

Prevalence of the Attributes of the Female Athlete Triad in Competitive Nigerian Female Athletes

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The Female Athlete Triad (Triad) syndrome describes three interrelated conditions: low energy availability with or without disordered eating, menstrual dysfunction, and poor bone health, inclusive of low bone density and bone stress injury. Data on the prevalence of the Female Athlete Triad components is scarce in Nigerian athletes. **PURPOSE:** The purpose of this study was to investigate the prevalence of Triad components in competitive Nigerian female university athletes as well as explore hematological markers. **METHODS:** A cross-sectional study design was employed. Eighty-eight participants met the inclusion criteria. The study sample consisted of 71 study completers aged 21.8 ± 0.3 yr and BMI 22.5 ± 0.6 kg/m² in female athletes from the University of Lagos, during the Nigeria University Games Competition. The participants completed a Health, Exercise Nutritional Survey questionnaire to provide demographics, medical history, exercise, and dietary practices. Seventy-one female athletes consented to a blood sample for a complete blood count (CBC) assessment using a Unicel DxH 800 coulter hematology analyzer. The following hematological assessments were performed: white blood cell (WBC), hematocrit (HCT), red blood cell (RBC) and hemoglobin (HGB). **RESULTS:** The Nigerian competitive female athletes were aged 21.8 ± 0.3 yr and BMI 22.5 ± 0.6 kg/m². Exercise frequency was 4.6 ± 0.3 days/wk, age at menarche 12.8 ± 0.1 yrs, and gynecological age 9.2 ± 0.5 yrs. Factors reflecting energetic status include reports that 28% reported eating a low-fat diet, 38% dieted to lose weight to change their body composition and to improve performance and 3% reported a history of anorexia. Prevalence of oligomenorrhea was 15% while that for amenorrhea was 19%. Stress fracture prevalence was reported to be 13% and 34% refrained from training due to injuries during the past year. Complete blood count measures showed RBC ($3.95 \pm 0.06 \times 10^{12}/L$), HGB (10.64 ± 0.11 g/dL), HCT ($32.68 \pm 0.31\%$) WBC ($5.20 \pm 0.14 \times 10^9/L$) and platelets ($245.17 \pm 8.2 \times 10^9/L$), demonstrating that RBC and WBC are within the normal range while HGB, HCT and platelets are abnormal. Trained athletes, particularly in endurance sports, had a decreased hematocrit (HCT). **CONCLUSION:** In Nigerian competitive athletes, a significant percentage demonstrated factors reflective of poor energy intake, menstrual dysfunction and bone health problems including a history of stress fractures and absence from sport due to injury. **SIGNIFICANCE/NOVELTY:** Our findings indicate that the number of female athletes in the Nigeria University Games experiencing some aspects of the Triad is significant and warrants further study. The prevalence of factors observed suggests the need to advance screening tools and education efforts to optimize health and provide information for future investigation into the Triad among Nigerian athletes.

Nutritional Knowledge of Division II Female Athletes in Team vs Individual Sports

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Sports Nutrition knowledge among female athletes has been an increased area of research due to the rising number of female student-athletes participating in the National Collegiate Athletic Association (NCAA). Optimal nutritional knowledge is essential for athletes to maximize their health and meet the energy demands of the sport. Female athletes should make dietary decisions with the intent of fueling their bodies with the appropriate macronutrients and micronutrients. When comparing team and individual sports there are different nutritional needs and characteristics of each sport. Based on this information it is important to assess and evaluate nutritional knowledge so we can better prepare our athletes for competition. **PURPOSE:** To evaluate nutritional knowledge of Division II female athletes in team and individual sports. **METHODS:** All subjects were currently rostered DII athletes at a small school in Northeastern PA, 278 student athletes were identified as potential participants with 119 subjects completing the survey. The 119 subjects represented 13 female sports and consisted of 94 team sport athletes and 25 individual sport athletes. The survey instrument used was the Sports Nutritional Knowledge Questionnaire consisting of 23 questions (18 macro and micro nutrients, 5 demographic). The survey was administered electronically with a 2 week follow up. Data was collected using google sheets, scored by the PI (passing score >75%) and analyzed using SPSS V29. **RESULTS:** The results of this study suggest that overall nutritional knowledge is poor in our sample of DII female athletes, the overall score for the population was $54.7\% \pm 12.7$, with scores ranging from 27% - 88% which indicated an inadequate level of overall nutritional knowledge. Only 8.4%, (n=10) of the population passed the survey suggesting there are significant delinquencies in nutritional knowledge. Further evaluation of team and individual sports suggest that there is no difference ($p=0.064$) in scores $54.8\% \pm 11.6$ and $54.2\% \pm 16.4$ for team and individual sports respectively. **CONCLUSION:** The current study suggests that DII female athletes have low nutritional knowledge. Further analysis reveals that despite differences in nutrition needs, team and individual sport athletes show no differences in nutritional knowledge with both groups being deficient. **SIGNIFICANCE/NOVELTY:** The results of this study amplify the lack of understanding of nutrition in collegiate female athletes which is consistent with the current literature. This study supports the need for additional formal education programs for student athletes to address these barriers related to nutrition.

Assessing the Feasibility of Whole-Body Vibration Training on Individuals with Autism

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Individuals with autism spectrum disorder (ASD) have a high propensity for a sedentary lifestyle which contributes to morbidities such as cardiovascular disease and muscular atrophy. Unlike traditional aerobic and resistance exercise, whole body vibration (WBV) training provides a novel therapeutic approach for special populations who have limited motor control, time, and mobility. **PURPOSE:** The aim of this study was to assess the feasibility of a six-week WBV training program on individuals with ASD while measuring body composition, leg strength, blood pressure, waist hip ratio (WHR), and body mass index (BMI). **METHODS:** After meeting inclusion criteria, six individuals (age, 22.17 ± 2.14 years) diagnosed with ASD participated in a six-week, twice per week exercise intervention on a WBV machine ranging in duration from 10-24 minutes at intensities from 5-25 Hz. Measures of central tendencies and *t*-tests were used for data analyses. **RESULTS:** Findings indicated that WBV is a feasible and safe intervention for ASD individuals, however it did not elicit statistically significant improvements in WHR, body composition, leg strength, blood pressure, and BMI. This may be attributed to the small sample size as data indicates improvement in leg strength (20.55 ± 15.06 vs. 28.46 ± 12.16 , $p = .148$), BMI (25.16 ± 4.30 vs. 25.07 ± 3.70 , $p = .806$), and WHR ($.848 \pm .080$ vs. $.826 \pm .086$, $p = .166$) for some participants. **CONCLUSION:** This research study showed that WBV training is a well-tolerated exercise modality for some individuals with ASD and may be a potential strategy for improving cardiovascular disease risk factors. WBV training may also aid in reducing sedentary behaviors and provide a foundation for future investigation in individuals with autism. **SIGNIFANCE/NOVELTY:** This is the first study to evaluate WBVexercise as a training modality for adults with autism.

The researchers report no conflicts of interest for this study. Two WBV machines were granted by Hypervibeä in order to undertake this investigation. No individual or other entity from or acting on behalf of Hypervibeä was involved in the design or any other aspect of this research study.

The Effects of Different Surfaces on Running Kinematics in Collegiate Athletes

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The use of surfaces other than grass for sporting activities (e.g., football, soccer, running) has increased in recent years. The influence of different surfaces on the kinematics of running is an important area of research. A thorough understanding of the biomechanical effects of the surfaces on running may lead to better performances. **PURPOSE:** The purpose of this study was to determine the effects of different surfaces on the kinematics of running performance of collegiate student athletes. **METHODS:** Nine males (age 20 ± 1 yrs) completed the study. Each participant performed a 20-yard trial run on each surface for acclimatization purposes. After a 2-minute rest period, participants completed three 20 yard sprints separated by a 2 minute rest period. Four surfaces were tested (artificial turf, natural grass, asphalt, sand). Each surface was tested on a different day to allow for optimal performance. Stopwatches were used to record run times and a high-speed camera was used to record video of each performance. Kinematic data (sprint time, step length, & step frequency) were obtained from the video recordings, and ANOVA tests and pairwise comparisons were used to assess for statistical differences. **RESULTS:** Significant differences ($p < 0.05$) in step frequency were found between grass (4.18 ± 0.26 steps/second) and asphalt (3.82 ± 0.27 steps/second), and grass and sand (3.82 ± 0.22 steps/second). No significant differences were found in running times between surfaces (range 2.98 to 3.15 seconds) nor in step lengths between surfaces (range 1.63 to 1.73 meters). **CONCLUSION:** The results of this investigation revealed differences in step frequencies between some of the surface types, while no significant differences were found for sprint times or step lengths. **SIGNIFICANCE/NOVELTY:** The step frequencies obtained in the current investigation (3.82 to 4.18 steps/s) are smaller than those of elite sprinters such as Usain Bolt (4.28 steps/s) but larger than the 3 steps/s rate used by elite distance runners. Moreover, the step length used by Bolt (2.44 m) is larger than those found in the present study (~ 1.7 m). The differences in step frequency and step length between collegiate athletes and elite sprinters help to explain the gap in running times between athletes of different competitive levels.

Low Heart Rate Variability is Related to Decreased Microvascular Insulin Sensitivity in People with Obesity

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Heart rate variability (HRV) is an index of autonomic nervous system tone that is reportedly low in individuals with obesity. While low HRV is associated with hyperinsulinemia and large conduit artery dysfunction, it is less clear how HRV relates to insulin-stimulated capillary perfusion rates. **PURPOSE:** To determine if HRV relates to microvascular insulin sensitivity. **METHODS:** Individuals with obesity (n= 32, 25F; 55.3±1.2y; 36.4±0.9kg/m²) with HIGH (n=16, 13F) insulin-stimulated microvascular flow velocity (Δ MFV) were compared to those with LOW (n=16, 12F) Δ MFV in this cross-sectional study. A 120min euglycemic clamp (40mU/m²/min, 90 mg/dl) determined metabolic insulin sensitivity (glucose infusion rate (GIR)), and indirect calorimetry was used to depict non-oxidative glucose disposal (NOGD). MFV was measured with ultrasound at 0 and 120min of the clamp via intravenous infusion of microbubbles. Resting supine ECG was monitored for 5min to calculate HRV indices: mean RR, standard deviation of HR (STDHR), RR (STDRR), and NN (SDNN) intervals, the root mean square of NN interval differences (RMSSD), and the proportion of consecutive NN intervals >50 ms (pNN50). Body composition (DXA), aerobic fitness (VO₂max), and glucose tolerance (180min 75g OGTT; total area under the curve (tAUC)) were also assessed. **RESULTS:** There were no differences in age ($P=0.34$), body fat % ($P=0.46$), VO₂max ($P=0.90$), or GIR ($P=0.22$) between groups. However, HIGH had a longer mean RR ($P=0.02$) and lower mean HR ($P=0.02$) than LOW, independent of differences in STDHR ($P=0.82$), RMSSD ($P=0.72$), STDRR/SDNN ($P=0.69$), or pNN50 ($P=0.33$). RMSSD associated with GIR ($r=0.36$, $P=0.04$) and glucose tAUC_{180min} ($r=-0.36$, $P=0.04$). Further, STDRR/SDNN related to GIR ($r=0.46$, $P<0.01$) and NOGD ($r=0.40$, $P=0.03$) as well as glucose tAUC_{180min} ($r=-0.46$, $P<0.01$). **CONCLUSIONS:** Insulin-stimulated capillary perfusion rates related to favorable HRV, independent of GIR. Yet, greater HRV associated with metabolic insulin sensitivity and glucose tolerance. Thus, the autonomic nervous system may regulate microvascular capillary perfusion during insulin-stimulation to promote skeletal muscle nutrient delivery for glucose homeostasis. **SIGNIFICANCE/NOVELTY:** While insulin resistance and endothelial dysfunction have been linked to impaired HRV in those with obesity, the relationship between insulin-stimulated capillary perfusion rates and HRV has not yet been investigated. These findings highlight that the autonomic nervous system may regulate insulin-stimulated capillary perfusion rates in people with obesity to coordinate nutrient delivery to skeletal muscle for glucose uptake and storage.

Supported by NIH RO1-HL130296 (SKM) and NSF Award 2125872 (PS)

The Isolated Mechanical Effect of Walking in Late Pregnancy May Contribute to The Risk for Knee Osteoarthritis Over the Lifetime

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Evidence suggests that pregnancy increases a woman's risk of knee osteoarthritis (OA). While understanding the underlying causes or association with pregnancy is complex, the mechanical load on cartilage during walking appears to be important to the initiation and progression of the disease. **PURPOSE** It is currently unknown if mechanical changes associated with pregnancy, which may be substantial in magnitude but may be limited in duration, can explain the OA risk since it is diagnosed later in life. Therefore, we aimed to model the effect of walking in late pregnancy on cartilage loading and simulate the mechanical effect of pregnancy or pregnancies, experienced at different times over the lifetime, on knee joint health. **METHODS** Static optimization, joint contact force modeling and a mechanical model of cartilage response were used to estimate cartilage loading at a self-selected "comfortable" walking speed for 10 healthy non-pregnant controls and 10 healthy pregnant women in their 3rd trimester. Probabilistic models of cartilage fatigue and failure simulated cases of 0-3 pregnancies separated by 2 years with first births at age 23 or 30 and estimated the probability of structural failure at age 55, the median age of first diagnosis of OA. Peak pregnant/non-pregnant cartilage strain in stance and estimates of cartilage failure probability were compared using paired *t*-tests. **RESULTS** Pregnant women experienced additional peak strain on knee cartilage (0.29 ± 0.06 , non-pregnant: 0.23 ± 0.03 $p = 0.004$). The increased compressive load experienced over one or more pregnancies resulted in a greater estimates of cartilage failure probability when virtual subjects experienced 1, 2, or 3 pregnancies starting at age 23 (average increases of 7.69%, 13.43% and 15.45% from the never-pregnant condition, respectively all $p \leq 0.01$) with differential effects when women experience multiple pregnancies later in their lifetime (6.9% greater risk when experiencing 2 pregnancies starting at age 30 $p \leq 0.01$). **CONCLUSION and SIGNIFANCE/NOVELTY** Simulated pregnancy increased the probability of cartilage failure and there was additional risk when experiencing multiple pregnancies later in life. Although understanding the underlying causes of knee OA is complex the mechanical load on cartilage during pregnancy seems to be elevated and may, in part, contribute to the increased risk off knee OA for this population. Results may have implications for pregnant physical activity and future research may aim to determine if biomechanical modifications can be used to reduce joint loading and possibly reduce knee OA risk.

Does the Presence of an External Observer Affect Participant RPE?

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Studies have shown that the presence of an observer can have an impact on participant effort, reported ratings of perceived exertion (RPE), and even resting physiological measures. **PURPOSE:** To investigate the effect of external observers on reported RPE during a bout of cycling. **METHODS:** Thirteen subjects, six recreationally active males (Age: 21.0 ± 0.9 yrs, Height: 177.7 ± 7.2 cm, Mass: 87.6 ± 18.1 kg, Body Fat: $19.0 \pm 4.6\%$, $Workload_{max}$: 220.8 ± 71.4 watts) and seven recreationally active females (Age: 20.4 ± 1.5 yrs, Height: 164.2 ± 5.4 cm, Mass: 70.1 ± 7.8 kg, Body Fat: $30.5 \pm 7.3\%$, $Workload_{max}$: 160.7 ± 24.4 watts) participated in the study. The first visit consisted of a body composition assessment and a maximal workload test on the cycle ergometer. On three more visits, subjects were asked to complete a 5-minute warmup on a cycle ergometer, followed by a 20-minute bout at a constant workload equal to 70% of their maximum workload. In each visit, subjects were exposed to a different observer condition: no external observer (C), a female observer (F), and a male observer (M). Testing order was determined by counterbalanced assignment. Overall RPE (RPE-O), peripheral RPE (RPE-P), and heart rate (HR) were assessed every minute. Blood lactate was assessed pre- and post-exercise. Delta-lactate was calculated as the difference between the pre- and post-lactate measures. Repeated measures ANOVAs were used to compare the different observer conditions. **RESULTS:** Average RPE-O (C: 14.6 ± 2.0 , M: 14.0 ± 2.1 , F: 13.9 ± 2.8 ; $p = .279$), peak RPE-O (C: 17.1 ± 2.1 , M: 16.6 ± 2.2 , F: 16.7 ± 2.8 ; $p = .620$), average RPE-P (C: 15.4 ± 2.1 , M: 14.6 ± 2.1 , F: 14.5 ± 2.6 ; $p = .104$), and peak RPE-P (C: 17.7 ± 2.0 , M: 17.3 ± 2.1 , F: 17.3 ± 2.6 ; $p = .592$) were not significantly different across conditions. In addition, no significant differences were observed for average HR (C: 162.9 ± 12.4 , M: 161.1 ± 14.8 , F: 161.9 ± 14.0 bpm; $p = .751$), delta-lactate (C: 4.4 ± 2.1 , M: 3.2 ± 3.1 , F: 4.2 ± 2.0 mmol·L⁻¹; $p = .195$), or post-lactate (C: 5.5 ± 2.2 , M: 5.0 ± 2.3 , F: 5.6 ± 1.9 mmol·L⁻¹; $p = .558$). **CONCLUSION:** The presence of an external observer during the exercise bout did not influence participant reported RPE. **SIGNIFICANCE:** RPE is a commonly used tool to assess and prescribe exercise intensity but has been shown to be influenced by a variety of external factors. The influence of observers on RPE has been reported more during low and moderate-intensity exercise as opposed to high-intensity. This study demonstrates that in this population of college-aged students, during a submaximal exercise bout of 70% of their maximal workload, no observer effect was seen, regardless of the sex of the observer.

