional lapses ($r=.32$, $p=.017$) and negatively correlated with enjoyment ($r=-.31$, $p=.019$). Enjoyment was also positively correlated with all internalized forms of motivation: identified regulation ($r=.43$, $p<.001$), integrated regulation ($r=.27$, $p=.044$), and intrinsic motivation ($r=.37$, $p=.005$). The effective action subscale was positively correlated with enjoyment ($r=.42$, $p=.001$) and two of the three internalized forms of motivation: identified regulation ($r=.38$, $p=.004$) and intrinsic motivation ($r=.41$, $p=.002$). **CONCLUSION:** Results showed that student-athletes who are self-motivated to exercise and enjoy exercising also have better cognitive functions throughout the day. In contrast, amotivation towards exercise is linked with increased distractibility throughout the day.

Evaluation of Cytokine Pattern in Perivascular and Intramuscular Fat During Heart Failure

Maria Canellas da Silva[1], David J. Song[1], Yuan Liu[1], William S. Evans[1], Sarah Kuzmiak-Glancy[1], Steven J. Prior[1,2]. [1]University of Maryland, College Park, MD. [2]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center and Research and Development Service, Baltimore, MD.

Adipose tissue (AT) is responsible for energy storage and release, but also has several endocrine and immunomodulatory actions. AT can secret a variety of cytokines that play an important role in immune regulation and therefore impact overall body health. Increased fat accumulation is strongly associated with inflammation and the onset of cardiovascular disease including heart failure (HF). TNFα and IL10 are two important pro- and anti-inflammatory cytokines respectively, but their specific effects in HF remain elusive. Moreover, the contribution of AT from different anatomic regions to the immune imbalance seen in HF is not completely understood. **PURPOSE:** Compare secretion of IL-10 and TNFα between intramuscular (IMAT) and perivascular AT (PVAT) from male and female rats with or without HF. **METHODS:** Four-week-old Sprague-Dawley rats underwent transverse aortic constriction (TAC) to induce cardiac pressure overload, hypertrophy, and HF. Forty weeks post-surgery, the rats were sacrificed and IMAT and PVAT samples were collected from the lower limb and aorta, respectively. AT samples were cultured in M199 medium for 24h and conditioned medium was collected for analyses. TNFa and IL-10 were quantified by ELISA in 11 TAC and 9 control (SHAM) rats. Cytokine levels were normalized and expressed as pg of cytokine/g of AT. Statistical analyses were performed using a two-factor ANOVA. **RESULTS:** PVAT secreted higher amounts of IL-10 (850± 52 *vs* 95 ± 45 pg/g, $p<0.01$) and TNFa (290 ± 49 *vs* 25 ± 11 pg/g, $P<0.005$) than IMAT from both TAC and SHAM rats, combined. There were no differences in IL-10 secretion between TAC and SHAM for PVAT (756 ± 114 *vs* 774 ± 113, $p>0.05$) or IMAT (89 ± 17 *vs* 97 ± 20, $p>0.05$). Likewise, TNFa secretion from PVAT (251 ± 123 *vs* 328 ± 65, $p>0.05$) and IMAT (15 ± 7 *vs* 34 ± 23, $p>0.05$) did not differ between TAC and SHAM samples, respectively. However, when comparing sexes, PVAT from females secreted higher amounts of IL-10 than males (1053 ± 124 *vs* 643 ± 81, $p=0.016$). **CONCLUSION:** Compared with IMAT, PVAT is secretes greater amounts of both pro- and anti-inflammatory cytokines, with higher secretion of anti-inflammatory IL-10 in females compared with males. Further analysis of additional cytokines is needed to fully elucidate the relationship between AT and inflammation in HF in male and female rats.

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Comparison of Near-Infrared Spectroscopy Measured Muscle Metabolism with Predicted Whole-Body Metabolism

Gregory L. Chartier, Grace E. Dietz, Rian Q. Landers-Ramos, Nicolas D. Knuth. Towson University, Towson MD

Resting metabolic rate (RMR) comprises the majority of energy expenditure in a given day and is associated with overall health. Research has shown that an altered RMR is associated with illness, disease, and mortality. Skeletal muscle (SM) is one of the largest contributors to RMR and evaluation of SM metabolism may provide more detail on the association between altered metabolism and disease. **PURPOSE:** To explore the relationship between whole-body RMR and rate of resting muscle oxygen consumption using near-infrared spectroscopy (NIRS) at four different muscle beds. **METHODS:** A NIRS device was placed on the belly of the muscle of participants (n=13, age = 30 ± 10 yrs) and a pneumatic rapid inflation cuff placed proximal to the testing site to occlude arterial blood flow. While laying supine, participants experienced 5 minutes of rest followed by three rounds of 30s arterial occlusion and 30s of rest. This protocol was conducted at the medial gastrocnemius (MG), brachioradialis (BR), vastus lateralis (VL), and tibialis anterior (TA). Differences in oxygenated and deoxygenated hemoglobin (Hb_{diff}) at each testing site were collected and the average rates of resting muscle oxygen consumption ($\%/s^{-1}$) for each muscle were calculated. RMR was predicted from recorded age, height, and weight of each participant using the Mifflin-St. Jeor equation and was compared to NIRS measures of muscle metabolism through Pearson correlations. **RESULTS:** Resting rate of oxygen consumption was significantly lower in the MG (0.08±0.04 %/s, $p<0.05$) compared to the other muscle tissue (BR: 0.17±0.05 %/s; TA: 0.14±0.07 %/s; VL: 0.13±0.07 %/s). BR showed a greater correlation between muscle oxygen consumption rate and predicted RMR while the TA had the lowest correlation, however none of the correlations were significant within the different muscles tested (BR: b=0.43, p=0.17; MG: b=0.33, p=0.33; VL: b=0.36, p=0.27; TA: b=0.09, p=0.77). **CONCLUSION:** Though differences in oxygen consumption rates were found between the different muscles tested, no significant relationships were found with predicted RMR. Further evaluation should include direct measure of RMR through indirect calorimetry.

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The Relationship Between Daytime Sedentary Behavior and Sleep Health in Desk-based Workers

Caitlin A. Cheruka[1], Mara E. Egeler[2], Andrew G. Kubala[1], Joshua O. Paley[1], Olivia M. Vogan[1], Rachel M. Sanders[1], Sanjay R. Patel[1], Martica H. Hall[1], Subashan Perera[1], Bethany Barone Gibbs[3], Christopher E. Kline(FACSM)[1] [1]University of Pittsburgh, Pittsburgh, PA; [2]University of Arkansas, Fayetteville, AR; [3]West Virginia University, Morgantown, WV

Adults with desk-based occupations may have higher amounts of sedentary behavior (SB). Greater amounts of SB are independently associated with negative health outcomes. The health risks of excessive SB may be due to poor sleep health; however, the relationship between SB and sleep health is unclear. **PURPOSE:** To examine the relationship between SB and sleep health in a sample of adults who are desk-based workers. **METHODS:** Data were collected on 168 desk-based workers with elevated blood pressure (51.8% female; 85.7% White race; age=44.4±10.8 y; body mass index [BMI]=31.1±6.5 kg/m^2). SB was objectively measured by the activPAL3 micro, worn for approximately 7 days; SB variables were overall daily SB, SB spent in bouts ≥30 minutes (SB30), SB spent in bouts ≥60 minutes (SB60). Sleep was objectively measured using the Actiwatch Spectrum, concurrently worn with the activPAL3 micro for approximately 7 days. Self-reported sleep was assessed using Pittsburgh Sleep Quality Index and Epworth Sleepiness Scale. Six dimensions of sleep health (regularity, satisfaction, alertness, timing, efficiency, and duration) were categorized as "good" or "poor" from the objective and self-reported sleep measures; a composite score summed good sleep health dimensions on a scale of 0-6, with higher scores indicating better sleep health. Linear regression models examined the relationship between SB and sleep health with adjustment for age, gender, race, and BMI. **RESULTS:** The mean daily time spent in SB was 662.2±93.8 min, with 384.0±125.8 min and 202.9±116.0 min each day spent in SB bouts of ≥30 min and ≥60 min, respectively. The mean sleep health score was 4.7±1.1, with 23.2% of the sample meeting "good" for all six sleep health dimensions. No measure of SB was significantly associated with overall sleep health (each $p>0.50$). Overall daily SB was not significantly associated with any of the individual domains of sleep health (each $p>0.86$) except sleep midpoint ($\beta=0.16$, $p=0.04$). Greater time spent in SB bouts ≥30 min and ≥60 min were also associated with later sleep midpoint ($\beta=0.18$ [$p=0.01$] and $\beta=0.16$ [$p=0.03$], respectively). **CONCLUSION:** These cross-sectional analyses showed that SB was generally not associated with sleep health in a sample of highly sedentary adults. Future work should examine whether intervening SB impacts sleep health.

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Sprinting Velocity Increases Through Postactivation Potentiation with a Hex-Bar Farmers Walk

Jeffrey T. Chimenti, Jordan L. Cola, Jason Wicke, Michael A. Figueroa. William Paterson University, Wayne, NJ

Postactivation Potentiation (PAP) is an enhanced muscle contractile response for a given activation following a maximum or near maximum voluntary contraction. Inducing PAP can commonly elicit acute postactivation performance enhancements that may be used to enhance in-competition performance, with the greatest responses using exercises of similar movement patterns. However, very few studies have induced PAP for sprinters with a conditioning exercise (CE) of a similar movement pattern to examine subsequent sprinting performance. **PURPOSE:** To examine the influence of initiating PAP with a hex-bar farmers walk (HBFW) on subsequent 20 m sprint performance. **METHODS:** Recreationally trained individuals (n = 12, age 23 ± 2 years), performed five 20 m sprints at baseline, 4, 8, 12, and 16 minutes after a walking control (C), light farmers walk (LFW) with 70% their hex-bar deadlift (HBD) 1-Repetition Maximum (RM), and heavy farmers walk (HFW) with 80% their HBD 1-RM, no less than 48 hours apart. Comparisons were made using paired samples t-tests. **RESULTS:** Mean (M) sprint velocities ($m \cdot s^{-1}$) over 20 m were similar between trials at baseline. Thereafter, 20 m sprint velocities significantly improved during the LFW condition at 8 minutes ($M = 6.03$, $SE = 0.14$, $p < 0.001$), 12 minutes ($M = 6.05$, $SE = 0.15$, $p < 0.001$), and 16 minutes ($M = 6.03$, $SE = 0.14$, $p = 0.010$) compared to previous baseline sprints ($M = 5.91$, $SE = 0.14$, $p < 0.05$). The HFW condition yielded significant increases to sprint velocities at 4 minutes ($M = 6.03$, $SE = 0.14$, $p = 0.004$), 8 minutes ($M = 6.03$, $SE = 0.14$, $P = 0.002$), 12 minutes ($M = 6.01$, $SE = 0.13$), $p = 0.001$), and 16 minutes ($M = 5.99$, $SE = 0.13$, $p = 0.026$) compared to subject's baseline sprints ($M = 5.93$, $SE = 0.14$, $p < 0.05$). Most notably, sprint velocity significantly increased during the LFW condition at 8 minutes ($M = 6.03$, $SE = 0.14$, $p = 0.025$), 12 minutes ($M = 6.05$, $SE = 0.15$, $p = 0.016$), and 16 minutes ($M = 6.03$, $SE = 0.14$, $p = 0.011$) when compared to their respective control condition intervals ($M = 5.96$, $SE = 0.14$; $M = 5.97$, $SE = 0.15$; $M = 5.94$, $SE = 0.14$; $p < 0.05$). No change to sprinting velocity was witnessed across either of the C conditions. **CONCLUSION:** Sprinting performance is enhanced after a HBFW, when an optimal amount of time is allotted to reduce the initial fatigue. However, the magnitude of enhancement appears to differ with the load of the CE.

Acute effect of ketogenic diet on metabolic flexibility during exercise in adults

Wonhee Cho[1], Justin Y. Jeon[2], Joon Young Kim[1]. [1]Syracuse University, Syracuse, NY, [2]Yonsei University, Seoul, South Korea

A ketogenic diet (KD) has shown positive effects on metabolic improvement in individuals with chronic diseases; however, we found that 3-days of KD causes impaired exercise efficiency (EE) by 11% during the graded exercise testing (GXT) when compared to 3-days of mixed diet (MD). To explain potential mechanism(s) responsible for impaired EE by KD, we hypothesized that metabolic flexibility (ability to adjust substrate use in response to a physiological stimulus) will be blunted during the GXT after KD vs. MD. **PURPOSE:** We aimed to compare acute effects of KD vs. MD on metabolic flexibility during the GXT in adults. **METHODS:** Fourteen adults (age 26.3±3.1 [SD] years; BMI 23.6±4.2 kg/m^2) completed the following procedures: 3-days of MD (15% fat, 25% protein, 60% carbohydrate), 3-days of wash-out, and 3-days of KD (75% fat, 20% protein, 5% carbohydrate). Upon completion of each diet arm, all participants completed the GXT on treadmill with low- (LIE; 40% of VO_2max), moderate- (MIE; 55%), and high-intensity exercise (HIE; 70%). Metabolic flexibility was estimated by the changes in respiratory quotient (DRQ) from resting to LIE to MIE to HIE to recovery period in both diet arms. Repeated measures ANOVA with Bonferroni's post-hoc tests were used to examine DRQ over the GXT by two diet arms (i.e., interaction). Pearson correlation was used to examine bivariate relationship between metabolic flexibility and EE (%). Statistical significance was set at $p < 0.05$. **RESULTS:** Baseline RQ was lower in KD vs. MD (0.75±0.1 vs. 0.84±0.1, $p<0.01$), and fat oxidation was higher in KD vs. MD (1.1±0.3 vs. 0.6±0.3 kcal/min, $p<0.01$). Significant interactive effects were observed for the group by time on DRQ ($F=3.58$; $df=2.1$; $p<0.01$), indicating that (after the KD vs. MD), DRQ was blunted (a) from resting to LIE (-0.013±0.01 vs. -0.076±0.01) and (b) from MIE to HIE (0.116±0.02 vs. 0.163±0.01), all $p<0.01$. DRQ correlated positively with EE ($r=0.437$; $p<0.05$). **CONCLUSION:** Our data suggest that 3-days of ketogenic diet could cause metabolic inflexibility during the GXT, potentially explaining the relationship between KD and exercise inefficiency. Our positive correlation between metabolic flexibility and EE further supports our hypothesis/speculation. Combined effects of KD and exercise training on metabolic flexibility should be uncovered.

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High Antioxidant Load Impairs Cutaneous Microvascular Function In Healthy Young Women

Virginia G. Content, Auni C. Williams, Gabrielle A. Dillon, Lacy M. Alexander, FACSM The Pennsylvania State University, University Park, PA

PURPOSE: Human cutaneous circulation is used as a bioassay to assess mechanisms underlying vascular dysfunction in a variety of populations. Local drug interventions (intradermal microdialysis), including Atorvastatin (statin; LOX inhibitor), have been used to elucidate mechanisms underlying microvascular dysfunction in cohorts with accelerated cardiovascular disease risk. Additionally, systemic drugs (e.g., oral salsalate) have been used to further elucidate these mechanisms. However, high antioxidant load from these localized and systemic treatments may impair endothelial function in healthy control groups. **METHODS:** In a randomized placebo control design oral salsalate (1500mg/twice daily/5 days) was used to assess the impact of systemic inflammation on cutaneous vascular function. Two intradermal microdialysis fibers were placed into the ventral forearm skin of eight healthy control women (32±3 yrs). Cutaneous blood flow was measured via Laser-Doppler flowmeter probes placed in local heating units set to a thermoneutral temperature of 33°C. Increasing concentrations of acetylcholine (ACh; Endothelial nitric oxide synthase agonist) from 10^{-10} to 10^{-1} M were perfused with lactated Ringer's (control) or 0.02 mM statin sequentially for 5 min each. Following the dose-response protocol, local skin temperature was increased to 43°C and 28 mM sodium nitroprusside was perfused to elicit maximal cutaneous vasodilation. Brachial blood pressure was measured every 5 min. Cutaneous vascular conductance (CVC) was calculated (red blood cell flux/mean arterial pressure) and normalized as a percentage of the site-specific maximum (%CVC_{max}). **RESULTS:** There was no impact of oral salsalate at either control or local statin sites (p=0.3411). Following salsalate intake, there was a significant reduction in %CVC_{max} at the statin treated site (control 56± 17% vs statin 34± 11% 10^{-5} M, control 65± 17% vs statin 41± 14% 10^{-4} M, control 64± 16% vs statin 41±13% 10^{-3} M ACh; p=0.0078, 0.0045, 0.0069, respectively). **CONCLUSION:** Combination of oral salsalate and localized treatment with statin resulted in attenuated endothelial function. In healthy women, five-day oral salsalate intake and local statin may result in high antioxidant load creating a shift in redox balance leading to impaired endothelial function.

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Association Between Measures of Body Composition and Functional Movement in Cancer Survivors

Marie-Therese J. Cooper, Laken O. Hill, Kristofer S. Wisniewski. Saint Francis University, Loretto, PA

Body composition is known to change in individuals with a history of cancer. Cancer survivors may also have impairments in functional mobility, decreased overall strength, and increased risk of falls compared to those without histories of cancer. Currently, there is limited research comparing various measures of body composition with clinical mobility assessments. **PURPOSE:** The purpose of this study was to examine the relationships between measures of body composition and functional movement in cancer survivors. **METHODS:** Subject were 15 cancer survivors (6 male, 9 female), aged 65.1 ± 11.1 years and BMI 31.8 ± 9.6 kg/m^2. Body composition measures of skeletal muscle mass (SMM), skeletal muscle index (SMI), and percent lean body mass (%LBM) were assessed using an InBody770. Functional movement assessments included 8-foot Timed Up and Go (TUG), 6-meter gait speed walking at normal pace (normal GS) and as fast as comfortable (fast GS), and 30-sec Chair Stand (CS). **RESULTS:** Significant negative correlations were found between SMI and normal GS ($r = -0.532$, $p = 0.041$), SMM and fast GS ($r = -0.594$, $p = 0.020$), SMI and fast GS ($r = -0.684$, $p = 0.005$), SMM and CS ($r = -0.730$, $p = 0.002$), and SMI and CS ($r = -0.566$, p = 0,028). Significant positive correlations were found between SMM and TUG ($r = 0.751$ $p = 0.008$), SMI and TUG ($r = 0.614$, $p = 0.044$), and %LBM and fast GS ($r = 0.730$, $p = 0.002$). SMM and SMI showed positive correlations with body weight of $r = 0.902$ ($p < 0.001$) and $r = 0.882$ ($p < 0.001$), respectively. SMM and SMI showed positive correlations with BMI of $r = 0.744$ ($p = 0.001$) and $r = 0.926$ ($p < 0.001$), respectively. **CONCLUSIONS:** Results demonstrated that body composition indicators of LBM showed moderate to strong inverse relationships with functional assessments performance. Subjects in the current study with higher SMM and SMI produced lower scores on these assessments. However, they also had more body weight and higher BMIs than those with lower SMM and SMI and better functional scores. Therefore, the excess weight may have contributed to the poorer functional assessment scores. Future studies should examine these relationships further.

Core Temperature Responses to Compensable vs. Uncompensable Heat Stress in Young Adults (PSU Heat Project)

Rachel M. Cottle, Zachary S. Lichter, Daniel J. Vecellio, S. Tony Wolf, and W. Larry Kenney, The Pennsylvania State University, University Park, PA

Purpose: With global warming, much attention has been paid to the upper limits of human adaptability. However, the time to reach a generally-accepted core temperature criterion (40.2°C) associated with heat-related illness above (uncompensable heat stress) and just below (compensable heat stress) the upper limits for heat balance remains unclear. **Methods:** Forty-eight (22 men/26 women; 23±4 y) subjects were exposed to progressive heat stress in an environmental chamber during minimal activity (MinAct, 159±34W) and light ambulation (LightAmb, 260±55W) in warm-humid (WH; ~35°C, >60% RH) and hot-dry (HD; 43-48°C, <25% RH) environments until heat stress became uncompensable. For each condition, we compared heat storage (S) and the change in gastrointestinal temperature (ΔT_{gi}) over time during compensable and uncompensable heat stress. Using the slopes of the T_{gi} response, we estimated the time to reach T_{gi}=40.2°C. Finally, we examined whether individual characteristics or seasonality were associated with the rate of increase in T_{gi}. **Results:** During compensable heat stress, S was higher in HD than in WH environments ($p<0.05$) resulting in a greater but more variable ΔT_{gi} ($p\geq0.06$) for both metabolic rates. There were no differences among conditions during uncompensable heat stress (all $p>0.05$). There was no influence of sex, aerobic fitness, or seasonality, but a larger body size was associated with a greater ΔT_{gi} during LightAmb in WH ($p=0.003$). **Conclusion:** Sustained light activity *without intervention* in uncompensable thermal environments may result in a T_c of 40.2°C (from a 37°C baseline) in 3-7 hours even in young adults vs. several days under compensable heat stress.

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Exploring Attitudes about Weight and Weight Stigma Among Undergraduate Health Science Students

Tyler Countess[1], MS, LAT, ATC, Krista L. Rompolski[1], PhD, Travis Pollen[2], PhD, [1]Moravian University, Bethlehem, PA, OR, [2]Thomas Jefferson University, Philadelphia, PA

Weight stigma is commonly described as the rejection, discrimination, or devaluation of those who do not fit societal norms of body weight and shape. Weight stigma is frequently experienced by patients in the healthcare setting, but it is uncertain where and when healthcare providers develop the weight bias that leads to stigmatizing patients. **PURPOSE:** To measure the prevalence of weight bias among undergraduate health profession students and examine if and how a lesson on weight bias and stigma influenced the magnitude of weight bias over time. **METHODS:** In the first week of a senior capstone course focused on social issues in healthcare, students were invited to complete an anonymous survey that assessed their attitudes about weight and weight stigma. In week 3, students were asked to read an article and listen to two podcasts about weight stigma prior to an in-class lesson. Students were asked to repeat the survey eight weeks later. The Attitudes Towards Obese Persons Scale (ATOP) and Modified Weight Bias Internalization Scale (WBIS) were used to measure weight stigma and internalized weight bias, respectively. Higher Scores on the WBIS and lower scores on the ATOP denote more negative attitudes towards fatness. Pre- and post-intervention scores were compared using a paired samples t-test (ATOP) and Wilcoxon Signed Rank Test (WBIS). The relationship between body mass index (BMI) and ATOP changes scores was assessing using Spearman's ρ. **RESULTS:** 18 students (13 females, 5 males; body mass index = 25.3 ± 4.9) completed the initial survey and 11 students completed the post-intervention survey. There were no significant differences in ATOP ($p = 0.70$) or WBIS total scores ($p = 0.80$) compared to baseline scores. Participants with higher BMI tended to have higher score changes (Spearman's $\rho = 0.44$), which indicates less bias towards overweight or obese individuals' post-intervention, although this relationship was not statistically significant ($p = 0.17$). **CONCLUSION:** Understanding how weight bias develops among future healthcare providers is critical. In this preliminary study, weight bias was prevalent among senior health professions students. There was a tendency towards more positive post-intervention ATOP scores, but only in individuals with a higher BMI. Longer interventions with larger sample sizes may be necessary.

Consistency is Key for Activity: Sleep Duration Regularity is Associated with Increased Activity in Children

Michele N. D'Agata, Bray Fedele, Elissa K. Hoopes, Melissa A. Witman, FACSM. University of Delaware, Newark, DE

Children are recommended 9-11 hours of sleep per night and at least 60 minutes of moderate-vigorous physical activity (MVPA) per day, which are known to prevent childhood obesity and other poor cardiometabolic outcomes. Short sleep duration has been associated with lower MVPA and higher sedentary behavior in children, indicating that these behaviors may simultaneously contribute to poor cardiometabolic health in this life stage. However, previous studies tend to rely on subjective estimates of sleep duration, or fail to consider other metrics of sleep health, like sleep regularity. Thus, the extent to which sleep regularity relates to activity and sedentary time in children is unclear. **PURPOSE**: To evaluate associations between objectively estimated sleep and activity metrics in typically developing 7-12-year-old children. We hypothesized that shorter and less regular sleep duration would be associated with less MVPA, less steps/day, and more sedentary time/day. **METHODS**: 28 children (10 ± 2 years; 13 M/15 F) completed 7 consecutive days of 24/7 wrist accelerometry. Sleep metrics included average sleep duration (total time asleep) and sleep duration standard deviation (SDSD), a measure of sleep regularity (calculated as the standard deviation of nightly sleep durations). Physical activity metrics included average MVPA (min/day) and step count (steps/day), as well as sedentary time (min/day). Pearson's *r* correlations were used to evaluate associations between sleep and our metrics of interest. **RESULTS**: On average, sleep duration was 7.63 ± 0.67 hrs/night, SDSD was 0.83 ± 0.58 hrs, MVPA was 6.88 ± 1.80 hrs/day, step count was 11752 ± 2910 steps/day, and sedentary time was 5.60 ± 1.45 hrs/day. Sleep duration was not associated with our metrics of interest ($p > 0.25$ for all). However, SDSD was negatively associated with steps/day ($r = -0.39$, $p = 0.04$) and positively associated with sedentary time ($r = 0.41$, $p = 0.03$). Though not significant , the association between SDSD and MVPA ($r = -0.33$, $p = 0.09$) was in the hypothesized direction. **CONCLUSIONS**: Irregular sleep duration is associated with less physical activity and more sedentary time in children. These findings suggest the importance of promoting both regular sleep habits and physical activity in youth.

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The Effects of COVID-19 Restrictions on College Students Physical Activity and Mental Health

Justin A. DeBlauw[1], Daniela German[1], Aaron Jaggernauth[1], Brian Lora[1], Noa Schabes[1], Raymani Walker[1], Farouq Yusuf[1], Mary Stenson[2], W. Astrid Mel[3], Steve J. Ives[1]. [1]Skidmore College, Saratoga Springs, NY, [2]University of Minnesota-Duluth, Duluth, MN, [3]Mercy College, Dobbs Ferry, NY

The public health restrictions put in place by colleges and states to reduce the spread of the COVID-19 resulted in forced isolation and modifications to health-related behaviors. College students suffer from high levels of stress and anxiety while also failing to meet the recommended physical activity guidelines. The restrictions and uncertainty associated with COVID-19 may have exacerbated this situation.

PURPOSE: To determine if students engaged in a reduced number of days, intensity, and minutes of exercise during health-related restrictions from COVID-19. Additionally, to determine if students experienced increased levels of anxiety, stress, and depression during health-related restrictions from COVID-19. Finally, to explore whether roommate status and location of permanent residence played a mediating role.

METHODS: Five-hundred and forty female (n =382), male (n =132), and non-binary (n =23) students completed a 29-question survey. The survey consisted of yes-no, multiple choice, or Likert scale questions on individual demographics, living arrangements, physical activity (i.e., days, minutes, intensity), sleep, diet, and mental health (i.e., sleep, anxiety, depression).

RESULTS: Significant changes in weekly days of exercise (pre=3 vs. post=6, p=0.001, ES=0.663) and intensity (p=0.001, ES=0.464) were reported. Additionally, increases in anxiety (x^2=471, p=0.001), stress (x^2=516, p=0.001), and depression (x^2=331, p=0.001) were reported. Student most frequently reported an increase in aerobic training (n=92) and a combination of reduced aerobic and resistance training (n=92). Significant main effects were found for ethnicity (x^2 = 17.8, p = 0.003) and northeast region residence (x^2 = 7.96, p = 0.005) on changes in stress. Significant main effects were observed for gender (x^2 = 16.9, p = 0.001), ethnicity (x^2 = 15.9, p = 0.007), and northeast region residence (x^2 = 6.86, p = 0.009,) on anxiety. Significant main effects were found for gender (x^2 = 16.0, p = 0.001) and ethnicity (x^2 = 14.9, p = 0.011) on depression.

CONCLUSION: Even in the face of pandemics, it is important for colleges to establish opportunities for students to engage in physical activity and exercise outside of recreational centers to allow them to meet recommendations while mitigating stress, anxiety, and depression.

Trends in Moderate-to-Vigorous Physical Activity among Veterans: Findings from the National Health Interview Survey 2011-2020

Jacob P. DeBlois, Andrew S. London, Kevin S. Heffernan. Syracuse University, Syracuse, NY

The "Healthy Soldier Effect" postulates that service members have lower rates of mortality compared with civilians due to military physical requirements, frequent physical screenings, and access to medical care. However, this effect may wane over time resulting in similar or increased mortality rates. Declines in moderate-to-vigorous physical activity (MVPA) post-service may contribute to the reduced health of veterans. **PURPOSE:** Compare age-related changes in MVPA among veterans to civilians over the past decade. **METHODS:** Data from 2011-2020 of the National Health Interview Survey were examined for age, sex, veteran status, and self-reported MVPA. To account for age differences between groups, age was assessed in decade increments beginning at 20 years until 80+ years. MVPA was expressed as $min \cdot wk^{-1}$ and classified by meeting the 2018 Federal physical activity guidelines as follows: "Inactive" (0 $min \cdot wk^{-1}$); "Below Guidelines" (1-149 $min \cdot wk^{-1}$); "Meets Guidelines" (150-300 $min \cdot wk^{-1}$); and "Exceeds Guidelines" (300+ $min \cdot wk^{-1}$). The influence of study year, age, and veteran status on MVPA was determined using an analysis of variance with Bonferroni-corrected alpha levels while controlling for sex. Differences in MVPA guideline classifications were assessed via Chi-square. **RESULTS:** A total of 203,092 civilians and 22,803 veterans were included for analysis. Both groups reduced MVPA with older age ($p \leq 0.03$). Veterans had greater MVPA for the ages 20-29 yrs (353.5 ± 336.3 vs 285.8 ± 303.5 $min \cdot wk^{-1}$, $p < 0.001$), 30-39 yrs (342.8 ± 323.7 vs 257.5 ± 287.6 $min \cdot wk^{-1}$, $p < 0.001$), 40-49 yrs (270.2 ± 294.4 vs 230.1 ± 276.2 $min \cdot wk^{-1}$, $p < 0.001$), and 70-79 yrs (193.0 ± 271.9 vs 157.2 ± 238.0 $min \cdot wk^{-1}$, $p = 0.01$). MVPA was similar for 50-59 yrs, 60-69 yrs, and 80+ yrs ($p \geq 0.06$). Across age groups, a greater proportion of veterans than civilians exceeded Federal MVPA guidelines (15.5-48.0% vs 10.0-39.8%, $p \leq 0.006$). **CONCLUSION:** Data from a large-scale, nation-wide study show that, over the last decade, veterans participate in more MVPA than their civilian counterparts at almost every age and were more likely to exceed the physical activity guidelines. While follow-up studies with objective assessments of MVPA are warranted, this study suggests that reduced MVPA may not contribute to the waning "Healthy Soldier Effect" observed in veterans.

The Effect of Low-Density Lipoprotein Cholesterol on T-Cell Mitochondrial Respiration

Theodore M. DeConne[1], Houston R. Ward[1], Ibra S. Fancher[1], Daniel W. Trott[2], David G. Edwards[1], Christopher R. Martens[1]. [1]University of Delaware, Newark, DE, [2]University of Texas at Arlington, Arlington, TX.

Aging is associated with an increase in chronic, sterile, low-grade inflammation, known as "inflammaging". Inflammaging is implicated in the development of multiple diseases, including cardiovascular disease. Immune cells are one of the primary sources of inflammaging, of which T-cells play a major contributing role. Mitochondria are essential for maintaining proper T-cell function and reduced mitochondrial respiration ($Mito_{RESP}$) induces T-cell dysfunction and shifts T-cells towards a pro-inflammatory phenotype. Aging has been shown to impair T-cell $Mito_{RESP}$; however, the mechanisms have not been fully elucidated. Age-related increases in circulating low-density lipoprotein cholesterol (LDL-C) are cross-sectionally associated with lower $Mito_{RESP}$ in circulating immune cells, but whether LDL-C is causally related to impaired $Mito_{RESP}$ in T-cells is not known. We hypothesized that treating T-cells *in vitro* with a high concentration of exogenous LDL-C would impair T-cell $Mito_{RESP}$. **METHODS**: Seven young adults were recruited for this study (6 female / 1 male, age: 23 ± 2 years, BMI: 23.29 ± 6.4 kg/m^2, total cholesterol: 154 ± 16 mg/dl, high-density lipoprotein cholesterol: 59 ± 17 mg/dL, & LDL-C: 78 ± 14 mg/dL). $CD4^+$ and $CD8^+$ T-cells were separated from peripheral blood mononuclear cells isolated using magnetic bead separation (Miltenyi). $CD4^+$ and $CD8^+$ T-cells were treated exogenously with a physiologically normal (1.8 mMol/L) and high (4.9 mMol/L) concentration of LDL-C for 24 hours. $Mito_{RESP}$ was assessed using extracellular flux analysis (Agilent). **RESULTS:** High LDL-C lowered basal (1.8 mMol/L: 0.47 ± 0.06 pMol/min/10^5 cells vs. 4.9 mMol/L: 0.35 ± 0.10 pMol/min/10^5 cells, p=0.031) and ATP-linked oxygen consumption rate (OCR) (1.8 mMol/L: 0.51 ± 0.13 pMol/min/10,000 cells vs. 4.9 mMol/L: 0.35 ± 0.12 pMol/min/10^5 cells, p=0.016) in $CD8^+$ T-cells. High LDL-C also lowered ATP-linked OCR in $CD4^+$ T-cells (1.8 mMol/L: 0.69 ± 0.23 pMol/min/10^5 cells vs. 4.9 mMol/L: 0.54 ± 0.22 pMol/min/10^5 cells, p=0.031), but did not statistically alter basal OCR (p=0.063). **CONCLUSION:** Treatment with a high LDL-C impaired $Mito_{RESP}$ in T-cells. Future studies should explore the relation between T-cell $Mito_{RESP}$ and cardiovascular function in humans.

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A Pilot Weight Loss Program for Parents of Children with a Disability

Julia L. Depuy, Payson A. Wisniewski, Olivia R. Garrison, Cassandra W. Kim, and Gerald J. Jerome, FACSM, Towson University, Towson MD 21252

Obesity is a significant public health issue for both adults and children. Lifestyle approaches to weight management that include changes to diet and physical activity are effective for both adults and children. Research indicates that parental weight loss is associated with child weight loss. Therefore, a parent focused approach to supporting healthy weight in children could benefit children with disabilities who are excluded or lack access to health promotion programs. Adaptable weight loss programs are needed to support parents with varying child-care responsibilities. **PURPOSE:** This pilot study evaluates a 12-week, evidence-based weight loss program for parents of children with a disability. The main outcome was parental weight loss, and a secondary outcome was parent adherence with coaching sessions. **METHODS:** Participants were ≥ 18 years old with a child (8-18 years) who had a disability. Inclusion criteria for the parent included BMI ≥ 25, internet access, and willingness to participate in a lifestyle-based weight loss program. Participants were offered program materials, tailored weekly emails, and weekly video coaching from trained undergraduate students. The 12-week weight loss program included recommendations for calorie reduction, increased physical activity, regular self-weighing, and self-monitoring of these activities. The study was conducted remotely. Weight was assessed at baseline and 12 weeks using study scales that transmit data using cellular technology. Participants provided weights on 3 days during a 7-day period. Staff verified the weights with the participants, and the 3-day average was used in analyses. Compliance with weekly coach calls, weight monitoring, diet tracking and physical activity was also tracked. A Wilcoxon signed-rank test was used to examine changes in weight. **RESULTS:** The participants (n=13) were female, predominately Non-Hispanic White (77%) with an average age of 46 years and BMI of 35. The average weight loss was 2.9(SD = 2.8, p = .006) kgs or 3.2% (SD = 3.2, p = .005) of baseline weight. Participants completed 89% of the weekly coaching sessions and 62% achieved the study goal of 5-pound weight loss. **CONCLUSION:** A remote delivered weight loss program using student coaches appears effective in supporting weight loss among parents of children with a disability.

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The authors have no conflicts of interest to report.

Surveying Athletic Trainers on COVID-19 Incidence and Severity Among Athletes

Daniel D DeSio, Victoria Coles, Sara Campbell, PhD, FACSM, Rutgers University, New Brunswick NJ

PURPOSE: To survey athletic trainers (ATs) and examine the experiences of their athletes during COVID-19 infection and incidence of Post-Acute Sequalae of COVID-19 (PASC). **METHODS:** ATs across various disciplines were surveyed through electronic solicitation and in collaboration with the National Athletic Trainers' Association. A comprehensive 30 question Qualtrics survey was designed to assess the severity of COVID-19 as well as presence and length of long-term sequelae. Additionally, ATs were asked about how underlying health conditions impacted their athletes' recovery, athletes' symptoms, as well as how return-to-play (RTP) protocols were implemented. The data was analyzed using Qualtrics StatsiQ. **RESULTS:** In total, 138 ATs consented to participate. Most ATs completing the survey reported their patients were between the ages of 12-25, with a large population of NCAA Division I and III athletes. ATs who participated covered many sports with the most frequently reported being men's and women's basketball, and women's volleyball. ATs (n=117) noted that they had patients with mild-moderate symptoms. However, 60 ATs noted <25% of their patients had severe symptoms, and 23 ATs reported that <25% of their patients were hospitalized. Roughly half of ATs (n=57) noted that their patients experienced PASC, with the majority lasting >4 weeks but less than 3 months. Of the 57 ATs reporting they had patients with PASC, 10 reported <25% of cases were asymptomatic, 75-95% of cases were mild-moderate, and <25% of cases were severe. ATs (n=57) felt their patients' recoveries were impacted by underlying health conditions. Asthma was the most predominant underlying condition (n=46) followed by diabetes (n=9). Furthermore, ATs reported that of these patients 60% also experienced PASC. Finally, 86% of ATs reported utilizing RTP protocols with 61.2% utilizing a gradual exercise progression. **CONCLUSION:** This survey is one of the first comprehensive evaluations of ATs experience with their patients regarding COVID-19 and PASC. Results demonstrate that while most patients had mild-moderate symptoms, some had severe symptoms and required hospitalization, deviating from the narrative that young patients were immune from severe infection. Results also demonstrate lacking uniformity in the implementation of RTP protocols.

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Establishing the Reproducibility of Mitochondrial Capacity using Near-Infrared Spectroscopy

Grace E. Dietz, Gregory L. Chartier, Nicolas D. Knuth, Rian Q. Landers-Ramos. Towson University, Towson, MD

Near infrared spectroscopy (NIRS) has been used as a valid measure of skeletal muscle oxidative capacity. Some studies have indicated non-uniform measures of NIRS-derived measures of oxygen consumption within a specific muscle bed. Thus, determining standardization of protocols and reproducibility of NIRS-derived muscle oxidative capacity is critical to ensure trusted responses. **PURPOSE:** Establish the reproducibility of NIRS-derived skeletal muscle oxidative capacity within the medial gastrocnemius muscle. **METHODS:** Eight healthy participants (35 ± 10 years old) participated in two visits to the lab scheduled 2-7 days apart. For each visit, a NIRS device was placed on the belly of the medial gastrocnemius muscle of the subject's dominant leg. A pneumatic cuff capable of rapid inflation was placed on the same leg proximal to the tibiofemoral joint. Laying supine, participants were instructed to voluntary plantarflex their foot against an exercise band for 30s followed immediately by 6 rapid arterial occlusions lasting 5s each with 5s recovery between occlusions. The protocol was repeated four times, and a physiological calibration was performed to correct for changes in blood volume. Differences in oxygenated and deoxygenated hemoglobin (HB_{Diff}) were collected continuously using NIRS. Recovery rate constants (min^{-1}) following the plantarflexion exercise were derived from analyses of HB_{Diff} signals to estimate skeletal muscle oxidative capacity. Location of the device was marked, and the protocol was repeated 2-7 days later. Intraclass correlation coefficients (ICC) was used to determine intra- and inter-day reproducibility of results. **RESULTS:** The recovery rate constant for oxygen consumption was 1.55 ± 0.37 min^{-1} on Day 1 and 1.72 ± 0.41 min^{-1} on Day 2 ($p=0.62$). Day 1 and 2 ICCs for four repeated trials were 0.888 and 0.932, respectively. The ICC between days 1 and 2 was 0.908. **CONLCUSIONS:** The intra- and inter-day ICC for mitochondrial capacity measures of the medial gastrocnemius indicated good reproducibility using NIRS. These data support the use of NIRS to reliably assess mitochondrial capacity in younger adults.

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Relationships Between Vascular Function and Social Determinants of Health in Young Black and White Adults

Lauren E. Eagan, Sara E. Mascone, Cynthia M. Weiner, Emily F. Blake, Sushant M. Ranadive. University of Maryland, College Park, MD

Black adults experience higher rates of cardiovascular disease (CVD) than their White counterparts. Measures of vascular function (via flow-mediated dilation, FMD) can predict CVD risk, even in young adults. However, the data regarding the racial differences in vascular health among Black and White adults is inconsistent, in part due to race being a social construct. Thus, the role of Social Determinants of Health (SDoH) are important in assessing vascular health especially when comparing different races. However, the relationship between SDoH and FMD have yet to be studied among young Black and White adults. **PURPOSE:** To determine the relationships between self-reported SDoH conditions and FMD among young Black and White adults. **METHODS:** 16 young adults (20±2 y; Black, n=8) self-reported quality of and/or access to adequate: health care; nutrition; education; housing; social acceptance; financial stability; and low-stress environments using 5-point Likert scales. Vascular function was assessed via FMD in response to an ischemic stimulus. The mean response to each SDoH question, sum of the SDoH questionnaire (sum SDoH-Q), and FMD were compared between Black and White adults. Pearson's correlation coefficients were calculated between each SDoH condition and FMD, as well as between the sum SDoH-Q and FMD. **RESULTS:** Self-reported quality of and/or access to adequate: nutrition ($p=0.035$), housing ($p=0.011$), low-stress environments ($p=0.007$), social acceptance ($p=0.022$), and financial stability ($p=0.0001$) were significantly lower among Black as compared to White adults. While the sum SDoH-Q was also significantly lower in Black than White adults (26.00±3.38 vs. 32.75±1.83, $p<0.0001$), there were no significant differences in %FMD (5.18±4.34 vs. 4.36±3.10, $p=0.675$). In Black adults only, %FMD was negatively correlated with self-reported quality of and/or access to adequate: education ($p=0.031$, $r=-0.755$), low-stress environments ($p=0.023$, $r=-0.777$), and financial stability ($p=0.017$, $r=-0.801$). **CONCLUSION:** Self-reported quality of and/or access to adequate low-stress environments and financial stability are significantly lower and share negative relationships with vascular function in young Black adults.

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Carbohydrate Mouth Rinse vs. Ingestion and Swim Performance

Rebecca F. Entner, Nick Griffin, Sarah Nealon and William A. Braun (FACSM), Shippensburg University, Shippensburg, PA

PURPOSE: The purpose of this study was to study the effects of carbohydrate (CHO) ingestion (ING) vs. mouth rinse (MR) on swim performance during swim training in collegiate level swimmers. **METHODS:** The study used 17 (8 Female, 9 Male) swimmers from Shippensburg University. A 15% CHO solution (50 ml) was used for testing. This was administered on two testing days: one as MR (10 second swish) the other as ING. On the third testing day, the subjects were given a 50 ml non-CHO placebo (PL) treatment. The participants swam a cycled practice (three cycles, each consisting of 1 x 300 yd, 2 x 150 yd, 6 x 50 yd, with increasing intensity) followed by a 200 yard, timed, freestyle performance trial. CHO or placebo was supplied prior to each cycle and prior to the 200 yd performance swim. Blood lactate and glucose, heart rate, rating of perceived exertion (RPE) and 200 yd performance time were measured. **RESULTS:** There were no group differences for any of the variables tested. Performance times were: 133.85 (MR), 133.01 (ING), 133.71 sec (PL). Mean blood lactate across conditions was: 3.35 (MR), 3.41 (ING), 3.8 $mmol \cdot L^{-1}$ (PL). Mean overall BG by condition was: 95.95 (MR), 99.84 (ING), 98.09 $mg \cdot dl^{-1}$ (PL). Significant time effects were detected for blood lactate, heart rate, and RPE. **CONCLUSION:** Based on the results of this study we conclude that neither ingestion or mouth rinse of CHO during a swim training session was found to improve 200 yd swimming performance completed at the end of the training session.

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Exercise Variety Associates with Low Adiposity and Better Emotional Wellbeing in Adults with Metabolic Syndrome

Aqib Fahumy[1], Jaclyn K. Dosik[1], Daniel J. Battillo[1], Todd A. Hagobian[2], FACSM, Steven K. Malin[2], FACSM, [1]Rutgers University, New Brunswick, NJ 08901; [2]California Polytechnic State University, San Luis Obispo, CA 93407

Exercise is linked to low cardiovascular disease (CVD) risk, in part, through weight loss and enhanced insulin sensitivity. While these benefits are linked to time spent being physically active (PA), less is known about how exercise variety relates to favorable metabolic health and emotional well-being. **PURPOSE**: To test the hypothesis that greater exercise variety would associate with low adiposity, metabolic health, and emotional wellbeing. **METHODS:** Forty adults with obesity (n= 30F; 54.7±1.2y; 36.6±0.8kg/m^2) were classified using the Minnesota Leisure Time PA Questionnaire (MLTPA) on variety. Those who completed walking for at least 10 min/wk of moderate-vigorous PA (MVPA) to 1 additional PA were classified LOW variety (n=10). However, those who completed 2+ PA above walking were classified Moderate(Mod)-HIGH (n=30). Total exercise energy expenditure was determined using the activity metabolic index (AMI), and activity intensity was defined as light, moderate, and heavy. PA pattern subgroup analysis was performed using 7-d accelerometry (n=26). A 120min euglycemic-clamp (40mU/m^2/min, 90 mg/dL) assessed metabolic insulin sensitivity (glucose infusion rate (GIR)). The Pittsburgh Sleep Quality Index determined sleep quality and the Veterans Rand-36 assessed quality of life. Fasting leptin, body composition (DXA), and aerobic fitness (VO_2max) were also assessed. **RESULTS:** There were no differences in body fat, metabolic insulin sensitivity, PA patterns, or VO_2max between groups. However, Mod-HIGH participants were older (54.7±1.2 vs. 49.6±1.8; P=0.01) and tended to have lower body fat (42.7±1.3 vs. 47.1±1.8 %; P=0.07) and better LDL/HDL ratios (2.6±0.2 vs. 3.2±0.3; P=0.05) than LOW. Further, Mod-HIGH had fewer role limitations due to emotional problems (P<0.01) and more normal social activities and social functioning (P=0.01) than LOW. Exercise variety related to lower LDL/HDL (r=-0.34, P=0.04) and leptin (r=-0.62, P<0.01). Lower leptin also related to heavy AMI (r=-0.54, P=0.03), higher VO_2max (r=-0.50, P=0.04) and lower body fat (r=0.61, P=0.02). **CONCLUSION:** Exercise variety related to better blood lipids, body fat and emotional well-being. More work is needed to understand if exercise variety impacts activity adherence and CVD risk reduction.

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A Comparison of Warm-up Effects on Maximal Aerobic Exercise Performance in Children

Avery D. Faigenbaum, Jie Kang, Michael DiFiore, Caitlyn Finnerty, Andy Garcia, LeeAnn Cipriano, Jill A. Bush, Nicholas A. Ratamess, The College of New Jersey, Ewing, NJ

Cardiopulmonary exercise testing is a valid and reliable method for evaluating aerobic fitness in children, yet there are no accepted warm-up protocols for pediatric exercise testing. **PURPOSE**: The aim of this study was to compare the warm-up effects of treadmill walking (TW) with a dynamic bodyweight warm-up (DY) on maximal aerobic exercise performance in children. **METHODS:** Sixteen healthy children (10.9 ± 1.5 vrs) were tested for peak oxygen uptake (VO_2 peak) on 2 nonconsecutive days following different 6-min warm-up protocols. TW consisted of walking on a motor-driven treadmill at 2.2 mph and 0% grade whereas the DY warm-up consisted of 9 progressive bodyweight movements including dynamic stretches, lunges, and jumps. **RESULTS**: Maximal heart rate was significantly higher following DY than TW (193.9 ± 6.2 vs 191.6 ± 6.1 bpm, respectively; $P = 0.008$). No significant differences between DY and TW were found for VO_2 peak (54.8 ± 9.6 vs 51.8 ± 8.7 ml/kg/min; $P = 0.09$), maximal minute ventilation (68.9 ± 14.8 vs 64.9 ± 9.4 L/min; $P = 0.27$), maximal respiratory exchange ratio (1.12 ± 0.1 vs 1.11 ±0.1; $P = 0.85$) and total exercise time (614.0 ± 77.1 vs 605 ±95.0 sec; $P = 0.55$), respectively. **CONCLUSION**: These findings indicate that the design of the warm-up protocol can influence the heart rate response to maximal aerobic exercise and has a tendency to influence VO_2 peak in healthy children. A DY warm-up could be a viable alternative to a TW warm-up prior to pediatric exercise testing.

β-aminoisobutyric Acid Relates to Favorable Glucose Metabolism and Adiponectin in Adults with Metabolic Syndrome

Habiba Faiz[1], Emily M. Heiston[2], and Steven K. Malin, FACSM[1 2]. [1]Rutgers University, New Brunswick, NJ, [2]Virginia Commonwealth University, Richmond, VA.

β-aminoisobutyric acid (BAIBA) is a non-protein amino acid secreted by the skeletal muscle that relates to insulin sensitivity, fat oxidation, and anti-inflammation. While BAIBA is purportedly lower in type 2 diabetes (T2D) compared with normoglycemic (NG) controls, no work has assessed this link in people with pre-diabetes (PD). **Purpose:** Examine BAIBA in people who have metabolic syndrome (MetS), with or without PD, and its relation to metabolic health. **Methods:** Adults with MetS (ATP III criteria) were categorized into NG (N=22, 20F; 48.0±2.4y; 36.9±1.2 kg/m^2) or PD (N=23, 18F; 54.2±1.6; 38.4±1.2 kg/m^2) based on ADA criteria (75g OGTT). Glucose, insulin, C-peptides, and free fatty acids (FFA) were collected during a 180-min OGTT to estimate fasting (HOMA-IR (liver)) and post-prandial (Matsuda Index (muscle)) insulin sensitivity as well as disposition index (DI; glucose-stimulated insulin adjusted for insulin sensitivity). Fasting fat oxidation (indirect calorimetry), adipokines (adiponectin and leptin), body composition (DXA) and fitness (VO_2max) were also determined. **Results:** People with NG had lower ATP III criteria (2.5±0.2 vs. 3.6±0.1, P<0.001), fasting plasma glucose (92.2±5.4 vs. 104.1±3.2 mg/dl, P=0.002), as well as glucose $tAUC_{180\ min}$ (20922.5±545.8 vs. 25633.4±1099.2 mg/dl-180min, P<0.001) when compared to those with PD. Moreover, people with NG had higher post-prandial insulin sensitivity (P=0.01) and DI_{muscle} (P=0.003) but lower DI_{liver} (P=0.001), FFA $tAUC_{180\ min}$ (P=0.028), and C-Peptide $tAUC_{180\ min}$ (P=0.02) than PD. Although people with NG and PD had similar fat oxidation (0.93±0.06 vs. 1.05±0.09 mg/kg FFM/min, P=0.31)) and BAIBA concentrations (1.4±0.1 vs. 1.2±0.1μM, P=0.23), BAIBA was associated with adiponectin (r=0.37, P=0.02) adiponectin/leptin ratio (r=0.39, P=0.01) and also correlated with lower 180-min glucose (r=-0.31, P =0.03) and insulin (r=-0.39, P=0.03) during the OGTT. Adiponectin correlated with lower 180-min glucose (ρ=-0.45, P=0.005) and higher DI_{muscle} (ρ=0.42, P=0.05). **Conclusion:** While BAIBA did not differ between MetS adults with or without PD, higher BAIBA related to favorable glucose metabolism through possibly an adiponectin related mechanism. Additional work is required to understand how exercise and/or diet impact BAIBA in relation to T2D risk.

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Sleep Regularity is Associated with Physical Activity and Sedentary Behavior in 13-17-Year-Old Adolescents

Bray Fedele, Michele N. D'Agata, Melissa A. Witman, FACSM. University of Delaware, Newark, DE

Adolescence represents a pivotal life stage marked by a circadian phase delay whereby later sleep-wake times are preferred. This shift in sleep timing may result in shorter sleep duration during the weekdays due to early school start times and longer "catch-up" sleep on the weekends. Sleep regularity is a component of sleep health that is operationalized as the variability in sleep duration (sleep duration standard deviation (SDSD)) and sleep timing (sleep midpoint standard deviation (SMSD)). Sleep irregularity has been associated with increased cardiometabolic disease risk among adolescents. Moreover, previous studies report that shorter sleep durations are linked to decreased physical activity among adolescents, which may exacerbate cardiometabolic disease risk. However, not known is the influence of sleep regularity on physical activity and sedentary behavior in adolescents. **PURPOSE**: To evaluate the associations between sleep regularity and metrics of physical activity and sedentary behavior in 13–17-year-old adolescents. We hypothesized that less regular sleep duration and timing would both be associated with decreased physical activity and increased sedentary time. **METHODS**: 13 adolescents (14 ± 1 years old; 3 M/10F) completed 7 consecutive days and nights of wrist worn actigraphy. Sleep regularity was calculated as SDSD and SMSD. Activity metrics included average moderate-vigorous physical activity (MVPA)/day, steps/day, and sedentary time/day. Pearson's *r* correlations were used to evaluate associations between variables of interest. **RESULTS**: SDSD was not associated with MVPA ($r = -0.50$, $p = 0.09$) or steps/day ($r = -0.51$, $p = 0.08$) but was positively associated with sedentary time/day ($r = 0.57$, $p = 0.04$). SMSD was negatively associated with MVPA ($r = -0.54$, $p = 0.05$) and steps/day ($r = -0.70$, $p < 0.01$), and positively associated with sedentary time/day ($r = 0.74$, $p < 0.01$). **CONCLUSIONS**: Preliminary findings suggest an important relation between sleep regularity and daily activity among adolescents. Further research should explore relations between sleep regularity, physical activity, and sedentary behaviors, particularly in this important adolescent developmental period, to encourage the maintenance of good cardiometabolic health.

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Analysis of Inter-Limb Asymmetry of Landing Forces and Ankle Injury in Warfighters: A Prospective Study

Evan D. Feigel, Matthew B. Bird, Kristen J. Koltun, Mita Lovalekar, Qi Mi, Brian J. Martin, Jennifer N. Forse, Elizabeth J. Steele, Bradley C. Nindl, FACSM. University of Pittsburgh, Pittsburgh, PA, USA

Landing is a biomechanically demanding movement performed during military tasks that increases the risk for ankle injuries (AIs). Inter-limb asymmetry of landing forces may detect risk of AIs in warfighters. **PURPOSE** To assess baseline inter-limb kinetic asymmetries during a landing task in Marine Officer Candidates (MOCs) at the start of military training and compare asymmetries between those who did and did not sustain AIs during training. **METHODS** 672 MOCs (24.9 ± 3.0 y, 174.3 ± 8.3 cm, 77.3 ± 10.8 kg, 550 men) participated. Dual force plates (Hawkin Dynamics, Portland, ME) captured kinetic data during a drop jump task from an 18-in box. Kinetic data included relative peak limb landing force ($rPLLF_{left}$, $rPLLF_{right}$) defined as peak landing force of a limb relative to body weight (N/kg). Limb Symmetry Index (LSI, [$rPLLF_x$/$rPLLF_y$]/100], %) classed MOCs into symmetrical (≥ 90%) or asymmetrical (< 90%) landing. Deidentified injury data were derived from internal medical reports. Independent samples *t* tests or Mann-Whitney U test, as appropriate, assessed differences between LSI, $rPLLF_{right}$ and $rPLLF_{left}$ in injured and uninjured MOCs. Paired samples *t* tests assessed same variables between injured MOCs with asymmetry and uninjured MOCs with asymmetry best matched (sex, age, height, weight). Statistical significance was set α=.05, two-sided. **RESULTS** Mean ± SD of $rPLLF_{left}$, $rPLLF_{right}$ and LSI were 27.4 ± 11.8 N/kg, 27.9 ± 11.6 N/kg, and 74.8% ± 0.2%, respectively. Four hundred and ninety three (73.4%) and 179 (26.6%) MOCs showed asymmetrical and symmetrical landing, respectively. Injured (n = 30) and uninjured MOCs showed no significant differences in $rPLLF_{left}$ (27.5 ± 13.0 N/kg vs 27.4 ± 11.8 N/kg, p = .905), $rPLLF_{right}$ (26.1 ± 12.8 N/kg vs 27.9 ± 11.5 N/kg, p = .535) and LSI (U = 8565.0, z = -1.0, p = .305). Injured MOCs with asymmetry (n = 25) best matched showed no significant differences in $rPLLF_{left}$ (25.9 ± 11.1 N/kg vs 26.3 ± 9.2 N/kg, p = .902), $rPLLF_{right}$ (27.2 ± 12.7 N/kg vs 27.1 ± 13.1 N/kg, p = .989) or LSI (U = 276.0, z = -.48, p = .631). **CONCLUSION** Inter-limb asymmetry of landing forces may not differ between MOCs who sustained AIs and those that did not, suggesting that other lower-limb biomechanical factors may be more pertinent for ankle injury risk detection in warfighters.

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Four Months of Kettlebell Training Improves Muscle Strength and Functional Outcomes in Older Adults

Morgan T. Fique[1], Hannah A. Zabriskie[1], Rian Q. Landers-Ramos[1], Andrea Barton[1], Kathleen Dondero[1], Nicolas D. Knuth[1], Davi A. G. Mázala[1,2]. [1]Towson University, Towson, MD; [2]Children's National Medical Center, Washington, DC

Aging is characterized by loss of muscle mass, decrease in muscle strength, and decline in bone mineral density (BMD). Resistance training has been proposed as a strategy to help attenuate these changes in older adults, but not many studies have evaluated whether high intensity strength training with free weights is effective in mitigating such age-related alterations. **PURPOSE:** Determine the effects of 4 months of kettlebell training (KT) on BMD, muscle strength, and functional outcomes in older adults. **METHODS:** Participants meeting the inclusion criteria ($\geq$60 years old and body mass index <42kg/m^2) were enrolled in the study. The KT program (2x/week) consisted of the following exercises: deadlifts, shoulder press, bent over rows, squats, and swings (3-9 sets with 4-10 reps for each exercise at a rate of perceived exertion level 7/10). Baseline assessments were conducted one week prior to initiating the training program and were repeated after 2- and 4-mo of training. At each timepoint, participants were evaluated in the following assessments: body composition and BMD (dual-energy X-ray absorptiometry), stair climb test, short physical performance battery (SPPB) test, grip strength, and knee extension torque. A repeated measures one-way Analysis of Variance was used to determine statistical differences across time. **RESULTS:** Eight subjects (2 men/6 women) completed the training (age: 70$\pm$4 yrs). Preliminary results show that 4 months of KT led to no changes in body composition (fat mass and fat free mass), BMD, time to ascend stairs, or SPPB score ($p>0.05$ for all). Time to complete the 6-meter walk test decreased from 2 to 4 months (5.0$\pm$1.0sec vs. 4.2$\pm$0.5sec; $p=0.0491$). Grip strength and knee extension torque increased from baseline to 4 months (grip strength: 27.5$\pm$6.7kg vs. 31.6$\pm$6.5kg; $p=0.0014$, knee extension torque: 72.4$\pm$19.1Nm vs. 89.5$\pm$33.2Nm; $p=0.0185$). **CONCLUSION:** The present results demonstrate that four months of high intensity strength training with free weights leads to significant improvements in functional outcomes in older adults while not altering body composition or BMD.

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Chronic Ultraviolet Radiation Exposure Does Not Effect Nitric Oxide-Mediated Vasodilation in the Cutaneous Microvasculature

Kat G. Fisher, W. Larry Kenney, and S. Tony Wolf. The Pennsylvania State University, University Park, PA

Ultraviolet radiation (UVR) exposure acutely reduces nitric oxide (NO)-dependent cutaneous vasodilation. However, the impact of chronic UVR exposure (e.g., seasonal tanning) has not been investigated. **PURPOSE:** To investigate the effect of chronic UVR exposure on the NO-dependent cutaneous vasodilation response to local heating. **METHODS:** Three intradermal microdialysis fibers were placed in the upper arm (least sun exposed), ventral forearm (moderately sun exposed), and dorsal forearm (most sun exposed) of four adults with light-to-moderate constitutive skin pigmentation. Differences in sun exposure among the sites was confirmed using the melanin-index (M-index; an index of skin pigmentation), measured via skin reflectance spectrophotometry. Lactated Ringer's solution was perfused through the microdialysis fibers while local heating to 42°C induced cutaneous vasodilation. After attaining a stable plateau in cutaneous blood flow, 15mM N^G-nitro-L-arginine methyl ester (L-NAME; NO synthase inhibitor) was perfused at all sites to quantify NO-mediated vasodilation. Red cell flux was measured using laser-Doppler flowmetry (LDF). Cutaneous vascular conductance (CVC=LDF/mean arterial pressure) was calculated for each phase of the local heating response (baseline, local heating plateau, NO-mediated vasodilation) and expressed as percent maximum (%CVC_{max}; 28mM sodium nitroprusside + 43°C local heating). **RESULTS:** M-index was highest (i.e., skin pigmentation was darkest) in the dorsal forearm (54.6 ± 14.0 a.u.) compared to the ventral forearm (39.5 ± 6.0 a.u.) and upper arm (33.1 ± 4.6 a.u.), although there were no statistical differences among the sites ($p \geq 0.03$). There were no baseline ($p \geq 0.06$) or maximal CVC ($p \geq 0.06$) differences across the three sites. Likewise, the magnitude of the local heating plateau was not different among the 3 sites (dorsal: 85.03±20.79%; ventral: 69.77±20.89%; upper: 87.28±15.00%; $p \geq 0.16$), nor was NO-mediated vasodilation (dorsal: 63±19%; ventral: 49±16%; upper: 61±6%; $p \geq 0.28$). **CONCLUSION:** These data suggest that, in contrast to the previously demonstrated effects of *acute* UVR exposure, chronic UVR exposure sufficient to cause substantial skin tanning does not alter NO-mediated vasodilation.