Effects of Aerobic Exercise on Hunger in Normal Weight and Obese Adults: A Pilot Study

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Obesity is a major public health issue in the United States. The prevalence of obesity affects an estimated 100.1 million US adults and is an independent risk factor for cardiovascular disease, type II diabetes mellitus, and cancer. Aerobic exercise (AE) is a lifestyle therapy we and others have shown to suppress appetite-regulating hormones in normal weight (NW) and obese (OB) adults; however, the effects of acute AE on subjective measures of perceived hunger are limited. **PURPOSE:** To examine the acute effects of AE on perceived hunger in a pilot sample of NW and OB adults. **METHODS:** Nine adults with NW ($n=4$, body mass index [BMI] = 21.3 ± 1.2 kg/m²) and OB ($n=5$, BMI = 38.9 ± 6.2 kg/m²) completed a preliminary health/fitness assessment. Participants returned to the laboratory on three separate occasions, separated by ≥ 48 hours to perform cycle exercise at 30% and 60% oxygen uptake reserve (VO₂R), or a seated control session with no exercise for 40 min. Perceived hunger was assessed with a validated 0 (Not Hungry) to 16 (Very Hungry) visual analog scale before and after exercise and control. Nonparametric procedures assessed pre-to-post differences in perceived hunger between exercise and control conditions for NW and OB. Alphas were set *a priori* to $p < 0.10$. **RESULTS:** For the total sample, significant mean rank differences were observed between pre-light and pre-vigorous ($p=.059$), pre-light and post-vigorous ($p=.068$) and pre-light and post-control ($p=.020$). Between NW and OB, significant mean rank differences were found for pre-light ($p=.090$). Significant correlations were identified between pre-and-post control ($r=.854$, $p=.004$), light ($r=.805$, $p=.009$), and vigorous ($r=-.712$, $p=.032$). No other mean rank differences or relationships were identified for the total sample or between NW and OB ($p > .10$). **CONCLUSION:** We found differences in perceived hunger after compared to before vigorous but not light AE or control conditions. **SIGNIFICANCE/NOVELTY:** Our findings support the premise that AE performed at vigorous intensities can regulate appetite-stimulating hormones and perceived hunger, perhaps creating an interdependent paradigm whereby energy expenditure suppresses energy intake as a weight management strategy.

A Meta-Analysis on the Influence of Aerobic Exercise on Blood Pressure in Chronic Kidney Disease

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Chronic kidney disease (CKD) is a major public health issue in the United States (US). Hypertension (HTN) is a primary risk factor for CKD that affects 31.0% of US adults. Aerobic exercise (AE) is a lifestyle therapy recommended by the American College of Sports Medicine to prevent and manage hypertension due to the immediate post-exercise hypotensive effects that persist for 9 to 14 hours. However, despite these recommendations, efficacy of AE for managing HTN remain unclear as studies to date have included small sample sizes, been subjected to sample selection bias, and employed exercise interventions that have varied in frequency, intensity, time, and type. **PURPOSE:** To metaanalyze studies examining the effects of AE on systolic and diastolic blood pressure (BP) in samples living with CKD. **METHODS:** A systematic search was conducted in MEDLINE, CINAHL, SportsDiscus, PeDro, and Cochrane with keywords and MeSH descriptors from 1961-present. Studies retrieved included those involving an AE intervention, pre-and-post exercise blood pressure measurement, and samples with CKD and/or end-stage renal disease (ESRD). Effect sizes were generated using Cohen's $d+$ for each intervention arm of each study, study quality was assessed with the Downs and Black methodological quality checklist, and alphas were set *a priori* to $p < .05$. **RESULTS:** Sixteen studies ($n=866$) qualified for the meta-analysis. On average, participants were middle-aged (50.9 ± 13.0 yr.), overweight (25.4 ± 2.1), men ($n=526$, 60.7%), and women ($n=340$, 39.3%), with pre-hypertension (130.3 ± 10.2 / 78.6 ± 6.6 mmHg). AE interventions were performed on average at $58.6 \pm 10.8\%$ peak oxygen consumption for 33.5 ± 9.7 min \times session⁻¹, 4.0 ± 1.5 d \times wk⁻¹ for 27.0 ± 20.5 wk. The weighted mean effect size on the change in pre-and-post-exercise BP was statistically significant for systolic ($d+ = -.244$, $p < .001$) and diastolic ($d+ = -.296$) BP. The average study quality score was 18.4 ± 3.6 out of a possible 26 points, indicating good study quality, and effects lacked heterogeneity across studies. **CONCLUSION:** We found small but significant antihypertensive effects of AE on systolic and diastolic BP from samples with CKD and ESRD. **SIGNIFICANCE/NOVELTY:** Our findings indicate that AE may provide important clinical benefits for those with CKD as BP regulation is implicated in the pathogenesis of kidney disease. Future studies should expand upon our findings and include larger samples of men and women with different stages of CKD and ESRD to better refine the exercise prescription and identify those who do and do not respond to AE as a therapeutic modality for managing CKD.

Association of In-Group Colorism with Vascular Function in Black Emerging Adults

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Emerging adulthood is a critical developmental stage characterized by identity exploration, which is associated with increased exposure and vulnerability to internalizing negative discriminatory and other race-related experiences. Chronic experiences of discrimination during this period lead to exaggerated stress responses that influence health outcomes, to which internalization of these experiences may increase susceptibility to maladaptive psychological and physiological responses. Colorism is discrimination or prejudice based on skin tone. Individuals who identify as Black or African American who have darker skin tones are subject to both race- and color-based discrimination. Internalizing colorism, or self-assigning greater meaning and significance to skin tone may serve as a unique psychosocial stressor that impacts physiological functioning and more specifically vascular function, thus increasing risk for diseases such as hypertension (HTN). **PURPOSE:** To evaluate the relationships between self-assigned significance/meaning to skin tone and vascular function using the flow-mediated dilation (FMD) technique. **METHODS:** Brachial artery responses to 5-minutes of forearm ischemia via FMD [(peak post-occlusion diameter – baseline diameter)/baseline diameter]*100) were assessed in a sample of 97 Black emerging adults (20 ± 1 yrs, 33M/64W) at the University of Maryland. Participants also completed a 20-item In-Group Colorism Scale (IGCS) on a 5-point Likert scale to assess self-assigned significance and meaning to skin tone. **RESULTS:** IGCS scores were not correlated with FMD ($\rho = -0.06, p = 0.55$). However, in sex-specific analyses, women with higher IGCS scores had higher resting diastolic blood pressure ($\rho = 0.31, p = 0.01$) and mean arterial pressure ($\rho = 0.28, p = 0.03$), associations that were not present in men. **CONCLUSION:** While self-assigned significance and meaning to skin tone was not associated with vascular function in Black emerging adults, there may be a sex-specific impact on blood pressure at rest. This relationship may help explain the increased HTN prevalence seen in Black women. **SIGNIFICANCE/NOVELTY:** Vascular dysfunction is a major precedent to cardiovascular diseases, including HTN. There are significant health disparities in HTN, in which individuals who identify as Black or African American experience disproportionate rates, often earlier in life than other race/ethnic groups. This project seeks to understand the potential impact of race-related stressors, specifically internalized colorism, on vascular function in Black emerging adults, during a critical developmental period and in a context where they are underrepresented (primarily white institution/PWI).

Funding – UMD Human Integrative Physiology and Resilient Adaptation across Culture and Context Laboratories

Does 2-Weeks of Aerobic or Resistance Exercise Microcycles Elicit Different Health Improvements in Untrained Adults?

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Physical inactivity and poor cardiorespiratory fitness (CRF) threaten public health, contributing to rising rates of obesity, cardiovascular disease (CVD), and related comorbidities. While aerobic training (AT) and resistance training (RT) are effective exercise training modalities for the improvement of health, individuals cite a lack of time as a primary reason for not meeting the AT and RT guidelines. Due to the inability to meet the recommended AT and RT, identifying which modality provides the most initial health benefits may provide insight into initial exercise recommendations for untrained individuals. **PURPOSE:** To investigate the effect of 2 week aerobic and resistance training microcycles on body composition, resting cardiovascular function, and CRF in healthy untrained adults. **METHODS:** In a randomized crossover design study, eight healthy adults ($n=8$, 29.8 ± 9.5 yrs) engaged in 7 sessions (~60-minutes per session) of either AT or RT with a 14-day washout in-between. Anthropometrics (height, weight, body mass index, and body composition), resting cardiovascular function, and CRF were assessed at baseline and after each microcycle. Paired sample t-tests were used to determine the effect of time and condition. **RESULTS:** Following AT, central systolic blood pressure (cSBP) increased 8.5 mmHg ($p=0.027$, $d=0.984$), peripheral systolic blood pressure (pSBP) increased 10.4 mmHg ($p=0.01$, $d=1.254$), and mean arterial pressure (MAP) increased 6.6 mmHg ($p=0.045$, $d=0.861$), compared to baseline. Following RT, pSBP increased 8.4 mmHg ($p=0.028$, $d=0.979$) and resting heart rate (rHR) increased 7.0 bpm ($p=0.032$, $d=0.94$), compared to baseline. No other significant anthropometric or cardiovascular changes were observed following AT or RT (all, $p>0.05$). No significant change in VO_{2peak} was observed following AT or RT ($p>0.05$). No significant differences were observed between AT or RT interventions (all, $p>0.05$). **CONCLUSION:** A microcycle of AT or RT was not sufficient to induce significant changes in body composition or CRF in untrained individuals. Additionally, we observed that microcycles of AT and RT training appeared to negatively impact resting cardiovascular function by increasing systolic blood pressure (peripheral and estimated central) in untrained healthy adults. This may suggest that the short-term responses to exercise training may be biphasic, inducing initial increases, followed by the well-documented hypotensive effect of exercise training. **SIGNIFICANCE/NOVELTY:** Two-week microcycles of aerobic and resistance training do not improve body composition and CRF in untrained healthy adults but may actually increase systolic blood pressure in the short term.

Supported by the MARC-ACSM Early Stage Investigator Award.

The Relationship of Cardiorespiratory Fitness with Leisure-time, Occupational and Transportation Physical Activity among College Students

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Physical activity (PA) is protective against cardiometabolic risk and improves cardiorespiratory fitness (CRF). The majority of studies examining these relationships have only included leisure-time PA (LTPA) and the relationship between different domains of PA and CRF among young adults is unknown. As young adults engage in a multitude of PA behaviors across domains, domain-specific PA impacts on CRF must be examined. **PURPOSE:** To examine the relationship between CRF and LTPA, occupational (OPA), and transportation (TPA) activity by gender and race/ethnicity. **METHODS:** A volunteer sample of students from a large Northeastern U.S. university completed a comprehensive fitness test (VO₂max estimated via submaximal single stage treadmill walking test) and a self-report survey (demographics, Global Physical Activity Questionnaire [LTPA, OPA, TPA, overall PA]) to assess CRF and current PA levels. Descriptive statistics described the sample, t-tests and ANOVAs examined the differences between CRF and PA. Linear regression examined the relationship between CRF and the different PA domains separately by racial/ethnic and gender groups. **RESULTS:** Participants (n=457) were predominately male (n=319, 69.8%) and Non-Hispanic (NH) White (n=295, 65.4%). Men reported greater OPA, LTPA and overall PA (p's <0.05) compared to women and also had greater CRF (p<0.001). NH Black students had higher OPA than NH White, Latino, and Asian American students (p's<0.01); however, there were no other racial/ethnic differences for PA. NH White students had the highest CRF (F=2.42, p=0.04). Regression analysis for men indicated that LTPA ($\beta=0.26$, p<0.001) and TPA ($\beta=0.14$, p=.02) were significant predictors of CRF. Among women, LTPA ($\beta=0.31$, p<.001) was the only significant predictor of CRF. For NH White students, LTPA ($\beta=0.024$, p<0.001) and TPA ($\beta=0.15$, p=0.008) were significant predictors of CRF. Among Hispanic students TPA ($\beta=0.31$, p=0.05) and OPA ($\beta=0.36$, p=0.02) were significant CRF predictors, though there were no significant CRF predictors for NH Black and Asian American students. **CONCLUSION:** CRF and PA types varied significantly by gender and race/ethnicity, with each PA domain impacting CRF uniquely. **SIGNIFICANCE:** Good CRF levels are important for overall health and disease prevention. Health and PA disparities are present in this population and it is essential to determine how different types of PA can contribute to CRF differently by demographic group. Further studies examining a link between CRF and PA behavior should consider measuring multiple domains of PA.

Age Comparisons of Cardiac Work During Exercise in Women: Insight from Acute β -1 Adrenergic Blockade

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Postmenopausal women exhibit exaggerated increases in blood pressure during activities of daily living and exercise. The decreased size and increased stiffening of postmenopausal women's hearts elevate myocardial oxygen demand when compared to age-matched men and younger cohorts. Together, this poses a risk to the safety of, and capacity for, exercise in postmenopausal women. We recently studied the effects of esmolol, a fast-acting, cardio-selective β -adrenergic antagonist, on oxygen transport variables during dynamic exercise in healthy young and older women to better understand differences in cardiovascular responses to exercise. **PURPOSE:** To determine the effects of acute cardiac specific blockade on myocardial oxygen demand and cardiac work in healthy young premenopausal and older postmenopausal women. **METHODS:** Thirteen healthy young (Y) (20-32 yr) and older postmenopausal (O) (58-70 yr) women performed moderate (MOD) (85% of lactate threshold (LT)) and heavy (HVY) (50% between LT and the respiratory compensation point) recumbent leg cycling exercise during IV infusion of saline (S) or esmolol (E) in randomized order. Brachial blood pressure (BP, automated cuff), heart rate (HR), and cardiac output (CO, bioimpedance) were measured continuously. Myocardial demand (RPP, $HR \times \text{systolic BP}$), cardiac work (CW, $CO \times \text{MAP}$), and relative cardiac work (CW/W, $CO \times \text{MAP} / \text{Watts}$) were calculated. Repeated measures ANOVAs were used to determine the effect of exercise intensity, drug treatment, and age. **RESULTS:** Power outputs were lower in O vs. Y at both MOD ($45 \pm 9\text{W}$ and $72 \pm 15\text{W}$, $p < 0.001$) and HVY ($81 \pm 21\text{W}$ vs. $117 \pm 32\text{W}$, $p < 0.001$). During the saline trial CO was lower ($p < 0.001$), and MAP was RPP were higher ($p < 0.001$) in the O vs Y group during both intensities. There was a main effect of treatment; E reduced CO, MAP, and CW in O and Y. There was a significant effect of age*treatment on CW/W; pairwise comparisons revealed CW/W was higher in O in both treatments and CW/W decreased to a greater extent in O vs. Y (-4.2 ± 0.7 vs -2.1 ± 0.7 , $p = 0.039$). **CONCLUSION:** Older postmenopausal women perform more cardiac work per watt of dynamic leg exercise compared to younger women. Beta blockade reduces cardiac work in postmenopausal women more than young women. **SIGNIFICANCE/NOVELTY:** Acute β -1 adrenergic blockade narrows the gap between central cardiovascular function in young and old women and provides a powerful tool to investigate age-related cardiovascular differences.

Supported by NIH Grant R21 AG054940

Association Between Whole-Body and Skeletal Muscle Oxygen Consumption Rate while Ambulatory

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Near-infrared spectroscopy (NIRS) is a relatively novel device that allows for non-invasive measurement of oxy- and deoxy-hemoglobin content in skeletal muscle (SM). Among other things, NIRS can be used to measure SM oxygen consumption rate. However, scarce studies have evaluated the relationship between SM and whole-body O₂ consumption rates at rest and during physical activity. **PURPOSE:** The purpose of our study is to investigate the correlation between NIRS-derived SM O₂ consumption rate (mVO₂) and whole-body O₂ consumption (wbVO₂) at rest and while walking at varying speeds. **METHODS:** mVO₂ was measured by placing a NIRS device on the belly of the medial gastrocnemius (MG) of the participant's dominant leg (N=9, 22 ± 2 years old). A pneumatic rapid inflation cuff was placed proximal to the testing site for occlusion of arterial blood flow. While laying supine, resting mVO₂ was measured while participants experienced 5 minutes of rest followed by three rounds of 30s arterial occlusion and 30s of rest. Ambulatory mVO₂ was measured during a 10s arterial occlusion immediately following 5min of walking at usual gait speed over a 40m course and after walking on the treadmill at 8 different speeds (0.0, 1.1, 1.5, 1.9, 2.3, 2.7, 3.1, and 3.5 mph). Whole-body oxygen consumption (wbVO₂) rate was measured at rest (15 min) and during ambulation by portable indirect calorimetry and compared to mVO₂ through Pearson correlations. **RESULTS:** No correlation was found between wbVO₂ and mVO₂ while at rest (r=0.01, p=0.97) or while standing (r=-0.12, p=0.78). However, correlations between wbVO₂ and mVO₂ was seen at speeds of 1.1 mph (r=0.68, p=0.06), 2.7 mph (r=0.71, p=0.05), and 3.5 mph (r=0.64, p=0.09). The speed of 2.7 mph is closest to the group's average over-the-ground walking self-selected gait speed (1.25 ± 0.20 m/s). **CONCLUSION:** Even at the slowest measured speed of ambulation (i.e., 1.1 mph), an association between whole-body and muscle oxygen consumption rate was detected, however, no association was found during rest or standing. These findings indicate a greater contribution of SM metabolism to whole-body metabolism while active compared to when sedentary. **SIGNIFICANCE/NOVELTY:** This is the first known study to report associations between NIRS-measured SM metabolism and whole-body metabolism during activity. These results suggest that through the utilization of NIRS, medical professionals may non-invasively obtain valuable insights into the metabolic changes occurring in muscles in response to activity and allow for improved assessment and diagnoses of SM metabolism impediments during various disease states. Such information can help in the development of more targeted treatment plans and facilitate more accurate assessments of patient progress.

Supported by Towson University College of Health Professions Summer Undergraduate Research Institute.

Repetition Frequency Affects Accuracy of Repetitions in Reserve (RIR) in Resistance Trained College Females

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Repetitions in reserve (RIR) simplifies measuring intensity during resistance training. However, previous studies suggest individuals underestimate RIR, with greater inaccuracy further from muscular failure. It is unclear if controlling for repetition (rep) frequency affects RIR accuracy. **PURPOSE:** This study's goal was to determine if a standardized rep frequency affects the prediction accuracy of reps to momentary failure through the means of RIR. It was hypothesized that participants with standardized rep durations would have improved RIR accuracy than participants with self-selected rep durations. **METHODS:** Participants (n=29 resistance trained females) performed a dynamic warm-up before completing standard protocols for the determination of 1-repetition maximum (1RM) back squat. After a 10-minute rest, during which time 70% of 1RM was loaded on the bar and blinded to them using trash bags, participants performed back squats to momentary failure, calling out their RIR estimates of 5, 3, and 1. For 14 participants, rep frequency was standardized, with participants completing 1 rep every 3 seconds (tempo). For 15 participants, rep frequency was self-determined (standard). Paired t-tests were used to compare group characteristics. A one-way between-groups multivariate ANOVA with Bonferroni adjustment was used to compare RIRDIF values (actual RIR – predicted RIR). A $p < 0.017$ was considered significant. **RESULTS:** There were no differences between the tempo and standard groups with regards to age (20 ± 1 vs 20 ± 1 yr), height (65.6 ± 1.6 vs 65.6 ± 1.6 in), weight (145.2 ± 24.4 vs 143.3 ± 11.8 lb), 1-RM (162.9 ± 28.7 vs 177.7 ± 24.8 lb), and reps completed (14.4 ± 2.8 vs 16.3 ± 5.2). There was a significant difference in RIR accuracy between the tempo and standard groups (Wilks' Lambda=4.505, $p = 0.012$). Evaluation of the dependent variables indicated that the tempo group was more accurate than the standard group at 1 RIR (RIRDIF= 0.3 ± 0.7 vs 1.8 ± 1.3 reps, $p < 0.001$) and 3 RIR (RIRDIF= 1.4 ± 2.0 vs 3.5 ± 2.4 reps, $p = 0.013$). **CONCLUSION:** As hypothesized, controlling for rep frequency was found to improve RIR accuracy. Further research is needed on variables like velocity loss and recovery to understand how these factors affect RIR. **SIGNIFANCE/NOVELTY:** To the best of the researcher's knowledge, this is the first investigation to evaluate the impact of prescribed repetition tempo on RIR accuracy. Given these findings, prescribing a repetition frequency to individuals as they learn how to implement RIR may improve their ability to gauge proximity to failure with self-selected repetition pacing.

Supported by the McDaniel College student-faculty summer research fund.

Mitochondrial Respiration is Preserved, While Respiratory Protein Organization is Altered in Pressure-Overload Induced Heart Failure

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Heart Failure (HF) is a condition in which the cardiac muscle is unable to adequately pump blood to the body, leading to the inability to perform physical activity and poor quality of life. Mitochondria provide the ATP needed for muscle contraction, and this requires the coordinated uptake of Ca^{++} and activation of respiration, with the organization of the electron transport chain into super-complexes (SCs) affecting mitochondrial function. **PURPOSE:** The goal was to determine if Ca^{++} activated respiration of cardiac mitochondria was lower from rats with, compared to those without HF, and identify if HF affects the organization of cardiac mitochondrial respiratory proteins, after controlled perfusion and after ischemia-reperfusion (IR). **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 mitochondria were isolated from hearts of TAC and SHAM-operated controls. Maximal O_2 consumption rates (J_0) were measured in the presence of respiration media supplemented with $5\mu\text{M}$ CaCl_2 , fuels, and ADP. Alternatively, mitochondria were isolated from hearts perfused with Krebs-Henseleit buffer immediately or after ischemia and reperfusion. Mitochondria membranes were solubilized at 8g/g digitonin to protein ratio and loaded into a 3-13% gradient BN-PAGE for the analysis of protein complexes and SCs in their native state. Differential expression of mitochondria proteins (A.U.) was analyzed using Image Lab (Biorad) and two-tailed t-tests. **RESULTS:** Maximal calcium-activated J_0 was similar between TAC and SHAM mitochondria (498.2 ± 35.8 vs. 426.9 ± 40.1 nmol/mg/min). TAC and SHAM rats had similar expression of SCs regardless of hearts being perfused (76.2 ± 3.4 vs 71.8 ± 4.5) or exposed to IR (71.9 ± 0.4 vs 63 ± 12.7). The abundance of I+III₂ SC was lower in perfused hearts of TAC rats when compared to control (22.5 ± 0.8 vs 27.6 ± 1.1 , $p=0.02$). While levels of CV expression were observed in TAC vs SHAM with (9.8 ± 0.3 vs 12.6 ± 3.3) or without IR (13.2 ± 0.6 vs 14.5 ± 0.3), after IR CV expression was reduced in TAC but maintained in SHAM rats ($p=0.02$ vs $p=0.67$). **CONCLUSION:** Despite mitochondria J_0 rates being similar between TAC and SHAM hearts, baseline decreased I+III₂ SC formation and lower CV expression after IR can be implicated in the disease mechanism and prognosis. **SIGNIFICANCE:** Uncovering molecular alterations in mitochondria, potentially involved in HF disease mechanisms, can illuminate new drug targets, while conferring prognostic value and improving care.

FUNDING: This work was funded by Dr. Kuzmiak-Glancy's start up at University of Maryland College Park.

Visceral Fat Area as a Predictor of Radius Bone Strength in College-Aged Young Adults:

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Greater body mass is known to be associated with increased bone mineral density, but higher levels of visceral adipose tissue may potentially have a negative impact on bone health. However, little is known about the relationship between visceral fat area (VFA) and site-specific bone strength measured by quantitative ultrasound in healthy young adults. **PURPOSE:** This cross-sectional study aimed to investigate whether VFA is related to site-specific bone strength. **METHODS:** We recruited healthy young women (n=102, aged 21.6±2.3 years, height 163.9±6.6 cm, weight 64.1±13.4 kg) and men (n=110, aged 21.7±2.4 years, height 176.1±7.8 cm, weight 80.7±14.5 kg) between 18 and 25 years from Rowan University. VFA was estimated using bioelectrical impedance analysis. Lifetime physical activity related to bone health was assessed using the past bone-specific physical activity (pBPAQ) score. Quantitative ultrasound-assessed speed of sound (SOS in m/s) was measured at the one-third distal radius of the nondominant hand and midshaft tibia of the nondominant leg. Daily calcium intake (mg/d) was estimated using the calcium calculator. **RESULTS:** Student's t-tests revealed that young women had greater VFA (79.6 vs. 60.0 cm², p=0.002) but lower daily calcium intake (683.9 vs. 803.1 mg/d, p=0.033) compared to young men. No sex differences were found in radius and tibia SOS and pBPAQ (p>0.05). After controlling for pBPAQ and daily calcium intake, partial correlation analysis showed negative relationships between VFA and radius SOS in both young women (r=-0.409) and men (r=-0.443) (p<0.001). However, there was no significant relationship between VFA and tibia SOS in either young women or men. **CONCLUSION:** These findings suggest that VFA may serve as a predictor of radius bone strength in college-aged healthy young adults. **SIGNIFANCE/NOVELTY:** The identification of VFA as a potential predictor of radius bone strength provides a novel perspective on factors influencing bone health. This novel insight emphasizes the importance of considering body composition beyond traditional metrics like weight and bone mineral density. These insights can have implications for preventive measures and interventions aimed at preserving bone health early in life, potentially reducing the risk of osteoporosis and related fractures in later years. Future research may explore the potential for interventions aimed at reducing VFA to positively impact bone health outcomes in young adults.

The Effect of Post-Activation Potentiation on Barbell Bench Press Velocity and Power

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Post-activation potentiation (PAP) has been demonstrated to increase power output for single repetition activities with proper load and optimal rest time. There is limited research on upper body PAP with multiple repetitions. **PURPOSE:** To examine the effect of post-activation potentiation on barbell bench press velocity and upper body power output in a group of college students. **METHODS:** Subjects included 10 DeSales University Students (5 male, 5 female, 18-21 years old) who participated in the research study on 4 separate days. Day 1 consisted of an orientation meeting. Day 2 consisted of one repetition maximum (1RM) testing for the bench press exercise. Days 3 & 4 consisted of a brief warm-up with randomized testing protocols (control and PAP). The control session included three repetitions at 60% 1RM as fast as possible. The PAP session included three sets of 3 repetitions at 80% of 1RM with a 6-minute rest period after the last set, followed by three repetitions at 60% of 1RM as fast as possible. Mean barbell velocity and average power were measured using a linear position transducer. Paired sample t-tests were used to compare differences between average measurements of barbell velocity pre and post potentiation and upper body power output pre and post potentiation. **RESULTS:** There was a statistically significant difference in mean barbell velocity was 0.76 ± 0.096 m/s pre-potentiation and 0.71 ± 0.087 m/s post-potentiation. There was a statistically significant difference in average velocity ($p=0.028$). Average power output was 277.2 ± 100.2 W pre-potentiation and 272.4 ± 106.1 W post-potentiation. There was no statistically significant difference in average power output ($p=0.562$). **CONCLUSION:** The present study did not demonstrate that a high-intensity potentiating exercise improved barbell velocity or upper body power output with multiple repetitions. Further research should be conducted to understand the full effects of post-activation potentiation for optimal performance on multiple repetition activities. **SIGNIFICANCE/NOVELTY:** This research was intended to determine if PAP would affect power output in multiple repetitions of the barbell bench press exercise exercises. Fatigue appeared to be a crucial factor in testing and resulted in the PAP testing day producing a lower power output compared to the control. This information plays an important role in the field of strength and conditioning as professionals are always looking at what optimizes or hinders athlete performance.

Reduced-Exertion High-Intensity Interval Training Improved Post-Prandial Blood Glucose in Healthy, Recreationally Active Middle-Aged Men

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Men are at a greater risk of developing insulin resistance and poor blood glucose control at an earlier age compared to women. Although 30-minute exercise bouts can improve glucose control, “lack of time” is often cited as a primary barrier to exercise. Reduced-Exertion High-Intensity Interval Training (REHIT) exercise consists of 10-minutes of unloaded cycling interspersed with two 20-second sprints with resistance set to 5% body weight. Previous studies have reported that REHIT leads to improved oral glucose tolerance and 24-hour (24h) glucose responses under controlled feeding conditions in healthy young and middle-aged adults with metabolic dysfunction. However, the ecological relevance of REHIT under habitual conditions and a standardized mixed meal (55% carbohydrate, 25% fat, 20% protein) remains unknown in healthy, active, middle-aged men. **PURPOSE:** This study investigated the effects of a single bout of REHIT on 3h post-prandial and 24h blood glucose measures in physically active, middle-aged men compared to a non-exercise control condition (Non-EX). **METHODS:** Twenty physically active men (Age: 52±8 years; VO₂max: 44.5±6.0 mL·min⁻¹·kg⁻¹; BMI: 24.3±1.7 kg·m⁻²) completed a randomized crossover study comparing REHIT to Non-EX. All participants completed the 10-minute REHIT exercise bout and Non-EX condition 30 minutes after consuming a standardized breakfast, and then consumed their habitual diet for the rest of the day. Continuous glucose monitors measured 24h interstitial glucose every five minutes throughout the duration of the study. The continuous glucose monitor data were analyzed to measure post-prandial and 24h mean glucose control and glycemic variability (mean amplitude of glycemic excursions, MAGE; coefficient of variation, 24h CV). **RESULTS:** REHIT blunted 3h post-prandial blood glucose responses to breakfast (REHIT: 110.2 ± 5.6 vs. Non-Ex: 137.6 ± 5.6, *p*<0.001) but not 24h average blood glucose (REHIT: 118.9 ± 14.0 vs. Non-EX: 117.2 ± 13.1 mg/dL, *p*=0.453) or measures of blood glucose variability: 24h standard deviation of blood glucose (REHIT: 16.6 ± 5.2 vs. Non-EX: 18.1 ± 5.5 mg/dL, *p*=0.173), 24h MAGE (REHIT: 2.5 ± 0.9 vs. Non-EX: 2.6 ± 0.9 mmol/L, *p*=0.474), and 24h CV (REHIT: 14.6 ± 4.0 vs. Non-EX: 14.9 ± 4.6 %, *p*=0.746). **CONCLUSION:** Post-breakfast REHIT blunted post-prandial glucose responses in active middle-aged men. However, these effects did not carry over throughout a 24h period. REHIT may provide an ideal regimen to acutely blunt post-prandial glucose responses in healthy middle-aged men, but it does not reduce 24h mean glucose or glucose variability. **SIGNIFICANCE/NOVELTY:** This is the first study to assess the benefits of REHIT under a more ecologically relevant study design. These findings suggest limited glucose regulation benefits in healthy, active, middle-aged men following a single bout of REHIT under ecologically-relevant conditions.

COMPARISON OF BODY COMPOSITION METHODS: CIRCUMFERENCE MEASUREMENTS AND BIOELECTRICAL IMPEDANCE TO DUAL-ENERGY X-RAY ABSORPTIOMETRY

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High-frequency (500Khz) direct segmental multifrequency bioelectrical impedance analysis (BIA) accurately calculates total water mass and body fat% (BF%), but it is unknown whether higher frequencies (1000Khz) increase measurement accuracy. **PURPOSE:** This study compared BIA 500Khz, BIA 1000Khz, the Department of Defense (DoD) Circumference Method (CM), and the reference-standard Dual Energy X-ray Absorptiometry (DEXA). **METHODS:** A total of 62 participants from the military healthcare system (n=25 males, 38.8±11.4yrs, n=37 females 43.7±15.95yrs) were measured. BF% was estimated via DEXA, BIA 500, BIA 1000, and CM to identify the relationship between methods using Pearson Correlation, Intraclass Correlation Coefficients, and Bland Altman Plots (p <.05). **RESULTS:** CM BF% estimates displayed significant moderate correlations with BIA 500 (males r=.63, ICC=.76; females r=.77, ICC=.85), BIA 1000 (males r=.59, ICC=.74; females r=.77, ICC=.85), and DEXA (males r=.62, ICC=.62; females r=.73, ICC=.82). BIA 500 BF% displayed significant strong correlations with BIA 1000 (males r=.99, ICC=.99; females r=.99, ICC=.99) and DEXA (males r=.93, ICC=.94; females r=.89, ICC=.89). Lastly, BIA 1000 BF% also showed a significant strong correlation DEXA (males r=.93, ICC=.94; females r=.84, ICC=.90). Evaluating proportional bias using a Bland-Altman analysis confirmed an overall mean bias of -1.72% (CM and DEXA) in the female group, indicating the tendency of CM to underestimate BF% compared to DEXA limits of agreement from -14.24 to 10.8. There was an upward slope of .33 as the CM BF% decreased and the DEXA BF% increased. There was agreement of BF% to 32%, but after 32%, there was more dispersion from the mean and outliers and with a significant trend for a greater difference in BF% between CM and DEXA (p<.05). **CONCLUSION:** The correlation was higher between BIA 500 and BIA 1000 to DEXA when compared to CM. There was proportional bias between DEXA and CM in the female group with CM underestimating BF% compared to DEXA. **SIGNIFANCE/NOVELTY:** When compared to BIA methods, BF% estimated via CM methods do not correlate well with BF% from DEXA. However, it does not seem as though higher BIA frequencies better predict BF%.