Relationship of Body Composition Variables and Performance Outcomes in Male Professional Soccer Players

Shay L. Fisher[1], Nyree Dardarian[1], Garrison Draper[2], Michael Bruneau Jr.[1] [1]Drexel University, Philadelphia, PA, [2] Philadelphia Union, Philadelphia, PA

Competitive environments in professional sports triggered the emergence and transformation of performance analysis. Body composition is acknowledged as a health-related component of athlete fitness that may relate to performance; however, its relationship in professional soccer players has not been elucidated. **PURPOSE:** Explore relationships between body composition and performance outcomes in male professional soccer players. **METHODS:** Nineteen professional male soccer players were assessed for body composition (lean mass, tissue mass, fat mass, fat-free mass, body fat percentage [%], and total mass) via dual-energy x-ray absorptiometry. Performance outcomes (total distance, high speed running, sprint distance, and mechanical loading) were measured for 10 weeks via GPS tracking. Multivariate regressions elucidated which body composition variables predicted performance outcomes with alphas set to $p<.05$. **RESULTS:** Total distance positively correlated with lean mass arms difference ($p=.05$), right tissue trunk mass ($p=0.04$), android tissue mass ($p=0.04$), and android total mass ($p=0.04$), and negatively correlated with arm region difference in fat % ($p=0.02$). Sprint distance positively correlated with legs difference fat mass ($p=0.02$) and negatively correlated with legs region fat % ($p=0.03$), left leg region fat % ($p=0.03$), legs tissue fat % ($p=0.03$), and left leg tissue fat % ($p=0.03$). Total distance was linearly, positively predicted from total bone mass ($p=0.004$), and negatively predicted from total body less head (TBLH) bone mass ($p=0.005$), arms difference region fat % ($p=0.03$), and arms difference tissue fat % ($p=0.02$). Sprint distance was strongly, positively predicted from legs mass fat difference ($p=0.02$), total fat regional difference ($p=0.01$), TBLH fat regional % ($p=0.01$), and negatively predicted from total right region fat % ($p=0.01$). No relationships were predicted between high-speed running and mechanical load and body composition parameters. **CONCLUSION:** Body composition related with total and sprint distance. Sports performance experts monitoring and managing player workloads may consider these relationships when making decisions on how to support athletes in optimizing their physical abilities in sport.

Psychological Resilience is Associated with Higher Physical Fitness Scores during Military Training

Jennifer N. Forse, Kristen J. Koltun, Matthew B. Bird, Mita Lovalekar, Elizabeth J. Steele, Qi Mi, Brian J. Martin, Bradley C. Nindl, FACSM. University of Pittsburgh, Pittsburgh, PA

Military training exposes candidates to physically demanding multi-stressor environments to ensure they have the ability to execute orders and complete occupational tasks when under extreme stress. The ability to adapt under stress, identified as psychological resilience (RES), has been linked to high levels of physical fitness. **PURPOSE:** To examine if physical fitness scores differ among candidates with high, moderate, and low self-reported RES. **METHODS:** 357 candidates (age: 24.82 ± 3.24 years; BMI: 25.51 ± 2.27 kg/m^2; 15.7% women) completed the Connor-Davidson Resilience (CD-RISC) scale prior to the initiation of a 10-week military training program. Candidates were grouped into tertiles based on self-reported CD-RISC score for RES (range: 53 to 100, M ± SD: 82.42 ± 9.85) defined as low (≤ 77, n = 111), moderate (≥ 78 and ≤ 87, n = 120), and high (≥ 88, n = 126). During training, candidates were scored on military-specific physical fitness tests (PFT): Combat Fitness Test (CFT), inventory PFT (iPFT), and final PFT (fPFT). Differences in fitness scores among RES groups were analyzed using a one-way multivariate analysis of variance, followed by Bonferroni adjusted pair-wise comparisons. **RESULTS:** There was a statistically significant difference in PFT performance based on a candidate's RES grouping ($p = 0.014$; partial $\eta^2 = 0.022$). Following significant univariate tests, pairwise comparisons showed mean CFT scores (high: 282.98 ± 1.59; moderate: 276.55 ± 1.63; low: 278.82 ± 1.70) were significantly greater in the high vs. moderate RES groups ($p = 0.015$), but not different between high and low RES groups ($p = 0.224$), or low and moderate RES groups ($p = 1.000$). Mean iPFT (high: 269.87 ± 1.71; moderate: 264.38 ± 1.75; low: 270.22 ± 1.82) scores were not significantly different among RES groups. Mean fPFT scores (high: 283.18 ± 1.30; moderate: 278.41 ± 1.34; low: 282.88 ± 1.39) were significantly greater in the high vs. moderate RES groups ($p = 0.033$), but did not differ between high and low RES groups ($p = 1.000$), or low and moderate RES groups ($p = 0.063$). **CONCLUSION:** Candidates with high RES scores performed better on two physical fitness tests than those with moderate RES, suggesting a potential link between high physical fitness and resilience during military training.

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Real-Time Hemodynamic Evidence Supporting the Safety of Acute Isometric Exercise

Benjamin DH. Gordon[1], Michael E. Holmstrup[2], Brock T. Jensen[2]. [1]University of Pittsburgh, Pittsburgh, PA. [2]Slippery Rock University, Slippery Rock, PA

Leading authorities recommend regular exercise as an effective first line strategy in the fight against rising blood pressure (BP). Specifically, isometric exercise has gained substantial ground as an effective nonpharmacological approach for lowering BP in individuals with and without hypertension. Yet, apprehension for adopting isometric exercise in clinical practice remains, even among experts, due in part to concerns over the safety of participants during sustained contractions. **PURPOSE:** To compare real-time hemodynamic responses during isometric and aerobic exercise in a normotensive population. **METHODS:** Seventeen normotensive males (18-35y) completed all test procedures. After a 15-minute seated rest, two BP measures were collected at 5-min intervals on three separate days to establish baseline. Using a randomized crossover design, participants were first assigned to either a three-session AER condition (moderate intensity, 8-min of cycling at 6 METS) or a three-session isometric handgrip condition (IHG; moderate intensity, 8-min (2-min alternating right and left at 30% MVC with 1-min rest periods)) with 48 hours separating each session. A one-week washout period separated conditions. For AER and IHG, BP measures were collected at 1, 4, 7, and 10 min of exercise and 2, 5, 10, 20 and 30 min of recovery. Systolic BP, diastolic BP, and heart rate were collected, and mean arterial pressure (MAP) and rate pressure product (RPP) were calculated and analyzed. A two-way, repeated measures ANOVA (time x condition) was used. **RESULTS:** There were no recorded peak BP values in excess of accepted exercise test termination criteria ($\geq$250 mmHg systolic and $\geq$115 mmHg diastolic). Significant interactions were uncovered wherein systolic BP and RPP were higher during the AER compared to IHG exercise sessions ($P<0.01$). Conversely, diastolic BP and MAP were both higher in the IHG compared to the AER condition ($P<0.01$). **CONCLUSION:** No hypertensive response to exercise was observed during either condition. IHG elicited a lower myocardial burden when directly compared to AER. Our findings suggest that an acute bout of IHG can be used safely and effectively in normotensive males. Future research should aim to quantify similar hemodynamic responses in participants with diagnosed hypertension.

Biomechanical Comparison of Open versus Percutaneous Techniques for Primary Mid-Substance Achilles Tendon Repair: A Meta-Analysis

Heath P. Gould[1] Jonathan J. Lawson[2], Sean B. Sequeira[1], Casey M. Imbergamo[1], Gregory P. Guyton[1], Walter C. Hembree[1]. [1]Medstar Union Memorial Hospital, Baltimore, MD, [2]Georgetown University School of Medicine, Washington, DC

PURPOSE: Primary repair of mid-substance Achilles tendon rupture may be performed using an open or a percutaneous technique. Previous meta-analyses of clinical data comparing the two techniques have demonstrated mostly equivalent functional outcomes and re-rupture rates. Individual cadaveric studies have also compared the biomechanical properties of the two approaches. However, the results of these studies have been heterogeneous, and there is currently no consensus as to whether one technique may be biomechanically superior. The purpose of this meta-analysis was to evaluate the biomechanical properties of open versus percutaneous Achilles tendon repair. **METHODS:** A systematic review of original research articles was performed using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. To qualify for study inclusion, articles were required to be published in English, utilized a cadaveric laboratory design, and had to directly compare the biomechanical properties of open Achilles repair using a Krackow or Kessler technique versus percutaneous repair using either the PARS (Arthrex) or Achillon (Integra) tendon repair systems. Evaluated outcomes included displacement (mm), load to failure (N), and stiffness (N/m). **RESULTS:** Nine studies met inclusion criteria, including 190 cadaveric specimens (open: 83, PARS: 56; Achillon: 51) that underwent primary mid-substance Achilles tendon repair. Pooled analysis demonstrated no statistically significant difference in displacement ($p = 0.418$), load to failure ($p = 0.923$), or stiffness ($p = 0.195$) between the open and percutaneous techniques. **CONCLUSION:** The results of this study suggest that both open and percutaneous techniques are biomechanically viable approaches for primary mid-substance Achilles tendon repair. These biomechanical findings must be interpreted in the context of clinical outcomes data as well as the differing complication profiles of the two techniques to best inform the surgical decision-making process for primary mid-substance Achilles tendon repair.

Depressive Symptomology Predicts Nighttime Central Systolic Blood Pressure Dipping in Adults

Andrew R. Heckel, Danielle M. Arcidiacono, Kailee A. Coonan, Alaina C. Glasgow, Jacob P. DeBlois, Tiago V. Barreira, Brooks B. Gump, Joon Young Kim, Kevin S. Heffernan
Syracuse University, Syracuse, NY

Blunted nighttime blood pressure (BP) dipping is correlated with an increased risk for cardiovascular disease (CVD). Psychological (depressive, anxiety, and stress symptomology) and behavioral (sleep quality and physical activity (PA)) factors have important implications for BP regulation, with improved psychological and behavioral health lowering the risk for hypertension and CVD. Whether these psychological and behavioral factors are associated with nighttime BP dipping remains unclear.
PURPOSE: To examine associations between psychological and behavioral factors with nighttime systolic BP dipping in adults. **METHODS:** Central and peripheral BP were measured in 68 adults (28±13 years, n = 45 women) from 24-hour ambulatory BP monitoring using an oscillometric BP device. Nighttime systolic blood pressure (SBP) dipping was calculated as a percentage: [(daytime SBP – nighttime SBP)/daytime SBP] x 100. Psychological and behavioral factors included: depressive symptomology (DS) using the Center for Epidemiologic Studies Depression Scale, anxiety symptomology (AS) via the Generalized Anxiety Disorder-7, perceived stress (PS) from the Perceived Stress Scale, posttraumatic stress disorder (PTSD) symptomology via the PTSD Checklist for DSM-5, sleep quality (SQ) from the Pittsburgh Sleep Quality Index, and moderate-to-vigorous PA (MVPA) levels from accelerometry. These psychological and behavioral factors were entered into a backward stepwise regression model to determine significant predictors of nighttime peripheral SBP and central SBP dipping.
RESULTS: DS was a significant predictor of nighttime central SBP dipping (β=0.305, p=0.023), explaining 30.5% of the variance in nighttime central SBP dipping. The variables excluded from the final model were AS, PS, PTSD symptomology, SQ, and MVPA (p>0.05). Factors measured herein were not associated with nighttime peripheral SBP dipping, with DS, AS, PS, PTSD symptomology, SQ, and MVPA all being excluded from the final model (p>0.05). **CONCLUSION:** DS was found to be a significant predictor of nighttime central SBP dipping, but no psychological or behavioral predictors were found for nighttime peripheral SBP dipping. These findings suggest that DS may increase CVD risk by blunting nighttime central BP dipping.

Acute Effects of Prolonged Endurance Exercise on Circulating Microparticles

James M. Heilman[1], Katherine I. Kim[1], William S. Evans[1], Odessa Addison[2,4], Rian Q. Landers-Ramos[3], Steven J. Prior[1,4]. [1]University of Maryland, College Park, MD, [2]University of Maryland, Baltimore, MD, [3]Towson University, Towson, MD, [4]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center and Research and Development Service, Baltimore, MD.

Annexin-V+ microparticles and their subpopulations are extracellular vesicles released by cells in response to various stimuli including apoptosis, cellular damage, and exercise. Microparticles are thought to be mechanisms of cell-to-cell communication between parent cells and spread phenotypic changes dependent on their stimulus of release. Short bouts of aerobic exercise are known to reduce circulating endothelial microparticles (EMPs) in healthy individuals. However, little is known about the response of microparticles to prolonged endurance exercise. **PURPOSE:** Determine the effects of prolonged endurance exercise on total circulating microparticles (TMPs), EMPs, and platelet microparticles (PMPs). **METHODS:** Eight healthy, recreational runners (41 ± 8 yrs) completed a 50-km ultramarathon trail race and underwent blood draws at baseline, 10km, 50km, and 24hrs post-race. Following isolation from plasma collected in acid citrate dextrose tubes via sequential centrifugation, microparticles were stained with fluorescent conjugated antibodies for flow cytometry to quantify annexin-V^+ TMPs, $CD31^+42b^-$ (apoptosis) and $CD62E^+$ (endothelial cell activation) EMPs, and $CD42b^+$ PMPs. T-tests were used to compare means among time points within each microparticle population. **RESULTS:** Compared with baseline, TMPs, EMPs, and PMPs were numerically lower at 10km and 50km; however, these did not reach statistical significance. There was a significant increase in TMPs (74 ± 23 vs. 180 ± 36 TMPs μL^{-1}, P = 0.03, apoptotic EMPs (7 ± 2 vs. 19 ± 5 EMPs μL^{-1}, P = 0.04), and PMPs (62 ± 14.54 vs. 121 ± 20 PMPs μL^{-1}, P = 0.04) from 10km to 24hr post-race. There was also a significant increase in TMPs (79 ± 21 vs. 180 ± 36 TMPs μL^{-1}, P = 0.03) from 50km to 24hr post-race. There were no statistically significant differences between other timepoints among the microparticle subpopulations. **CONCLUSION:** Circulating TMPs, apoptotic EMPs, and PMPs may decrease during prolonged endurance exercise possibly due to continued shear stress signaling enhanced clearance. This is followed by an increase at 24hrs post-race. Indeed, prolonged endurance exercise may accelerate uptake of circulating microparticles, with a subsequent increase in the recovery period.

The Relationship of Functional Movement Patterns and Health-Related Quality of Life

Megan P. Heintzelman [1], Heather A. Grimm [2], Deric J. Grohowski [2], Jan Kretzschmar [2]. [1] University of Delaware, Newark, DE, [2] King's College, Wilkes-Barre, PA

The Functional Movement Screen (FMS) is a low-cost, time-efficient screening tool used to assess functional mobility and postural stability, identify functional imbalances, and predict injury. The screening battery includes seven tests: deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability. The maximum total score for the FMS is 21, with a score of <14 indicating increased risk for injury. The 36-Item Short Form Health Survey (SF-36) is a widely used method for assessing health-related quality of life. The SF-36 measures eight health concepts: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health. Each concept is scored out of 100. **PURPOSE**: To investigate the relationship between functional mobility and health-related quality of life. **METHODS**: 207 individuals were recruited to participate in a free health screening. Assessments included a standard demographic questionnaire, SF-36, anthropometric measures (height, weight), and FMS. **RESULTS**: Participants were 52.7±12.0 years old, identified as male and female (57.0%), and had a mean BMI of 28.4±5.6 kg/m^2. The mean total FMS score was 11.0±3.3, with 164 (79.2%) participants scoring <14 indicating increased risk for injury. Mean SF-36 scores were generally high: role limitations due to physical health 92.0±22.2, social functioning 92.0±16.8, physical functioning 91.3±12.6, role limitations due to emotional problems 90.5±26.3, pain 81.9±18.9, emotional well-being 81.1±12.6, general health 74.7±16.6, and energy/fatigue 64.5±18.0. Of the eight health indices measured by the SF-36, ratings of physical functioning were significantly affected by the score of the deep squat ($p<.001$), hurdle step ($p=.004$), in-line lunge ($p<.001$), active straight leg raise ($p<.006$), trunk stability push-up ($p<.001$), and rotary stability ($p<.001$) tests. **CONCLUSION**: While the FMS is an established screening tool in athletic populations, it may also be beneficial for use in the general population as an easy predictor of quality of life.

The Quantification of Muscle Activation during the Loaded Carry Movement Pattern

Thomas P. Holcomb, Autumn R. Hultberg, Madison L. Nehlen, Kaitlyn E. Bergmann, Jonas D. Chan, Samuel H. Ellestad, Michael E. Holmstrup, Jeremy R. Dicus. Slippery Rock University, Slippery Rock, PA

The 'loaded carry' movement pattern is a popular resistance training activity that stresses the core musculature across multiple movement planes. Contrary to other dynamic movement patterns (i.e., squat, hinge), all loaded carries involve locomotion, the conveyance of an implement across a set distance. Variations include bilateral (i.e., farmer's carry; FC) and unilateral (i.e., suitcase carry; SC) implement positions, which recruit the core differently. To the authors' knowledge, the unique contribution of locomotion to the loaded carry has not been quantified. **PURPOSE:** To compare the activation of core musculature between the FC and SC and intensity-matched, non-locomotive farmer's (FH) and suitcase holds (SH). **METHODS:** Healthy, college-aged individuals were recruited and surface electromyography of the rectus abdominis (RA), external oblique (EO), longissimus (LT), and multifidus (MF) was measured bilateral using standard procedures. Individuals completed time- (i.e., time to walk 25 meters) and intensity-matched (i.e., body weight in plank position) randomized sets of the FC, SC, FH, and SH separated by 5-min rests. A one-way ANOVA was utilized to compare the exercises. **RESULTS:** Twenty-five apparently healthy, young individuals participated. The FC/FH load averaged 50.7±1.9 kg across two equally-weighted dumbbells. The FC elicited higher activation bilaterally in the LT (+9.2% left (L), +10.8% right (R)), MF (+9.6% L, +11.2% R), RA (+4.3% L, +6.1% R), and EO (+4.7% L, +7.3% R), respectively, compared to the FH ($P<0.05$). The SC/SH single-dumbbell load averaged 25.3±0.95 kg. There was greater activation bilaterally in the LT (+7.5% L, +2.8% R), and MF (+8.2% L, +4.6% R) during the SC compared to the SH ($P<0.05$), with a similar response noted in the contralateral ($P<0.05$). Conversely, on the ipsilateral side of the SC, the RA (+1.8%) and EO (+2.3%) displayed greater activation compared to the SH ($P<0.05$), but this was not different in the contralateral side. **CONCLUSION:** This is the first study to quantify muscle activation unique to locomotion in the loaded carry movement pattern. The FC and SC were characterized by increased core muscle activation bilaterally than matched holds, with the SC exhibiting unique additions to ipsilateral muscle activation.

Examination of 24-hour movement behaviors in home vs. office work locations

Anthony J. Holmes[1], Christopher E. Kline[1], FACSM, Lee Stoner[3], Kelliann Davis[1], FACSM, Joshua L. Paley[1], Bethany Barone Gibbs[2]. [1]University of Pittsburgh, Pittsburgh, PA, [2]University of North Carolina at Chapel Hill, Chapel Hill, NC, [3]West Virginia University, Morgantown, WV

PURPOSE: Healthy 24-hour movement behaviors can positively impact health and quality of life. Despite recent increases in working from home and the implications that may have on daily movement and sleep patterns, little is known about the 24-hour movement behaviors of home-based workers compared to office-based workers. This study examined 24-hour movement behaviors across work locations. **METHODS**: This secondary analysis used baseline data from the RESET BP clinical trial which enrolled inactive, desk-based workers with elevated blood pressure (n=270, mean age: 45.3±11.6 years, BMI: 30.66±7.1 kg/m^2, 60.8% women). Participants wore an activPAL (thigh), Actigraph (waist) and Actiwatch (wrist) for 7 days to measure sedentary behavior (SB), physical activity (PA), and sleep. ActivPAL measured total SB, SB accumulated in bouts of ≥30 mins (SB30) and ≥60 mins (SB60) and standing time. Actigraph measured moderate-to-vigorous intensity PA (MVPA). Actiwatch measured sleep duration (n=170). We calculated light PA by subtracting total SB, standing time, and MVPA from total monitor wear time. Worksite location (home vs. in-office) was determined by self-report. Demographics were compared across work locations using independent t-tests. Linear regression compared 24-hour behaviors across work locations, adjusting for age, bmi, gender, and waking wear time where appropriate. **RESULTS**: Home and office workers did not differ on demographics or body mass index ($p>0.05$). Participants spent 71% of waking hours in SB, and this did not differ by worksite location ($p=0.16$). Home workers spent significantly more time in SB30 (37.1 ± 16.5 minutes/day, $p=0.03$) and SB60 (39.0 ± 15.3, $p=0.01$) than office workers. Sleep duration was significantly different between groups, with home workers accumulating 433.5 ± 45.4 sleep minutes/day, 15.8 minutes/day more than office workers (417.4 ± 45.8, $p=0.02$). **CONCLUSIONS**: Home workers have significant differences in prolonged SB and sleep behaviors when compared to office workers. Further research is needed to understand the drivers of these different behaviors as well as whether there are negative physical and psychological consequences associated with these different 24-hour behavior patterns.

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No Racial or Gender Disparities in Cardiac Rehabilitation Attendance after CABG

Tara Honeycutt, Melissa A Reed, Jeffrey Harris, Meghan G. Ramick. West Chester University, West Chester, PA

Cardiac rehabilitation (CR) is an important element in improving the health and quality of life of patients with numerous cardiovascular disease diagnoses. In the United States, this form of monitored exercise and patient education provided by healthcare professionals is under prescribed and underutilized. Furthermore, research has revealed disparities in patient referral to and utilization of CR based on race and sex, among other characteristics. Previously, we demonstrated racial disparities in CR attendance in patients undergoing a percutaneous coronary intervention (PCI) procedure at a particular hospital.

PURPOSE: The purpose of this study was to determine if racial or gender disparities exist in CR attendance (defined as engaging in at least one session of CR) in patients who have undergone coronary artery bypass graft (CABG) surgery. METHODS: Data from patients who had undergone CABG surgery between 1/1/2017 and 1/31/2021 were provided by a local hospital. Data included age, race, gender, medical insurance, procedure, date of surgery/discharge, CR referral and CR attendance. Patients were grouped into white (W) vs nonwhite (NW), males vs females, attended vs not attended, referred (yes, no, N/A), types of insurance (none, one type, more than one type) and Pre COVID (1/1/2017-2/29/2020) vs Post COVID (3/1/2020-1/31/2021). Chi-Squared tests of independence were used to determine association between the aforementioned variables and CR attendance in those who were referred. RESULTS: There was no effect of race on CR referral with 92.9% of patients being referred ($p=0.877$). Of those referred, there was no effect of race on attendance (71.3% of W attended vs 75% of NW; $p=0.721$). There was also no effect of gender on attendance (72.7% of males attended vs 67.2% of females, $p=0.415$). There was an effect of insurance on attendance with 45.5% of patients with no insurance attending, 72.6% of patients with one type of insurance attending, and 75.5% of those with more than one insurance attending, $p=0.016$). Finally, there was no effect of COVID on attendance (72.0% attended pre COVID vs 69.6% post COVID, $p=0.725$). CONCLUSION: Racial and gender differences did not impact CR attendance. However, it was demonstrated that the insurance did play a role in CR attendance.

Fatigue Index is Affected by Repetitive Transcranial Magnetic Stimulation Target but not Protocol

Juliana R. Hougland, Maria C. Canino, Felix Proessl, James M. Baker, Deanna R. Huck, Ryan J. Campbell, Meaghan E. Hazelet, Bradley C. Nindl, FACSM, Shawn D. Flanagan. University of Pittsburgh, Pittsburgh, PA.

Repetitive transcranial magnetic stimulation (rTMS) has been used in clinical populations to improve motor function by modulating corticospinal excitability (CSE). Two methods of rTMS, continuous theta burst stimulation (cTBS) and intermittent theta burst stimulation (iTBS), can decrease (cTBS) or increase (iTBS) CSE, thus impairing or improving motor performance. Nevertheless, the impact of these rTMS procedures on a healthy population is unclear. **PURPOSE:** To examine differences between cTBS and iTBS over the pre-supplementary motor area (preSMA) and leg representation of the motor cortex ($M1_{LEG}$) on anaerobic performance measures. **METHODS:** 54 participants (21 women, age: 26.9±6.2y, BMI: 24.1±3.4kg/m^2) either received cTBS (N=26) or iTBS (N=28) over the preSMA or $M1_{LEG}$. rTMS was delivered as 600 pulses at 50Hz either continuously (cTBS) or with 8s breaks every 30 pulses (iTBS). Stimulation intensities for the preSMA and $M1_{LEG}$ were selected as 80% of active motor threshold (defined as the minimum single pulse TMS intensity needed to produce a motor evoked potential in a target muscle) for the rectus abdominis and vastus lateralis, respectively. 20min after the rTMS intervention, participants performed one Wingate Anaerobic Test on a cycle ergometer. A 2min self-paced warm-up and a 15s lead-in at 100RPM/125W was given prior to the test. Mean and peak RPM, anaerobic capacity and power, and fatigue index were assessed using a 2 (group: cTBS, iTBS) by 2 (target: preSMA, $M1_{LEG}$) mixed-method ANOVA. **RESULTS:** Fatigue index (range=5.2-27.7W/s) was higher for $M1_{LEG}$ than preSMA ($M1_{LEG}$=13.3±5.1W/s, preSMA=12.5±4.9W/s, $F_{1,52}$=4.6, p=0.04), but there was no difference between groups ($F_{1,52}$=0.2, p=0.7). Mean RPM (range=62-149RPM), peak RPM (range=105-186RPM), anaerobic capacity (range=4.6-10.9W/kg), and anaerobic power (range=7.7-13.7W/kg) did not differ by group (F range=0.1-0.2, p range=0.7-0.8) or target (F range=1.2-3.9, p range=0.1-0.3). **CONCLUSION:** Fatigue index increased (participants experienced more fatigue) after rTMS over the $M1_{LEG}$ compared to the preSMA, but stimulation protocol (cTBS vs iTBS) did not have an impact, nor were other measures affected by rTMS protocol or target. Future research could assess the influence of other protocols, such as suprathreshold rTMS, on anaerobic performance.

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Effects of Short-term 3-Day Caloric Restriction on Cardiometabolic Health in Overweight and Obese Individuals

Stephen J. Ives, Anna I. Churchill, Brigitte C. Yunda, Christopher J. Kotarsky, Justin A. DeBlauw. Skidmore College, Saratoga Springs, NY

Obesity is a major risk factor for developing cardiometabolic disease, but also characterized by impaired fat metabolism. Dietary interventions have been explored as mitigating strategies, including caloric restriction (CR), but little is known about the acute or short-term changes with caloric restriction and often such diets are not standardized. **PURPOSE:** To assess the impact of a standardized 3-day caloric restriction diet (~500kcal/d) on cardiometabolic health and fat metabolism in individuals who are overweight or obese. **METHODS:** Fifteen men and women were assessed pre-post 3-day CR using standardized commercially available diet; specifically, body weight and body composition (% body fat, visceral fat score (Vfs), Tanita RD-545), waist-hip circumferences, blood pressure and vascular stiffness (Sphygmocor Xcel), resting energy expenditure (REE) and substrate utilization (respiratory quotient, RQ) via metabolic cart Parvomedics), and blood glucose and lipid profile (Cholestech LDX) in overweight and obese adults pre- and post-dietary intervention. **RESULTS:** The CR diet induced changes in body weight (93.1±15.2 to 90.67±14.4kg, $p<0.001$, $d=1.9$), body mass index (32.9±4.0 to 32.0±3.7kg/m^2, $p<0.001$, $d=1.4$), body fat (37.2±7.5 to 35.8±7.5%, $p=0.002$, $d=1.1$) and Vfs (13.1±4.5 to 12.2±3.9, $p=0.002$, $d=1.1$), but not body water (46.3±3.6 to 46.0±3.6%, $p=0.29$, $d=0.3$). Peripheral mean arterial pressure (86±5 to 89±5 mmHg, $p=0.23$, $d=0.3$), central mean arterial pressure (86±5 to 87±6 mmHg, $p=0.44$, $d=0.2$), and augmentation index (29.8±17.5 to 21.5±14.5%, $p=0.06$, $d=0.6$) were unaffected. Blood glucose (86±7 to 84±11 mg/dl, $p=0.33$, $d=0.3$) and blood lipids (total cholesterol (196±49 to 203±54 mg/dl, $p=0.16$, $d=0.4$) and TC/HDL(4.9±2.4 to 6.1±4.7, $p=0.13$, $d=0.4$)) were relatively unchanged. RQ decreased with CR (0.84±0.01 to 0.76±0.00, $p<0.001$, $d=1.9$), indicating increased fat metabolism, though REE was unchanged (1718±274 to 1722±317 kcal/d, $p=0.83$, $d=0.1$). **CONCLUSION:** The 3-day CR significantly improved body weight and body composition, without apparent changes in body water, with improved fat metabolism, though no cardiovascular effects were noted, future studies should explore chronic intermittent use of this diet.