The views expressed in this abstract are those of the author(s) and do not necessarily reflect the official policy of the Department of Army, Navy, Defense, or any other agency of the U.S. Government, nor should any official endorsement be inferred by the Department of Defense, or the U.S. Government.

Examining Critical Power Metrics Following a Submaximal Bout of Pre-Exhausting Exercise in Competitive Cyclists

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Competitive cyclists often modify periodization and training strategies prior to competition to improve performance metrics related to critical power (CP) and blood lactate (BLA) threshold. **PURPOSE:** To examine the effects of submaximal pre-exhausting exercise (PreEx) on maximal power cycling performance, while defining the relationship between BLA accumulation and power output after CP is achieved. **METHODS:** 8 participants (age: 38 ± 6.1 years; VO_{2max} was 52 ± 6 ml/kg/min; 5 males, 3 females) with 2 years of competitive cycling history were recruited for this exploratory investigation. Following assessment of maximal aerobic capacity (VO_{2max}) and functional threshold power (FTP), participants completed two identical sessions; Session 1 (CON): 6 back-to-back 30-second maximal cycling efforts separated by 5 minutes of active recovery at 60% FTP, and Session 2 (PreEx): mirrored protocol of CON following a submaximal cycling bout at an intensity of 75% FTP for 90 minutes. The following variables were analyzed: VO_2 , BLA, heart rate (HR), average power (AvePwr), peak power (PkPwr), minimum power (MinPwr), and fatigue index (FI). **RESULTS:** Participant FTP was 240 ± 50 watts (W). Initial 30-second sprint data resulted in AvePwr of 550.21 ± 170 W, PkPwr of 632 ± 231 W, and post-sprint BLA of 6.5 ± 2.2 mmol. A significant Time x Session interaction was observed for BLA ($p=0.03$), further explained by significantly lower BLA values during PreEx than CON for all 6 sprint intervals ($p=0.01$). A main effect of time indicated BLA values increased across all 6 sprint intervals in both sessions ($p<0.001$) (92.7% and 31% increase in BLA in CON and PreEx respectively, represented by an average of 12.53 ± 2.75 mmol post-all-CON sprints and 8.52 ± 3.75 mmol post-all-PreEx sprints). The main effect of time for AvePwr was driven by reduced power output across all 6 sprint sessions in both conditions ($p=0.022$; 12.4% and 20.7% decrease in AvePwr in CON and PreEx, respectively, represented by 489 ± 113.41 W AvePwr CON and 436.31 ± 133.5 W AvePwr PreEx). Despite no main effect of condition or session for PkPwr, significant differences were observed between CON and PreEx at sprint 1 ($p=0.027$), 2 ($p=0.006$), and 3 ($p=0.011$) with CON sprints eliciting higher PkPwr. Furthermore, both CON and PreEx reduced average PkPwr by 11.5% (559.32 ± 157.23 W) and 19.3% (510.02 ± 205.26 W), respectively. **CONCLUSION:** Upon reaching CP, sustained exercise and performance during PreEx led to greater drops in AvePwr and PkPwr compared to CON. BLA values did not increase at significantly greater rates during bouts of CP following PreEx compared to CON. **SIGNIFICANCE/NOVELTY:** While achieving CP in PreEx may simulate racing conditions, it may be more advantageous to train in preparation for events in a state similar to CON prior to achieving CP so that athletes may benefit from true BLA threshold training, saving both time and energy in training.

Supported the Grove City College Swezey Fund

Five-Days of Salicylate Treatment Does Not Alter Endothelial-Dependent Flow-Mediated Dilatation in Women with Endometriosis

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Endometriosis, an estrogen-dependent disorder, is characterized by the presence of endometrium-like tissue outside the uterine cavity. Systemic inflammation including increased production of proinflammatory cytokines regulated by the nuclear factor- κ B (NF- κ B) pathway occurs in endometriosis. Administration of nonacetylated salicylate inhibits NF- κ B activation and improves endothelial function in clinical cohorts, but whether it improves endothelial function in women with endometriosis is unclear. **PURPOSE:** To quantify conduit artery endothelial function, via brachial artery flow-mediated dilatation (FMD), in women with endometriosis following inhibition of systemic inflammation with five-days of an oral salicylate intervention. We hypothesized that systemic inhibition of NF- κ B activation would improve conduit artery endothelial function in women with endometriosis. **METHODS:** In five women with laparoscopically-confirmed endometriosis [Mean (SD): Age: 31 (5) yrs; BMI: 24.24 (4.48) $\text{kg}\cdot\text{m}^{-2}$], brachial artery FMD was measured (GE Logiq E) in a randomized double-blind placebo-controlled design. Brachial artery diameter was measured at baseline and post-reactive hyperemia. %FMD is expressed as the percent change in brachial artery diameter in response to reactive hyperemia compared to baseline. Edge detection software (Cardiovascular Suite 4) was utilized and placebo and salicylate treatments were compared using a paired t-test. **RESULTS:** Five-day salicylate treatment did not improve %FMD in women with endometriosis [Placebo: 6.06 (3.80)% vs Salicylate: 3.93 (3.72)%; $p=0.08$]. **CONCLUSION:** Conduit artery endothelial function in women with endometriosis was not improved after the five-day salicylate intervention. **SIGNIFICANCE/NOVELTY:** Inhibition of NF- κ B activation did not impact endothelial function in women with endometriosis. Other mechanisms may be mediating endothelial dysfunction in women with endometriosis.

Supported by NIH Grant R01 HL161000

Age-Related Differences in the Onset of Cardiovascular Drift during Progressive Heat Stress (PSU HEAT Project)

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As a result of the increasing duration, frequency, and severity of heat waves, older men and women are at greater risk for heat-related morbidity and mortality, with the majority of excess heat-related deaths attributed to increased cardiovascular strain associated with heat stress.

PURPOSE: To (1) identify the critical environmental limits (ambient temperature (T_{db}) and humidity (rh)) at which increased cardiovascular strain (i.e., continuous rise in heart rate (HR)) begins, and (2) compare the environments in which increases in cardiovascular strain occur relative to those at which a continuous rise in core temperature (T_c) is observed in young (Y), middle (M), and older (O) adults. **METHODS:** 19 Y (7F; 23 ± 3 yrs), 26 M (21F; 54 ± 8 yrs), and 16 O (7F; 70 ± 3 yrs) subjects were exposed to progressive heat stress in an environmental chamber at a low metabolic rate reflecting activities of daily living (159 ± 34 W) in a warm-humid (WH, $\sim 34^\circ\text{C}$, 50-80% rh) and/or hot-dry (HD, 38°C - 52°C , $<30\%$ rh) environment. The environmental thresholds above which HR and T_c equilibrium could no longer be maintained were identified. **RESULTS:** In WH (34°C) environments, sustained increases in HR preceded the T_c inflection point in Y ($73\pm 5\%$ rh vs. $81\pm 4\%$ rh; $p=0.001$), M ($67\pm 11\%$ rh vs. $72\pm 12\%$ rh; $p<0.001$), and O adults (34°C , $53\pm 11\%$ rh vs. 34°C , $57\pm 12\%$ rh; $p=0.041$). Similarly, in HD (15-20% rh) environments, the onset of cardiovascular drift preceded the T_c inflection point in Y ($47\pm 3^\circ\text{C}$ vs. $49\pm 3^\circ\text{C}$; $p=0.004$), M ($44\pm 4^\circ\text{C}$ vs. $46\pm 4^\circ\text{C}$; $p<0.001$), and O adults ($42\pm 5^\circ\text{C}$ vs. $44\pm 4^\circ\text{C}$; $p=0.007$). Additionally, in WH environments, cardiovascular drift began at lower combinations of T_{db} and rh in O vs. Y (34°C , $53\pm 11\%$ rh vs. 34°C , $73\pm 5\%$ rh; $p<0.001$) and O vs. M adults (34°C , $53\pm 11\%$ rh vs. 34°C , $67\pm 11\%$ rh; $p=0.008$). In HD environments, cardiovascular strain occurred at lower environments in M vs. Y ($44\pm 4^\circ\text{C}$, 18% rh vs. $47\pm 3^\circ\text{C}$, 15% rh; $p=0.044$) and O vs. Y ($42\pm 5^\circ\text{C}$, 20% rh vs. $47\pm 3^\circ\text{C}$, 15% rh; $p=0.006$) **CONCLUSION:** These data suggest that cardiovascular drift, indicating increases in cardiovascular strain, precede uncompensable heat stress at metabolic rates reflecting activities of daily living in Y, M, and O adults. Further, there is an age-associated shift in the onset of drift toward lower combinations of T_{db} and rh. **SIGNIFICANCE/NOVELTY:** These results are the first to identify the specific environmental conditions at which increases in cardiovascular strain occur across age groups. These findings provide important information for the development of safety guidelines and policy decisions to mitigate cardiovascular-related morbidity and mortality during impending heat events.

Supported by NIA Grant T32 AG049676 (to R.M.C.) and NIH Grant R01 AG067471 (to W.L.K.)

THE RELATIONSHIP BETWEEN SPORTS PERFORMANCE VARIABLES AND BASEBALL HITTING PERFORMANCE IN DIVISION II ATHLETES

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Hitting performance is an integral part of baseball performance. Ultimately, the better you can develop hitters, the more baseball games you can win. Current literature demonstrates there are ways to improve an athlete's hitting ability through proper preparation in the weightroom, yet more evidence towards which type of training tactics are most effective are limited. **PURPOSE:** The purpose of this quantitative study was to examine the relationship between measures of strength or power and sports specific training tactics to bat velocity and batted ball velocity in NCAA Division II Collegiate baseball players. **METHODS:** Twenty-four Division II baseball athletes from East Stroudsburg University (age: 19.92 ± 1.53 years, height: 71.33 ± 2.91 inches, mass: 186.43 ± 26.01 pounds) participated in the study. Participants were tested on Bat Velocity (BV), Batted Ball Velocity (BBV), Medicine Ball (MB) Rotational Shotput for distance, Lateral Bound for distance, lean body mass, 1RM Trap Bar Deadlift, and 1RM Back Squat. Subjects were assessed in a one-week period, consisting of four testing days. BV, BBV, MB Rotational Shotput, and Lateral Bound were performed on the same day and 1RM Trap Bar Deadlift and Back Squat were integrated into the resistance training program of all twenty-four athletes and completed towards the end of the testing week. **RESULTS:** Lean body mass ($r=0.544$, $p=0.006$) and 1RM Trap Bar Deadlift ($r=0.426$, $p=0.038$) were significant in relation to BBV while MB Rotational Shotput ($r=0.389$, $p=0.060$) showed a trend. In terms of BV, Lean body mass ($r=0.468$, $p=0.021$) had significance again. 1RM Back Squat ($r=0.393$, $p=0.058$) and 1RM Trap Bar Deadlift ($r=0.379$, $p=0.068$) showed a trend with BV. **CONCLUSION:** There is a need for sports performance professionals to understand the importance of lean body mass and Trap Bar Deadlift strength in their baseball athletes. In addition, rotational MB exercises and Back Squat strength are reliable means of training baseball hitters. Incorporating these training measures may translate into an increase in BV and BBV which ultimately creates more offensive success on the field. **SIGNIFICANCE:** As the baseball performance industry progressively moves towards a more data-driven approach, especially with the creation of the MLB Draft Combine, MLB organizations and university's ability to objectively evaluate athletes is essential. In working towards a valid and reliable testing battery as it relates to hitting performance, the baseball industry can make more informed decisions about development, performance, prospect rankings, draft picks, and ultimately on field success.

Habitual Sleep Does Not Influence Blood Pressure Dipping Differences Between Young Black and White Women

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Blunted nocturnal blood pressure (BP) dipping, defined as less than 10% reduction in BP during sleep as compared to wake, predicts cardiovascular disease. Short and disturbed sleep are associated with less nocturnal BP dipping in young adults. Black women (BLW) demonstrate less nocturnal BP dipping and poorer sleep health compared to White women (WHW) as early as young adulthood. However, not known is the extent to which habitual, objectively estimated sleep metrics explain race differences in BP dipping. **PURPOSE:** To evaluate the influence of objectively estimated habitual sleep duration and sleep efficiency on race differences in nocturnal BP dipping between apparently healthy, young BLW and WHW. We hypothesized that BLW would have significantly lower nocturnal BP dipping than WHW, but that BP dipping differences would be abolished after co-varying for habitual sleep duration and sleep efficiency. **METHODS:** Participants were aged 18-29 years, female, normotensive, nonobese, free of sleep disorders, with a self-identified race of Black or White. Systolic and diastolic BP dipping were each derived from 24-hour ambulatory BP monitoring by subtracting mean asleep BP from mean awake BP, divided by mean awake BP, *100. Sleep duration (total sleep time between sleep onset and offset) and sleep efficiency (total sleep time divided by total time in bed dedicated to sleep, *100) were measured via wrist actigraphy for 14 consecutive nights, and means were generated. Race differences in BP dipping and sleep metrics were assessed via independent-samples t-tests. A one-way between group analysis of covariance was used to compare race differences in BP dipping while co-varying for sleep duration and sleep efficiency. **RESULTS:** Participants included 17 BLW (22±3 years) and 17 WHW (25±3 years). Systolic (BLW: 9.1±6.3, WHW: 13.9±5.1 %, p=0.02) and diastolic (BLW: 16.2±7.7, WHW: 21.9±5.5 %, p=0.02) BP dipping were lower among BLW. Sleep duration was not different between races (BLW: 6.8±0.5, WHW: 7.0±0.7 hrs, p=0.24), but sleep efficiency was lower among BLW (BLW: 81.9±4.5, WHW: 86.0±3.1 %, p<0.01). Co-varying for sleep duration did not influence race differences in systolic (F(1,31)=4.86, p=0.03, $\eta^2=0.13$) and diastolic (F(1,31)=4.99, p=0.03, $\eta^2=0.14$) BP dipping. Similarly, co-varying for sleep efficiency did not influence race differences in systolic (F(1,31)=4.16, p=0.049, $\eta^2=0.12$) and diastolic (F(1,31)=6.26, p=0.02, $\eta^2=0.17$) BP dipping. **CONCLUSIONS:** Significant differences in nocturnal BP dipping between young BLW and WHW exist independent of habitual sleep duration and efficiency, thus other social or environmental determinants should be considered. **SIGNIFICANCE/NOVELTY:** This study is first to reveal minimal impact of habitual sleep on race differences in nocturnal BP dipping between young BLW and WHW.

Supported by UDRF-SI Grant and AHA Award #831488

Can Noninvasive Characteristics Predict The Adaptation to Short-term Resistance And Cardiovascular Training? A Preliminary Investigation

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A large heterogeneity exists in physiological adaptations following resistance and cardiovascular training. This heterogeneity has led to classifying individuals as slow and fast responders. Given the low exercise adherence rates, it possible that a slow adaption to exercise training may exacerbate low exercise adherence. Therefore, it may be beneficial to identify noninvasive characteristics that predict slow and fast responses to exercise training to better guide individuals starting an exercise routine. **PURPOSE:** To identify sets of noninvasive baseline characteristics that would predict whether an individual would be a slow or fast responder to a microcycle of resistance and cardiovascular training. **METHODS:** Eight untrained individuals (29.8±9.5 years, 170±10 height (cm), 80.2±8.4 weight (kg)) participated in a randomized crossover design which assigned subjects to 7-sessions of resistance or cardiovascular training (~60-minutes per session) over 14-days. Pre-and-post each exercise intervention subject's anthropometrics, blood pressure, cycling aerobic capacity (VO₂peak), leg extension and flexion peak torque, and leg extension and flexion fatigue index (F.I.) were assessed. Multiple linear regression analysis with a backward selection model was performed. **RESULTS:** The model of best fit found that baseline central diastolic blood pressure (cDBP) accounted for 49% of the variance in the percent change in VO₂peak following resistance training (F (1,6) = 7.79; p = 0.032; R² = 0.49). The model of best fit found that baseline body fat %, body mass index (BMI), and VO₂peak accounted 98% of the change in peak leg extension torque following cardiovascular training (F (3,4) = 113; p = 0.001; adjusted R² = 0.98). The model of best fit found that baseline flexion F.I., cDBP, peripheral diastolic pressure, and flexion type 1 fiber % accounted for 85% of the variance in the change in leg extension F.I. following cardiovascular training (F (4,3) = 11; p = 0.039; adjusted R² = 0.851). **CONCLUSION:** Our data shows that a relationship exists between baseline characteristics and the percent change in VO₂peak following resistance training and peak leg extension torque and leg extension F.I. following cardiovascular training. Based on these findings, it might be possible to identify from baseline characteristics which type of training intervention an individual may see the greatest initial improvements. **SIGNIFICANCE/NOVELTY:** Previous work has identified that large heterogeneity exists following resistance and cardiovascular training; however, invasive and costly measures have been used to attempt to identify the physiological rationale for the heterogeneity. Our study uses non-invasive techniques that can be administered in laboratory and non-laboratory settings to help identify potential response rates to resistance and cardiovascular training.

Supported by the Mid-Atlantic Regional Chapter of the American College of Sports Medicine Early-Stage Investigator Award

The Influence of Cholesterol on Resting Brain Blood Flow and Cognition in Mid-Life Adults

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Low-density lipoprotein (LDL) cholesterol tends to increase, while high-density lipoprotein (HDL) cholesterol tends to decrease with age. Cognition can begin to decline with aging past mid-life (50-64 years old). Alterations in resting brain blood flow have been linked to this impaired cognitive function. **PURPOSE:** To determine the influence of cholesterol on resting brain blood flow and cognition in mid-life adults. **METHODS:** LDL and HDL cholesterol were measured in 18 participants (57 ± 4 years old). Resting whole brain and hippocampal blood flow were assessed using a pseudo-continuous arterial spin labeling (pCASL) sequence from the Human Connectome Project with a 64-channel head coil inside a Siemens Prisma 3T MRI scanner. Cognition was assessed using the Hopkins Verbal Learning Test (HVLT) and the National Institute of Health (NIH) Toolbox's Flanker Inhibitory Control and Attention Test and Pattern Comparison Processing Speed Test. The influence of cholesterol on resting brain blood flow and cognition was analyzed using Pearson correlations. **RESULTS:** LDL cholesterol (123 ± 23 mg/dL) was negatively correlated with resting whole brain (70.1 ± 12.5 ml. $100g^{-1} \cdot min^{-1}$; $r = -0.78$, $p = 0.0001$) and hippocampal (67.6 ± 13.1 ml. $100g^{-1} \cdot min^{-1}$; $r = -0.74$, $p = 0.0005$) blood flow. There were no associations for HDL cholesterol (67 ± 17 mg/dL) on resting whole brain ($r = -0.03$, $p = 0.9$) or hippocampal ($r = -0.04$, $p = 0.9$) blood flow. From the cognitive testing, only hippocampal-dependent memory retention using the HVLT was positively associated with HDL cholesterol ($r = 0.51$, $p = 0.03$). A follow-up analysis revealed participants with a higher resting brain blood flow presented a tendency for higher scores in the Pattern Comparison Processing Speed Test ($r = 0.44$, $p = 0.06$). **CONCLUSION:** LDL cholesterol, a cardiometabolic risk factor, was negatively associated with resting whole brain and hippocampal blood flow whereas the potentially cardioprotective factor HDL cholesterol was not. HDL cholesterol was positively associated with memory related outcomes. Our results suggest cholesterol may impact resting brain blood flow and cognitive function in mid-life adults, but additional data is required to elucidate the underlying mechanisms. **SIGNIFICANCE / NOVELTY:** The cardiometabolic effects of cholesterol may have further implications on cerebrovascular and brain health.

GRANT SUPPORT: NIH/NIGMS - P20 GM113125

Changes in Loaded Carry Magnitude and its Effect on Stride Length, Cadence, and Muscle Activation

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The loaded carry is a movement pattern where an individual lifts and moves an implement a set distance. Due to their rigor and direct application, loaded carries have become a popular form of resistance training. Exercises like the farmers carry (FC), where the weight is held in both hands, have been shown to activate the core muscles across multiple planes of movement. However, we found little research on the implications of simple changes (i.e., load of implements) in altering the potential kinematics and neuromuscular effort of the FC. **PURPOSE:** To examine how changes in load alter stride length, cadence and muscle activation during the FC. **METHODS:** Healthy, college-aged individuals were recruited and their body composition (i.e., %fat, fat-free mass (FFM)) was measured. Each participant's FFM was used to calculate their FC loads. Standard surface electromyography (EMG) procedures were used to measure muscle activation of the rectus abdominis, external oblique, longissimus and multifidus during the FC. Maximal voluntary isometric contractions (MVIC) were completed and used to standardized muscle activation across subjects (% MVIC). Participants were fitted with inertial measurement units (IMUs) and videoed to capture joint kinematics. Randomized trials of 20-meter walks with no external load, 75% FFM, 100% FFM, and 125% FFM were recorded. A within-subject, repeated measures ANOVA was used to analyze differences in stride length, cadence, and EMG activity (% MIVC) and across load conditions. **RESULTS:** An increase in load was shown to reduce stride length (e.g., No weight- 140.4±2.8 v. 125% FFM- 122.4±2.1 cm; P<0.05), but increase the overall cadence (e.g., No weight- 107.1±1.6 v. 125% FFM- 115.0±2.1 steps/min; P<0.05) of the FC in our cohort. Further, an increase in implement load was associated with an increased % MVIC muscle activation across all examined muscles (e.g., external oblique: No Weight- 8.7±1.3, 75% FFM- 15.0±2.5, 100% FFM- 18.2±2.4, and 125% FFM- 23.8±2.6 %MVIC; P<0.05). **CONCLUSION:** Participants walked more rapidly when under an external load. In addition, as external load increased stride length decreased and muscle activation increased. **SIGNIFICANCE/NOVELTY:** Load selection for the FC can influence both exercise kinematics and muscle activation. These changes should be considered when designing a safe and effective resistance training program that includes the FC.

The Effects of a Resistance Band Warm-Up Protocol on Muscular Endurance: A Pilot Study

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A warm-up is defined as a series of exercises done in preparation for subsequent competition or training for performance enhancement. Different warm-ups include static stretching, dynamic stretching, or dynamic exercise (with or without equipment). Currently, debate exists as to which type is most beneficial for subsequent performance. **PURPOSE:** To determine if a resistance band-based warm-up affects muscular endurance in recreational strength and conditioned individuals. **METHODS:** Three males and two females (age: $21 \pm .84$ yrs; height: 178.9 ± 8.96 cm; weight: 75.04 ± 16.45 kg) took part in this pilot study. Each subject completed a specific dynamic warm-up protocol, once with a looped resistance band (BND) and another time without (N-BND) it. Subjects were then tested on back squats for maximum repetitions, immediately following the warm-up, at 50% of their pre-determined 1-repetition maximum weight. A subjective performance measure was taken via a post-test survey regarding ratings of perceived exertion (RPE). Comparisons were made by paired t-tests and $P \leq 0.05$ was considered statistically significant. **RESULTS:** There were no significant differences in back squat repetitions ($p=0.074$) or RPE ($p=1.00$) between N-BND and BND conditions. There was a large effect size of $d=1.077$ for repetitions completed following the BND protocol. **CONCLUSION:** Based on the magnitude of this effect, it may be possible that resistance bands are effective in enhancing muscular endurance performance. This could provide a practical, cost-effective, and more portable option for athletes and coaches when searching for an optimal warm-up strategy to improve performance. **SIGNIFICANCE/NOVELTY:** The results from this pilot study are encouraging and additional research with more subjects is forthcoming.

The Effects of Dietary Nitrate on Endothelial Resistance to Ischemia Reperfusion Injury in Postmenopausal Women

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Regular aerobic exercise has been shown to enhance endothelial function in aging men, however, the same vascular benefits are not consistently observed in estrogen-deficient postmenopausal women. Consumption of nitrate and antioxidant-rich foods (beetroot, spinach, leafy greens, etc.) is an effective dietary strategy to increase bioavailability of the vasoprotective molecule, nitric oxide and improve endothelial function. **PURPOSE:** To determine if a single dose of nitrate-rich beetroot juice can improve endothelial *resistance to-* and *resilience following-* whole-arm ischemia-reperfusion (IR) injury (20 min. occlusion, 15 min. reperfusion) in postmenopausal women. **METHODS:** Healthy, physically active early- (1-6 years following their final menstrual period (FMP), MET-week: 2918 ± 3679 , n=12) and late- (>6 years FMP, MET-week: 3116 ± 2240 , n=12) postmenopausal women consumed a single dose of nitrate-rich (600 mg NO₃⁻/ 140 mL) and nitrate-depleted (placebo, 0 mg NO₃⁻/ 140mL) BR on two separate visits. Brachial artery flow-mediated dilation was measured pre-, post-IR, and recovery (30-minutes post-IR) for each drink. **RESULTS:** Analyses with general linear models revealed a significant (p<0.05) time*treatment interaction (p=0.014) effect for FMD. FMD was significantly lower post-IR in comparison to all other time points with BR_{placebo} (Early: BR_{placebo} 2.51 ± 1.18 %, p<0.001, Late: BR_{placebo} 1.30 ± 1.10 %, p<0.001) and was significantly lower than post-IR with BR_{nitrate} (Early: BR_{nitrate} 3.84 ± 1.21 %, Late: BR_{nitrate} 3.21 ± 1.13 %, p=0.045). Recovery FMD with BR_{nitrate} (Early: BR_{nitrate} 6.71 ± 1.14 %, p=0.023) was significantly higher in the early postmenopausal group, and with BR_{placebo} (Early: BR_{placebo} 6.25 ± 1.16 %, p<0.001, Late: BR_{placebo} 5.11 ± 1.10 %, p<0.001) in both groups. **CONCLUSION:** These results suggest that BR_{nitrate} improves endothelial *resistance* to whole arm IR injury in healthy, active postmenopausal women, however, given recovery FMD was significantly higher with BR_{placebo} in both groups might suggest that the high antioxidant capacity in BR plays an important role in endothelial *resilience* following IR injury. **SIGNIFICANCE:** Nitrate-rich beetroot juice enhances endothelial resistance to IR injury in healthy, active, postmenopausal women.

Supported by NCATS NIH Grant UL1 TR002014, NIH NIGMS T32GM108563, NIH NIDDK T32DK120509 and The Huck Endowment for Nutritional Research in Family and Community Medicine at PSCOM and University Park

Prevalence of and Reasons for Dietary and Supplementation Habits Among Physically Active College Students

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Research finds that vegetarian diet, sports participation, and living during the COVID-19 pandemic have separately been found to increase risk of eating disorder behavior. Such behavior contributes to decline in athletic performance due to RED-S and micronutrient deficiencies. **PURPOSE:** To describe supplement habits, knowledge, and reasoning for dietary practices among vegetarian (VEG) and nonvegetarian (NON) physically active college students. **METHODS:** A 50-item survey was collected in fall 2020 from college students in the United States, detailing demographic, anthropometric, exercise participation, food and supplement intake data. Adapted Sports Nutrition Knowledge Questionnaire and Eating Attitudes Survey (EAT) questions were included. Of 425, the 154 complete responses were analyzed in R using mean scores and frequencies where applicable. Independent sample t-tests and chi-square tests used significance level of $p < .05$. **RESULTS:** 114 females and 39 males completed the survey, among this 19 VEG and 135 NON VEG status was not significantly associated with EAT score, nor did it significantly differ by gender identity. Mean BMI = 25.41 for males and 23.2 for females. No difference in BMI was detected in males due to vegetarian status. BMI was significantly lower in female VEG than NON, though mean EAT scores were below the threshold for eating disorder risk. Supplement use among VEG (68%) was significantly higher than NON group (30%), though NON took more supplements than VEG (1.95 vs. 2.76). Most used supplements were multivitamin, vitamin B₁₂, and iron for VEG group and multivitamin, vitamin D, probiotic, fish oil, and creatine among nonvegetarian. Reasons for VEG diet include: health benefits (26.6%), ethical concerns (19.4%), environmental concerns (18.8%), weight control (12.3%), reducing risk of chronic disease (12.3%), improved athletic performance (9.1%), cost savings (3.2%) and other reasons (5.8%). EAT score was not significantly correlated with desire for weight control, although reducing risk of chronic disease was significantly correlated. **CONCLUSION:** Vegetarianism among the physically active college students differs from the general population. Data indicates health-promoting behaviors and awareness of dietary needs for overall health and athletic performance. **SIGNIFICANCE/NOVELTY:** Dietary and physical activity habits and attitudes formed in college have lasting impact throughout life. The stress imposed on college students with the sudden forced move-out and increased alone time from remote learning environments during COVID-19 has exacerbated risk of unhealthy behaviors at this period of emerging adulthood and independence. Thus, this study aims to describe prevalence and motivations of physically active college students' nutrition behaviors, which may represent a cohort that is receptive to further knowledge and habit change.

The Use of Tart Cherry Juice for Muscle Recovery in Females

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An inflammatory response and oxidative stress are known causes of muscle damage within the body following exercise, with a greater intensity of exercise contributing to severity. Symptoms associated with exercise-induced muscle damage (EIMD) include soreness, swelling, and pain, possibly affecting future exercise participation. Tart cherry juice (TCJ) may provide protection against EIMD, due to its potent antioxidant and anti-inflammatory properties. Research has suggested that the prevention of EIMD from TCJ supplementation enhances muscle recovery following intense exercise, though data on females are lacking. **PURPOSE:** To assess the effects of TCJ supplementation on muscle recovery and inflammation following intense resistance training exercise in young, healthy females. **METHODS:** Fifteen females (18-24y) completed two trials of intense resistance exercise separated by one month. Participants were randomly assigned either a TCJ supplement or placebo to consume for eight days (6 days before trial, and 2 days after trial). On day 6 of each trial, participants completed 6 sets of 10 repetitions of a machine chest press at 80% of their previously determined 1RM. If unable to complete a set, the subsequent set was reduced by 5%. On days 7-8 of each trial, participants followed 1RM protocols to assess possible strength loss and reported perceived soreness and pain levels using a visual analogue scale (VAS). Venous blood samples were collected on days 6-8 of each trial and processed. Inflammatory biomarkers (IL-1 β , IL-6, IL-8, TNF- α) were assessed from plasma samples using an electrochemiluminescence model. A two-way repeated-measures ANOVA were used for statistical analysis of the data. **RESULTS:** The average total volume of exercise completed across the TCJ and placebo conditions did not differ (-33.3kg in TCJ condition, $P>0.05$). There were no differences noted between the TCJ and placebo conditions for perceived pain (VAS; 48.3 ± 6.6) or soreness (VAS; 47.8 ± 7.6), respectively. Inflammatory biomarker data to be determined. **CONCLUSION:** Despite potential differences in inflammatory markers following TCJ ingestion, the use of tart cherry juice supplementation did not impact participant perceptions of soreness and pain in this cohort. Further studies of this phenomenon in females are warranted. **SIGNIFICANCE/NOVELTY:** To the author's knowledge, this is the first study to examine the use of TCJ for muscle recovery in females only.

Continuous Monitorization of Physiologic Mediators of Allostasis Indicate Overuse Injury Risk in Marine Officer Candidates

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Allostasis is the dynamic shift of physiologic mediator activity of biological responses to stress such as increased heart rate (HR), energy expenditure (EE) and altered sleep architecture (SA) that increase overuse injury risk. Overuse injuries are common in multi-stressor military training courses. Yet, mediator activity between recruits who later sustain overuse injuries (MSKI) and those who do not (noMSKI) remain unknown. **PURPOSE** Compare mediator activity via wearables between MSKI and noMSKI recruits during Marine Corps Officer Candidates School (OCS). **METHODS** 149 recruits received a wrist-worn device to record distance (mi), steps, EE (kcal; kcal/kg), SA (deep, light, REM, total sleep; h) and HR (bpm). Devices included age (y), height (cm), mass (kg), and sex for metrics and continued wear excluding device charge and data export every 15 ± 3 d. Inclusion criteria required $\geq 80\%$ 24 h wear time (WT) $\geq 50\%$ maximum WT. EE was captured as kilocalories burned during activity. Overuse injury data were sourced from OCS physical therapists. Data post-injury date were omitted. Data were shown as median [Q1, Q3]. Device metrics were compared between MSKI and noMSKI via Mann-Whitney U-test ($\alpha = 0.05$). **RESULTS** 69 recruits (23 women, 24 [22, 27] y, 172 [166, 178.5] cm, 73.7 [67.6, 84.9] kg) were included minus dropouts ($n = 52$), those with unmet WT ($n = 26$), or lost devices ($n = 2$). Daily device metrics were as follows: absolute EE: 1261 [751.2, 1910] kcal, relative EE: 17.04 [10.07, 25.79] kcal/kg, day HR: 86 [74, 100] bpm, sleep HR: 56 [49, 63] bpm, deep sleep: 1.03 [0.53, 1.87] h, light sleep: 2.77 [1.98, 3.63] h, REM sleep: 0.43 [0, 1.28] h, total sleep: 5.02 [3.72, 6.08] h, steps: 20529 [16344, 24354], and distance: 11.09 [8.50, 13.47] mi. 21 recruits (30.4%, 8 women) sustained an overuse injury (strains: 47.6%, 5 women). MSKI had significantly more daily absolute EE (1624 [925, 2479] vs 1224.5 [749.5, 1786] kcal, $p < 0.001$), relative EE (22.32 [13.58, 33.33] vs 16.42 [9.90, 23.89] kcal/kg, $p < 0.001$), higher day HR (90 [78, 104] vs 86 [73, 99] bpm, $p < 0.001$) and sleep HR (59 [48, 62] vs 55 [48, 62] bpm, $p < 0.001$), more deep sleep (1.22 [0.62, 2.04] vs 0.93 [0.48, 1.75] h, $p < 0.001$), light sleep (2.99 [2.03, 3.80] vs 2.75 [2, 3.58] h, $p < 0.001$), less REM sleep (0.28 [0, 1.10] vs 0.52 [0, 1.33] h, $p = 0.001$) and more total sleep (5.22 [3.91, 6.15] vs 4.88 [3.65, 5.93] h, $p = 0.012$) than noMSKI. Daily steps (21102 [16999, 24710] vs 20696 [16610, 24446], $p = 0.265$) and distance (11.35 [8.72, 13.53] vs 11.25 [8.75, 13.59] mi, $p = 0.985$) were similar between groups. **CONCLUSION** Greater cardiometabolic activity and altered sleep architecture from more deep and light sleep and less REM sleep were found in MSKI recruits under similar physical activity to suggest overuse injury risk signs. **SIGNIFICANCE/NOVELTY** Wearable devices are crucial for military practitioners to detect shifts in mediator activity for overuse injury prevention.