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Early and Late Chronotype Have Similar Glucose Effectiveness in adults with Metabolic Syndrome

Aashik Jagani[1], Tristan J. Ragland[1], Mary-Margaret E. Remchak[1], Steven K. Malin[1], FACSM.
[1]Rutgers University, New Brunswick, NJ

Chronotype generally refers to the time of day in which someone prefers to perform specific activities. Early versus late chronotype is linked to lower risk of obesity and type 2 diabetes through, in part, insulin sensitivity. Low glucose effectiveness (GE), though, contributes to hyperglycemia, and it is unknown if there are differences in GE between chronotypes. **PURPOSE**: Determine whether GE differs between early (EC) and late chronotype (LC). **METHODS**: The Morningness-Eveningness Questionnaire (MEQ) was used to classify 30 participants with metabolic syndrome (ATP III criteria) as EC (n=14, 12F, MEQ=64.8±1.5, 54.6±1.4 yrs, 34.7±1.0 kg/m^2, VO_2max 23.9±1.2 ml/kg/min) or LC (n=16, 12F, MEQ=47.4±1.1, 54.6±2.9 yrs, 37.9±1.3 kg/m^2, VO_2max 21.4±1.0 ml/kg/min) chronotype. A 3-h 75g oral glucose tolerance test (OGTT) was used to assess GE along with fasting (HOMA-IR) and post-prandial (Matsuda Index) insulin sensitivity from plasma glucose and insulin. Sleep (Pittsburgh Sleep Quality Index), non-exercise physical activity (Minnesota Leisure Time PA questionnaire), body composition (DXA and waist circumference (WC)) along with aerobic fitness (VO_2max) were also determined. **RESULTS**: There were no differences in metabolic syndrome criteria, age, VO_2max, total body fat or FFM between groups. However, EC had a lower android-to-gynoid body fat (1.1±0.0 vs 1.2±0.0, P=0.04) than LC, which related to higher insulin area under the curve$_{180min}$ (r=0.46, P=0.01) as well as HOMA-IR (r=0.49, P=0.01) and lower post-prandial insulin sensitivity (r=-0.58, P=0.003). Despite no difference in GE between groups (P=0.31), low GE was associated with higher body weight (r=-0.41, P=0.02) and WC (r=-0.41, P=0.02). Furthermore, EC had better sleep quality than LC (0.5±0.2 vs 1.8±0.2, P=0.04) independent of sleep duration (P=0.26). Sleep quality correlated with higher VO_2max (r=-0.61, P=0.001) and lower LDL (r=0.44, P=0.03). **CONCLUSION**: Although there were no differences in GE between groups, EC had lower central obesity and better sleep quality. These may be relevant factors contributing to lower type 2 diabetes risk seen in EC through aerobic fitness, insulin sensitivity and lower LDL. Future research should assess how exercise alignment with chronotype may impact cardiometabolic health.

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Low and High Carbohydrate Diets on Performance, Metabolism and Cardiometabolic Health in Middle-Aged Athletes

Kelli T. Jancay[1], Philip J. Prins[1], Timothy D. Noakes[2], Alex Buga[3], Dominic P. D'Agostino[4], Jeff S. Volek[3], Jeffrey D. Buxton[1], Kara Heckman[5], Dalton W. Jones[1], Naomi E. Tobias[1], Holly M. Grose[1], Anna K. Jenkins[1], Andrew P. Koutnik[6]. [1]Grove City College, Grove City, PA, [2]Cape Peninsula University of Technology, Cape Town, South Africa, [3]The Ohio State University, Columbus, OH, [4]University of South Florida, Tampa, FL, [5]Nebraska Methodist Health System, Omaha, Nebraska, [6]Institute for Human and Machine Cognition, Pensacola, FL,

High carbohydrate, low fat (HCLF) diets have been the predominant eating strategy for athletes for performance, but recent evidence has challenged the superiority of HCLF over low carbohydrate, high fat (LCHF) diets, along with growing interest in the potential health and disease implications of dietary choice. **PURPOSE:** To evaluate the effects of 4-week habituation to either an LCHF or HCLF diet on (i) high-intensity short duration exercise performance, (ii) oxidation rates, and (iii) continuous glycaemic, and cardiometabolic biomarker changes. **METHODS:** Ten highly trained middle-aged male runners (age 39.9 ± 5.1 years, height 181.7 ± 8.8 cm, weight 86.7 ± 12.5 kg; VO_{2max} 58.7 ± 5.2 ml/kg/min) consumed an ad libitum LCHF and HCLF diet in a random order, each for 31 days in a crossover design. Each subject completed a one-mile (1,560m) running time trial (TT), repeated sprint protocol (RSP; 6x800m), assessment of body composition and cardiometabolic parameters before (PRE) and at the completion (POST) of each 31-day dietary intervention. Participants interstitial glucose concentrations were measured throughout each dietary intervention via continuous glucose monitoring (CGM). Gas exchange were recorded throughout each performance trial. **RESULTS:** We demonstrated: (i) equivalent high-intensity exercise performance for one-mile TT (M_{diff} = 6.9 sec; p = 0.159, □□p = 0.208), RSP (M_{diff} = 17.9 sec; p = 0.556, □□p = 0.040), fasting insulin (M_{diff} = 0.32 μU/ml; p = 0.350, □□p = 0.097), high-sensitivity C-reactive protein (M_{diff} = 0.18 mg/l; p = 0.134, □□p = 0.232), hemoglobin A1c (M_{diff} = 0.09 %; p = 0.388, □□p = 0.084); (ii) record high peak fat oxidation rates on the LCHF diet (LCHF:1.58 ± 0.33g/min @ 86.40 ± 6.24%VO_{2max}; 30% subjects >1.85g/min); (iii) elevated total (Δ: 20.7 ± 3.3 mg/dL; p = 0.001), LDL (Δ: 10.7 ± 4.6 mg/dL; p = 0.03), and HDL cholesterol (Δ: 11.4 ± 3.3 mg/dL; p = 0.045) on LCHF diet, and; (iv) reduced mean glucose on LCHF (mean: 15. 0%; range: -34.3% to 0.7%; p = 0.006). **CONCLUSION:** These results (i) challenge whether higher carbohydrate intake is superior for athletic performance, even during shorter-duration, higher-intensity exercise; and (ii) demonstrate that lower carbohydrate intake may be a therapeutic strategy, to improve blood glucose control in athletes.

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Characterization of Yoga-Associated Teaching Format, Barriers, And Injuries During COVID-19

Indiana Jenkins[1], SoJung Kim[1], June Solow[1], Donald H. Lein Jr[2], Harshvardhan Singh[2].
[1]Rowan University, Glassboro, NJ, [2]University of Alabama, Birmingham, AL

Latest evidence shows that yoga is beneficial for maintaining a healthy lifestyle and reduces stress during the COVID-19 pandemic. **PURPOSE:** To investigate whether COVID-19 affected yoga instructors (YI)' perception toward yoga teaching methodology, potential barriers, and yoga-related injuries of clients. **METHODS:** We performed a cross-sectional study design and used a web-based survey to query YI regarding their practice patterns before and during the COVID-19 pandemic. We recruited current YI from yoga studios, national yoga teacher's associations, and yoga teaching resource groups in the Northeastern US. **RESULTS:** Four hundred and seven YI completed the online survey. Respondents were primarily females (90%) that completed a bachelor's degree (46.4%) or higher (37.2%). Before the pandemic, approximately 90% of the YI taught classes using a Face-to-Face (FtoF) format followed by a mix of FtoF and online (7.4%) and an online format (2.4%). During the pandemic, 47% of the YI used the online teaching format followed by the mixed (45.9%) and FtoF (7.1%). Most of the YI who taught yoga online reported that the quality of the online yoga classes ranged from very good (45.7%) to excellent (29.0%). Most YIs (84.6%), teaching yoga online during the pandemic, were also willing to offer online yoga classes after the pandemic. The three most common barriers of teaching yoga online were: i) having technical issues (75.4%), ii) monitoring clients (66.9%), and iii) clients unable to successfully interact with the software (51.7%). A total of 5 yoga-related injuries were reported in FtoF, while 9 injury cases were reported in online yoga. The most common injury that occurred in all forms of teaching yoga was a sprain/strain. **CONCLUSION:** Online yoga was used most to deliver yoga during the pandemic. The findings of this yoga survey could inform the development of guidelines and recommendations that support safe yoga practices in various yoga teaching methods.

PGC-1α Overexpression Improves Angiogenic Signaling Potential of Skeletal Muscle-derived Extracellular Vesicles

Chris K. Kargl[12], Brian P. Sullivan[1], Derek Middleton[1], Andrew York[1], Lundon Burton, Jeffrey J. Brault[3], Shihuan Kuang[1], Timothy P. Gavin[1]. [1]Purdue University, West Lafayette, Indiana, USA, [2]University of Pittsburgh, Pittsburgh, Pennsylvania, USA, [3]Indiana University School of Medicine, Indianapolis, IN, USA.

PURPOSE: Skeletal muscle capillary densities are proportional to muscle fiber mitochondrial contents and oxidative capacity. Muscle cells secrete numerous factors that regulate neighboring capillary endothelial cells (EC), including extracellular vesicles (SkM-EV). Peroxisome proliferator-activated receptor-gamma coactivator-1alpha (PGC-1α) is a key regulator of mitochondrial biogenesis and the oxidative phenotype in skeletal muscle and is a molecular driver of adaptations to exercise. Skeletal muscle PGC-1α regulates secretion of multiple angiogenic factors, but it is unknown whether PGC-1α regulates the angiogenic signaling potential of SkM-EVs. **METHODS**: PGC-1α was overexpressed via adenovirus in primary human myotubes. EVs were collected from PGC-1α myotubes (PGC1-EV) as well as from myotubes treated with a GFP adenoviral control (GFP-EV) and from untreated myotubes (CON-EV). Human umbilical vein endothelial cells (HUVEC) were treated with EVs (10 μg/ml) and *in vitro* angiogenic responses were analyzed. To determine if PGC-EVs are protective against oxidative stress, HUVECs were treated with 200 μM H_2O_2 following EV treatments *in vitro* angiogenic responses were analyzed. Significance: $P \leq 0.05$. **RESULTS**: PGC-EV treatment of cultured human umbilical vein endothelial cells (HUVEC) increased HUVEC proliferation (+36.6%), tube formation (length: +28.1%; number: +25.7%), cellular viability (+52.9%), and reduced reactive oxygen species levels (-41%) compared to GFP-EV. Additionally, PGC-EV treatment improved tube formation (length: +52.8%; number: +57%) and reduced cellular senescence (-30.1%) following acute oxidative stress compared to GFP-EV treatment. **CONCLUSIONS**: This report demonstrates that overexpression of PGC-1α in human myotubes increases the angiogenic potential of skeletal muscle EVs. These angiogenic benefits coincided with greater protection against H_2O_2 induced reductions in tube formation and increases in cellular senescence. Increases in PGC-1α expression in skeletal muscle may prompt the release of SkM-EVs that support vascular redox homeostasis and angiogenesis.

Grip Strength Not Associated with Changes in Vascular Function Post-Aerobic Exercise Training in Older Adults

Shannon E. Khan, Sara E. Mascone, J Carson Smith, and Sushant M. Ranadive. University of Maryland – College Park. College Park, Maryland.

Decrease in grip strength and vascular function are both strong predictors of all-cause mortality, especially cardiovascular disease. Aerobic exercise training improves vascular function in older adults. However, it is currently unknown if grip strength is associated with vascular function in older adults following an aerobic exercise training regimen. **PURPOSE:** To evaluate the association between maximal voluntary contraction (MVC) and change in vascular function following 6-months of aerobic exercise training in older adults. **METHODS:** 26 older adults (21F/5M 71±8y) performed MVC at baseline and underwent brachial-artery flow mediated dilation (FMD) testing before and after a 6-month aerobic exercise training program. Average initial MVC was obtained by having participants perform 3 consecutive contractions spaced one minute apart. The change in post training FMD from pre training FMD was calculated and reported as ΔFMD. **RESULTS:** There was a non-significant linear correlation between the average initial MVC and ΔFMD ($r=0.14$, $p=0.48$) following the exercise protocol. Additionally, baseline MVC was not a significant predictor of ΔFMD ($R= 0.02071$, $p= 0.4830$). **CONCLUSION:** There is no association between grip strength and vascular responsiveness following aerobic exercise training in older adults. Furthermore, initial grip strength did not significantly predict change in vascular function following aerobic exercise training.

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Bone Mineral Density and Tibial Microarchitecture Changes in Division I Male and Female Cross-Country Runners

Kristen J. Koltun[1], Nicole M. Sekel[1], Adam J. Sterczala[1], Kelly H. Mroz[1], Evan D. Feigel[1], David N. Mowery[1], Pouneh K. Fazeli[1], Jane A. Cauley[1], Sophie L. Wardle[2], Thomas J. O'Leary[2], Julie P. Greeves[2], Bradley C. Nindl FACSM[1] [1]University of Pittsburgh, Pittsburgh, PA; [2]Ministry of Defence, UK

Habitual weight-bearing physical activity can improve bone mineral density (BMD), structure, and strength, but it remains unclear if bone adaptations to prolonged physical training are similar between elite male and female endurance athletes. **Purpose:** To compare the effect of 6 months of sport training on areal BMD (aBMD) and tibial volumetric BMD (vBMD), microarchitecture, and strength between elite male and female distance runners. **Methods:** Twenty-one male (n=12; 19.4±0.5 yr; 21.4±0.4 kg/m^2) and female (n=9; 18.9±0.4 yr; 20.9±0.4 kg/m^2) Division I cross-country runners completed high-resolution peripheral quantitative computed tomography (HR-pQCT; XtremeCTII) scans at 4% (metaphysis) and 30% (diaphysis) of total tibial length and DXA (Lunar iDXA) scans of the total body, lumbar spine, and hip prior to and following the competitive fall season. Generalized linear mixed effects modeling was used to compare changes over time between men and women, adjusting for baseline BMI. Data are presented as estimated marginal mean±SEM, α=0.05. **Results:** At the tibial diaphysis, training increased (main effects of time) cortical area (286.8±5.4, 290.3±4.9 mm^2, p=0.016) and perimeter (77.7±0.6, 78.2±0.6 mm, p=0.007), stiffness (307.2±6.2, 310.8±5.6 kN/mm, p=0.021), and failure load (17.5±0.4, 17.7±0.3 kN, p=0.040). Training also increased (main effect of time) total body aBMD (1.238±0.014, 1.248±0.016 g/cm^2, p=0.001). No significant main effects of time were observed for the tibial metaphysis (4%). Men had lower total and cortical vBMD, but greater cortical area, perimeter, and thickness, stiffness, and failure load than women at the tibial diaphysis (main effects of sex, p≤0.032). Men had greater trabecular area and thickness, stiffness, and failure load than women at the tibial metaphysis (main effects of sex p≤0.003). Men had greater aBMD for the total body, femoral neck, and total hip (main effects of sex p≤0.037). No significant sex*time interaction effects were observed. **Conclusion:** Six months of cross-country training elicited positive bone adaptations for the whole body and at the diaphyseal tibia, which were similar between men and women. Sex-differences in parameters of bone health may also explain differences in risk for bone stress injury between men and women.

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Bilateral Asymmetry in the Single Leg Step Down among Young Healthy Adults

Katy N. Krueger, George Sikoryak III, Reese P. Michaels, Deborah L. King, Ithaca College, Ithaca, NY

Asymmetries in functional movements/rehabilitation exercises are used by practitioners in the pre-habilitation and rehabilitation of athletes and clients. Normative asymmetry data is essential to evaluate the asymmetry values for determining rehabilitation progress and return to play. The majority of asymmetry literature focuses on performance asymmetry (e.g., single leg hop distance) as opposed to asymmetry of movement skill biomechanics. **PURPOSE:** To determine normative bilateral asymmetry values of joint kinematics and kinetics during the single leg step down (SLSD). **METHODS:** Eighteen healthy college-aged individuals (n=4 male, n=14 female; Age: 20.0 ± 1.19 y, Ht: 1.68 ± 0.08m, Mass: 65.1 ± 9.7 kg) each completed 3 trials of 5 functional movement skills. For this study only SLSDs were analyzed. Eighteen reflective markers were placed on 24 anatomical landmarks to create a 7-segment model (pelvis, and R/L thigh, lower leg, and foot) of the participant. A motion capture system integrated with force plates was used to capture 3D data and ground reaction forces. Bilateral asymmetry indices (BAI) were calculated for maximum ankle, knee and hip flexion; maximum sagittal plane ankle, knee, and hip power; and medial-lateral (M/L) knee displacement. Joint power was expressed as a percent of total lower extremity power prior to calculating BAI. BAI was calculated as 100*[((Max(R/L)-Min(R/L))/Min(R/L)]. Mean and standard deviations of BAI are reported. **RESULTS:** Mean BAI for ankle flexion was 8.58 ± 7.51%, BAI for knee flexion was 7.51 ± 4.60%, and BAI for hip flexion was 9.35 ± 6.04%. M/L knee displacement BAI was 33.43 ± 39.81%. Percent power BAI for the ankle was 39.49 ± 29.03%, for the knee was 19.16 ± 21.03%, and for the hip was 51.99 ± 62.09%. **CONCLUSIONS**: Bilateral asymmetry was smallest for variables related to SLSD depth, hip and knee flexion, indicating high levels of symmetry for these motions (>94%). Variables related to control strategies and stabilization, such as joint power and M/L displacement, had large bilateral asymmetry. The large normative asymmetry for key SLSD biomechanical measures could question the use of lower extremity biomechanical symmetry as a return to play/function guide. Conclusions should be tempered by the small sample size; increasing sample size is warranted.

Accuracy of Measuring Intensity Through Means of Repetition in Reserve in Trained College Females

Kyle J. Kunzer, Amanda E. Butz, Kara M. Lang, Richard H. Laird IV, and Jennifer A. McKenzie. McDaniel College, Westminster, MD 21157

Repetitions in reserve (RIR) has been utilized to enhance autoregulation and appropriately adjust training intensity to match daily performance capacity. Previous studies suggest individuals over predict intensity, thus underestimating RIR. **PURPOSE**: This study's goal was to assess the ability to accurately predict repetitions (reps) to momentary failure through the means of RIR. It was hypothesized that participants would display greater RIR accuracy closer to failure as opposed to further away from failure and that more experienced participants would have greater RIR accuracy than those with less training experience. **METHODS**: Healthy, trained college females (n=15) completed a barbell back squat for determination of 1 rep maximum (1RM). Following the 1RM, participants had a 10-minute rest period while 70% of their 1RM was calculated, loaded on the bar, and blinded to them with the use of trash bags. Participants performed a set of back squats to momentary exhaustion while indicating their RIR estimates of 5, 3, and 1 reps until failure. Repeated measures ANOVA, post hoc comparisons with Bonferroni adjustment, and Pearson product-moment correlation analyses were used to assess the data. **RESULTS**: Participants completed 16.3±5.2 reps to failure. RIR was significantly ($p<0.001$) under predicted by 1.8±1.3, 3.5±2.4, and 5.3±2.9 reps for the called 1, 3, and 5 RIR estimates, respectively. Post-hoc comparisons indicated significant differences between all measures ($p<0.001$ for RIR 5 versus 3 and RIR 5 versus 1, $p=0.006$ for RIR 3 versus 1). Further, lifting experience was not significantly related to RIR accuracy at RIR 5 ($r=-0.13$, $p=0.68$), RIR 3 ($r=-0.02$, $p=0.95$), or RIR 1 ($r=0.30$, $p=0.34$). **CONCLUSION**: As hypothesized, closer proximity to failure was associated with improved ability to accurately predict RIR. While lifting experience did not improve RIR prediction accuracy in this study, comparisons involved lifters with experience of 2 years (n=7) and 1 year (n=5). This time frame may not reflect enough of a training difference. To enhance RIR application in resistance training, future research is needed on variables such as lifting tempo, extended intraset rest closer to failure, and different types of resistance exercise (upper body, machine, single joint, etc.) to understand how these factors affect RIR accuracy.

Complications Associated with Proximal Hamstring Tendon Repair: A Systematic Review

Jonathan J. Lawson[1], Eliza A. Abraham[2], Casey M. Imbergamo[2], Sean B. Sequeira[2], James C. Dreese[2], Heath P. Gould[2]. [1]Georgetown University School of Medicine, Washington, DC, [2]Medstar Union Memorial Hospital, Baltimore, MD

PURPOSE: Although several potential complications of proximal hamstring tendon ruptures have been reported in the literature, few studies comprehensively analyze the complication profile of proximal hamstring tendon repair. The purpose of this systematic review was to identify the overall rate of complications following proximal hamstring tendon repair, to differentiate these complications into categories, and to compare the complication rates of open versus endoscopic repair. **METHODS:** To qualify for study inclusion, included articles were required to be published in English, Level-4 evidence or higher, and had to examine surgical repair of proximal hamstring tendon ruptures. No restrictions were made regarding publication date and methodological quality. Data regarding complications were extracted to calculate the overall complication rate as well as the rate of major and minor complications. A quantitative data synthesis was conducted using Chi-square tests to compare the proportion of patients who experienced complications with endoscopic and open approaches. **RESULTS:** Forty-three articles including 2,823 proximal hamstring tendon repairs were identified. The overall postoperative complication rate was 15.4% (n=436). The rate of major complications was 4.6%, including a 0.8% re-rupture rate, 0.8% re-operation rate, 1.7% rate of sciatic nerve injury, 0.9% rate of venous thromboembolism, and 0.4% rate of deep infection. Minor complications included posterior femoral cutaneous nerve injury (2.4%), persistent sitting pain (2.3%), persistent hamstring myopathy (2.3%), hematoma/seroma (0.8%), peri-incisional numbness (1.8%), and superficial infection (1.1%). Endoscopic proximal hamstring tendon repair was associated with a higher rate of overall complications ($p=0.012$), major complications ($p=0.048$), and minor complications ($p<0.001$) compared to open repair. **CONCLUSION:** Proximal hamstring tendon repair is associated with an overall complication rate of 15.4%, including a 4.6% rate of major complications. There was a statistically significant increase in complications for patients treated endoscopically compared to those who underwent open surgical repair.

Arch Stiffness Does Not Determine Running Economy in Recreational Runners

Brian K. Leary, Ian Bradford, Padraig Kirkwood, Jared Eddy, Phillip Essenmacher, and Jean L. McCrory

Running economy is a primary determinant of endurance performance and is determined by a variety of physiological and biomechanical factors. Foot anthropometrics, including arch stiffness and Achilles tendon moment arm length, may improve running economy by increasing the elastic energy storage or ankle extensor moment generated while running. Prior research examining the relationship between anthropometric factors and running economy has only been conducted at high testing velocities (e.g., > 16 km/hr) in well-trained runners. **PURPOSE:** To determine the relationship between foot length, arch stiffness, and running economy in recreational runners and low testing velocities. **METHODS:** Foot anthropometrics and running economy was measured in 16 trained endurance athletes (age 20.5 ± 0.4 yrs, height 172.0 ± 1.8 cm, and mass 68.53 ± 2.40 kg). Foot Length (FL), Arch Stiffness Index (ASI), Achilles Tendon Moment Arm Length (ATML), maximal oxygen consumption (VO_{2max}), and running economy (RE) were assessed. RE was measured as the oxygen consumption during running at velocities of 9.9 km/h and 11.9 km/h at a 1% grade. Data is reported as Mean ± SE, and the relationship between foot anthropometrics and running economy was assessed with linear regression (α=0.05). **RESULTS:** Absolute and relative VO_{2max} values were 3.68 ± 0.19 L/min and 52.96 ± 1.51 mL/kg/min, respectively. ASI was 1513.0 ± 174.3 A.U. with a standing foot length of 25.4 ± 0.4 cm. Subject oxygen consumption at 9.9 km/h and 11.9 km/h was 34.90 ± 0.80 mL/kg/min and 41.02 ± 0.82 mL/kg/min, respectively. There was no correlation between ASI, FL, AHI, and RE ($p>0.05$). **CONCLUSION:** Arch stiffness and Achilles tendon moment arm do not determine running economy at low testing velocities in recreational runners. Therefore, at low running velocities, running economy may be impacted by other physiological and biomechanical factors.

Changes in Glenohumeral Kinematics after a Competitive Season in Collegiate Baseball Pitchers

Benjamin G. Lerch & R. Tyler Richardson. Penn State University Harrisburg, Middletown, PA

Pitching is a highly dynamic movement involving a large range of motion (ROM), high rotational velocities, and substantial loading at the shoulder. Over years, repetitive loading from pitching results in alterations in passive glenohumeral (GH) rotation ROM including increased external rotation (ER) and decreased internal rotation (IR). This adaptation, known as humeral retroversion, is vital to improving performance, but may lead to GH IR deficit and losses in total shoulder ROM, both of which can increase injury risk. It is unknown if these passive ROM adaptations are present during GH kinematics during pitching and if these changes are observable from pre- to post-season. **PURPOSE:** To determine if adaptations in GH rotational kinematics during pitching occur during a competitive season. **METHODS:** Seven Division III collegiate pitchers participated. Pitchers threw six fastballs at pre-season visit and again eight months later at post-season visit. Motion capture recorded all kinematics. An individualized linear model approach was used to estimate scapular kinematics based on measurable humerothoracic motion and GH kinematics were subsequently calculated for each pitch. Data from the five pitches not used for model creation were analyzed for pre-/post-season changes in GH rotational kinematics using simulation modeling analysis, a single-subject approach for time-series data. **RESULTS:** One subject reported less maximum GH ER at post-season (p=0.002; mean difference = -17.3°) while all other subjects had similar values (range of post- minus pre-season differences: -7.0° to 6.5°). One subject reported greater maximum GH IR at post-season (p=0.008; mean difference = 15.6°) while all other subjects had similar values (range of post- minus pre-season differences: -9.6° to 16.1°). No significant differences were found for maximum GH IR velocity (range of post- minus pre-season differences: -389.0°/s to 392.9°/s). **CONCLUSION:** Most collegiate pitchers do not experience changes in GH rotational kinematics during a competitive season, however, the few that do so may exhibit changes that do not align with expected adaptations.

The Impact of a Weighted Warmup on 1-Mile Run Performance

Ashley Y. Lesniak, Mason S. Martin, Curt B. Dixon, FACSM. Lock Haven University, Lock Haven, PA

PURPOSE: To investigate the impact of a weighted warmup on 1-mile run performance. **METHODS:** 7 males (Age: 20.9 ± 0.9 yr; Height: 175.5 ± 7.0 cm; Weight: 80.8 ± 11.4 kg; Body Fat: 12.8 ± 4.2%) and 5 females (Age: 22.4 ± 3.8 yr; Height: 167.9 ± 9.0 cm; Weight: 65.1 ± 10.1 kg; Body Fat: 20.5 ± 2.6%) participated in the study. On four separate days, subjects completed a 15 min warmup walking on a motorized treadmill, at a predetermined unloaded intensity equal to 5 METs, followed by a 1-mile run. Warmup sessions included an unloaded (UL) trial, which served as the control, and wearing a light load (LL; 24 lb), moderate load (ML; 48 lb) and heavy load (HL; 80 lb) weighted vest. The testing order of the weighted warmup trials was determined by counterbalanced assignment. Following the 15 min warmup, subjects were asked to complete an unloaded 1-mile run as quickly as possible. Ratings of Perceived Exertion (RPE) were assessed every minute and heart rate (HR) was measured continuously throughout the 1-mile run and averaged for statistical comparison. Repeated Measures ANOVAs were used to compare the different weighted conditions. **RESULTS:** 1-mile run time (UL: 9.4 ± 0.9, LL: 9.0 ± 1.3, ML: 9.4 ± 1.3, HL: 9.0 ± 1.3 min; $p = .340$) and average RPE (UL: 11.6 ± 1.9, LL: 10.9 ± 2.3, ML: 10.8 ± 2.4, HL: 11.2 ± 2.2; $p = .191$) were not significantly different between warmup conditions. Average HR, during the 1-mile run, was significantly higher after the HL warmup (167.3 ± 10.7 $b \cdot min^{-1}$) when compared to the UL (161.9 ± 8.9 $b \cdot min^{-1}$; $p = .013$) and ML (159.0 ± 13.3 $b \cdot min^{-1}$; $p = .019$) warmup trials. **CONCLUSION:** The 15-minute weighted warmup sessions did not impact run performance or perception of effort.

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Association between Pre-diagnosis Physical Activity and Risk of Breast Cancer Recurrence – the California Teachers Study

Dan Lin, Alaina Demalis, Laila Al-Shaar, Kathleen Sturgeon. Penn State University College of Medicine, Hershey, PA

Physical activity (PA) before breast cancer (BCa) diagnosis may provide health status information related to survival outcomes. Epidemiological studies has consistently observed an inverse association between pre-diagnosis PA and all-cause mortality among BCa patients. The association between pre-diagnosis PA and BCa recurrence or BCa specific mortality is unclear. **PURPOSE:** To investigate the association between pre-diagnosis PA and risk of BCa recurrence in the California Teachers Study. **METHODS:** A total of 6,479 women who had initial diagnosis of stages I-IIIb BCa after completing the baseline questionnaire (Q1) were eligible for the study. During a median follow-up of 7.3 years, 553 BCa recurrence cases were identified. BCa recurrence subtypes were defined by the expression status of estrogen receptor (ER) and progesterone receptor (PR). Long-term (from high school to age at Q1, or, age 55, whichever was younger) and recent (during 3 years prior to Q1) pre-diagnosis recreational PA were recalled at Q1 and converted to a metabolic equivalent of task hours per week (MET-h/wk). Multivariable Cox proportional hazards models estimated hazard ratios (HRs) and 95% confidence intervals (CIs) for risk of BCa recurrence overall and by ER/PR subtypes. **RESULTS:** Both long-term and recent pre-diagnosis recreational PA were not associated with risk of BCa recurrence (Long-term: P_{trend}=0.77; recent: P_{trend}=0.29). The association remained non-significant after adjusting for PA after BCa diagnosis (P_{trend}=0.84). The inverse association between recent pre-diagnosis recreational PA and risk of BCa recurrence was only observed in ER negative/PR negative (ER-/PR-) cases (≥26.0 vs. <3.4 MET-h/wk: HR=0.28, 95% CI=0.13-0.59; P_{trend}=0.0069), but not ER positive/PR positive (ER+/PR+; ≥26.0 vs. <3.4 MET-h/wk: HR=0.86, 95% CI=0.62-1.20; P_{trend}=0.77) or other (ER+/PR- or ER-/PR+; ≥26.0 vs. <3.4 MET-h/wk: HR=0.83, 95% CI=0.37-1.88; P_{trend}=0.81) cases. **CONCLUSION:** Higher levels of recent pre-diagnosis recreational PA was associated with lower risk of ER-/PR- BCa recurrence in the California Teachers Study. Knowing the potential survival benefits of pre-diagnosis PA may help clinicians better evaluate health status and optimize treatment plans for BCa patients.

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Effect of Menstrual Cycle Phase and Sex on Carotid Artery Pulsatility in Healthy Young Adults

Zoe R. Lincoln, Ninette Shenouda, David G. Edwards. University of Delaware, Newark, DE.

Carotid artery pulsatility is a measure of vascular resistance and is associated with aortic stiffness and cardiovascular disease risk. In healthy young adults, studies of carotid artery pulsatility have been limited to the early follicular (low hormone) phase of premenopausal women's menstrual cycles to avoid the potential confounding effects of naturally occurring hormonal fluctuations. Whether carotid artery pulsatility differs across a natural menstrual cycle in premenopausal women, and whether sex differences emerge during specific cycle phases, is largely unknown. **PURPOSE** To determine the influence of menstrual cycle phase and sex on common carotid artery (CCA) pulsatility index (PI) in young healthy adults. **METHODS** Fourteen premenopausal women with naturally occurring menstrual cycles (28 ± 7 yrs; cycle length, 30 ± 6 days) and nine age-matched men (27 ± 3 yrs) participated in three repeated visits. Women were tested during the early follicular (Visit 1, cycle day 4 ± 2), late follicular (Visit 2, cycle day 13 ± 3), and mid-luteal phases (Visit 3, cycle day 23 ± 4) and men's visits were time-matched to the women. Doppler ultrasound was used to measure CCA peak systolic blood velocity (SBV), minimum diastolic blood velocity (DBV) and mean blood velocity (MBV). PI was calculated as (SBV-DBV)/MBV. **RESULTS** CCA PI did not differ across menstrual cycle phases in women (Visit 1, 1.4 ± 0.2; Visit 2, 1.5 ± 0.3; Visit 3, 1.5 ± 0.3) or across visits in men (Visit 1, 1.7 ± 0.3; Visit 2, 1.8 ± 0.4; Visit 3 1.8 ± 0.3; interaction $p > 0.05$), but it was significantly lower in women compared to men (1.4 ± 0.3 vs. 1.8 ± 0.3; main effect of sex, $p = 0.02$). There were no significant interactions or main effects of sex or visit on SBV, DBV, or MBV ($p > 0.05$). **CONCLUSION** Controlling for the menstrual cycle may not be necessary when measuring CCA PI in young healthy premenopausal women. Moreover, differences in CCA PI between men and women appear to be independent of women's menstrual cycle phases.

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Cardiac Response to β2-Adrenergic Stimulation is Attenuated in Old Rats Despite Higher Protein Expression

Yuan Liu, Sushant Ranadive, & Sarah Kuzmiak-Glancy

University of Maryland, College Park, MD

Age and biological sex affect the heart's response to β-adrenergic receptor (β-AR) stimulation. Cardiomyocytes from young females have a lower contractile response to β-AR stimulation than young males, and increasing age is associated with blunted increases in heart rate and contractility upon β-AR stimulation. This may be due to the altered β-AR density, altered pathway signaling, or both. **Purpose:** Therefore, the purpose of this study is to evaluate the effect of age on β2-adrenergic receptor (β2-AR) protein expression and cardiac responsiveness to β2-adrenergic stimulation in male and female rat hearts. **Methods:** Young (<8 months), middle-aged (10 months) and old (>20 months) male and female rats were anesthetized, hearts were excised, and Langendorff-perfused. Dose response curves were generated utilizing albuterol, a β2-AR agonist, in all groups, while heart rate, coronary flow rate, and oxygen consumption were continually monitored. Heart samples were saved and homogenized to evaluate the β2-AR expression via western blot. **Results:** Increases in heart rate upon addition of albuterol were blunted in young female compared to young male rat hearts (from 244 ± 12 to 298 ± 11 beats/min in male hearts, and from 236 ± 10 to 252 ± 25 beats/min in female hearts). Middle-aged rats showed similar increases in heart rate (males: 221 ± 15 to 272 ± 20 beats/min, females: 226 ± 9 to 296 ± 47 beats/min). Old male and females demonstrated similar increases in heart rate that were blunted compared to middle-aged rats (males: 195 ± 7 to 235 ± 7 beats/min, females: 225 ± 35 to 240 ± 0 beats/min). Despite this, β2-AR expression was higher in old rat hearts compared to young rats. **Conclusion:** Cardiac responses to β-adrenergic stimulation were blunted in young female compared to young male hearts; however, the age effects eliminate the sex difference in β2-AR stimulation response. The findings in this study indicate that impairment of the β2-AR signaling pathways may play a role in the decreased responsiveness in old rat hearts, as β2-AR protein expression was higher in old compared to young rats.

Acute Effects of Exercise Time on Mood and Stress

Brenden J. Livinghouse, Matthew Lenahan, Payton Bowman, Braeden Harris, Victoria Cornish, Samuel Forlenza, Joohee Sanders. Shippensburg University, Shippensburg, PA

Exercise has been shown to reduce stress and improve mood. The time at which exercise is performed during the day may enhance these benefits and could be useful for university students to know because of the stress that college often causes. **PURPOSE:** To examine the best time of day for college students to exercise in order to reduce stress and improve their mood. **METHODS:** Ten male and female college students, 18 years of age and older, who exercise regularly volunteered to participate in the study. After completing a baseline survey, participants completed the Stress Scale and the International Positive and Negative Affect Schedule Short Form (PANAS) 5 minutes before and after each exercise session. Subjects also used the Borg Scale 5 minutes after the exercise to determine their rating of perceived exertion (RPE). The exercise completed during each session included a 5-minute warm-up, 20-minute jog, and 5-minute cool-down. Exercise sessions were completed once in the morning between 5 and 9 am and once in the evening between 5 and 9 pm. These two sessions were completed on different weeks, but on the same day of the week within a 4-week time period. Dependent t-tests were used to evaluate the differences in stress and mood with time. **RESULTS:** The results indicated that stress level in the morning, prior to the workout, was higher than in the evening, although the difference was not statistically significant (5.6 vs. 5.3, $p>0.05$). After the workout, the reduction of stress was greater in the morning when compared to the evening, although the difference was not statistically significant (5.6 to 4.9 vs. 5.3 to 4.9, $p>0.05$). Moreover, after the morning workouts, all the emotions of the participants, measured by PANAS, changed in a positive manner, whereas after the evening workouts, some of the participants' emotions changed in a negative manner. Notably, ratings of alertness and activity decreased by almost 20%. Additionally, RPE was higher during the evening workout when compared to the morning workout (13.1 vs. 10.7, $p=0.06$). **CONCLUSION:** College students who exercise in the morning may experience a modest acute stress reduction and mood improvement compared to students who exercise in the evening.

Relationship of Dynamic Balance with Kinematic Pitching Parameters in Collegiate Baseball Pitchers

Paulo Lobo[1], Richard J. Boergers[2]. [1]Hackensack Meridian Health School of Medicine, Nutley, NJ, [2]Seton Hall University, South Orange, NJ

Pitching injuries in baseball are prevalent and pitchers have a higher rate of arm injury than fielders. Poor dynamic balance in pitchers may affect kinetic chain efficiency, thus altering forces on joints, increasing potential for injury. Previously, Y balance test (YBT) results have been found to be related to arm health in pitchers. **PURPOSE:** To investigate the relationship between dynamic balance and several pitching kinematic parameters. **METHODS:** Participants (N=10) were Division 1 college baseball pitchers (age=20.4±1.2; weight=84.4±6.02kg; height=186.5±6.29cm). They completed the YBT, dynamic balance testing [forward lunge test (FLT), unilateral stance test (UST), weight bearing squat test (WBST)], and a full body motion capture analysis of their pitching as part of pre-participation performance assessments. Several key kinematic variables associated with the pitching motion were extracted for analysis. We ran Pearson's r test to assess relationships of the pitching parameters and the dynamic balance data using SPSS. **RESULTS:** Correlations were found between YBT composite scores of both the lead and drive legs and max shoulder velocity (r=0.96, p=0.04 and r=0.97, p=0.03, respectively). The lead leg YBT anterior reach score was correlated to shoulder external rotation (SER) (r=0.99, p=0.006) and YBT posteromedial and posterolateral reach scores were both correlated with knee flexion at ball release (r=0.99, p=0.01 and r=0.99, p=0.007, respectively). The drive leg YBT posteromedial reach score was correlated with both elbow flexion at foot contact (r=0.98, p=0.02) and lateral trunk lean at max SER (r=0.96, p=0.04). On the UST, the lead leg with eyes open and the drive leg with eyes closed were both correlated with max SER (r=0.87, p=0.001 and r=0.71, 0.02, respectively) and the lead leg with eyes closed was negatively correlated with shoulder abduction at max SER (r=-0.73, p=0.02). With the FLT, lunge percent weight of the drive leg was correlated to SER at foot contact (r=0.78, p=0.007). **CONCLUSIONS:** Our results confirm the relationship between dynamic balance and pitching kinematic parameters. Our findings infer the value of using dynamic balance tests (YBT, UST, and FLT) for potentially helping to predict and prevent injury in collegiate pitchers.

Resident Gut Microbiota Mediates Exercise Capacity and Tissue Metabolomes in Mice

Candace R. Longoria, Lee J. Kerkhof, Marko Oydanich, Xiaoyang Su, Eric Chiles, Stephen F. Vatner, Sara C. Campbell, FACSM. Rutgers, The State University of New Jersey

The Regulator of G Protein Signaling 14 knockout (RGS14 KO) mouse has a unique brown adipose tissue (BAT) mechanism mediating its phenotype of improved exercise performance. RGS14 KO mice showed a 51 ± 8% increase in running distance and a 44 ± 7% increase in work to exhaustion compared to wild type (WT). Three days after BAT transplantation from RGS14 KO mice to WT mice, RGS14 KO BAT donors lost their enhanced exercise capacity (EXC), whereas WT BAT recipients gained this EXC. We also found that RGS14 KO mice harbor a distinct gut microbiota and BAT metabolome, suggesting a gut-BAT-muscle axis that may regulate EXC. **PURPOSE:** 1) Examine EXC and tissue (BAT, quadriceps) metabolomes of RGS14 KO mice upon antibiotic treatment (ABX) and 2) begin establishing a gut-BAT-muscle axis that may regulate EXC. **METHODS:** Eight mice (n=4 RGS14 KO, n=4 WT) were used to examine EXC and identify predominant metabolites following ABX. Metabolomics used ultra-high performance liquid chromatography and mass spectrometry to evaluate untargeted metabolites in fecal, quadriceps, and BAT samples. T-test was used to compare EXC before and after ABX. Two-tailed t-tests were used to compare WT and RGS14 KO metabolite means ($p<0.05$). MetaboAnalyst 5.0 was used to identify significant metabolite pathways and generate pathway plots. **RESULTS:** RGS14 KO running distance fell by 35 ± 7%, and work to exhaustion fell by 41 ± 7%, showing RGS14 KO mice lost their enhanced EXC after ABX. Significant baseline BAT metabolite pathways included starch and sucrose metabolism ($p=0.004$); no significant BAT pathways were detected after ABX. Further, significant baseline quadriceps metabolite pathways included pentose and glucuronate interconversion ($p=0.024$) and the pentose phosphate pathway ($p=0.029$). Of the 6 significant metabolite pathways in quadriceps after ABX, none included baseline pathways. **CONCLUSIONS:** RGS14 KO BAT responds to changes in resident microbiota that are beneficial to EXC and upon removal with ABX EXC declines. Ablation of the gut microbiota alters metabolite pathways in RGS14 KO compared to baseline suggesting the absence of the resident microbiota changes metabolism. These data support the importance of the gut microbiota in tissue-specific metabolite production and how the gut microbiota may influence BAT and muscle function.

Aerobic Exercise Training Affects Exercise Pressor Reflex in Older Adults

Lindsay A. Lotter, Sara E. Mascone, J. Carson Smith, and Sushant M. Ranadive. University of Maryland – College Park. College Park, Maryland.

Physiological responses to isometric handgrip exercise (IHG) are indicative of the ability to regulate the cardiovascular system during exercise. Aging augments the exercise pressor reflex, and exaggerated blood pressure responses to isometric exercise have been associated with an increased risk of adverse health effects due to cardiovascular disease. However, the impact of aerobic exercise training over the course of 6 months on mitigating the effects of aging on the exercise pressor reflex during IHG remains unknown. **PURPOSE:** To evaluate the impact of 6 months of aerobic exercise training on exercise pressor reflex during IHG in older individuals. **METHODS:** 23 older individuals (5M/18F; 71± 8y) completed IHG exercise before and after a 6-month period of aerobic exercise training. Beat-to-beat blood pressure (BP) was recorded by finger plethysmography for a 2-minute baseline and the last minute of IHG. The IHG exercise was performed at 30% of maximal voluntary contraction until volitional fatigue. To determine baseline and peak BP values, average mean arterial pressure (MAP), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were calculated for a two-minute baseline and the last minute of IHG exercise, respectively. BP values are reported as the difference between baseline and peak (ΔMAP, ΔSBP, ΔDBP). **RESULTS:** ΔMAP, ΔSBP, and ΔDBP from resting baseline to the last minute of IHG exercise for older individuals before the 6 months of aerobic exercise training were 29.3 ± 13.8 mmHg, 35.4 ± 19.1 mmHg, and 20.2 ± 10.9 mmHg, respectively. Following aerobic exercise training, the delta values for ΔMAP, ΔSBP, and ΔDBP were 25.4 ± 16.9 mmHg, 37.1 ± 24.5 mmHg, and 15.0 ± 12.0 mmHg. There were no statistically significant differences in ΔMAP ($p=0.16$) and ΔSBP ($p=0.68$) following 6 months of aerobic exercise training. However, ΔDBP significantly decreased following 6 months of aerobic exercise training ($p=0.04$). **CONCLUSION:** 6 months of aerobic exercise attenuated the DBP response during exercise pressor reflex with IHG in older adults, suggesting that aerobic exercise does not improve systolic or mean arterial pressure but does have an effect on diastolic blood pressure during IHG.

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Relationship Between Lung Function and Skeletal Muscle Morphology in Predicting Risk of Cachexia

Briauna M. Malone[1], Lauren E. Rentz[1], Emidio E. Pistilli[1,2]. [1]West Virginia University School of Medicine, Morgantown, WV, [2]West Virginia University Cancer Institute, Morgantown, WV

Cancer cachexia is prevalent among many cancer types and can drastically alter metabolism. These alterations can result in irreversible changes to one's muscle composition, exacerbating disease outcome and reducing quality of life. **PURPOSE:** This preliminary study was intended to assess the relationship between pulmonary function and longitudinal changes in body mass (BM) and muscle density. **METHODS:** A subset of 16 patients (12 males, 4 females; age 65.6±7.4 y/o; BMI 26.9±3.9) with stage 3 non-small cell lung cancer (NSCLC) from the ACRIN-NSCLC-FDG-PET collection of The Cancer Imaging Archive (TCIA) were included in analysis (DOI: 10.7937/tcia.2019.30ilqfcl). Participants completed pulmonary function tests at intake (baseline) to quantify force of expired volume (FEV1). Two full body computed tomography (CT) scans were obtained approximately six months apart: the first at baseline and the second after chemoradiation treatment. Scans were evaluated bilaterally to quantify muscle density via CT attenuation for subcutaneous adipose tissue (SAT), pectoralis major, erector spinae, oblique muscles, psoas, gluteus maximus, gluteus medius and piriformis at various anatomical levels. The absolute change in CT attenuation between timepoints and relative change in BM were calculated for each patient, and their association to baseline pulmonary test performance was assessed using Pearson's R. **RESULTS:** FEV1 was positively correlated with attenuation at baseline in pectoralis major (r=0.602, p=0.018), erector spinae (r=0.684, p=0.005), gluteus medius (r=0.578, p=0.024) and piriformis (r=0.597, p=0.019) and with relative changes in BM (r= 0.627, p=0.012). Neither FEV1 or changes in BM were correlated with CT attenuation changes for SAT or any muscles evaluated. **CONCLUSION:** This preliminary analysis suggests that greater pulmonary function may be related to enhanced protection against weight loss, as seen with cancer cachexia. Further, while a higher FEV1 may be associated with greater muscle density initially, it is not indicative of future changes to muscle quality (i.e., muscle wasting). Future research should evaluate the impact of exercise, surrounding chemoradiation treatment to further identify opportunities to preserve a patient's physical function capacity and quality of life.

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fat-1 overexpression mitigates the weight gain and intestinal inflammation in ovariectomized mice on high-fat diets

Natasha M. Malonza, Candace R. Longoria, Ke Sui, Diana Roopchand, Ali Yasrebi, Troy Roepke, Laurie B. Joseph, Sara C. Campbell

Studies show that compared to omega-6 fatty acids, omega-3 fatty acids reduce metabolic endotoxemia and low-grade inflammation. *fat-1* transgenic mice express fatty acid desaturase allowing conversion of omega-6 fatty acids to omega-3 fatty acids, reducing the n-6:n-3 ratio in tissues without diet adjustment. **PURPOSE:** Examine the impact of dietary fat on intestinal inflammatory response in ovariectomized (OVX) mice fed SFA- or PUFA-based HFD with/without E2. **METHODS:** WT (n= 20) and *fat-1* transgenic [Tg(CAG-fat-1)1Jxk] (n=20) C57BL/6 female mice were OVX at 11 weeks and split into experimental groups. WT and *fat-1* mice divided into 10 mice per group and fed SFA- or PUFA-based HFD formulations: 1) HFD-SFA = 45% kcal fat containing low LA (1% kcal), high SFA (31% kcal); and 2) HFD-PUFA = 45% kcal fat containing high LA (22.5% kcal), low SFA (8% kcal). Oral dosing of estradiol benzoate (300 mg/kg) began one week after surgery and then every other day for 8 weeks. After 8 weeks animals were sacrificed, and colon samples were collected for immunohistochemistry. H&E and ABPAS staining was performed to examine colon histology, and immunohistochemical localization of cyclooxygenase-2 (COX-2) was performed to examine colon inflammation. **RESULTS:** E2 supplemented *fat-1* animals had significantly ($P < 0.001$) less weight gain compared to controls on either the 1% or 22.5% LA diet. Average *fat-1* bodyweight with E2 supplementation compared to average WT 1% LA bodyweight (23.85g v 34.375g $P < .001$) and average WT 22.5% LA bodyweight (23.85g v 33.633g, $P < 0.007$). No morphological changes were observed in any treatment group. There was no significant difference between the average goblet cell count (13.3489 v 15.9409, $p < 0.366$) and average nuclei (44.7656 v 44.4219, $p < 0.521$) in *fat-1* or control animals respectively. *fat-1* animals have less localization of COX-2 as indicated by lighter staining compared to control. **CONCLUSION:** Estrogen-supplemented *fat-1* mice appear to be protected from weight gain and intestinal inflammation typically associated with high-fat diets rich in SFA. Further studies can elucidate the protective mechanisms of *fat-1* on intestinal health.

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Acute Intermittent Hypoxia Does Not Impact Vascular Function in Young, Healthy Individuals

Sara E. Mascone[1], Cynthia M. Weiner[1], Emily F. Blake[1], Lauren E. Eagan[1], Jacqueline K. Limberg[2], and Sushant M. Ranadive[1]. [1] University of Maryland- College Park. College Park, Maryland. [2] University of Missouri. Columbia, Missouri.

Cardiovascular disease is a culmination of vascular dysfunction, oxidative stress, and chronic inflammation. Acutely induced inflammation negatively affects conduit artery and microvascular function even in young, healthy adults. Acute intermittent hypoxia induces acute inflammation and increases sympathetic activity and blood pressure; however, the impacts of acute intermittent hypoxia on conduit artery and microvascular function are unknown. **PURPOSE:** To evaluate vascular (conduit artery and microvascular) function before and after acute intermittent hypoxia. **METHODS**: In a study of 13 young, healthy participants (10M/3F; 23 ± 4y)**,** blood pressure, conduit artery vascular function (flow-mediated dilation [FMD]), and microvascular function (reactive hyperemia area under the curve [RH AUC] and venous occlusion plethysmography forearm blood flow [VOP FBF]) were measured before (BL) and 30 minutes (30P) after acute intermittent hypoxia. Acute intermittent hypoxia consisted of 16 cycles of 25 seconds (s) of low oxygen air followed by 90s of room air (30 minutes total). **RESULTS:** During acute intermittent hypoxia, participants achieved an average nadir blood oxygen saturation (SpO_2) of 92%. Following acute intermittent hypoxia, brachial systolic (bSBP) and diastolic blood pressures (bDBP) increased from baseline (bSBP BL: 116 ± 6 mmHg, 30P: 120 ± 7 mmHg, p=0.02; bDBP BL: 65 ± 8 mmHg, 30P: 71 ± 7 mmHg, p=0.002). However, conduit artery vascular function and microvascular function were unchanged following acute intermittent hypoxia (p>0.05 for all; FMD BL: 4.8 ± 3.4 %, 30P: 4.6 ± 3.2 %; RH AUC BL: 37,132 ± 18,124 AU, 30P: 30,683 ± 13,471 AU; VOP FBF BL: 74.7 ± 22.2 ml/min, 30P: 79.5 ± 28.6 ml/min). **CONCLUSION:** Conduit artery and microvascular function are unaffected by acute intermittent hypoxia in young, healthy participants.

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Acute Changes in Levels of Inflammatory Proteins After a Single Bout of HIIT

Davi A.G. Mázala[1,2], Kathleen Dondero[1], Dakota Siok[1], Hannah A. Zabriskie[1], Devon A. Dobrosielski[1], Odessa Addison[3,4], Rian Q. Landers-Ramos[1]. [1]Towson University, Towson, MD; [2]Children's National Medical Center, Washington, DC; [3]University of Maryland School of Medicine, Baltimore, MD; [4]Veterans Affairs Medical Center, Baltimore, MD

High Intensity Functional Training (HIFT) is a type of high intensity training involving multi-joint movements emphasizing functional outcomes. While studies have shown that high intensity training can elicit a plethora of chronic health benefits, not many studies have evaluated the acute effects of HIFT on circulating inflammatory proteins that might also play a role in early phases of exercise-induced adaptations. **PURPOSE:** To evaluate acute changes in plasma levels of inflammatory proteins in response to a single session of HIFT. **METHODS:** The workout consisted of 4 sets of following body-weight exercises (15 reps of each): two lunge variations, jump squats, and burpees. Plasma samples were collected from recreationally active men (n=7) and women (n=6) (18-45 yrs) – samples were collected before exercise (pre), 15min post- and 24h post-completion of the training session and frozen until analyses. Levels of different inflammatory factors were evaluated by using the Inflammation 20-Plex Human ProcartaPlex™ Panel. **RESULTS:** Of the 20 different inflammatory proteins analyzed, 10 showed an increase from pre vs. 15min post exercise (TNFα: 42%; GM-CSF: 9%; IFNα: 49%; IFNγ: 24%; IL-1 α: 61%; IL-1 β: 62%; IL-6: 17%; IL-8: 19%; IL-13: 20%; IL-17A: 21%; $p<0.05$ for all), while 3 showed a decrease from pre vs. 15min post exercise (CD62E: 25%; ICAM-1: 27%; IL-12p70: 8%; $p<0.05$ for all). Additionally, 10 proteins showed a decrease from 15min post vs. 24h post exercise (CD62P: 20%; TNFα: 35%; GM-CSF: 7%; IFNα: 28%; IFNγ: 36%; IL-1α: 37%; IL-1β: 32%; IL-6: 18%; IL-8: 14%; IL-13: 23%; IL-17A: 17%; $p<0.05$ for all), while only 1 protein showed an increase from 15min post vs. 24h post exercise (IP-10: 29%; $p<0.05$). Two proteins showed a decrease from pre vs. 24h post exercise (CD62E: 18%; IL-12p70: 14%; $p<0.05$ for all) and 1 protein showed an increase from pre vs. 24h post exercise (IP-10: 19%; $p<0.05$) - no changes were reported for IL-4, MCP-1, MIP-1α, MIP-1β, nor IL-10. **CONCLUSION:** Our results demonstrate that HIFT induces acute changes in in plasma levels of inflammatory proteins, but that their levels seem to return to baseline values within 24h post exercise.

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Meeting Physical Activity Guidelines During Pregnancy and Its Relationship With Low Back/Pelvic Girdle Pain

Traci A. McCarthy[1], Sarah M. Velez[1], Adrienne H Simonds[2], Andrea M. Spaeth[1]. [1]Rutgers University, New Brunswick, NJ, [2]Rutgers University, Newark, NJ

Low back pain and pelvic girdle pain (LBP/PGP) are common complaints during pregnancy, with more than 45% of pregnant women experiencing moderate to severe LBP/PGP. Exercise is a non-pharmacological treatment for reducing and preventing the development of pain in the adult population. **Purpose:** To determine if women who meet physical activity recommendations during pregnancy experience less LBP/PGP than women who do not meet the guidelines. **Methods:** Pregnant women (n=24, 32.1±4.1 y, pre-pregnancy BMI=23.2 ± 6.0) in their third trimester (between 28-32 weeks gestation) who reported exercising >150 min/wk (n=10) or < 90 min/wk (n=13) were included in this study. Participants filled out a series of questionnaires assessing physical activity, pain, stress, and mood (anger, anxiety, depression, positive affect) and underwent a physical exam performed by a licensed physical therapist to determine the presence of LBP/PGP. Multivariate ANOVAs and nonparametric tests compared groups on outcome measures. **Results:** Thirty percent of women reported LBP and twenty-six percent reported PGP. Compared to women who were physically inactive, women who were physically active reported higher metabolic equivalent (MET) minutes per week ($p<0.05$) and less anger ($p<0.10$). There were no significant differences between groups on both subjective and clinical LBP/PGP measures. **Conclusion:** Although LBP/PGP was common in this sample and women who exercised exhibited greater weekly physical activity and less anger, there were no differences between groups on pain measures. Data collection for this study is ongoing.

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Home-Based Hypertension and Physical Activity Screening by Community Health Workers in Under-Resourced South African Communities

Lia McNulty[1], Mark Stoutenberg[1], Simone Crouch[2], Andrea Kolkenbeck-Ruh[2], Andy Ly[1], Georgia Torres[2], Philippe Gradidge[2], Lisa Ware[2]. [1]Temple University, Philadelphia, PA, [2]University of the Witwatersrand, Johannesburg, South Africa

Low- and middle-income countries have struggled with the prevention and control of non-communicable diseases. Community health workers (CHWs) are capable of providing valuable healthcare services and individualized care to patients and relieving the workload of local health clinics. **PURPOSE:** This study sought to explore the feasibility and acceptability of CHW-led home-based visits consisting of screening and brief counseling for blood pressure and physical activity. **METHODS:** In September 2021, CHWs visited community member homes in Soweto, South Africa where they performed blood pressure and physical activity screenings, followed by brief counseling, as appropriate. Community members were asked to complete a satisfaction survey at the end of the visit. A sample of community members were later contacted to participate in a semi-structured interview to better understanding their experience with the home visit, the CHWs, and the screenings. **RESULTS:** CHWs visited 169 households, from which 122 community members consented to participate in the study. Of the 122 participants, 32.0% were hypertensive and 56.6% were deemed physically inactive. Nearly all participants reported that it was 'very easy' or 'easy' to understand information from CHWs (97%), that the CHWs answered their questions 'very well' or 'well' (100%), and that they would be 'very likely' or 'likely' to request home service again (93%). Twenty-eight interviews were later conducted revealing four main themes: 1) receptiveness to the visits and allowing CHWs into their homes, 2) openness to the advice and counseling provided, 3) satisfaction with the blood pressure and physical activity screening and a basic comprehension of the results, and 4) receptiveness to the physical activity advice and an interest in becoming more physically active. **CONCLUSION:** Home visits led by CHWs are an acceptable and feasible method for providing healthcare service to address non-communicable diseases in under-resourced communities. The acceptability of the home visits indicates the potential for using CHWs to provide more accessible and individualized care and reducing barriers individuals living in under-resourced communities face attempting to achieve a healthier lifestyle.

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Bilateral Asymmetry in the Forward Lunge Exercise

Reese P. Michaels, Deborah L. King, George Sikoryak III, Katy N. Krueger, Madison J. Martinez, Ithaca College, Ithaca, NY

Bilateral asymmetry is a common metric used by clinicians and professionals within the medical community. Between-limb asymmetry is an indicator of strength, power, and mechanical progression in athletes recovering from unilateral injury, and thus may have application in return-to-play (RTP) evaluations. Consensus normative values for bilateral asymmetry indices (BAI) are lacking within the literature for many common rehabilitation exercises, making it increasingly difficult to use BAI as a RTP metric. **PURPOSE:** To determine normative BAI values for select biomechanical measures for a forward lunge exercise. **METHODS:** As part of a larger study, 10 female and 3 male healthy, college-aged individuals with no prior neuromuscular or musculoskeletal pathologies participated. A total of 24 reflective markers were placed on the participant on both left (L) and right (R) lower extremities, creating a 7-segment model (pelvis and R/L thighs, lower legs, and feet). Three trials of 5 rehabilitation exercises/functional movements were completed but only the lunges were analyzed for this study. 3D kinematic and kinetic data were collected via a motion capture system integrated with force plates. Maximum flexion angles at the ankle, knee, and hip joints, medial-lateral (ML) knee displacement, maximum percent power at these joints, and maximum percent loading on the front foot were used for BAI analysis. BAI was calculated as $BAI = 100 * \frac{[(RMAX,LMAX)-(RMIN,LMIN)]}{[(RMIN,LMIN)]}$. **RESULTS:** Mean L and R BAI was 15.69±17.92% for max ankle dorsiflexion, 3.80±2.13% for max knee flexion, and 6.16±4.07% for max hip flexion. ML knee displacement BAI was 49.92±64.26%. Mean max sagittal joint power BAI was 43.17±52.46% for the ankle, 22.42±22.34% for the knee, and 32.90±52.13% for the hip. Mean BAI for percent loading on front foot was 2.25±1.96%. **CONCLUSION:** Preliminary findings suggest that there are large BAIs in joint kinematics and kinetics related to control of movement in a forward lunge rehabilitation exercise in healthy populations. Variables related to movement outcome (e.g., lunge depth) such as knee and hip flexion were more symmetric (>93%). Kinematic and kinetic BAIs for a lunge are large and variable in uninjured populations, therefore, the feasibility of BAI of biomechanical markers as rehabilitation metrics remains in question.

Validation of a New Assessment of Surfer's Performance

Jerry-Thomas Monaco[1,2] , Richard J. Boergers[1] , Thomas Cappaert[2] , Michael Miller[2,3] .
[1]Seton Hall University School of Health and Medical Sciences, Nutley, NJ, [2]Rocky Mountain University, Provo, UT, [3]Western Michigan University, Kalamazoo, MI.