Effects of β_1 -Blockade on Rate Pressure Product and Perceived Exertion During Exercise

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Over 15 million people in the U.S. are prescribed cardio-selective beta blockers. However, whether β_1 -blockade impacts myocardial oxygen demand in combination with the perception of effort during large muscle dynamic exercise has not been explored. **PURPOSE:** To assess the effects of a cardio-selective beta blocker, esmolol (E), infusion during moderate (MOD) and heavy (HVY) intensity cycling exercise on rate pressure product (RPP) and rating of perceived exertion (RPE) in young, healthy women. We hypothesized that RPP would be lower and RPE would be higher during E compared to saline (S) treatment conditions during dynamic exercise in young women. **METHODS:** Thirteen healthy, normally active younger (20-32 yrs) women performed very light (20W warm-up), MOD (85% of estimated lactate threshold, LT) and HVY (50% between LT and the respiratory compensation point) recumbent leg cycling exercise during IV infusion of S and E in randomized order (45 min apart) on a single study visit. Heart rate (HR), brachial blood pressure (BP, automated cuff), RPE (Borg Scale), and VO_2 (indirect calorimetry) were measured during the fourth minute of each intensity. RPP (HR x systolic BP) was calculated. Repeated measures ANOVAs were used to determine differences in RPP, RPE, and VO_2 across intensities and treatments. **RESULTS:** A significant interaction effect for intensity*treatment on RPP was found. Pairwise comparisons revealed that RPP was significantly lower in MODE compared to MOD_S (12703 ± 1809 vs 15954 ± 3432 , $p < 0.001$) and HVYE compared to HVYS (16433 ± 1864 vs 22155 ± 4041 , $p < 0.001$). RPP was not different at rest (6782 ± 1030 vs 7297 ± 1273 , $p = 0.066$). A significant effect of both intensity and treatment was found on RPE, pairwise comparisons showed RPE in HVYE was greater than HVYS (14.7 ± 1.4 vs 14.0 ± 1.3 , $p = 0.011$). There was no effect of treatment on VO_2 . **CONCLUSION:** These findings confirm the myocardial demand lowering effects of β_1 -blockade in healthy humans and demonstrate perceived effort increases during high intensity exercise. **SIGNIFICANCE/NOVELTY:** The beneficial effects of β_1 -blockade drugs may be complicated by the increased perception of effort during exercise, likely due to reduced oxygen delivery to active muscle.

Supported by NIH Grant R21 AG054940

The Impact of Sport Performance Variables on Game Statistics in NCAA Division II Baseball Players

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At the highest levels in baseball, Professional and NCAA Division I universities alike, sport performance variables such as bat velocity (BV) and batted ball velocity (BBV) along with game statistics (GS) such as batting average (BA) and slugging percentage (SP) are well documented. At the Division II or III level, the same information can be limited based on the lack of access to similar resources and technology. **PURPOSE:** The purpose of this study was to evaluate the relationship between sport performance variables and game statistics in Division II baseball players. **METHODS:** Eight Division II baseball athletes (age: 20.25 ± 1.56 years, height: 71.38 ± 2.45 inches, mass: 183.28 ± 22.19 pounds) participated in the study. Participants were tested on BV and BBV before the season began, with offensive statistics being collected throughout the season. Correlations were then run between BA and BV, BA and BBV, SP and BV, SP and BBV, Age and BV, and Age and BBV. Spearman and Pearson Correlations were used for data analysis. **RESULTS:** BA and BBV had a significant negative correlation ($r = -0.81$, $p = 0.01$). SP and BBV were found to have a negative trend ($r = -0.67$, $p = 0.07$). SP and BV were found to have a strong negative correlation ($p = 0.12$, $r = -0.60$). BA and BV were found to be moderately negatively correlated, ($r = -0.52$, $p = 0.18$). There was a strong positive correlation between Age and BBV, ($r = 0.61$, $p = 0.11$). Age and BV were found to be moderately correlated ($r = 0.42$, $p = .30$). **CONCLUSION:** There was a statistical significance between BA and BBV. Other variables such as age and SP should also be closely examined when studying the relationship between BBV and performance measures. Thus, when evaluating baseball athletes, sport performance variables should be considered. **SIGNIFICANCE/NOVELTY:** This study found that measures such as BV or BBV can provide some value to predicting offensive baseball success in future seasons.

Kettlebell Training Increases Muscle Mass and Improves Muscle Function in Older Adults

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The age-related loss of muscle mass can begin as early as 40 years of age, with muscle mass declining at a rate of roughly 1% annually. When the progressive loss of muscle mass is accompanied by decline in muscle function, it can ultimately lead to increased morbidity and mortality. Resistance training has been introduced as a method to increase muscle mass and improve muscle function in older adults, but only a limited number of research studies has evaluated whether training with kettlebells can induce positive changes in this population. **PURPOSE:** Determine whether kettlebell training (KT) increases fat free mass (FFM), muscle strength (grip strength and knee extension torque), and muscle function [short physical performance battery test (SPPB)] in older adults. **METHODS:** Individuals meeting the inclusion criteria (≥ 60 years old and body mass index $< 42 \text{ kg/m}^2$) were enrolled in the study and participated in KT (2x/week) consisting of 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 measurements were conducted prior to initiating the training program and were repeated after 2 and 4 months of training. Participants were evaluated in the following assessments: body composition (dual-energy X-ray absorptiometry), SPPB test (including balance tests, gait speed test, and repeated chair stand test), grip strength, and knee extension torque. A repeated measures one-way Analysis of Variance was used to determine statistical differences across time. **RESULTS:** Sixteen subjects (3 men/13 women) completed the training. KT increased FFM from baseline to 4 months of training (+2.55lbs, $p=0.001$) while not altering body weight or fat mass ($p>0.05$). Time to complete the 6-meter walk test and time to complete 5 repeated chair stands decreased from baseline to 4 months of training ($5.2 \pm 1.0 \text{ sec}$ vs. $4.2 \pm 0.5 \text{ sec}$, $p=0.001$; $10.3 \pm 2.9 \text{ sec}$ vs. $8.6 \pm 2.2 \text{ sec}$, $p=0.011$, respectively). Grip strength and knee extension torque increased from baseline to 4 months ($29.3 \pm 7.6 \text{ kg}$ vs. $32.3 \pm 6.9 \text{ kg}$, $p=0.0003$; $85.9 \pm 26.3 \text{ Nm}$ vs. $97.9 \pm 30.9 \text{ Nm}$, $p=0.039$, respectively). **CONCLUSION:** Our data shows that KT increases in FFM and improves muscle strength and muscle function in older adults. **SIGNIFICANCE/NOVELTY:** The age-related decline in muscle mass and strength leads to an inability to easily and safely complete activities of daily living. Therefore, strategies to maintain/improve muscle function and independence in older adults should receive increased attention. Here we show that long-term KT increases muscle mass and improves muscle function in older adults, thus suggesting that this type of training could be prescribed to counteract some of the age-related changes experienced in older adults.

Supported by Towson University College of Health Professions Summer Undergraduate Research Institute

Critical Environmental Limits for Middle-Aged Adults (PSU HEAT Project)

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Critical environmental limits are the combinations of temperature and humidity above which heat balance cannot be maintained for a given metabolic heat production. Our lab has previously established critical environmental limits for young and older adults; however, these limits have yet to be established for middle-aged adults. **PURPOSE:** The purpose of the present study was to (1) identify critical environmental limits for middle-aged adults, and (2) investigate age-related differences in critical environmental limits at a low metabolic rate reflecting activities of daily living across the adult age spectrum. **METHODS:** Twenty-six older (71±5 yrs, 14F/12M), 30 middle aged (54±8 yrs, 23F/7M), and 27 young adults (23±3 yrs, 13F/14M) were exposed to progressive heat stress in a controlled environmental chamber during minimal activity. Progressive heat stress for the determination of critical environmental limits comprised either (1) constant dry-bulb (T_{db}) temperature at 34°C with progressively increasing water vapor pressure (P_a) by 1 mmHg every 5 minutes (P_{crit} trial), or (2) constant P_a at 12 mmHg with progressively increasing T_{db} by 1°C every 5 minutes (T_{crit} trial). **RESULTS:** Critical environmental limits in hot-dry environments were higher in young compared to middle aged (49.3±2.3 °C vs. 45.1±4.0 °C; $p < 0.001$) and older adults (49.3±2.3°C vs. 43.2±4.1°C; $p < 0.001$), but were not different between middle aged and older adults (45.1±4.0 °C vs. 43.2±4.1°C; $p = 0.21$). Critical environmental limits in warm-humid conditions were lower in older adults compared to young (23.1±5.8 mmHg vs 31.7±1.6 mmHg, $p < 0.001$) and middle aged (23.1±5.8 mmHg vs 27.9±5.5 mmHg, $p = 0.034$), but were not different between the young and middle aged (31.7±1.6 mmHg vs 27.9±5.5 mmHg, $p = 0.08$). Age was correlated with critical environmental limits in T_{crit} ($R^2 = 0.34$; $p < 0.001$) and P_{crit} ($R^2 = 0.50$; $p < 0.001$) trials based on linear and curvilinear regression, respectively. **CONCLUSION:** Critical environmental limits for middle aged adults performing minimal activity in warm-humid and hot-dry environments are intermediate to young and older adults. These data demonstrate an age-related decline in critical environmental limits that can be characterized by linear decline in hot-dry environments and by curvilinear decline in warm-humid environments. **SIGNIFICANCE/NOVELTY:** These results are the first to identify critical environmental limits for the maintenance of heat balance in middle-aged adults. These findings provide important empirical data that may be used in the development of safety guidelines and alert-based communication to mitigate heat-related morbidity and mortality during impending heat waves.

Supported by NIH Grant R01 AG067471

The Effects of Three Weeks of Mixed Interval Training on Fitness Markers: A Pilot Study

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PURPOSE: There are scientific and practical reasons for elucidating the minimal effective dose of exercise. High-intensity interval training (HIIT) has been shown to elicit significant improvements in fitness markers in as little as a few weeks. The purpose of this pilot study was to ascertain the magnitude of change in fitness markers from three weeks of six HIIT sessions. **METHODS:** Six collegiate men (3) and women (3) completed an incremental bicycle GXT before and after training. Testing consisted of three initial 5-min stages at 40, 85, and 120 W where blood lactate was measured, followed by a 10 W increase every 30-sec until volitional exhaustion. Heart rate, VO₂, and RPE were measured throughout the test. Six bicycle HIIT sessions were performed over three weeks. Each 20-min HIIT session consisted of six randomly assigned sessions of 4X 30-sec, 8X 20-sec/10-sec, and 4X 2-min intervals, each completed twice. Data were analyzed for pre and post changes using a non-parametric Wilcoxon sign rank test. Data are presented as median (25%, 75% IQR). **RESULTS:** Subjects were 21 (20.0, 22.8) yo, 171.3 (161.4, 187.4) cm, and 72.6 (60.3, 97.2) kg. Pre and post training data reported include Max Power, VO₂ peak, 85 W – BLC, RPE, HR, respectively. Pre training showed 202.5 (168.8, 250) W, 34.0 (31.3, 41.3) ml.kg.min⁻¹, 4.8 (3.9, 6.0) mM, 3.5 (3.0, 4.5) RPE, and 146.0 (136.0, 166.3) bpm. Post training changes were 227.0 (198.8, 283.8) W, 39.0 (32.4, 42.3) ml.kg.min⁻¹ (p= 0.5752), 4.0 (3.4, 4.5) mM (p= 0.1720), 2.5 (2.0, 3.0) RPE (p= 0.0248), 137.5 (122.5, 149.8) bpm (p= 0.2002). Five of six subjects increased their VO₂ peak and other markers. Relative change, pre and post, represented median improvements of 13.8% for max power and 7.6% improvement in VO₂ peak. **CONCLUSION:** This pilot study indicates that even just six sessions of mixed HIIT can result in modest improvements in fitness markers and a significant reduction in perceived effort at or near OLBA. **SIGNIFICANCE/NOVELTY:** This pilot work lends further support for continued research in the minimum effective dose of exercise. The model used in this research used mixed intervals of varying work and rest periods and was well tolerated among healthy adults. Further work is needed to develop minimal training regimens that show high exercise compliance.

Assessment of Metabolic Flexibility to a Glucose Tolerance Test in Young Adults

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PURPOSE: To compare postprandial metabolic response to an oral glucose tolerance test in young adults of varying body mass index (BMI) classifications. **METHODS:** Young adults (ages 18-40; n = 20, 10 females) completed a cardiopulmonary exercise test on a cycle ergometer to determine maximal aerobic capacity (VO_{2MAX}). Indirect calorimetry was conducted prior-to (fasting) and following (30, 60, 90, 120 min) consumption of a 100g glucose beverage. Metabolic flexibility was defined as the change in respiratory exchange ratio (RER) from baseline to 60 minutes. Serum and plasma were collected at corresponding timepoints and analyzed for blood glucose, insulin, and non-esterified fatty acids. Student's t-test was used to determine significance among indices of metabolic flexibility and anthropometric measures between those with a healthy BMI (<24.9 ; n = 11) vs. those with overweight or obesity (BMI ≥ 25.0 ; n=9). An $\alpha = 0.05$ was determined a priori. Hedge's g was used as a measure of effect size. **RESULTS:** Compared to those with a healthy BMI, those with overweight or obesity had a higher BMI (23.0 ± 1.6 vs. 30.7 ± 4.1 ; $p < 0.001$, $g = 2.3$), lower relative VO_{2MAX} (41.3 ± 7.7 vs. 28.7 ± 7.4 mL/kg/min; $p = 0.002$, $g = 1.6$), higher visceral adipose tissue mass (0.42 ± 0.52 vs. 1.58 ± 0.98 lbs.; $p = 0.008$, $g = 1.4$), higher overall fat mass (36.1 ± 9.6 vs. 67.8 ± 17.4 lbs.; $p < 0.001$; $g = 2.1$), and similar overall lean mass (105.1 ± 17.0 vs. 123.5 ± 21.9 lbs.; $p = 0.055$, $g = 0.9$). The following RER values were recorded across all participants: 0.79 ± 0.06 at fasting, 0.80 ± 0.07 at 30 min, 0.83 ± 0.06 at 60 min, 0.84 ± 0.06 at 90 min, and 0.85 ± 0.06 at 120 min. Metabolic flexibility was higher in those with a healthy BMI than those with overweight or obesity (0.058 ± 0.05 vs. 0.036 ± 0.04), though these differences were not significant in this sample ($p = 0.31$, $g = 0.44$). **CONCLUSION:** Despite differences in cardiorespiratory fitness and anthropometric variables, we show metabolic flexibility is reduced but not significantly impaired in young adults with overweight or obesity when compared to young adults with a healthy BMI. **SIGNIFICANCE/NOVELTY:** Overweight and obesity in young adulthood significantly increases the lifetime risk for chronic disease. In studies focused on older adults, blunted metabolic flexibility has been linked to insulin resistance, metabolic syndrome, and fat mass deposition. Impaired changes in postprandial glucose metabolism in young adults with overweight and obesity warrants further study to determine whether these relationships hold in this population.

Sex-differences and Changes in Psychophysiological Stress and Resilience During Military Training

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Individuals undergoing initial military training are exposed to multi-stressor environments to simulate wartime situations and ensure tactical readiness, which may impact physiological and psychological measures of stress, but the positive adaptation to stress (i.e., resilience) has not been extensively studied. **PURPOSE:** Compare baseline measures of physiological and psychological indicators of stress and resilience between those that dropout vs. complete Marine Corps Officer Candidates School (OCS) and examine changes in men and women who complete OCS. **METHODS:** A total of 163 candidates (age: 24.6 ± 3.5 years; BMI: 25.1 ± 2.3 kg/m²; 38% women) completed a post-awakening saliva collection, the Perceived Stress Scale (PSS), and the Connor-Davidson Resilience (CD-RISC) scale at the start and end of OCS. Successful completion of training was ascertained from staff records. Salivary cortisol (SC), testosterone (ST), and α -amylase (SA) concentrations were analyzed using enzyme-linked immunoassays. Baseline SC, ST, SA, PSS total score, and CD-RISC total score were compared between completers (C) vs. non-completers (NC) using independent samples *t* tests. Two-way mixed measures ANOVAs (time*sex) were performed for each dependent variable; $\alpha=0.05$. **RESULTS:** Baseline SC, ST, and SA concentrations and CD-RISC were not different between C and NC ($p=0.064-0.443$). Baseline PSS was higher in those that dropped out from training (NC: 15.4 ± 6.4 ; C: 11.4 ± 5.8 , $p < 0.001$). There were no significant interaction or main effects for SC or SA. There was no significant time*sex interaction for ST; however, a main effect of sex indicated that concentrations were greater in men than women (men: 137.5 ± 5.5 pg/mL, women: 61.3 ± 7.8 pg/mL, $p < .001$, $h^2=0.484$). A significant interaction effect on CD-RISC ($p=0.040$, $h^2=0.056$) was present. In men, CD-RISC total score did not change from pre- to post-testing (82.4 ± 10 to 82.5 ± 9.6 , $p=0.904$), while, in women, CD-RISC decreased (84.3 ± 6.8 to 80.9 ± 10.2 , $p=0.014$). There was no significant interaction or main effect of sex on PSS total score, but main effects of time indicated that PSS increased from pre- to post-testing (11 ± 0.9 to 16.5 ± 0.8 , $p < 0.001$, $h^2=0.438$). **CONCLUSION:** Candidate's subjective feelings of stress, but not physiological indicators, increased following 10 weeks of initial military training. Sex-specific changes in resilience were present wherein men reported no change, while women's resilience was more responsive to training and decreased significantly. **SIGNIFANCE/NOVELTY:** Military training likely impacts subjective characteristics of stress while physiological measures of stress are more robust to changes. Resilience may be adaptable and future military training may be supplemented by adding mental resilience trainings to increase individual's ability to cope with stressors.

Supported by ONR Grant N00014-21-1-2725.

Obstacles to Physical Activity and Healthy Eating Among Older Veterans with Dysmobility: A Self-Report Survey

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Low levels of physical activity and mobility impairments are common in older Veterans and often accompanied by reduced diet quality. These limitations are a leading cause of repetitive falls, increased rates of hospitalization, and higher healthcare costs. **PURPOSE:** To utilize self-reported surveys to determine barriers to healthy diet and exercise in older Veterans. This survey is the foundation for the development of a larger pilot study that will investigate a peer-led nutrition and exercise program focusing on older Veterans with mobility limitations who are often excluded from lifestyle intervention studies. **METHODS:** 87 older Veterans (74 males; 73.9 ± 5.9 years; BMI 28.0 ± 5.8 kg/m²) from two diverse VA facilities (Baltimore, MD and San Antonio, TX) completed a comprehensive online survey. The multi-component questionnaire included a medical history, the VA Binge Eating Screener, the Center for Epidemiologic Studies Depression (CESD) Scale, the insomnia severity index-7 (ISI-7), and questions related to obstacles to exercise participation and healthy eating. Means and standard deviations were calculated for the CESD and the ISI-7. The percentage of responses for each answer was calculated for the remaining ordinal scales. **RESULTS:** Presence of at least one co-morbidity was reported by 100% of respondents, with 95% reporting use of at least two medications. 69% reported they were at least mildly overweight with 54% reporting an episode of binge eating at least once per month. 43% reported mild insomnia or greater and 21% expressed symptoms of depression on the CESD. Related to exercise barriers, 25% reported lack of proper equipment, 31% stated insufficient skill or coordination, 12% described issues finding a place to exercise, 24% reported lack of others to exercise with, and 9% stated lack of time. For questions related to dietary patterns, 6% admitted problems estimating portion sizes, 24% described issues estimating fat content and calories and 15% stated they were unknowledgeable about healthy food preparation. **CONCLUSIONS:** In this questionnaire, insomnia, episodes of binge eating, and presence of co-morbid conditions were frequently reported. A large proportion of Veterans stated a lack of knowledge related to healthy food choice and preparation as an obstacle to healthy dietary patterns and lack of equipment and exercise knowledge as an obstacle to exercising. Many of the identified barriers may be reduced through dietary and exercise education interventions and represent areas to address to improve the health of older Veterans. **SIGNIFICANCE/NOVELTY:** Many of the reported barriers may be ameliorated via dietary and exercise education interventions and therefore represent effective targets to improve the health of older Veterans.

Supported by a VA SPiRE (I21RX003739)

Systemic Low-Grade Inflammation and Associations with Sleep Disturbance in Marine Corps Officer Candidates During Training

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High circulating concentrations of C-Reactive Protein (CRP), an acute phase protein and indicator of systemic low-grade inflammation, have been associated with overtraining syndrome (OTS). During periods of intensified training, this association may be driven by a lack of recovery through disturbed sleep but has not been investigated during Marine Corps Officer Candidates School (OCS). **PURPOSE** To examine changes and potential sex differences in CRP concentrations during 10 weeks of military training, and associations with sleep disturbance (SD). **METHODS** 68 OCS candidates (males $n = 47$; $25 \pm 4y$, $23.2 \pm 2.1\text{kg/m}^2$, females $n = 21$; $25 \pm 3y$, $20.4 \pm 1.8\text{kg/m}^2$) enrolled and provided blood samples at pre- and post-OCS that were analyzed via commercial ELISA. CRP concentrations $>3\text{mg/L}$, a clinical cut-off for high inflammation, were classified as high CRP. The Athlete Sleep Screening Questionnaire assessed SD (range 0–17) (e.g. sleep duration and quality) during training, in 44 out of the 68 candidates ($n = 24$ missing data). CRP data was reported as median [Q1, Q3] and was log transformed for a two-way (time*sex) mixed-measures ANOVA. SD data is reported as mean \pm std dev and analyzed using an independent sample t test. Nominal data were analyzed using a Fisher's Exact Test or McNemar test, and a Spearman's correlation coefficient (ρ) was conducted to assess associations. Statistical significance was $\alpha=.05$. **RESULTS** Median CRP levels were 0.46 [1.56, 1.42] and 2.27 [0.76, 5.48] mg/L at pre- and post-OCS, demonstrating a 2.1 [0.9, 3.4]-fold increase. No interaction effect was observed, but main effects of time and sex, where CRP increased from pre- to post-OCS ($p < 0.001$, partial $\eta^2 = 0.470$), and was higher in female vs. male candidates ($p = 0.025$, partial $\eta^2 = 0.073$). The proportion of candidates with high CRP increased from pre- to post-OCS (12% vs. 40%, $p < 0.001$). At post, CRP was associated with SD ($\rho = 0.358$, $p = 0.017$). High CRP reported greater SD (8.3 ± 1.9 vs. 6.9 ± 1.4 , $p = 0.008$) and compared to their counterparts, a greater proportion were categorized as having moderate-to-severe SD (≥ 8) (63% vs. 36%), sleeping only 5-6h per night (95% vs. 76%) and dissatisfied with their quality of sleep (79% vs. 52%), though these differences weren't statistically significant. **CONCLUSION** Systemic inflammation can increase during military training, even to clinically high levels. Disturbances in sleep, a well-known attribute of military training, may be associated with this notable rise. However, the bidirectional nature between inflammation and sleep was not investigated. **SIGNIFICANCE/NOVELTY** Candidates may experience a clinically high level of systemic inflammation during OCS, which if not addressed could lead to increased risk of OTS, warranting preventative measures from practitioners and future studies to see if sleep management reduces systemic inflammation during periods of intensified training.

ONR N00014-21-1-2725

Relation of 24-hour Movement Patterns with Type 2 Diabetes Risk in Adults with Obesity

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Low moderate to vigorous physical activity (MVPA), increased sedentary behavior (SB), and poor sleep are each linked to insulin resistance and type 2 diabetes (T2D) risk. However, it is unclear what effect the aggregate of these movement patterns has on health. **PURPOSE:** To assess a healthy 24-hour movement pattern of MVPA, SB, and sleep in association with T2D risk in individuals with obesity. **METHODS:** In a cross-sectional study, individuals with obesity ($n=58$, 43F; 56.03 ± 8.37 y; 34.92 ± 5.35 kg/m²) who had a healthy 24-hour movement Z-score (i.e., low values; $n=29$, 23F) were compared to those with unhealthy Z-scores (i.e., higher values; $n=29$, 20F). MVPA and SB were recorded over a 7-d period via waist-worn triaxial actigraphy. Sleep was assessed via the Pittsburgh Sleep Quality Index (PSQI). The Canadian Society for Exercise Physiology 24-hour movement guidelines were used to define a Z-score of MVPA as ≥ 30 min/d ($\geq 2.94\%$ of awake time), SB as ≤ 8 hours/d ($\leq 47\%$ of awake time), and sleep time as ≥ 7 hours. A 120min hyperinsulinemic-euglycemic clamp (40mU/m²/min, 90 mg/dl) with indirect calorimetry was used to determine metabolic insulin sensitivity (glucose infusion rate (GIR)), fat (FOX) and carbohydrate (CHOox) oxidation, as well as non-oxidative glucose disposal (NOGD; GIR-CHOox). Fitness (VO₂max) and body fat (DXA) were also assessed. **RESULTS:** There were no differences in age ($P=0.69$), percent body fat ($P=0.20$), or VO₂max ($P=0.39$) between groups. Compared to healthy 24-hour patterns, however, unhealthy 24-hour patterns had higher FOX at 0min and 120min of the clamp (both $P<0.01$) as well as NOGD ($P=0.02$), despite similar GIR ($P=0.53$). Z-scores associated with high FOX at 0min ($r=0.64$, $P<0.01$) and 120min ($r=0.63$, $P<0.01$) and NOGD ($r=0.43$, $P<0.01$). **CONCLUSION:** In individuals with obesity, an unhealthy 24-hour movement pattern had no effect on insulin sensitivity, but related to high FOX and non-oxidative glucose disposal, independent of body fat and fitness. More work is needed to understand how habitual movement patterns modulate chronic disease risk. **SIGNIFICANCE/NOVELTY:** While physical activity, sedentary behavior, and sleep are each indicated for their importance in type 2 diabetes risk, understanding the impact of a 24-hour movement pattern is less clear. These findings highlight the relation of 24-hour movement patterns to fat oxidation and glucose storage independent of insulin sensitivity, body fat, and aerobic fitness.

Supported by National Institutes of Health RO1-HL130296 (SKM)

The Acute Effects of Vinyasa Yoga on Mood and Anxiety in Adults with Insomnia Symptoms

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Sleep is a vital aspect of health, however, poor and/or insufficient sleep may lead to negative health consequences. Yoga has shown to positively impact health, including mental health. Vinyasa yoga (VY), a form of yoga that connects breath with movement through various poses and sequences. However, it is unclear how VY may impact mental health in adults with insomnia symptoms. **PURPOSE:** To examine the acute effects of a single session of VY on mood and anxiety symptoms in adults with mild-to-severe insomnia symptoms. **METHODS:** 33 adults with self-reported insomnia symptoms (Insomnia Severity Index =15. \pm 3.9; 84.8% females; White =78.8%; body mass index =28.9 \pm 7.2 kg/m²; age=34.9 \pm 10.6y) were randomized in either a 60-minute VY (n=17) or control ([CON] n=16) condition. The VY completed a supervised 60-min pre-recorded yoga sequence that utilized the *Journey into Power sequence* by Baron Baptiste. CON completed a seated 60-min quiet rest period that included watching a nature documentary. Mental health was assessed using validated questionnaires (i.e., Profile Mood of States Short Form [POMS], State Trait Anxiety Inventory [STAI]) that were administered pre- and post-experimental sessions. The POMS total mood disturbance (TMD) was calculated by summing the total sub-scales scores for tension, anger, fatigue, depression, and confusion and subtracting the sub-scales scores for vigor and esteem-related affect; constant of 100 was added to the TMD with higher scores indicating greater mood disturbances. The STAI scores were summed for a total that ranged from 20-80; higher scores indicating greater symptoms of anxiety. Linear mixed models with unstructured covariances were used to determine the change from pre- to post-experimental session between groups. **RESULTS:** Baseline POMS TMD (106.18 \pm 4.86 and 106.25 \pm 5.01) and STAI (43.29 \pm 1.34 and 40.19 \pm 1.39) for VY and CON, respectively. Post experimental session POMS TMD (101.82 \pm 4.79 and 96.06 \pm 4.93) and STAI (43.77 \pm 1.52 and 40.56 \pm 1.56) for VY and CON, respectively. There were no significant changes in POMS TMD or STAI scores from pre- to post-experimental session between VY and CON (TMD: $F(1,31)=1.97$, $p=0.17$; STAI: $F(1,31)=0.003$, $p=0.96$). Sub-scales showed significant main effects for time (each $p<0.02$); indicating lower scores post-experimental session for tension, fatigue, anger, depression, and confusion. **CONCLUSION:** A single session of VY did not significantly improve mood or anxiety symptoms for the VY compared to the CON. Additionally, mood and anxiety symptoms were not amplified following a single bout of VY. **SIGNIFICANCE/NOVELTY:** To our knowledge, this is the first study to examine a single session of VY on mental health effects in a sample of adults who self-report insomnia symptoms. Insomnia is the most prevalent sleep disorder, therefore investigating therapies to improve the negative mental health consequences, are urgently needed.

Changes in Bone Turnover Biomarkers in Men and Women During Marine Corps Officer Candidates School

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Military training environments can expose individuals to novel, unaccustomed mechanical loading patterns that can influence bone density, structure, and strength, but structural changes may not be evident for several weeks or months. Alternatively, assessing changes in biomarkers of bone turnover may provide timely insight regarding the influence of military training on bone adaptation in the shorter term. **PURPOSE:** To examine changes in bone-related biomarkers in men and women undergoing Marine Corps Officer Candidates School (OCS). **METHODS:** Blood samples were collected at the start and end of the 10-week training program to assess markers of bone turnover in 313 men (24.7 ± 0.2 yrs, 80.9 ± 0.5 kg) and 72 women (24.3 ± 0.4 yrs, 65.5 ± 0.8 kg). Commercially available enzyme-linked immunoassays (ELISAs) were used to determine concentrations of human procollagen type 1 N-terminal propeptide (P1NP), tartrate-resistant acid phosphatase 5b (TRAP5b), osteocalcin (OC), and sclerostin (SOST). Generalized linear fixed effects models tested the effect of sex (male, female), time (pre, post), and their interaction (sex*time) on each analyte. When significant interaction effects were found, simple main effects with Bonferroni adjustments were used to identify the location of differences; $\alpha=0.05$. **RESULTS:** No significant sex*time interactions were observed for either P1NP ($p=0.190$) or OC ($p=0.983$). Both P1NP (men: 43056.46 ± 1051.54 to 48735.83 ± 1247.97 pg/ mL, women: 33806.12 ± 1551.84 to 42354.64 ± 1598.79 pg/ mL) and OC (men: 24082.75 ± 791.01 to 26315.50 ± 813.52 pg/ mL, women: 18877.65 ± 2483.40 to 21138.77 ± 1637.17 pg/ mL) concentrations increased during training (Main effect time: $p < 0.001$, $p = 0.001$) and were greater in men than women (Main effect sex: $p < 0.001$, $p = 0.016$). A significant sex*time interaction was observed for TRAP5b ($p = 0.008$) and SOST ($p < 0.001$). In men, decreases in concentrations of TRAP5b (3.29 ± 0.04 to 3.22 ± 0.04 U/L, $p = 0.019$) and SOST (27.49 ± 0.53 to 24.19 ± 0.42 pmol/ L, $p < 0.001$) were observed, but not in women (TRAP5b: 2.92 ± 0.09 to 3.03 ± 0.09 U/L, $p = 0.069$; SOST: 22.24 ± 0.90 to 21.61 ± 0.72 pmol/L; $p = 0.310$). **CONCLUSION:** Following training, bone turnover markers commonly associated with bone formation increased similarly in men and women; however, sex differences were evident for biomarkers of bone resorption and osteocyte activity to potentially favor positive bone balance. Arduous military training may promote adaptive bone formation, which may also be dependent on sex. **SIGNIFICANCE/NOVELTY:** Military training environments may provide an osteogenic stimulus to those who complete training. Differences in biomarker changes between men and women may relate to sex-differences in bone density, structure, strength, and future fracture risk.