The sport of surfing has gained popularity not only as a competitive sport, but as a recreational athletic activity that is non-age dependent. However, surfing is not a time-based sport and the current evaluation method of surf performance is only done by a panel of judges at a surf competition. Therefore, there is a need for a performance assessment for non-competitive, recreational surfers. **PURPOSE:** The purpose of this study is to establish content validity of the surfer's performance questionnaire (SPQ) using a modified Ebel method. **METHODS:** The content validation was done in a two-step process. First, face validity was established by five surf coaches. This developed the SPQ into an assessment consisting of five key elements of surfing: catching a wave, pop up, paddling, wave riding, and stamina in the water, each rated on a 9-point likert scale (best possible score is 45). Next, we used the Ebel method, which utilized a panel of experts to examine each item on the questionnaire in order to determine the level of difficulty (easy, appropriate, and difficult) and relevance (essential, important, marginal) of each item. Twenty-one individuals with surfing expertise (9 certified surf instructors/coaches, 8 non-certified surf instructors/coaches, and 3 surf performance trainers) used the Ebel method to evaluate the content validity of the SPQ. The goal was to have >50% of each item to be rated as easy or appropriate and essential or important to be retained. Any items that scored ≤50% on the Ebel method would have been excluded from the SPQ. Interclass Correlation (ICC) was also used to evaluate the agreement between the raters. **RESULTS:** All 5 key elements had greater than 50% agreement for Ebel results and were included on the final SPQ: catching a wave (61.9%), pop up (80.9%), paddling (80.9%), wave riding (57.1%), and stamina in the water (71.4%). The overall agreement of the raters on the SPQ was good (ICC=.877, p=.0001). The ICC for the SPQ individual elements demonstrated excellent agreement with catching the wave (ICC=.921, p=.002) and paddling (ICC=.966, p=.001), good agreement with pop-up (ICC=.857, p=.016) and stamina in the water (ICC=.804, p=.035) but poor agreement with wave riding (ICC=-0.54, p=.343). **CONCLUSION:** These findings suggest the SPQ is a valid assessment to measure a recreational surfer's performance.

Structural Differences in the Tibial Metaphysis Between Female NCAA Division I Cross-Country Runners and Gymnasts

Kelly H. Mroz[1], Kristen J. Koltun[1], Nicole M. Sekel[1], Adam J. Sterczala[1], Evan D. Feigel[1], David N. Mowery[1], Mita Lovalekar[1], Pouneh K Fazeli[1], Jane, A. Cauley[1], Sophie L. Wardle[2], Thomas J. O'Leary[2], Julie P. Greeves[2], Bradley C. Nindl[1], FACSM, [1]University of Pittsburgh, Pittsburgh, PA; [2]Army Health and Performance Research, Ministry of Defence, UK

Bone geometry and microarchitecture vary between athletes with different habitual loading patterns because bone adapts to withstand loading demands. As gymnastics involves infrequent high impact loading and running involves repetitive medium impact loading, differences in the tibial structure are expected between these athletes. **PURPOSE:** Investigate differences in geometry and microarchitecture of the distal tibial metaphysis between collegiate female athletes competing in gymnastics and cross-country. **METHODS:** High resolution peripheral quantitative computed tomography was used to assess the distal tibia of NCAA Division I female cross-country runners (n = 17, age = 19.0 ± 0.9yrs, BMI = 20.6 ± 1.4kg/m^2) and gymnasts (n = 16, age = 19.5 ± 1.4yrs, BMI = 23.3 ± 1.8kg/m^2). Scans were taken at 4% of tibial length and evaluation software measured bone parameters. Finite element analysis estimated stiffness and failure load. Unadjusted group comparisons were conducted using independent samples *t* tests, followed by analysis of covariance adjusting for baseline BMI. Data are presented as mean±SD, α=0.05, two-sided. **RESULTS:** Unadjusted group comparisons showed that gymnasts exhibited greater total area (1067.4±100.3mm^2, 950.8±65.9mm^2, p<.001), trabecular area (995.5±103.2mm^2, 880.7±64.5mm^2, p<.001), and trabecular number (2.1±0.2mm^{-1}, 1.9±0.2mm^{-1}, p=.015) than runners. Stiffness (228.7±47.5Nmm^{-1}, 190.5±46.9Nmm^{-1}, p=.027) and failure load (12.2±2.4N, 10.3±2.4N, p =.026) were also greater in gymnasts than runners. Group differences analyzed after adjusting for BMI remained significant for total area (p=.030), trabecular area (p=.020), and trabecular number (p=.008); whole bone stiffness and failure load were no longer significant (p≥.381). Cortical volumetric bone mineral density, area, and thickness were not significantly different between groups in either analysis (p>.05). **CONCLUSION:** Gymnasts presented with more favorable bone structure than runners, possibly due to higher forces experienced during training and competition. Differences in tibial metaphysis bone structure between gymnasts and runners, which persist after controlling for BMI, indicate that the adaptive bone formation response to sport training is specific to demands of the sport.

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Insulin-Induced Relative Hypoglycemia on Hemodynamics and Metabolic Insulin Sensitivity in Adults with Obesity

George A. Mysh, Daniel J. Battillo, Mary-Margaret E. Remchak, Steven K. Malin, FACSM, Rutgers University, New Brunswick, NJ 08901

Relative hypoglycemia (RH) is linked to stress hormones that alter autonomic function. While the clinical risks of RH have been investigated, less is known about the induction of RH on hemodynamics or metabolic insulin sensitivity in adults with obesity. PURPOSE: To determine if RH alters aortic waveforms and metabolic insulin sensitivity to a greater extent in those with chronic hyperglycemia (HG) versus normoglycemia (NG). METHODS: Seventy-one adults with obesity (55.02±0.9y; 36.2±0.6kg/m2) were classified using ADA criteria of HbA1c > 5.7% as HG (n=34, 28F; HbA1c=6.02±0.1%) or NG (n=36, 30F; HbA1c=5.4±0.0%). A 2-hr OGTT was also used to depict glucose tolerance status. A 120min hyperinsulinemic-euglycemic clamp (40mU/m2/min, 90 mg/dl) was used to determine metabolic insulin sensitivity (glucose infusion rate (GIR)). Pulse wave analysis (applanation tonometry) was used to assess augmentation index (AIx75), brachial (bBP) and central (cBP) blood pressure, as well as waveform components (forward pressure (Pf), backward pressure (Pb), and reflection magnitude (RM)) at 0 and 120min of the clamp. Plasma nitrate and nitrite were measured as surrogates of nitric oxide. RH was defined as the percent drop in glucose from fasting to steady state (90-120min) periods of the clamp, and symptoms were noted if any. RESULTS: There were no differences in age, weight, VO2max, or fasting aortic waveforms between groups. HG had higher HbA1c ($P<0.01$), fasting glucose ($P=0.04$), 2-hr OGTT glucose ($P<0.01$), and had a greater drop in glucose in response to insulin (-16.5±2.8 vs. -10.7±2.0%; $P=0.03$), whereas GIR was lower than NG ($P=0.03$). Despite no hypoglycemic symptoms being reported, heart rate (HR) increased in NG compared to HG (5.9±1.4 vs. -0.61±1.8%; $P<0.01$), while Pf decreased in HG (-6.9±3.5 vs. 3.0±3.1%; $P=0.04$). However, insulin lowered AIx75, AP, Pb and RM as well as plasma nitrate and nitrite similarly between NG and HG ($P\leq0.05$). Insulin-mediated decreases in HR associated with lower Pf ($r=0.34$, $P<0.01$). CONCLUSION: Insulin-induced RH was higher in HG compared to NG. This corresponded with a blunted rise in HR and drop in Pf during insulin infusion. These data suggest RH may relate to altered vascular and/or autonomic function in adults with HG.

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Role of Oncostatin M in Exercise-Induced Breast Cancer Prevention

Kara A. Negrini, Katherine Wehrung, Dhruvil Shah, Kathleen M. Sturgeon. Penn State College of Medicine, Hershey, PA

Epidemiologic studies and rodent models show moderate-intensity physical activity can decrease the risk of breast cancer. Proposed mechanisms of how physical activity impacts breast cancer progression range from minimizing risk factors to decreasing abnormal mammary cell proliferation. Muscle-derived cytokines, also known as myokines, are excreted by skeletal muscle following acute exercise. Specifically, the myokine oncostatin M (OSM), has been shown to decrease breast cancer cell proliferation *in vitro*. **PURPOSE:** To identify OSM involvement in physical activity-induced prevention of breast cancer *in vivo*. **METHODS:** Female, 22-day old, Sprague Dawley rats were injected with 50 mg/kg n-methyl-n-nitrosourea (MNU) to induce mammary adenocarcinoma. Rats were exercise (Ex) trained (MNU+Ex) or remained in standard cage conditions (Sedentary, Sed) (MNU+Sed). The study was powered with n=12 per group to observe a significant difference in tumor free survival time. Exercise training consisted of treadmill acclimation, and progressive increases in session duration, speed, and grade, until reaching 30 min/day, 20 m/min at 15% incline. Exercise training continued 5 days/week until tumor palpation or week 18, which ever came first. Rats completed a maximal endurance test (MET) after tumor palpation. Blood was drawn before, 30 min following, and 2 hr following MET to measure plasma OSM levels (pOSM). **RESULTS:** There were no significant differences between body weight growth curves of MNU+Sed and MNU+Ex groups during intervention. Tumor free survival was significantly higher ($p=0.002$; $p<0.05$) in MNU+Ex rats (52.2 ± 4.5 days post-MNU) compared to MNU+Sed rats (42.0 ± 0.0 days post-MNU). Following MET, pOSM levels were significantly higher compared to baseline pOSM levels in non-tumor bearing animals ($p=0.046$). Ongoing studies include analysis of pOSM in tumor-bearing animals after MET. MNU+anti-OSM+Ex groups were also added to observe changes in tumor latency after OSM blockade. **CONCLUSION:** Independent of differences in energy balance, exercise training increased tumor free survival in a rat model of carcinogen induced breast cancer. The observed protection may be modulated by acute exercise-induced increases in OSM levels.

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Relationship Between Left Ventricular Mass and Exercising Systolic Blood Pressure in Women

Skylar R. Paletta, Peter A. Hosick, Evan L. Matthews, Montclair State University, Montclair, New Jersey.

The elevated systolic blood pressure (SBP) that occurs during exercise contributes to the increase in left ventricular mass relative (LVM) to body surface area (LVM/BSA) resulting from exercise training. Resistance training primarily hypertrophies LVM in parallel resulting in thicker chamber walls. Conversely, aerobic exercise hypertrophies LVM in parallel and series thickening the walls and increasing chamber size. **PURPOSE:** Determine if a correlative relationship exists between the SBP response to resistance exercise (eSBP) and LVM/BSA in women with varied exercise training histories. **METHODS:** Twenty-nine young, adult women participated (age 23±4yrs, height 165±7cm, body mass 65.4±11.4kg, body surface area 1.72±0.16m^2, resting stroke volume 43±11mL/beat, SBP 110±10mmHg, diastolic blood pressure 68±7 mmHg). The participants were mostly active, but exercise habits varied (weekly aerobic exercise n=23, weekly resistance exercise n=21, both n=19, no exercise n=4). LVM was estimated by using linear cardiac measurements from the parasternal long axis echocardiographic view. Exercise consisted of 5 sets of bilateral leg extension at 70% of 1 repetition maximum with 60s rest intervals while continuously monitoring blood pressure using finger plethysmography. Pearson correlations were used to examine relationships of interest to the eSBP change from rest to the final 10s during set 5. **RESULTS:** LVM/BSA (71.8±14.9g/m^2) was shown to be inversely related to eSBP (33±15mmHg) (r=-0.512, p=0.004). Interventricular septum width during diastole (0.90±0.14cm) (r=-0.330, p=0.080) and left ventricle internal diameter during diastole (4.32±0.41cm) (r=-0.341, p=0.069) displayed insignificant inverse trends vs eSBP. Posterior wall thickness during diastole (0.88±0.16cm) (r=-0.196, p=0.308) did not correlate to eSBP. **CONCLUSION:** This preliminary analysis suggests that a lower systolic blood pressure response to resistance exercise may be related to greater left ventricular muscle mass in women with varied exercise training histories. These findings may have been influenced by the habitual aerobic training of the participants.

Conflicts of Interest : NONE

Neuroendocrine Responses to Cold Pressor Stimuli in Midshipmen Participating in the Naval Special Warfare Screener.

Varun J. Patel[1], Brian J. Martin[1], Martin Wright[2], Adam Susmarski[2] FACSM, Mita Lovalekar[1], Meaghan E. Beckner[1], Andrew K. Ledford[2], Shawn D. Flanagan[1], Bradley C. Nindl[1] FACSM.

[1]University of Pittsburgh, Pittsburgh, PA, [2]U.S. Naval Academy, Annapolis, MD

The Naval Special Warfare (NSW) Screener is an arduous, 24-hour event conducted at the U.S. Naval Academy for midshipmen aspiring to enter the Navy Sea-Air-Land (SEAL) Teams. Acute physical stress, such as military training, has a myriad of effects on the neuroendocrine system, adversely affecting anabolic hormones while increasing levels of adrenal hormones. Cold water immersion of distal limbs has been shown to stimulate neuroendocrine responses. **PURPOSE** To assess the effects of a modified cold pressor test (CPT) on neuroendocrine responses and explore the association between CPT time and successful completion of the screener. **METHODS** 65 midshipmen (body mass: 79.0 ± 6.9 kg, body fat: 10.0 ± 3.9%, height: 178.8 ± 7.1 cm) performed the CPT approximately 4-6 weeks prior to the NSW Screener. The CPT was conducted by submerging both feet to the midpoint of the medial and lateral malleolus in circulating ice-water (~1°C) until volitional withdrawal (max: 5-min, undisclosed). Total time for the CPT was recorded. Blood was collected before (PRE) and immediately after (POST) the CPT and analyzed for concentrations of cortisol, adrenocorticotropic hormone (ACTH), human growth hormone (HGH), insulin-like growth factor I, neuropeptide-Y, brain-derived neurotrophic factor, epinephrine (EPI), testosterone, and dehydroepiandrosterone. The analysis was conducted using unpaired t-tests. **RESULTS** 50 midshipmen (39 finishers, 11 non-finishers) participated in the screener, while 15 were excluded from the analysis for non-participation. We observed a significant increase pre- to post-CPT in ACTH (PRE: 55.7 ± 32.4 pg/mL vs POST: 76.8 ± 38.3 pg/mL, $p = 0.0094$), HGH (PRE: 0.88 ± 1.42 ng/mL vs POST: 2.61 ± 3.34 ng/mL, $p = 0.0019$), and EPI (PRE: 51.6 ± 40.8 ng/mL vs POST: 80.5 ± 54.5 ng/mL, $p = 0.047$). However, CPT time was not significantly different between finishers and non-finishers (272.5 ± 63.2s vs. 253.8 ± 84.4s, respectively, $p = 0.438$). We also observed no difference in the change from pre- to post-CPT for any analytes between finishers and non-finishers. **CONCLUSION** The CPT was effective in simulating acute stress in the midshipmen, leading to robust increases in ACTH (+37.8%), HGH (+195.8%), and EPI (+55.9%). However, there were no differences in CPT time or any biomarkers between finishers and non-finishers.

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Effects of a Novel Ankle Strengthening Protocol on Lateral Ankle Strength and Flexibility

Jack J. Petit, Christopher J. Otwell, Holton C. Gwaltney, Nikolas A. Grabiec, Samuel A. Luithle, Hayden D. Gerhart, Philip J. Prins, Jeffrey D. Buxton. Grove City College, Grove City, PA.

Lateral ankle sprains (LAS) are among the most reported injuries in college athletics. Strengthening the muscles of the lateral ankle and enhancing flexibility, specifically using exercises that mimic the typical mechanism of LAS may help to reduce injury incidence. **PURPOSE:** To compare the effects of a novel supination-style ankle strengthening protocol to a control protocol on common LAS indices (e.g., inversion and eversion strength, inversion ROM). **METHODS:** Thirty NCAA Division III collegiate varsity football players (19.9±1.0 yrs., 182.2±6.9 cm, 98.8±18.0 kg) were randomly assigned to the novel group (SUP, n = 16) or the control group (TRA, n = 14). The SUP group performed dynamic bodyweight exercises with controlled supination while the TRA group performed traditional ankle strengthening exercise using elastic bands and balance exercises. Each group completed their respective protocols 3 times per week for 6 weeks. Ankle inversion (InvR, InvL) and eversion (EvR, EvL) strength (kg), ankle inversion range of motion (romR, romL) (deg.), and the figure-8 hop test (fig8R, fig8L) (s) were assessed pre- and post-intervention. **RESULTS:** There were no significant interaction effects (p's>0.05) or main effects for group (p's>0.05) for all outcome variables. There was a main effect for time showing that all outcome variables improved from pre to post [ΔinvR (TRA 4.5±4.3; SUP 5.0±4.4 kg), ΔinvL (TRA 4.0±3.8; SUP 4.8±3.6 kg), ΔevR (TRA 5.7±4.3; SUP 4.7±3.3 kg), ΔevL (TRA 4.7±2.9; SUP 4.5±2.2 kg), ΔromR (TRA 4.5±2.6; SUP 4.9±3.0 deg.), ΔromL (TRA 4.7±4.5; SUP 4.6±5.1 deg.), Δfig8R (TRA -0.43±0.20; SUP -0.37±0.31 s), Δfig8L (TRA -0.40±0.22; SUP -0.34±0.30 s); p's<0.001)]. **CONCLUSIONS:** A bodyweight, supination style training program for the ankles can significantly improve physical indices related to LAS to a similar extent as a traditional program, and therefore, could potentially be a viable strategy for reducing LAS in Division III NCAA football players.

Supported by Grove City College Exercise Science Department

Validity of Remote Testing to In-Person Testing of 2-Minute Walk Test and Stepping in Place Test

Lori A. Portzer, Ashley M. Carpentier, Domonic W. Johns, Gretchen E. Thomas, Robert A. Creath. Lebanon Valley College, Annville PA

COVID-19 pandemic severely reduced in-person health-related testing in homeless shelters. This has created significant monitoring challenges for persons living in shelters considered at-risk for chronic health problems for which basic functional tests such as walking or stepping provide important health information. Recent studies have examined the feasibility of remote testing for a variety of functional tests. Holland et al. (2020), validated remote testing for functional mobility tests including stepping. Pessoa et al. (2013), compared walking with stepping. By combining the two approaches we proposed to compare: 1) In-person vs remote observation of the 2-minute walk (2MWT) test and two-minute step in-place test (STEP). **Purpose:** The purpose of this experiment was to validate comparisons between 1) in-person and remote testing; 2) stepping-in-place and walk test. **Methods:** 32 people performed stepping in place test (STEP) and two-minute walking test (2MWT) in person and remotely. Each test was performed twice on each subject for a total of 4 tests. Before each test heart rate was collected and had to be within a range of 10 bpm of its initial heart rate before the next data collection could begin. **Results:** Relative intensity of the 2MWT-IPO ranged from 47% to 101% (67.4 +/- 12.83%). Relative intensity of the 2MWT-RO ranged from 48% to 101% (67.53 +/- 12.59%). STEP -IPO relative Intensity ranged from 38% to 89% (63.09 +/- 14.08%). STEP-RO relative intensity ranged from 43% to 91% (63.28 +/- 13.89%). The difference between relative intensity of each 2MWT was not significant [$t(31)= -0.171, p= 0.865$]. The difference between relative intensity of each STEP was not significant [$t(31)= -0.236, p=0.815$]. **Conclusions:** A greater relative intensity was required to complete the 2MWT vs the STEP, indicating the STEP test would be better suited for populations with greater health issues or limited mobility. It was found that having a standard step height for the STEP could provide greater validity if the testing was to be redone. Remote and in-person testing was found to be comparable, proving that remote observation is a viable option. There was no effect if the observer was in-person or remote. 2MWT produced a higher relative intensity than stepping in place.

Relationship of Family Nutrition and Physical Activity (FNPA) Screening Scores and BMIz in Rural Children

Benjamin A. Potts[1,2], Joseph L. Andreacci[2], Craig G. Wood[1], Lisa D. Bailey-Davis[1]

[1]Geisinger Health System, Danville, PA, [2]Bloomsburg University of Pennsylvania, Bloomsburg, PA

Sustained childhood obesity prevalence has signified a need to assess modifiable contributors to adverse weight outcomes. The Family Nutrition and Physical Activity (FNPA) screening tool is an established method to assess obesogenic home environments and behaviors. **PURPOSE:** To examine the relationships between the Family Nutrition and Physical Activity (FNPA) screening tool and changes in BMIz and BMIz extended. **METHODS:** Data were extracted from Geisinger's electronic health record database for this retrospective study. Children were included if they were between 2-11 years and completed two FNPA's during well-child visits in successive years from 2013-2021. Data collected in each completed FNPA included sex, age, race/ethnicity, FNPA score, and BMI (including BMI%, BMIz, and BMIz extended). Multiple linear regression adjusting for baseline FNPA, age, and sex was used to determine if change in FNPA score was correlated with change in BMI (utilizing BMIz and BMIz extended). **RESULTS:** The 11,913 children (52% male; 48% female), had a mean age of 5±2.4 years, and were 83% non-Hispanic White, 9% Hispanic, 6% non-Hispanic Black, and 2% other race/ethnicity. BMI percentile at the baseline FNPA was 3% <5th percentile, 67% in the 5-85th percentile, 16% in the 85-95th percentile, and 15% >95th percentile. No significant relationships were observed between FNPA and BMIz or BMIz extended for children whose baseline BMI percentile was <85. However, for children with a baseline BMI percentile ≥85, a significant relationship was observed between FNPA score and BMIz (1 point increase with FNPA was associated with 0.0059 decrease in BMIz, p=0.0004) and BMIz extended (1 point increase with FNPA was associated with a 0.0048 decrease in BMIz extended, p=0.0029). **CONCLUSION:** Among a large rural pediatric population with longitudinal data, increased FNPA scores exhibit a significant inverse association with decreases in BMIz and BMIz extended when baseline BMI is ≥85th percentile. These findings suggest utility for FNPA in secondary prevention.

Plasma LEAP-2 after a Low-Calorie Diet with or without Exercise in Women with Obesity

Tristan J. Ragland and Steven K. Malin, FACSM. Rutgers University New Brunswick, NJ

Gut-derived factors regulate food intake and body mass. Recently, liver expressed antimicrobial peptide-2 (LEAP-2) has been identified to decrease caloric intake, in part, through lowering acylated-ghrelin (AG). Exercise reduces post-prandial AG and favors fullness while dieting may raise hunger and AG. However, it is unclear if LEAP-2 changes after a low-calorie diet with interval exercise (LCD+INT) compared with LCD in relation to weight regulation. **PURPOSE**: Assess if LCD+INT raises LEAP-2 more than LCD in relation to appetite, AG, and metabolic health. **METHODS**: Twenty-five women with obesity were randomized to either 2-wks of LCD (n=13, 46.2±3.3yrs, 37.5±1.5kg/m^2, VO_2max=18.9±1.2ml/kg/min; ~1200 kcal/d) or LCD+INT (n=12, 50.8±3.3yrs, 37.7±2.1kg/m^2, VO_2max=17.6±1.1ml/kg/min; 60 min/d of supervised INT alternating 3min of 90% and 50% HRpeak). LCD+INT were fed 350kcal post-exercise to equate energy availability. AG and LEAP-2 were measured at 0, 30, and 60min of a 75g OGTT. Glucose and insulin were obtained at 0, 30, 60, 90, 120, and 180min to estimate insulin sensitivity (Matsuda index) and glucose effectiveness (GE). Fasting appetite was assessed via visual analogue scales. **RESULTS**: LCD reduced BMI (-0.8±0.1 vs. -0.4±0.1kg/m^2; *P*=0.03) and fat mass (-1.2±0.2 vs. -0.4±0.2; kg *P*=0.03) compared with LCD+INT, but only LCD+INT increased VO_2max (1.0±0.6 vs. -0.6±0.4ml/kg/min; *P*=0.04). Both treatments tended to raise insulin sensitivity (0.9±0.5 vs. 0.2±0.2; *P*=0.06) and FFA $tAUC_{180min}$ (*P*=0.001), with no effect on GE (*P*=0.32). LCD+INT tended to preserve fasting fullness (1.7±7.9 vs. -16.1±5.1mm; *P*=0.07) and raise fasting AG compared to LCD (3.2±3.3 vs. -7.4±4.1ng/dl; *P*=0.06). Although there was no treatment effect on fasting LEAP-2 (*P*=0.41), LEAP-2 $tAUC_{60min}$ tended to decrease (*P*=0.07). Further, low LEAP-2 $tAUC_{60min}$ correlated with low post-trial body fat (r=0.45, *P*=0.03) as well as high VO_2max (r=-0.41, *P*=0.05) and AG $tAUC_{60min}$ (r=-0.45, *P*=0.03). **CONCLUSION**: Short-term LCD+INT does not alter LEAP-2 versus LCD alone. However, low LEAP-2 correlated with low body fat, VO_2max, and AG. These data suggest LEAP-2 responds to lifestyle-mediated energy deficit. Further working examining LEAP-2 mechanisms on weight regulation is warranted.

Relationship Between Body Satisfaction and Exercise Behavior: A Cross Cultural Comparison

Selen Razon[1] , Hyeon Jung Kim[2], Andrew J. Schlosser[1], Olivia Huffman[2], Lawrence Judge[2]
[1]West Chester University, West Chester, PA , [2]Ball State University, Muncie, IN

Body satisfaction among women has become an important subject worldwide. **PURPOSE:** This study investigated the correlation between physical activity and perception of body satisfaction, and weight status (BMI) among female college students in the United States and South Korea. This study also investigated the relationship between preferred physical activity and body satisfaction, and BMI. **METHODS:** Subjects were recruited from a university in the Midwest United States (n = 192, Mage = 20.3 yrs), and a university in South Korea (n = 198, Mage = 21.8 yrs).Participants responded to a self-reported questionnaire that included demographic information, Body Dissatisfaction Scale-Eating Disorders Inventory (BDS-EDI), International Physical Activity Questionnaire Short Form (IAPQ-SF), and Objectified Body Consciousness Scale (OBS). **RESULTS:** The results indicated that subjects' physical activity levels were unrelated to body satisfaction and BMI. However, South Korean students reported higher body dissatisfaction and body shame scores than American students (body dissatisfaction scores: South Korean 31.86 > American 28.21; body shame scores: South Korean 26.54 > American 22.40). American students reported higher physical activity levels than South Korean students (total recreation METs: South Korean 99.60 < American 1987.07). Preference of exercise types were not related to BMI among either population. BMI was related to body dissatisfaction in American and South Korean students ($p < .001$). Chi-square analysis resulted in a p-value of .271 among American students and .471 among South Korean students. **CONCLUSION:** Current subjects, across both cultures and independent from the activity levels reported dissatisfaction with their bodies. Body dissatisfaction is a cause of morbid exercise behavior. Achieving higher levels of body satisfaction can help psychological well-being and healthy exercise behavior.

Effects of Yoga and High-intensity Exercise on Heart Rate Variability and Stress- A Pilot Study

Robyn Redline, PT, DPT, NCS, CYT, Ranell Mueller, Ph.D., MFT, Saint Francis University, Loretto, PA

Healthcare students have increasingly higher stress levels than in other fields of study. Yoga and meditation are common suggestions to help manage stress and are highly supported in the available literature regarding stress management. Unfortunately, not all students are willing or able to partake in yoga and meditation. **PURPOSE:** This study aimed to determine if high-intensity aerobic exercise is a plausible and equally effective alternative to yoga and meditation for stress management among healthcare students. A second aim was to compare the impacts of yoga versus high-intensity aerobic exercise on heart rate variability (HRV). **METHODS:** Nine female healthcare students were assigned to one of three intervention groups: yoga, high-intensity aerobic exercise (HIT), or control group. The Perceived Stress Scale (PSS) and HRV were measured over eight weeks. **RESULTS:** The control group and the HIT group did not have statistically significant changes in HRV over the 8 weeks (control 65.33±9 to 66.67 ± 8.1 and HIT 54±10 to 66± 6.1). The yoga had an improvement in HRV from 56.33 ± 7.5 to 63.67 ±6.65 with $p<0.05$. ANOVA comparison between all three groups was not statistically significant. All subjects had a decrease in score on the perceived stress scale, however there was no significant difference between groups on ANOVA comparison. One subject from the yoga group and one subject from the HIT group improved from moderate to low stress on the PSS. No subjects in the control group reached low stress categorization. Pearson correlation revealed a negative correlation of -0.238 between HRV and PSS but was not statistically significant ($p=0.176$). One subject in the HIT group had lower than average HRV and the highest PSS score at the start of the study, however, at the end of 8 weeks her HRV improved to normal range and her PSS score decreased to the low stress category. **CONCLUSION:** This pilot study begins to explore the impacts of HIT and Yoga on HRV and perceived stress. Yoga and HIT may decrease perceived stress and improve HRV, especially in students with high PSS scores and below normal HRV. The limitation of low subject size can only demonstrate trends. Further studies with larger samples sizes need to be conducted.

Role of Chronotype on Vascular Insulin Sensitivity in Adults with Obesity

Mary-Margaret E. Remchak[1], Emily M. Heiston[2], Gregory Pappas[1], Andrew J. Gow[1], Steven K. Malin, FACSM[1].[1]Rutgers University, New Brunswick, NJ, [2]Virginia Commonwealth University, Richmond, VA.

Endothelial function lowers cardiovascular disease risk. Chronotype has a circadian rhythmicity that may regulate and increase endothelial function throughout the day. However, no study has examined insulin action on endothelial function. **PURPOSE** We hypothesized that morning chronotype (MC) would have reduced vascular insulin sensitivity compared to intermediate type (IC). **METHODS** Adults with obesity were classified as either MC (n=24, 20F, MEQ=63.8±0.9, 54.3±1.4yrs, 33.8±0.7kg/m^2, 24.1±0.9ml/kg/min) or IC (n=26, 21F, MEQ=48.9±1.5, 55.4±1.6yrs, 37.5±1.1kg/m^2, 21.8±0.7ml/kg/min) per Morningness-Eveningness Questionnaire (MEQ). A 120min euglycemic-hyperinsulinemic clamp (40mU/m^2/min, 90mg/dL) was used in the morning to examine vascular insulin sensitivity via brachial artery flow-mediated dilation (%FMD, conduit artery) and post-ischemic flow velocity (PIFV, resistance arteriole). Blood pressure (BP), blood flow (BF), vascular resistance and shear stress at 0 and 120min of the clamp were calculated. Fasting plasma arginine and citrulline, as well as fasting and clamp-derived plasma nitrate/nitrite and ET-1, were assessed as surrogates of nitric oxide and constriction, respectively. Aerobic fitness (VO_2max) and body composition (DXA) were also determined. **RESULTS** IC had higher BMI (P<0.01) but lower VO_2max (P=0.05). Fasting FMD corrected to shear stress, PIFV, BF, and shear stress were higher, while vascular resistance was lower, in IC than MC (group effect, all P<0.01). In response to insulin, both IC and MC decreased FMD corrected to shear stress (time effect, P=0.003) and ET-1 (trend time effect, P=0.09), with a delayed time to peak (time effect, P<0.001). Insulin lowered vascular resistance and raised PIFV, shear rate, BF and heart rate (HR) similarly between groups (time effect, all $P \leq 0.05$). IC had lower fasting and clamp nitrate (group effect, P=0.003) and fasting arginine (P=0.08). Higher MEQ correlated with lower PIFV (r=-0.36, P=0.02), shear rate (r=-0.38, P =0.02), and SBP (r=-0.38, P=0.01) during the clamp. **CONCLUSION** Although IC had favorable endothelial function compared with MC, both groups responded similarly to insulin. These data suggest that chronotype may influence diurnal variation of endothelial function independent of insulin.

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Can Blood Flow Restriction Enhance the Effectiveness of Electrical Stimulations for Treating Muscle Damage?

Kevin A. Rice, Tyler D. Baer, Scott J. Dankel. Rowan University, Glassboro, NJ.

The use of electrical stimulations (E-STIM) and blood flow restriction (BFR) have each been independently shown to alleviate sensations of discomfort and enhance the recovery of force following periods of muscle damage. To our knowledge, no studies have tested whether the simultaneous application of E-STIM and BFR can produce even greater effects. **PURPOSE:** To test if applying BFR during E-STIM would produce greater effects at treating symptoms of muscle damage as compared to E-STIM in the absence of BFR. **METHODS:** Individuals completed one set of eccentric elbow flexion exercises to induce muscle damage. Forty-eight hours later, E-STIM was applied using an interferential current administered to both arms for 20-minutes; however, only one arm completed the E-STIM protocol while also undergoing repeated bouts of BFR (full occlusion for 2-minutes separated by 1-minute rest intervals). Discomfort (Borg CR10+) and isometric strength of the elbow flexors were assessed immediately before the damaging exercise, immediately before the treatments, and 0, 10, and 30-minutes post-treatment. Bayesian repeated measures ANOVAs with uninformed priors were used to compute Bayes Factors (BF_{10}) for ($BF_{10}<0.33$) or against ($BF_{10}>3$) the null hypothesis. **RESULTS:** A total of 22 individuals (11 females) completed the study. There were no interactions with respect to discomfort ($BF_{10}=0.008$) or isometric strength ($BF_{10}=0.009$) indicating that the addition of BFR did not alter the effectiveness of E-STIM. There was a main effect of time indicating that the damaging exercise was successful at depressing torque (pre: 284 N, post: 199 N; $BF_{10}=2.70e9$) and inducing discomfort (pre: 0 au, post: 6.4 au; $BF_{10}=3.21e17$). While isometric strength did not recover with the E-STIM treatments, discomfort was reduced at each the immediate post (5.3 au; $BF_{10}=56{,}294$) 10-min post (5.0 au; $BF_{10}=46{,}163$), and 30-min post (4.9 au; $BF_{10}=707{,}600$) time points. **CONCLUSION:** E-STIM may be useful for treating discomfort, but does not appear capable of recovering strength associated with muscle damage. The efficacy of E-STIM was not enhanced if performed under BFR.

Maximal Fat Oxidation is Diminished in Individuals with Mild Cognitive Impairment

Nicholas A. Rizzi, Mary K. Kramer, Theodore M. Deconne, James M. Ellison, Alyssa M. Lanzi, Matthew L. Cohen, Curtis L. Johnson, Christopher R. Martens. University of Delaware, Newark, DE

Alzheimer's Disease (AD) affects approximately 6.5 million older adults and is currently the 7th leading cause of death in the United States. With cases of AD projected to triple within the coming decades as the population continues to age, great emphasis has recently been placed on developing methods to identify those at a higher risk of AD development at a possible early stage of the disease known as mild cognitive impairment (MCI). Mitochondrial dysfunction is one risk factor that may be useful in risk stratification. Metabolic flexibility represents the capacity of the mitochondria to oxidize a variety of fuel substrates (i.e., carbohydrates and fatty acids), and could assess mitochondrial health prior to the development of further risk factors. **PURPOSE:** To determine whether individuals with MCI display diminished metabolic flexibility in response to a graded exercise test. **METHODS:** 22 older adults with MCI and 21 sedentary healthy controls (HCs) matched for both age and sex underwent a Bruce Protocol on a treadmill to assess VO2max. Fat oxidation (FatOx) and carbohydrate oxidation (CHOOx) were calculated based on ventilatory equivalents using the equations FatOx = 1.67VO2 - 1.70VCO2 [L/min] and CHOOx = 4.585VO2 - 3.2255VCO2 [L/min], respectively. Unpaired t-tests were conducted to determine whether baseline or maximal FatOx and CHOOx were different between groups. **RESULTS:** The MCI and the HC groups were similar in age (73.5 $\pm$ 8.81 vs. 71.2 $\pm$ 6.33, p=0.33) and BMI (26.2 $\pm$ 4.92 vs. 26.8 $\pm$ 5.16, p=0.70). Baseline FatOx (0.09 $\pm$ 0.03 vs. 0.10 $\pm$ 0.05 g/min, p=0.47) and CHOOx (0.51 $\pm$ 0.17 vs. 0.59 $\pm$ 0.21 g/min, p=0.23) were not different between the MCI and HC groups. However, the HC group displayed a higher VO2max (1.32 $\pm$ 0.33 vs. 1.61 $\pm$ 0.47 L/min, p=0.027*), greater maximal FatOx (0.31 $\pm$ 0.13 vs. 0.39 $\pm$ 0.10 g/min, p=0.018*), and greater maximal CHOOx (1.89 $\pm$ 0.41 vs. 2.18 $\pm$ 0.49 g/min, p=0.047*) than the MCI group. **CONCLUSION:** These findings suggest that maximal FatOx, CHOOx, and oxygen consumption are diminished in older adults with MCI and may reflect impaired whole body mitochondrial capacity and metabolic flexibility.

Acute Hypernatremia Increases Functional Connectivity Between the SFO and OVLT: Time Course of the Response

Nathan T. Romberger[1], Joseph M. Stock[1], Roxana G. Burciu[1], Jae W. Chung[1], Ronald K. McMillan[1], Sean D. Stocker[2], William B. Farquhar[1]. [1]University of Delaware, Newark, DE, [2]University of Pittsburgh School of Medicine, Pittsburgh, PA

The subfornical organ (SFO) and organum vasculosum lamina terminalis (OVLT) have an incomplete blood brain barrier and contain specialized sodium sensing neurons. In turn, these brain regions mediate sodium-induced changes in sympathetic nerve activity, vasopressin, thirst, and blood pressure. However, few studies have investigated the network of sodium sensing brain regions in humans. **PURPOSE:** To evaluate temporally dynamic changes in connectivity between the SFO and OVLT during a HSI. **METHODS:** 11 normotensive, non-obese adults (6 male/5 female; age=30±7yr) completed resting-state fMRI at baseline followed by a 30-min 3% NaCl infusion. Thirst was assessed using a Likert scale and venous blood samples were obtained to assess serum electrolytes and plasma osmolality pre- and post-infusion. A seed-based voxel-wise connectivity analysis using a sliding-window approach was performed in AFNI with a spherical seed placed in the SFO. Functional connectivity was assessed with the OVLT and PCC (posterior cingulate cortex; control region of interest) at baseline and during nine ~3.3-min, non-overlapping bins during the HSI. One-tailed paired t-tests were used to compare thirst and blood analyses pre- and post-infusion and connectivity in each bin with baseline for the OVLT and PCC. P-values were corrected to account for false discovery rate using the Benjamini-Hochberg method (adjusted $p<0.05$ was considered significant). **RESULTS:** Serum sodium (Δ3.0±1.9mmol/l), plasma osmolality (Δ7±4mOsm/kg H_2O), and thirst (Δ2.1±2.1cm) increased post-infusion ($p<0.01$). Head motion was negligible (0.10±0.02mm) and did not change during the scan ($p>0.05$). Connectivity between the SFO and OVLT was higher than baseline in bins 5-9 ($p<0.05$) but not bins 1-4 ($p>0.05$) (z-scores: baseline=0.02, bin 1=0.03, bin 2=0.11, bin 3=0.08, bin 4=0.07, bin 5=0.11, bin 6=0.18, bin 7=0.11, bin 8=0.16, bin 9=0.18). Functional connectivity between the SFO and PCC (control region) did not change significantly ($p>0.05$). **CONCLUSION:** Acute hypernatremia increases functional connectivity between the SFO and OVLT at 13.5 to 30 minutes of a HSI.

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Physical Activity and 1-hr Glycemic Status on Pancreatic β-cell Function (βCF) in Youth

Jared Rosenberg[1], Joon Young Kim[1,2]. [1]Syracuse University, Syracuse, NY, [2]Arizona State University, Phoenix, AZ

Physical activity (PA) has been shown to moderate the relationship between 1-hr glucose concentration (1HGC) and insulinogenic index (IGI) in Latino adults, reducing type 2 diabetes (T2D) risk. However, it is unknown if PA applies similar effects on pancreatic βCF and/or insulin sensitivity (IS), two key pathophysiological parameters of T2D, in Latino youth. Given that clinical evidence indicates youth-adults contrast in therapeutic outcomes of T2D treatment, suggesting recovery of βCF is less efficacious in youth vs. equally obese adults. This suggests that PA may not have the similar reduction of T2D risk in youth vs. adults. **PURPOSE:** To examine the interactive effects between PA and 1HGC on IS and βCF measured by oral glucose tolerance test (OGTT)-derived indices in Latino youth. **METHODS:** A total of 143 Latino youth (age 16.3±0.2 [SEM] years; 77F/66M; BMI: 25.8±0.6 kg/m^2) underwent a 2-hr OGTT, and venous blood samples were obtained at -15, 0, 30, 60, 90, and 120 minutes for glucose and insulin concentrations. Participants who completed a PA screener (to assess whether they engaged in regular PA; "yes"; n=98 vs. "no"; n=45) were divided into two groups based on 1HGC with a cut-off of 155 mg/dL (above155 vs. below155). Matsuda index was calculated as 10,000/√((fasting glucose x fasting insulin) x (mean OGTT glucose x mean OGTT insulin)), and IGI as ($\Delta Ins_{0\text{-}30}$)/($\Delta Glu_{0\text{-}30}$). Two-way ANOVA was used to examine the effects of 1HGC (above155 vs. below155) and PA ("yes" vs. "no") on Matsuda index and IGI. **RESULTS:** The below155 phenotype had a higher IGI than the above155 phenotype (1.9±0.1 vs. 1.5±0.2, $p<0.05$), while there was no difference in IGI between the PA "yes" vs. "no" responders (1.8±0.1 vs. 1.8±0.3, $p=0.9$). When 1HGC and PA were examined as interactive terms, PA significantly moderated the relationship between 1HGC and IGI (interaction $p=0.05$). The change in IGI from below155 to above155 was greater in those with PA "yes" (40% decrease) vs. "no" (19% increase) responders. No significant interactive effects on Matsuda index were observed. **CONCLUSION:** Our data suggest that PA can moderate the relationship between 1HGC and βCF in Latino youth, potentially reducing the T2D risk. Studies with objectively measured PA should be warranted to confirm whether those relationships can be enhanced by PA.

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Markers of Mitochondrial Mitophagy and Fusion-to-Fission Ratio are Greater in Older vs. Young Rats

Catherine B. Sapp[1], Maria Canellas Da Silva[1], Katherine I. Kim[1], Sarah Kuzmiak-Glancy[1], Steven J. Prior[1,2]. [1]University of Maryland, College Park, MD. [2]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center and Research and Development Service, Baltimore, MD.

Mitochondrial dysfunction in skeletal muscle can contribute to age-related metabolic and functional declines due to the mitochondria's essential role in energy production, calcium handling, and apoptosis. Skeletal muscle mitochondria form a reticulum and can share membrane potential and matrix content. In healthy mitochondria, this network is maintained by a constant balance between mitochondrial fission, fusion, and mitophagy. Thus, proper regulation of mitochondrial fission, fusion, and mitophagy maintains structure and is crucial for adequate energy production. **PURPOSE:** To determine age-related differences in mitochondrial fusion, fission, and mitophagy in skeletal muscle, as measured by mitofusin 2 (MFN2), fission-1 (Fis1), and Parkin protein expression, respectively. **METHODS:** Six young (≤6 months) and six old (≥18 months) male and female Sprague-Dawley rats were anesthetized, and their tibialis anterior muscles were excised and homogenized. Western blots were used to determine protein expression of MFN2, Fis1 and Parkin. All blots were normalized to total protein in each sample using stain-free blots. Fusion-to-fission ratio was also determined as the ratio of MFN2 to Fis1 expression. Independent t-tests were used to compare protein expression between young and old rats. **RESULTS:** Muscle from old rats had 4-fold greater expression of Parkin compared with young rats (0.130 ± 0.058 vs. 0.033 ± 0.013 AU, respectively; P = 0.003). Fis1 expression did not differ between groups (P = 0.63), but MFN2 tended to be higher in old rats (0.055 ± 0.022 vs. 0.033 ± 0.012 AU; P = 0.06). The fusion-to-fission ratio was 49% higher in the old vs. young rats (0.725 ± 0.226 vs. 0.487 ± 0.125; P = 0.04). **CONCLUSION:** Collectively, our results suggest that mitochondrial mitophagy and fusion both increase in skeletal muscle with age. Although Fis1, as a marker of mitochondrial fission, was not different with age, the greater ratio of MFN2 to Fis1 indicated a shift favoring increased relative fusion. This may serve as a compensatory mechanism for dysfunctional mitochondria to preserve membrane potential and share matrix contents. Therefore, the relative ratio of fusion to fission may be a greater determinant of mitochondrial dysfunction in older individuals.

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Association between coffee, caffeine and gut biodiversity: A United States-Veteran Microbiome Project Sub-Study

Ryan E Sawyer[1], Kevin S. Heffernan PhD[1], Andrew J. Hoisington PhD[2], Lisa A. Brenner PhD[2], Syracuse University, Syracuse, NY[1], Military and Veteran Microbiome: Consortium for Research and Education, Aurora, CO[2]

The gut microbiome can be influenced by lifestyle, with diet being potentially an important strategy method to modify the microbiome for positive health outcomes. Caffeine is highly consumed in the typical US diet via coffee but consumed in excessive amounts in the military/Veteran population. It is theorized that caffeine and coffee consumption may have a negative effect on gut health, with select studies linking caffeine/coffee intake to irritable bowel syndrome and gut permeability. **PURPOSE:** Explore the association of coffee and caffeine intake with gut health (defined herein as alpha-diversity) in US Veterans. **METHODS:** The Veteran Microbiome Project is a branch of the Veteran Affair's Military and Veteran Microbiome Consortium for Research and Education. Using this framework, alpha-diversity of 331 Veterans (275 men; mean age = 48±13 years, mean BMI = 29±6) was assessed from fecal samples through unique operational taxonomic units [OTUS], Shannon Diversity Index, and Pielou Evenness. Coffee and caffeine intake were measured using a semi-quantitative food frequency questionnaire. Associations between coffee, caffeine and measures of alpha-diversity were assessed using linear regression, adjusting for age, sex, and BMI. **RESULTS:** On average, Veterans consumed 1.4±1.7 numbers of coffee per day and caffeine intake was 171±178 mg. Coffee was associated with OTUS (standardized $\beta = 0.11$, $p = 0.044$), Shannon Index (standardized $\beta = 0.17$, $p = 0.002$), and Evenness (standardized $\beta = 0.16$, $p = 0.004$). Including caffeine in each model attenuated associations such that they were no longer significant ($p>0.05$ for all). **CONCLUSION:** Our findings suggest that coffee, particularly caffeine, may play a role in gut alpha diversity. Those Veterans who consumed higher amounts of coffee and caffeine had higher levels of gut diversity suggesting more favorable gut health.

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The Impact of Leisure Constraints on Physical Activity Among Parent-Adolescent Dyads

Serena A. Schade, Jennifer P. Agans, Kimia Shirzad, Steven R. Hannah, Kelly W. Ngigi, Sunhye Bai. The Pennsylvania State University, University Park, PA.

Leisure constraints – intrapersonal, interpersonal, and structural barriers to leisure-time physical activity (LTPA) – are one reason why adults and youth do not meet recommended activity levels. However, prior research has not examined how constraints operate within family systems. **PURPOSE:** To examine the potential bi-directional relationships between parents' and adolescents' leisure constraints and LTPA. **METHODS:** In May – August 2021, 141 U.S. parent (64% female; mean age=40.81 ± 4.6 yrs.) and youth (48% female; mean age=15.15 ± 1.3 yrs.) dyads completed an online survey about their recreation. LTPA was assessed by asking how many days in the past week they engaged in moderate-vigorous intensity activity (MVPA) and how many days in the past week they participated in muscle strengthening. Leisure constraints were assessed using 19 items from Hubbard & Mannell's (2001) constraints scale. An actor-partner interdependence model in MPlus assessed the extent to which parent and adolescent leisure constraints predicted their own MVPA and muscle strengthening activity (actor effects) and each other's MVPA and muscle strengthening activity (partner effects). **RESULTS:** The model showed no significant partner effects and only one significant actor effect: Parent muscle strengthening was negatively associated with parental leisure constraints (β=-1.528, 95% CI=-2.33, -0.73, $p<0.01$). This model explained 22.1% of the variance in parent MVPA ($p<.001$), 17.7% of the variance in parent muscle strengthening ($p<.01$), 9.9% of the variance in youth MVPA ($p=0.10$), and 16.2% of the variance in youth muscle strengthening ($p<.01$). However, much of this explained variance was due to demographic variables. **CONCLUSION:** Constraints were not key barriers to LTPA. Future research should examine this question in more targeted samples; this study included 47% mixed-gender dyads, a wide range of youth ages (13–18 yrs.), and occurred during the COVID-19 pandemic, which may have impacted results.

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The Effect of 12-weeks of Concurrent Exercise Training on Body Composition and Bone Microarchitecture

Nicole M. Sekel[1], Adam Sterczala[1], Kristen Koltun[1], Kellen T. Krajewski[1], Mita Lovalekar[1], Kelly Mroz[1], Shawn Flanagan[1], Chris Connaboy[1], Sophie L. Wardle[2], Thomas J. O'Leary[2], Julie P. Greeves[2], Bradley C. Nindl, FACSM[1]. [1]Neuromuscular Research Laboratory, University of Pittsburgh, Pittsburgh, PA, USA; [2]Army Health and Performance Research, Ministry of Defence, UK

Understanding sex-specific bone adaptations to arduous training may yield insight into stress fracture susceptibility and ultimately reduce musculoskeletal injuries in the military. **PURPOSE:** To examine sex-specific adaptations in bone microarchitecture, body composition and turnover markers in recreationally active and military-aged men and women undergoing a 12-week, militarily relevant strength and high-intensity interval training program. **METHODS:** Recreationally active men (n=21, 29 ± 1 y, 1.78 ± 0.08 m, 84.3 ± 3.0 kg, 24.77 ± 7.87 % BF) and women (n=18, 27 ± 1 y, 1.64 ± 0.06 m, 65.0 ± 2.0 kg, 30.58 ± 6.83 % BF) completed the training program. Total body areal BMD and composition (Lunar iDXA, GE Healthcare), volumetric bone density (vBMD) and bone strength at the tibial metaphysis (4% site) and tibial diaphysis (30% site) (high-resolution peripheral quantitative computed tomography (HRpQCT), XtremeCTII, Scanco Medical AG) and biochemical markers of bone metabolism (βCTX and P1NP) from fasted venous blood samples were measured before and after training via immunoassays. All outcomes were assessed with 2 x 2 (sex [male vs female] x time [pre vs post training]) mixed-measures ANCOVAs and reported as main effects. Bone analyses were controlled for change in total mass as alterations in body mass are known to illicit adaptive skeletal responses.[1,2] **RESULTS:** Training increased total body ($p = .008$) and trunk aBMD ($p < .001$), total body lean mass ($p = .001$), leg lean mass ($p < .001$), arm lean mass ($p < .001$), and trunk lean mass ($p = .001$) and decreased regional fat percentage for the total body ($p = .027$), arms ($p = .017$), and legs ($p = .007$) in men and women. No training-induced changes were observed in vBMD, bone strength or bone biomarkers. Basal βCTX and P1NP exhibited main effects of sex ($p < .025$) such that men exhibited greater markers of bone turnover than women. **CONCLUSION:** The bone and body composition findings seem to indicate that men and women respond similarly to military relevant training. Although the training program was insufficient to induce significant tibial adaption, these findings demonstrate that it is possible to improve bone mineral density and body composition without significantly stressing the tibia.

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Acute Response of Different High-intensity Interval Training Protocols on Cardiac Auto-regulation.

Myong-Won Seo[1], Joon Young Kim[1], Jong Kook Song[2]. [1]Syracuse University, Syracuse, NY, USA; [2]Kyung Hee University, Yong-in, Gyeonggi-do, Republic of Korea.

High-intensity interval training (HIIT) has been demonstrated as a time-efficient strategy for improving cardiac auto-regulation. Despite its popularity, it has not been fully understood whether various HIIT protocols could produce similar or differential effects on cardiac auto-regulation. **PURPOSE:** The purpose of the present study was to compare 3 different HIIT protocols with different length of work and rest times for a single session (all three had identical work-to-rest ratio and exercise intensity) with respect to cardiac auto-regulation. **METHODS:** With a randomized cross-over counterbalanced design, thirteen physically active young male adult participants (Age: 19.4 ± 0.3 [SEM] yrs, BMI: 21.9 ± 0.5 $kg \cdot m^{-2}$) were included. The HIIT involved a warm-up of at least 5 min without resistance, followed by three protocols: 10s:50s (20 sets), 20s:100s (10 sets), and 40s:200s (5 sets), with intensity ranging from 115 to 130% $Watt_{max}$. The cardiac auto-regulation was measured using a non-invasive method, including heart rate variability and brachial-ankle pulse wave velocity. Repeated measures ANOVAs were used to determine significant interactive effects (group x time) on cardiac auto-regulation. **RESU LTS:** Immediately after the HIIT session, the 40s:200s protocol produced the most intense stimulation in heart rate (Δ52.8%, $p<0.05$), R-R interval (Δ-33.5%, $p<0.05$), $InLF_{log}$ (Δ-42.6%, $p<0.05$), $InHF_{log}$ (Δ-73.4%, $p<0.05$), and InLF/HF (Δ416.7%, $p<0.05$) when compared to other protocols with 10s:50s and 20s:100s. The post-exercise hypotension in the bilateral ankle area was shown in the 40s:200s protocol only at 5 min after HIIT (Right; Δ-12.2%, $p<0.05$; Left; Δ-12.6%, $p<0.05$). In addition, the bilateral ankle-brachial index was decreased from the normal range to 0.97 or less in the 40s:200s HIIT protocol at 5 min after HIIT (Right; Δ-14.9%, $p<0.05$; Left; Δ-15.2%, $p<0.05$). **CONCLUSION**: This study confirmed that longer work time might be more potent in stimulating cardiac auto-regulation despite identical work-to-rest ratio and exercise intensity. Additional studies with 24-hr measurement of cardiac auto-regulation in response to various HIIT protocols should be warranted.

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Changes in Circulating Angiogenic Cells After Exercise or Flexibility Intervention in Older Men and Women

Madison K. Shoemaker[1], James M. Heilman[1], Katherine I. Kim[1], J. Carson Smith[1], Steven J. Prior[1,2]. [1]University of Maryland, College Park, MD. [2]Baltimore Veterans Affairs Geriatric Research, Education and Clinical Center and Research and Development Service, Baltimore, MD.

Circulating angiogenic cells (CACs) is a term used to describe a wide variety of cell phenotypes and functions that act in a paracrine manner and are closely tied to cardiovascular health. Endothelial progenitor cells (EPCs, defined as CD34+/CD45-/VEGFR2+) and angiogenic T-cells (CD31+/CD3+) are subsets of CACs that have both vasculogenic and angiogenic properties, including vascular repair, endothelial maintenance, and cytokine secretion. Though all CACs tend to decline in number with age, aerobic exercise training is associated with both an increase in number and function of EPCs and angiogenic T-cells in older adults, which is thought to reduce overall cardiovascular disease (CVD) risk through improvements in endothelial cell function. **PURPOSE:** Determine the effects of 6-month, moderate-intensity, aerobic exercise training on EPCs and angiogenic T-cells in older adults. **METHODS:** Twenty older (72 ± 8 yrs) men (n=5) and women (n=15) participated in a 6-month aerobic exercise intervention (EX) or a 6-month flexibility control (CON). Blood was drawn at baseline and at the 6-month follow-up visit. Peripheral blood mononuclear cells (PBMCs) were isolated via density centrifugation, stained with fluorescent antibodies, and analyzed using a BD FACS Canto II Flow Cytometer. We hypothesized that 6 months of moderate-intensity, aerobic exercise would increase the number of EPCs and angiogenic T-cells. **RESULTS:** There was no interaction or significant effect of EX vs. CON for any CAC subset. However, there was a significant main effect of time across the EX and CON groups for CD31+CD3+ cells (5 ± 1 vs. 16 ± 2, $p<0.01$) and CD31+ cells (23 ± 3 vs. 38 ± 3, $p<0.01$). While there was no effect of time or EX vs. CON on EPCs, there was a main effect of time across the EX and CON groups for VEGFR2+ cells (1.0 ± 0.6 vs. 7 ± 2, $p<0.01$) **CONCLUSION:** The exercise intervention did not have a greater effect on EPCs or angiogenic T-cells compared with flexibility control. However, angiogenic T-cells and VEGFR2+ cells increased after either exercise or flexibility interventions. While the training intervention was not superior to the flexibility intervention, these data suggest that either intervention may increase the number of certain CACs and trend toward reduced CVD risk.

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Effects of Stress on Lactate Levels and Other Physiological Variables During Exercise

Rebecca L. Smith, Rebecca Entner, Lauren Mills, Shania Grimes, and Syera McCormick
Samuel Forlenza, William (Turi) Braun, Joohee Sanders. Shippensburg University, PA

Stress is a normal and common occurrence in college students and athletes' lives. Stress is also known to cause a rise in many physiological variables in day-to-day life. However, the response of these variables during exercise, under stressful conditions, is unclear. **PURPOSE:** To examine the effect that psychological stress has on blood lactate levels and other physiological variables while exercising. **METHODS:** Twenty subjects (Age: 20.6±1.5 yrs, 8 Male, 12 Female) were randomly assigned into two different conditions, stress (ST) and no stress (NS), which were tested on two separate occasions with a week in between. Baseline, post-exercise, and recovery data were collected for blood lactate (BL), heart rate (HR), blood pressure (BP), and rate of perceived exertion (RPE) for both conditions. For the exercise protocol, each subject performed a 5-6 minute graded exercise test on a cycle ergometer, where initial workload was standardized to body mass. Workload was then increased by 0.25 kp every minute for the first two minutes, then every 30 seconds thereafter up to 1.5 kp of additional resistance. Subjects continued to exercise until 2 km was reached. Two minutes into exercise, the N-Back test was administered for the ST only, which took approximately 2 minutes to complete. Dependent t-tests were used to compare differences in these measures between the two conditions. **RESULTS:** There was no significant difference in post exercise BL between ST and NS conditions, respectively (7.96±3.2 vs. 9.63±4.3 mM, p=0.12). HR did not show any significant difference between the two conditions either (136.7±21.5 vs. 142.4±24.9 bpm, p=0.38). Systolic BP also showed no significant difference between the two conditions (158.9±17.7 vs. 155.6±13.7 mmHg, p=0.43). The RPE for both conditions revealed no significant difference (14.6±1.9 vs. 14.8±1.6, p=0.68). **CONCLUSION:** Based on the results of the study, inducing mental stress during brief bouts of exercise does not seem to affect cardiovascular and physiological measures.

Load Differences in Male and Female Marine Officer Candidates Quantified by Inertial Measurement Units

Elizabeth J. Steele, Matthew B. Bird, Kristen J. Koltun, Jennifer N. Forse, Evan D. Feigel, Brian J. Martin, Mita T. Lovalekar, Jodie Wills, Tim Doyle, Bradley C. Nindl. University of Pittsburgh, Pittsburgh, PA

Marine Corps Officer Candidates School (OCS) is a 10-week training course during which men and women undergo the same rigorous and demanding physical training. Field training can be difficult to quantify, and the same absolute workload may impact men and women differently. Wearable technology can be utilized to assess the volume and intensity of training events. **PURPOSE** To evaluate sex differences in step volume and intensity of a loaded 9-mile ruck derived from inertial measurement units (IMUs) placed on the distal tibia. **METHODS** Marine officer candidates (MOCs) completed a loaded 9-mile ruck carrying a 50 lb pack. IMUs were placed above the medial malleolus of each ankle on 12 female (age: 23.5 ± 2.5 yrs; height: 167.7 ± 6.1 cm; body mass: 68.7 ± 6.3 kg) and 34 male MOCs (age: 23.9 ± 3.9 yrs; height: 177.2 ± 7.5 cm; body mass: 79.8 ± 9.7 kg). Impact acceleration was measured by each IMU to determine the intensity (gs) of each step. Step intensity was binned as low (1-5g), medium (6-20g), or high (21-200g). Total step count and proportion of steps at each intensity were compared between male and female MOCs using independent samples t-tests or Wilcoxon Rank Sum tests, as appropriate. Data are mean ± SD and $\alpha = 0.05$. **RESULTS** Male MOCs were taller and heavier than female MOCs ($p < .001$). The total number of steps taken during the ruck was significantly greater in female (26848.2 ± 8383.4) than male MOCs (22373.1 ± 1180.3; $p < .001$). Total step count in the low (females: 22176.9 ± 7931.9; males: 18784.2 ± 2607.8), medium (females: 4632.3 ± 2306.7; males: 3570.8 ± 2522.2), and high (females: 38.9 ± 49.8; males 18.1 ± 23.1) intensity bins were greater in females compared to male MOCs, but these differences were not significant ($p = .172$-$.207$). The proportion of steps in low (females: 82.2 ± 9.4%; males: 84.0 ± 11.2%), medium (females: 17.7 ± 9.3%; males: 15.9 ± 11.2%), and high (females: 0.15 ± 0.20%; males: 0.08 ± 0.10%) intensity bins were not significantly different between sexes ($p = .267$-$.632$). **CONCLUSION** The loaded 9-mile ruck consisted of a high volume of low intensity steps for both male and female MOCs. Female MOCs took significantly more steps than males, resulting in a higher training volume that may contribute to the greater prevalence of musculoskeletal injuries that occur in women compared to men during military training.

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A Comparison of the Energy Demands of Quadrupedal Movement Training to Walking

Micah T. Sterrett[1], Jeffrey D. Buxton[1], Sally A. Sherman[2], Kristia D. Kannel[1], Morgan E. Blanchflower[1], Kelli T. Jancay[1], Anna K. Jenkins[1], Troy P. Donofrio[1], Phillip J. Prins[1]. [1]Grove City College, Grove City, PA, [2]University of Pittsburgh, Pittsburgh, PA

Identifying alternative types of physical activity that meet exercise guidelines for achieving health and wellness may enhance public compliance to these current recommendations. Quadrupedal movement training (QMT) is a novel alternative form of exercise which has recently been shown to improve several fitness characteristics including, flexibility, movement quality, and dynamic balance. However, the specific energy demands of this style of training remain unknown. **PURPOSE:** To identify and compare the energy expenditure (EE) of a beginner-level QMT class to walking, and to compare EE between each of the segments of the QMT class. **METHODS:** In a randomized-crossover design 30 participants (15 male, 15 female; age 20.1 ± 1.5, 19.1 ± 1.2 yrs., height 178.3 ± 8.3, 168.8 ± 7.9 cm, mass 82.0 ± 11.1, 62.7 ± 10.1 kg, respectively) completed 1) a 60-minute session of QMT, 2) treadmill walking at a self-selected brisk pace (SPTM) and 3) treadmill walking at a pace that matched the heart rate of the QMT session (HRTM). Indirect calorimetry was used to estimate energy expenditure. **RESULTS:** QMT resulted in an EE of 6.7 ± 1.8 kcal/min, 5.4 ± 1.0 METs, and HR of 127.1 ± 16.1 bpm (63.4 ± 8.1% of the subjects' age-predicted maximum HR). Overall, EE, METs, HR and respiratory data for QMT was greater than SPTM (p's < 0.001) and either similar to or slightly less than HRTM. The "flow" segment of the QMT showed the highest EE (8.7 ± 2.7 kcal/min), METs (7.0 ± 1.7) and HR (153.2 ± 15.7 bpm). Aside from HR, males demonstrated greater EE, METs, and respiratory values across all sessions and segments of QMT. **CONCLUSIONS:** QMT meets the criteria for "moderate-intensity physical activity" and should be considered a viable alternative to help meet physical activity guidelines.

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Minimum Time Effect of Fish Oil on Arterial Stiffness- A Pilot Study

Alonzo H. Strickland[1], Colin J. Gimblet[2], Thomas K. Pellinger[3], Brent F. Fedorko[1], Jessica M. Walter[1], Lisa M. Marquette[1], Tim J. Werner[1]. [1]Salisbury University, Salisbury, MD, [2]University of Iowa, Iowa City, IA, [3]University of Maryland Eastern Shore, Princess Anne, MD

Arterial stiffness (AS) has long been regarded as an indicator of disease and is an independent predictor of cardiovascular events. Thus, identification and characterization of behaviors promoting the development of AS are warranted. Currently, there is little knowledge on the minimum time influence of fish oil supplementation on arterial stiffness. **PURPOSE:** This study sought to determine the minimum time of 4 g/day fish oil supplementation to cause clinically significant effect on indices of arterial stiffness. **METHODS:** 16 moderately active, otherwise healthy adult subjects (aged 18-65) were randomized in a double-blind fashion into one of two groups: placebo (PL) group (n = 8) or fish oil (FO) dietary supplementation group (n = 8) and consumed 4 g/day FO or PL for 6 weeks. Each participant underwent a battery of assessments at week 0, 2, 4, and 6 including anthropometry, ultrasonography of the carotid artery, applanation tonometry, and blood pressure acquisition. Repeated measures analysis of variance was used to examine the effects of treatment and the treatment-order interaction on indices of arterial stiffness. **RESULTS:** There was a significant reduction in beta-stiffness index (βS) (6.80 ± 2.2 to 4.93 ± 1.92 U; $p = 0.02$) and central systolic blood pressure (CSBP) (115.6 ± 16.9 to 104.6 ± 11.3 mmHg; $p = 0.01$), and increase in arterial compliance (AC) (1.33± 0.37 to 1.87 ± 0.44 $mm^2 \cdot mmHg \times 10^{-1}$; $p = 0.01$) in the FO group after 6 weeks only. There were no other significant differences detected in the other time periods. **CONCLUSION**: Our findings support the use of FO dietary supplements in the treatment of AS. Our data suggest improvements in AS begin after approximately 6 weeks of FO supplementation.

Early Chronotype Favors Appetite and Reduced Later Day Caloric Intake Among Adults with Metabolic Syndrome

U. S. Afsheen Syeda[1], Mary-Margaret E. Remchak[1], Emily M. Heiston[2], Steven K. Malin, FACSM[1]. [1]Rutgers University, New Brunswick, NJ, [2]Virginia Commonwealth University, Richmond, VA.

Late chronotype is linked to obesity and metabolic syndrome (MetS) risk. However, it is unclear if chronotype impacts caloric intake throughout the day in relation to appetite. **PURPOSE:** Test the hypothesis that early (EC) versus late chronotype (LC) has healthier appetite perceptions in relation to less food intake. **METHODS:** Adults with MetS (ATPIII criteria) were categorized into EC (n=22, 19F, MEQ=63.8±1.0, 53.4±1.2yr, 36.4±1.0kg/m^2, 22.8±0.9ml/kg/min) and LC (n=30, 25F, MEQ=47.3±1.4, 55.7±1.4yr, 37.1±1.0kg/m^2, 21.9±0.6ml/kg/min) based on the Morningness-Eveningness Questionnaire (MEQ). A visual analog scale was utilized during a 120min 75g OGTT at 30min intervals to assess fullness, hunger, and desires to eat. Three-day food logs were averaged for dietary analysis (ESHA Food Processor). Resting metabolic rate (RMR; indirect calorimetry), aerobic fitness (VO_2max), body composition (DXA), and fasting leptin were also measured. **RESULTS:** Age, body composition, fitness and RMR were similar between EC and LC. While total dietary intake did not differ, EC ate fewer carbohydrates (CHO) at lunch (50.68±5.79 vs. 69.14±6.87g, *P*=0.05) and more protein (22.62±1.7 vs. 16.94±1.4%, *P*=0.01) than LC. Further, EC compared to LC, had lower caloric (197.3±55.5 vs. 375.3±57.9kcal, *P*=0.03), protein (5.1±1.2 vs. 10.9±2.0g, *P*=0.03) and fat (*P*=0.08*)* intake during afternoon snacking. Dietary fat was lower in EC than LC (31.8±2.7 vs. 39.0±2.3%, *P*=0.05) at dinner, and EC consumed more CHO (43.9±3.4 vs. 33.5±2.1%, *P*=0.01). Early phase appetite perception of the OGTT did not differ between groups. However, during the late phase, EC had higher feelings of fullness $AUC_{60\text{-}120min}$ (2510.0±292.1 vs. 1499.4±249.5mm, *P*=0.01) and reduced desires to eat sweet (5103.5±179.0 vs. 4357.2±259.8mm, *P*=0.03), salty $AUC_{60\text{-}120min}$ (*P*=0.07) and fatty $AUC_{60\text{-}120min}$ (*P*=0.06) foods. Fasting leptin was associated with higher desires to eat salty foods AUC_{120min} (r=0.41, *P*=0.02) while total energy intake correlated with higher lean mass (r=0.32, *P*=0.04) and lower body fat % (r=-0.34, *P*=0.03). **CONCLUSION:** EC have favorable appetite and lower caloric intake later in the day that resemble a low-fat dietary pattern compared with LC. Future work should consider meal timing among chronotypes for weight management.

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Comparison of Positive and Negative Verbal Cueing on Muscular Endurance in College-Aged Females

Hannah L. Szmaciasz, Dana L. Ault, Macey A. Slack, Marah L. Slack, Naomi E. Tobias, Kylie G. Aiken, Lydia J. Sedjo, Jeffery D. Buxton, Hayden D. Gerhart, Philip J. Prins. Grove City College, Grove City, PA

An individual's optimal athletic performance is dependent on physical preparation, technical skills, and cognitive state. It is well known that verbal instruction is one of the most common ways to alter an individual's cognitive state. Verbal instructions can shift individuals' attention from an internal to external focus. Internal attentional focus disrupts motor movement, whereas external attentional focus improves motor movement. External attentional focus leads to automaticity of motor movements and has been linked to increasing individual's motivation, self-efficacy, and self-confidence. Despite established correlations between verbal instructions and athletic performance, little research has been done on assessing the type of verbal instructions on athletic performance outcomes. **PURPOSE:** To assess the effects of positive and negative verbal cueing instructions on muscular endurance in college-aged females. **METHODS:** Twelve subjects (age 20.2±1.2 yrs, body mass index 24.1±3.2 kg/m^2, weight 67.0±13.3 kg) completed a randomized, cross-over study that consisted of completing repetitions to failure for the barbell back squat while hearing positive (POS), negative (NEG), and no (CON) verbal cueing instructions. POS cueing instructions contained the phrases "keep pushing" and "drive", whereas NEG cueing instructions included the phrases "don't fail" and "don't stop". No phrases were given for the CON verbal cueing instruction session. Experimental sessions were separated by one week. **RESULTS:** There was no significant (p>0.05) main effect of condition (POS: 37.9±11.2 reps; NEG 36.6±8.9 reps; CON 34.3±11.4 reps) on repetitions to failure for the barbell back squat. There was no significant (p>0.05) interaction between verbal cueing instruction preference and the number of repetitions performed for the barbell back squat. **CONCLUSION:** Positive and negative verbal cueing instructions did not affect the number of repetitions performed for the barbell back squat in college-aged females.

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Effects of Submaximal Intensity Rowing vs Cycling on Cognitive Performance

Zaden A. Thomas, Ryan T. Morris, Elaine A. Miller, Katie L. Kelley, Lexi M. Buck, Reagan E. Saunders, Hayden D. Gerhart, Jeffrey D. Buxton, Dana L. Ault, and Philip J. Prins. Grove City College, Grove City, PA

PURPOSE: The purpose of the present study was to compare cognitive performance resulting from submaximal bouts of rowing and cycling in college-aged subjects. **METHODS:** Nineteen (10 female, 9 male) physically active college-aged students (20.4 ± 1.5 years) participated in three laboratory sessions. Maximal aerobic capacity (VO2max; 39.1± 9.3 ml/kg/min) was recorded using the Astrand Maximal Cycling Protocol during a familiarization session to determine subsequent submaximal experimental intensity. Experimental sessions included pre- and post-exercise cognitive tests and a 20-minute bout of moderate intensity exercise at 40-60% (15.9 ± 3.7- 23.9 ± 5.5 ml/kg/min) of subjects' VO2max on a cycling and rowing ergometer. Heart rate (HR), Rating of Perceived Exertion (RPE), Oxygen Consumption (VO2) and power output (watts) were recorded throughout the exercise sessions to ensure participants maintained the appropriate prescribed intensity. **RESULTS:** Results indicated no significant difference between rowing and cycling protocols. With each modality, post-exercise elicited significant improvement compared to pre-exercise in Switching MRT ($p < 0.01$) and SCW MRT ($p < 0.01$), Switching Correct ($p < 0.01$) and SWC Correct ($p < 0.01$), and SCW Interference Score ($p = 0.028$). **CONCLUSION:** These results show that moderate intensity exercise is effective in improving acute cognitive function. Rowing, a non-traditional exercise modality, can be used equally as effectively as more traditional exercise modalities like cycling in order to improve acute cognitive function.

Effect of Light Brightness on Cycling Performance

Kharizma M. Thompkins, Ashley Y. Lesniak, Curt B. Dixon, FACSM. Lock Haven University, Lock Haven, PA

Many spin classes are conducted in dark rooms in gyms. **PURPOSE:** To investigate if light brightness impacts cycling performance or perception of effort. **METHODS:** Six men (age: 21.5 ± 0.8 yr; height: 176.4 ± 6.5 cm; mass: 87.0 ± 7.6 kg; body fat: 14.6 ± 4.7%) and five women (age: 21.0 ± 1.2 yr; height: 165.1 ± 4.8 cm; mass: 69.1 ± 20.2 kg; body fat: 25.9 ± 11.6%) completed a maximal workload test and three light brightness trials on a cycle ergometer. During session one, subjects completed a graded exercise test to volitional fatigue to determine maximal workload. Using their preferred pedaling cadence (RPM) and a standard exercise intensity (70% of their maximum workload), a distance goal was calculated for each subject. On separate days, subjects were instructed to complete their distance goal as quickly as possible under three light brightness conditions: dim (D; 5 luxes), ambient (A; 200 luxes), and bright (B; 750 luxes). The testing order of the light brightness trials was determined by counterbalanced assignment. Heart rate (HR), Ratings of Perceived Exertion (overall = RPE-O; peripheral = RPE-P), and blood lactate were measured during the exercise trials for statistical comparison. Repeated Measures ANOVAs were used to determine differences between the different light brightness conditions. **RESULTS:** There was no significant difference in completion time (D: 30.4 ± 3.2, A: 28.2 ± 9.6, B: 30.8 ± 3.9 min; $p = .386$), HR (D: 157.0 ± 12.1, A: 155.0 ± 13.4, B: 155.4 ± 10.8 $b \cdot min^{-1}$; $p = .845$), average RPE-O (D: 13.5 ± 2.1, A: 13.7 ± 2.0, B: 14.0 ± 1.3; $p = .618$), average RPE-P (D: 14.6 ± 1.9, A: 14.7 ± 2.0, B: 14.8 ± 1.1; $p = .690$) or average blood lactate (D: 5.8 ± 1.5, A: 6.1 ± 2.2, B: 6.2 ± 2.9 $mmol \cdot L^{-1}$; $p = .913$) between the light brightness conditions. **CONCLUSION:** Variations in light brightness had no impact on cycling performance or perception of effort.

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Autonomic Nervous System Responses to a Bout of Vinyasa Yoga and Prolonged Seated Control

Alexis N. Thrower[1,3], Abdullah Alansare[2], Bethany Barone Gibbs[1], Sally A. Sherman[3], Kelliann K. Davis,[3]FACSM. [1]West Virginia University, Morgantown, WV, [2]King Saud University, Riyadh, Saudi Arabia, [3]University of Pittsburgh, Pittsburgh, PA

The leading cause of death worldwide is cardiovascular disease. One approach to reduce cardiovascular disease risk is to participate in regular physical activity, in part due to improved autonomic nervous system function. Vinyasa yoga is a recently recognized form of moderate-intensity physical activity that may improve cardiovascular and autonomic function, yet its effects have not been thoroughly studied. **PURPOSE:** To examine the effect of vinyasa yoga compared to a seated control session on measures of autonomic nervous system/cardiovascular function, including systolic blood pressure (SBP), heart rate (HR), and heart rate variability (HRV). **METHODS:** Eighteen subjects were enrolled in a randomized crossover design with two experimental conditions: (i) 60 minutes of vinyasa yoga; (ii) documentary viewing while seated (control). Baseline, 5-minute and 65-minute post-condition measurements included SBP, HR, and HRV [standard deviation of normal-to-normal R-R intervals (SDNN), root mean square of successive differences (RMSSD), and high frequency (HF)]. **RESULTS:** SBP was significantly lower post yoga at 5 minutes (-8.14 mmHg, $p= 0.001$) but not 65 minutes (-2.76 mmHg, $p=0.136$) compared to the seated control. HR was higher post yoga at 5 minutes (+10.49 bpm, $p<0.01$) and 65 minutes (+4.70 bpm, $p<0.01$) compared to the seated control. HRV was lower post yoga at 5 minutes for SDNN, RMSSD, and HF (all $p<0.01$) and at 65 minutes for SDNN and RMSSD only (both $p<0.001$) when compared to the seated control. **CONCLUSION:** Compared to sitting, a 60-minute bout of vinyasa yoga produced a hypotensive BP response without other improvements in cardiovascular autonomic function (HR and HRV). These findings suggest that complex mechanisms influence the cardiovascular responses to vinyasa yoga. Future studies with more comprehensive assessments of autonomic and cardiovascular function and measurement of chronic training effects on cardiovascular health are warranted.

The Effect of Lifting Straps on Deadlift Performance in Females

Kevin M. Trahey, Evan M. Lapp, Trent N. Talipan, Thomas J. Guydan, Alexander J. Krupka, Carrie E. Ellis. DeSales University, Center Valley, PA

Using lifting straps while deadlifting may improve performance, but research in this area has only been conducted on males. **PURPOSE:** The aim of this study was to investigate the effects of lifting straps on the total number of repetitions, mean and peak barbell velocity, and grip strength during the deadlift exercise in females. **METHODS:** Eleven females (20.1 ± 1.1 y; 165.4 ± 5.6 cm, 68.9 ± 10.3 kg) with 3.2 ± 2.1 years resistance training experience participated in the study. After completing a 1-repetition maximum (1RM) test without lifting straps, subjects completed two protocols: performing three sets of as many repetitions as possible of 80% 1RM with lifting straps (WS) and without lifting straps (NS). During both protocols, mean and peak barbell velocity were measured during each set, and grip strength was recorded before deadlifting, and after each set. Repeated-measures ANOVAs were used to examine differences in the variables of interest with an alpha level of 0.05 used to establish statistical significance. **RESULTS:** The WS condition (10.6±1.7) allowed participants to perform significantly (p=0.001) more reps than the NS condition (6.3±1.4), while resulting in no statistically significant differences in mean (NS=1.5±0.01, WS=1.6±0.01, p=0.10) or peak barbell velocity (NS=2.2±0.01, WS=2.30±0.01, p=0.36). The magnitude of grip strength loss was significantly lower during WS condition (NS=22.5±4.1, WS=26.4±1.2, p<0.05). Results indicate that using lifting straps while deadlifting allows females to perform more repetitions with greater preserved grip strength, without negatively effecting barbell velocity. **CONCLUSION:** Thus, lifting straps appear to be beneficial for deadlift performance in females, and should be considered during resistance training involving the deadlift exercise.

Aerobic Capacity Independently Predicts Central Augmentation Index Among Apparently Healthy Adults

Justin Updegraff, Kathleen Dondero, Hannah A. Zabriskie, Rian Q. Landers-Ramos, Devon A. Dobrosielski. Towson University, Towson, MD

Central augmentation index reflects both arterial stiffness and ventricular-vascular coupling and is influenced by age and body height. Increased aerobic capacity and reductions in total body fat are cardioprotective, but their combined influence on central augmentation index is not entirely clear. **PURPOSE:** To determine the extent to which cardiorespiratory fitness and total body fat influence central augmentation index, a measure of arterial wave reflection and stiffness, in apparently healthy adults. **METHODS:** Community dwelling adults between ages 24 and 79 years were screened to exclude clinical and occult cardiovascular disease. Arterial wave reflection was measured noninvasively as central augmentation index (AIx). Aerobic capacity was assessed as maximal oxygen uptake (VO_{2max}) during an incremental treadmill exercise test. Body composition was determined using a dual -energy X-ray absorptiometry and % total body fat was used for analyses. **RESULTS:** Across the cohort (age: 43.5 ± 12.1 years; 53 men; 42 women), significant Pearson correlations were observed between AIx and age ($r=0.47$, $p<0.001$) height ($r=-0.32$, $p=0.002$), % total body fat ($r=0.29$, $p=0.004$) and VO_{2max} ($r=-0.52$, $p<0.001$). Multiple linear regression with backwards selection was conducted and VO_{2max} ($\beta=-0.48$), age ($\beta=0.30$) and height ($\beta=-0.65$) were found to be significant predictors of AIx, accounting for 35% of the variance. Total % body fat was not a significant predictor of AIx. **CONCLUSION:** In an apparently healthy adult population, AIx was strongly influenced by aerobic fitness, after accounting for confounding factors, including age and height. In contrast, % total body found did not influence AIx.

Positional Differences in Areal Bone Mineral Density and Body Composition in NCAA Division-I Football Athletes

Alex W. Vincent1, Nicole M. Sekel1, Kristen J. Koltun1, Adam J. Sterczala1, Patrick A. Peterson1, Kelly H. Mroz1, David N. Mowery1, Evan D. Feigel1, Sophie L. Wardle 2, Thomas J. O'Leary 2, Julie P. Greeves2, Bradley C. Nindl FACSM 1, 1University of Pittsburgh, Pittsburgh, PA, USA, 2Ministry of Defence, UK

Different positions in football require different physical demands and training. Sport exposes athletes to forces that exceed those of daily living activities. To meet these demands there is a need for enhanced lean masses to augment force producing capabilities. The effect of which may alter the structural properties of the skeleton, namely areal bone mineral density (aBMD). Because of this, body composition has a pivotal role in performance and injury. Previous studies demonstrated that positions that are mirrored, such as wide receivers/defensive backs, (WR/DB) presented similar body compositions and body ratios. While these studies showed a significant difference in body composition, they had not included L1-L4 and total femoral aBMD comparisons between positions. PURPOSE: Compare differences in body composition and aBMD between NCAA Division I OL/DL and WR/DB. METHODS: Using DXA, we examined body composition (total regional body fat percentage, and lean mass) and aBMD (L1-L4 aBMD, total femoral aBMD, total body aBMD) in Lineman (OL/DL) (n=28, 191.2cm. ± 5.2cm., 130.4kg. ± 13.1kg.) and WR/DB (n=26, 181.5cm. ± 4.7cm., 82.8kg. ± 5.0kg.) from a NCAA Division 1 football team. All scans were analyzed using enCORE Software, version 15 (GE Healthcare Lunar) RESULTS: OL/DL had significantly greater total body aBMD (1.639 ± 0.096) vs. WR/DB (1.555 ± 0.086; $p = 0.001$). OL/DL had significantly greater body fat percentage (28.1% ± 6.1%) vs. WR/DB (12.8% ± 3.6%; $p < 0.001$). OL/DL had significantly greater lean mass (88.0 kg. ± 4.8 kg.) vs. WR/DB (68.7 kg. ± 3.8 kg.; $p < 0.001$). OL/DL did not have a significantly greater L1-L4 aBMD (1.567 ± 0.158) vs. WR/DB (1.551 ± 0.093; $p = 0.652$). OL/DL did not have a significantly greater total femoral aBMD (1.535 ± 0.109) vs. WR/DB (1.521 ± 0.122; $p = 0.662$). CONCLUSION: It is shown that different positions require different physical demands which create differences in composition in fat mass, lean mass, and total body aBMD. However, our findings have found no significant difference between femoral and L1-L4 aBMD between our position groups. Future studies may study body composition and aBMD differences between specific positions (ex. QB vs LB) rather than groups or, one may consider studying similar positions in a different scheme (ex. DT in 3-4 vs 4-3).

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The Influence of E-Stim on Posture and Respiratory Function to Improve Aerobic Capacity: A Pilot

Carol A. Weber[1], Erin E. Moyer[1], Alexa E. Juska[1], Gillian A. O'Rourke[1], Benjamin DH. Gordon[2], Kelly M. Lindenberg[1]. [1]Slippery Rock University, Slippery Rock, PA. [2]University of Pittsburgh, Pittsburgh, PA.

PURPOSE: Daily technology use and poor posture have paralleled trends in chronic neck pain, headache, musculoskeletal disorders in the spine, and respiratory dysfunction. Poor posture can negatively impact respiration resulting in impaired aerobic capacity and exercise performance. To address this, posture correction can be facilitated by techniques that include neuromuscular electrical stimulation (NMES). NMES is most often used for muscle re-education, strength, and motor performance. The influence of NMES on posture to improve respiratory function and exercise capacity is unknown. Therefore, the purpose of the study was to investigate the impact of NMES training on postural measures to improve respiratory volumes and subsequent aerobic performance. **METHODS:** 11 participants were randomized to experimental (NMES) or Control (C) groups. Familiarization preceded baseline testing. Measures included chest wall expansion, forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), FEV_1: FVC ratio, tragus to wall and acromion to the wall distances, and maximal oxygen consumption (VO_2max). Two dual-channel neuromuscular stimulators were used for NMES application. Eight surface electrodes were placed bilaterally on the neck and back of all subjects. The NMES group received electrical signals that promoted moderate intensity motor responses in the target muscles. The C group's frequency and amplitude parameters differed to elicit a sensory response only. NMES sessions were ~20 minutes and took place 4-5 times per week for 24 total sessions. Pre and post measures were then analyzed. **RESULTS:** A significant difference in the NMES group was observed between baseline and session-12 for FVC (4.158 ± 0.718 L, *p=0.0242*). Both groups showed significant improvements in VO_2max (Control: Pre-39.740 ± 5.743 ml/kg/min – Post-41.120 ± 5.906, *p=0.0208* ml/kg/min*; NMES:* Pre-37.528 ± 4.704 ml/kg/min – Post-40.350 ± 4.720 ml/kg/min, *p<0.0001*). No other significant differences were identified. **CONCLUSION:** In the present study the use of NMES may be useful for posture correction and improving aerobic capacity with respect to FVC and VO_2max. However, additional research is warranted to explore the impacts of NMES in a larger population and for its potential use in a rehabilitative setting.

Men and Women Have Similar Responses in Arterial Stiffness and Wave Reflection Post-High-Fat Meal

Cynthia M. Weiner, Emily F. Blake, Sara E. Mascone, Lauren E. Eagan, and Sushant M. Ranadive. University of Maryland, College Park, MD.

Sex differences in inflammatory responses and cardiovascular disease rates persist across the lifespan. Inflammation is one of the major causes of vascular dysfunction leading to cardiovascular disease. A high-fat meal (HFM) can be used as a model to induce acute inflammation. Previous literature has shown sex differences in vascular function following a HFM, however, it is currently unknown if sex differences persist in measures of arterial stiffness and wave reflection following a HFM in young, healthy adults. **PURPOSE:** To elucidate whether there are sex differences in arterial stiffness and wave reflection responses to a HFM in a young, healthy population. **METHODS:** Augmentation index (AIx), augmentation index standardized to a heart rate of 75 bpm (AIx75), and Carotid-femoral pulse wave velocity (cfPWV) were measured at baseline (BL) and 4 hours-post HFM (4HP) in seven women (27 ± 4 y) and twelve men (22 ± 3 y). **RESULTS:** AIx, AIx75, and cfPWV remained unchanged in both men (AIx BL: -1.25 ± 4.73 vs. AIx 4HP: -5.33 ± 6.99; AIx75 BL: -10.83 ± 5.15 vs AIx75 4HP: -12.58 ± 7.39; cfPWV BL: 5.34 ± 0.77 vs. cfPWV 4HP: 5.66 ± 0.67, n=11) and women (AIx BL: 3.14 ± 9.51 vs. AIx 4HP: -5.43 ± 13.86; AIx75 BL: -7.29 ± 12.65 vs. AIx75 4HP: -11.57 ± 10.74; cfPWV BL: 5.27 ± 0.92 vs. cfPWV 4HP: 5.39 ± 0.82) following the HFM. There were no significant model effects or interaction between time and sex for AIx ($F(2, 50) = 0.5018$, $p=0.61$), AIx75 ($F(2, 50) = 0.1218$, $p=0.89$), or PWV ($F(2, 48) = 0.1123$, $p=0.89$). **CONCLUSION:** Arterial stiffness and wave reflection responses are similar in young, healthy men and women following a HFM.

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No Impact of Biological Sex on Cutaneous Vascular Response to 39ºC Local Heating

Auni C. Williams, Gabrielle A. Dillon, S. Tony Wolf, W. Larry Kenney, FACSM, Lacy M. Alexander, FACSM, The Pennsylvania State University, University Park, PA

Purpose: Local skin heating is utilized to investigate mechanisms of vasodilation in health and disease states, specifically to elucidate the role of endothelial nitric oxide (NO)-dependent vasodilation. The 39ºC local heating protocol best isolates the endothelial NO-synthase (eNOS) pathway. It is unclear if biological sex influences the vascular response to 39ºC local heating. **Methods:** An intradermal microdialysis fibers were placed in the ventral forearms of 13 men and 13 women (24 ± 4.5 years). Local heaters and laser-Doppler flowmetry probes were used to measure red blood cell flux (perfusion units, PU). Cutaneous vascular conductance (CVC) was calculated as laser-Doppler PU/mean arterial pressure. A standardized 39ºC local heating protocol was conducted. After PU reached a steady plateau (40 minutes), 15 mM N^G-nitro-L-arginine methyl ester (L-NAME) was used to quantify NO-dependent vasodilation. Maximal vasodilation was induced by heating to 43ºC and perfusion of 28 mM sodium nitroprusside to normalize CVC to maximum (%CVC_{max}). **Results:** There was no interaction of sex with either absolute CVC (two-way repeated measures ANOVA, men 0.69 ± 0.29 PU, women 0.72 ± 0.48 PU at 39ºC phase) or %CVC_{max} (men 67 ± 31%, women 54% ± 20%) at any stage of the 39ºC local heating protocol (P = 0.21 and P = 0.14, respectively). The percentage of NO-dependent vasodilation was also not different between groups (men = 43 ± 22%, women = 39 ± 17%; P = 0.60). **Conclusion:** These data indicate there is no impact of biological sex on the vasodilatory response of the cutaneous vasculature to 39ºC local heating in young healthy adults.

Skin Tone Representation in Kinesiology Textbook: Objective and Subjective Analysis

Amy L. Winger, Robert Creath, Lori A. Portzer. Lebanon Valley College, Annville PA

Previous subjective analysis of the Foundations of Kinesiology and Biomechanics, Samuels 2018; textbook using New Immigrant Survey (NIS) determined images in this text represented light skin tones (NIS 1-3). These findings raise question about subjective interpretation of skin tone representation. **PURPOSE:** To determine skin tone representation in *Foundations of Kinesiology and Biomechanics* using objective method of measurement and compare to previous subjective findings. **METHODS**: 169 images from textbook were digitally assessed. Objective measurements included computer analysis of Image proportion, Average/Darkest/Lightest skin tone area. Objective Red/Green rating for skin tone analysis was calculated with R based modeling MatLab program. Subjective data from previous study was collected via visual assessment of images using NIS. T-test was performed to compare the NIS scale between the objective and subjective rating with an alpha set at 0.05. Bivariate analysis of image/page ratio to objective scale. **RESULTS**: Significant difference between NIS scale objective and subjective ratings, $t(168)= 37.977$, $p<0.001$. No significant difference between objective scale rating and image/page ratio, $r(168)= -0.78$, $p=0.313$. **CONCLUSION:** Findings indicate subjective raters perceived lighter skin tones than objective analysis. Subjective ratings indicated all images within NIS 1-3. Objective measurement showed greater skin tone diversity, indicating representations of skin tones NIS 1-6, but indicate omission of darkest tones (NIS 7-9). Representation of skin tone in image size relative to page size showed no significant difference, indicating that image size in this text is not influenced by skin tone representation. Foundations in Kinesiology and Biomechanics by Samuels highlights limitations in skin tone representation as indicated through both subjective and objective measures. Objective results show greater variability, though still indicating an omission of darker skin tone. This raises the question whether exclusion of darker skin tones is due to visibility and contrast issue versus a systemic bias in textbook development. Future research should continue to objectively assess course textbooks and generate discussion about skin tone representation in course curriculum.