ONR N00014-21-1-2725

Muscle Strengthening Activity and Perceived General Health in West Virginia Adults

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Muscle strengthening activity (MSA) is encouraged for all adults due to its positive associations with health outcomes, including bone strength, muscular fitness, and perceived health. MSA is also associated with improved functional health and is recommended as part of a multicomponent physical activity program. West Virginia (WV) is currently the lowest-ranking U.S. state regarding the percentage of adults meeting MSA guidelines. Moreover, the extent to which health status influences MSA in this population is not understood. **PURPOSE:** To examine the associations between perceived general health and MSA in WV adults. **METHODS:** Data for this study came from the CDC's Behavioral Risk Factor Surveillance System (BRFSS). A total of 5,301 adult participants 18+ years of age residing in WV were extracted from the national dataset. The primary outcome variable was meeting MSA guidelines status, where respondents reporting 2+ days per week of MSA were considered to have met guidelines. The primary predictor variable was perceived general health, where participants rated their general health as "excellent," "very good," "good," "fair," or "poor." General health was also dichotomized, with those responding as good or better categorized as good and all others as poor. Control variables included smoking, alcohol consumption, obese status, age, sex, race/ethnicity, and income. Analyses included prevalence estimates (%) of meeting MSA guidelines and multiple logistic regression modeling. **RESULTS:** Overall, 26.1% (95% CI: 24.5% – 27.7%) of WV adults met MSA guidelines. Across subgroups, male, younger, other races, and more income populations met MSA guidelines at a higher prevalence than their counterparts. The prevalence of meeting MSA guidelines was also higher among those with good as compared to those with poor general health (28.9% versus 18.2%, $p < .001$) and followed a linear trend from poor to excellent health ($p_{\text{trend}} < .001$). Additionally, adults with good general health saw an 83% increase in odds (OR = 1.83, 95% CI: 1.49 – 2.23) of having met MSA guidelines compared to those with poor health. After controlling for all covariates, these odds were reduced to an increase of 36% (OR = 1.36, 95% CI: 1.07 – 1.72). Finally, the general health and meeting MSA guidelines relationship was stronger (general health \times sex $p = .004$) in males (OR = 1.43, 95% CI: 1.23 – 1.64, $p_{\text{trend}} < .001$) than in females (OR = 1.21, 95% CI: 1.07 – 1.38, $p_{\text{trend}} = .004$) moving from poor to excellent health. **CONCLUSION:** These findings indicate that perceived general health is predictive of and may influence MSA behavior in WV adults. **SIGNIFICANCE/NOVELTY:** Efforts to explain and address the low MSA in WV should be prioritized. This study is the first to examine the population-level link between perceived health status and MSA in WV adults.

Perceptual and Affective Responses Relative to Maximal Fat Oxidation During Treadmill Walking Exercise.

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Identifying appropriate exercise intensities is critical for personal trainers and rehabilitation specialists working with certain populations. For individuals desiring weight loss, an intensity that elicits the point of maximal fat oxidation (FATox) may be appropriate. This intensity reflects the point of greatest fat utilization for energy cost and marks the beginning of a shift to carbohydrate utilization, but little is known about subjective responses approximate to this intensity. **PURPOSE:** To determine perceptual and affective responses across walking exercise intensities used to elicit FATox. **METHODS:** Eight apparently healthy college-aged female participants (Age: 21.14±1.07 yrs; BMI: 21.62±5.73 kg.m²; Height: 162.08±7.91 cm; Weight: 59.54±8.34 kg) performed the following treadmill walking exercise protocol: a 3-min warm-up at 58.96 m.min⁻¹ followed by six 3-min stages at 88.44 m.min⁻¹ with 3% gradient increases (0- 15%) each stage. FATox was measured via indirect calorimetry and calculated using expired VO₂ and VCO₂ values. Subjective measures of ratings of perceived exertion (RPE) and affect (Feeling Scale; FS) were assessed during the last 15 secs of each stage. A repeated measures ANOVA (Stage 1 [S1], point of FATox, End) with Bonferroni pairwise comparisons ($p < 0.05$) was calculated on all dependent variables. **RESULTS:** FATox was calculated at .53±.11 g.min⁻¹ and evidenced a significant time effect ($p < .001$). Significant time point comparisons were observed between FATox and End (M±SD = .25±.18; $p < .001$) and S1 (M±SD = .49±.08) and End ($p = .004$). RPE and FS both showed significant time effects (both $ps < .001$). Significant time point comparisons were noted for RPE from S1 (M±SD = 9.38±1.77) to End (14.63±1.77; $p < .001$) and FATox (M±SD = 11.75±2.31) to End ($p = .025$). Although no pairwise comparisons reached significance for FS ($p > .05$), Cohen's d calculations evidenced strong effect sizes from S1 (M±SD = 2.75±1.39) to FATox (M±SD = 1.50±1.51; $d = .86$) and FATox to End (M±SD = 0.00±1.60; $d = .96$). **CONCLUSIONS:** Walking intensity past the point of FATox resulted in greater carbohydrate utilization which, in turn, appears to result in greater effort sense (11 = Fairly Light; 13 = Somewhat Hard; 15 = Hard). This range of exercise intensity appears to also reduce feelings of pleasure significantly (3 = Good; 1 = Fairly Good; 0 = Neutral). **SIGNIFICANCE/NOVELTY:** Fitness professionals may want to tailor walking exercise intensities that elicit perceptual responses between an RPE of 11 to 13 as these may correspond to positive feelings of pleasure and FATox.

Effects of a High-fat Meal on Circulating Microparticle Quantity and Function

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A high-fat meal (HFM) is a well-known stimulus for studying changes in vascular inflammation and function. However, its effects on molecular changes within the vasculature warrant further study. Annexin-V+ microparticles and their subpopulations are extracellular vesicles released by endothelial and other cells in response to stimuli including inflammation, apoptosis, cellular damage, and exercise. Microparticles are thought to be mechanisms of cell-to-cell communication and spread phenotypic changes dependent on their stimulus of release. While previous studies found changes in circulating microparticle counts following a HFM, none have assessed the function of these microparticles. **PURPOSE:** Determine the effects of a HFM on circulating microparticle counts and their ability to stimulate endothelial cell oxidative stress *in vitro*. **METHODS:** Fourteen healthy adults (18-35 yrs.) of high ($VO_{2peak} 53.03 \pm 2.67$ mL/kg/min) or lower ($VO_{2peak} 36.29 \pm 1.66$ mL/kg/min) fitness status consumed a HFM (85.5% fat, 11.3% carbohydrates, and 3.4% protein) normalized to body surface area ($386g/2m^2$). Participants underwent a blood draw at baseline, as well as post-prandially at 2 hours and 4 hours. Microparticles were isolated from plasma via sequential centrifugation, then labeled with fluorescent conjugated antibodies for quantification via flow cytometry. Human umbilical vein endothelial cells (HUVECs) were incubated with 5000 microparticles from each sample for one hour, then stained with CellROX Green to quantify reactive oxygen species (ROS) production. Paired samples were analyzed using the Wilcoxon signed-rank test. **RESULTS:** Compared to baseline and 4h, all microparticle populations were numerically higher at the 2h timepoint but did not reach significance (191 ± 35 vs. 342 ± 85 vs. 185 ± 53 MP/ μ L). HUVEC ROS production was numerically increased between baseline and the 2h and 4h timepoints, but also did not reach significance (0.81 ± 0.09 vs. 0.91 ± 0.13 vs. 1.10 ± 0.23 RFU). The ROS-producing capacity of total microparticles tended to increase from baseline to 2h in all subjects (0.031 ± 0.007 vs. 0.047 ± 0.009 RFU*MP, $P = 0.057$) but decreased from 2h to 4h in high-fit individuals (0.061 ± 0.013 to 0.028 ± 0.006 RFU*MP, $P = 0.016$) while remaining elevated in lower-fit individuals (0.031 ± 0.012 to 0.033 ± 0.027 RFU*MP, $P = 0.9$). **CONCLUSION:** Following a HFM, the ROS-producing capacity of total microparticles may increase 2 hours post-prandially. This returns to baseline in high-fit individuals but stays elevated at 4h in lower-fit individuals. **SIGNIFICANCE/NOVELTY:** To our knowledge, this is the first study to examine microparticle function in response to a HFM, suggesting that high-fit individuals recover from acute HFM-induced inflammation faster than their lower-fit counterparts.

The Effect of Physical Activity and ACE Scores on Psychological vs. Physiological Addiction

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Addiction is a growing problem within the United States. Rehabilitation facilities have exercise as a component of their program, yet these facilities are not always within reach of every addict. Specifically looking at psychological and physiological addiction types allows for a narrower approach to finding the root of addictive tendencies. Understanding that addiction is a chronic disease that is treatable with integrated treatment methods, it is imperative to find the root of an addict's addictive tendencies. **PURPOSE:** To determine if there is a triangular relationship between addiction, physical activity, and adverse childhood experience (ACE) scores, looking specifically at psychological and physiological addiction types. **METHODS:** In preliminary data collection, 20 subjects 16 female (M=24.44 years, SD=10.7 years), and 4 males (M=27.75 years, SD=9.7 years) self-reported data, 8 subjects self-reported addictive behavior. Subjects were recruited from West Liberty University via-. email. Subjects completed a self-reported online anonymous 4-section survey concerning subject demographics, physical activity levels, adverse childhood experiences, and addictive tendencies. Subject's age, biological sex, race, and education level were self-reported. The International Physical Activity Questionnaire - Short Form (IPAQ-SF; 2002) was used to self-report physical activity levels. ACEs were self-reported through the Health-Resiliency-Stress Questionnaire Part D (HRSQ; Susie Wiet, MD, 2019). Addictive tendencies were self-reported through questions regarding the criteria for psychological and physiological addiction from the Diagnostic and Statistical Manual from the American Psychiatric Association. Correlations were assessed for total minutes of vigorous exercise, total minutes of moderate exercise, total minutes of light exercise, total minutes sedentary in the past 7 days, ACE scores, and addictive tendency score. **RESULTS:** Significant results were found among ACE scores, and addictive tendency scores $r=0.759$, $p < 0.001$. Preliminary data based on 7-day reporting shows a positive trend among total minutes sedentary and addictive tendency score $r=0.391$, $p < 0.088$, and a negative trend among total minutes of vigorous exercise and addictive tendency score $r=-0.409$, $p < 0.073$. **CONCLUSION:** Preliminary data shows that higher reported ACE scores are correlated with higher addictive tendencies. Preliminary data shows a positive trend that being sedentary is correlated with higher addictive tendencies and a negative trend that more vigorous activity is correlated with less addictive tendencies. **SIGNIFANCE/NOVELTY:** Results from this study show the importance of integrated treatment methods for addicts. By finding the root of addictive tendencies, medical professionals are more equipped to help addicts get clean and stay clean for a happier and healthier lifestyle.

Force Production Declines Without Effects On Mitochondrial Respiration In Rats Exposed To Consecutive Tetanus Contractions

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Skeletal muscle has an enormous dynamic range, and mitochondria are responsible for the aerobic production of ATP within muscle fibers. In the mitochondria, electrons are transferred across different protein complexes down their potential gradient to create a protonmotive force used to synthesize ATP. Recently, the organization of the protein complexes of the electron transport chain into supercomplexes (SC) (e.g. CI+CIII₂+CIV), which would theoretically aid in ATP synthesis, has been shown to increase with exercise training. It is unknown, however, if acute contraction can alter the organization of SC within skeletal muscle mitochondria. **PURPOSE:** The goal of the present study was to determine if performing fatiguing twitch contractions (Twitch - T) on Type I muscle (soleus) from male and female rats alters maximal mitochondrial respiration and/or SC formation compared to control (No-Twitch - NT). **METHODS:** Solei were dissected from 44 weeks old Sprague-Dawley rats following euthanasia. Suture loops were attached to the distal end of both solei and the excised muscles were transferred to the muscle force testing system incubated with the Ringer's-Solution bubbled with 100% O₂ at 37°C. Maximal twitch force was recorded with single twitches at 1Hz, followed by stretching of the passive tension by about 10mN. The muscle was then stimulated to tetanus at 100Hz. This procedure was repeated with 1min rest periods until maximal force was decreased to 50%. Mitochondria were then isolated from 0.1 g of T and NT muscles using differential centrifugation and O₂ consumption rate was determined in the presence of respiration media, fuels, and ADP. BN-PAGE was performed to examine the organization of complexes and SC in isolated mitochondria, after membranes were solubilized with digitonin. **RESULTS:** Repeated tetanus contractions resulted in reduction of force production in both male and female rats (1515±7 vs 776±12), however females were able to produce more force per mass compared to males (0.0013 vs 0.0009 mN/g, p< 0.05). No differences were observed in mitochondrial respiration rates between T and NT solei (0.17±0.01 vs 0.18±0.01 nmol/g/min), although qualitative analysis of BN-PAGE showed signs of severe protein degradation in muscles subjected to the tetanus protocol. **CONCLUSION:** Consecutive tetanus contractions lead to reduction in force production and are possibly causing intense protein damage. The optimization of tetanic contraction protocols is essential to determine if SC organization can be altered acutely following muscle exertion and how mitochondria respiration and ATP production can be affected by these events. **SIGNIFICANCE/ NOVELTY:** Assessing if acute changes in mitochondrial SC occur as a result of fatiguing contractions in skeletal muscle can provide novel insights into exercise prescription and adequate ways to promote optimal performance, avoiding muscle damage.

FUNDING: This work was funded by University of Maryland Aging Diversity And Professional Training (UMADAPT) Program NIH grant AG-045063

Protein Pacing and Plant-Based Protein: Predictors of Improved Body Composition in Division III Female Athletes

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Athletes, with their increased training and competitive demands, require more dietary protein for the repair and maintenance of skeletal muscle tissue. The relative recommendations for athletes are 1.2-2.0 g/kg/d. By pacing protein (PP), either absolutely (20-40 g/meal) or relatively (0.25-0.55 g/kg/meal), an athlete can maximize muscle protein synthesis and improve body composition, leading to better performance and overall health. Sources of dietary protein, animal- vs plant-based (ABP & PBP), have also been linked to these outcomes. PBP has been associated with reduced cardiovascular disease risk, whereas ABP, specifically red and processed meat, may increase risk. As not all athletes work with a sports nutritionist, it is critical to investigate their nutrition and indicators of health. **PURPOSE:** To examine associations between dietary intake, PP (relative & absolute), and protein source (ABP & PBP) with total body fat % in Division III female athletes. **METHODS:** Body composition was assessed using dual-energy x-ray absorptiometry. Dietary intakes were estimated with three-day dietary logs and EHSA software. Daily protein intake was divided into three mealtime periods: morning (before 11:30), afternoon (11:30-16:00), and evening (after 16:00). PP was defined as relative (≥ 0.4 g/kg) and absolute (≥ 30 g). Meeting PP cut points during one mealtime period was recorded as "1", and these were summed to create 2 ordinal variables, each with 4 levels, achieving relative or absolute PP at 0, 1, 2, or 3 periods. A stepwise linear regression was used to determine whether dietary intake, PP, and protein source were associated with body fat %. Age (years), body mass (kg), ABP (g/d), PBP (g/d), energy intake (kcal/d), absolute protein, carbohydrate, and fat intake (g/d), and relative (g/kg/d) and absolute PP (g/d) were included in the regression. **RESULTS:** A total of 13 females (mean \pm SD; age 19.69 ± 1.44 ; height 169.32 ± 5.48 ; body mass 66.39 ± 8.30) were included in the analysis. Body fat % was first predicted by relative PP and then by PBP ($F_{1,10} = 14.208$, $R^2 = 0.740$, adjusted $R^2 = 0.688$, $p \leq 0.001$). For each mealtime period an athlete achieved relative PP, and for every 1 g of PBP, body fat % decreased by 3.830 % and 0.212 % respectively. **CONCLUSION:** Relative PP and PBP were associated with lower body fat % in Division III female athletes, while ABP was unrelated. **SIGNIFICANCE/NOVELTY:** Utilizing relative PP and increasing PBP may help athletes achieve an optimal body fat %, which can translate to better performance and health outcomes. Greater PBP will also improve diet nutritional quality, contributing to better health, without the need to omit high-quality ABP essential for meeting energy and protein requirements. Our findings demonstrate that relative PP and PBP may improve body fat % in female athletes without requiring ABP removal from their diet.

Support provided by the Skidmore College Faculty Development Grant

The Effect of Vibrotactile Complexity on Spatial and Temporal Performance During a Wrist Movement Task

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PURPOSE: Compare task performance when individuals are provided vibrotactile (VT) sequences of increasing temporal complexity. **METHODS:** 30 right-hand dominant participants aged between 18-30 provided informed consent and were enrolled into 3 groups (C1, C2, C3). A 1-degree of freedom wrist flexion/extension matching task was performed with each group assigned to 1 of 3 VT sequence complexity options. VT information was supplied with a 2-tactor array on the right forearm, indicating the speed and direction of targeted movement patterns. Those in group C1 were provided with a simple VT pattern with 1 temporal component (500ms). C2 participants were provided a complex repeating pattern with 2 temporal components (750ms, 500ms). Participants in C3 were provided the most complex VT pattern with 3 repeating temporal components (1000ms, 500ms, 750ms). Participants were given 5, 20-second trials to reproduce their target pattern under VT guidance while wrist movement was captured with an electrogoniometer. Flexion/extension movements were combined to calculate overall temporal accuracy (ACC; absolute error) and precision (PREC; standard deviation), as well as overall wrist range of motion (ROM) and ROM variability (ROM-SD) across each trial. Repeated measures mixed-models (5x3) examined performance outcomes between patterns (C1, C2, C3) and across trials (1-5) with post-hoc Tukey HSDs. **RESULTS:** No significant interactions were observed. Within the spatial domain only ROM trial differences were observed, revealing trial 1 to be significantly different from all other trials (mean±SD; 1=69.1±22.9°; 2=83.1±20.6°; 3=83.4±20.6°; 4=83.1±20.5°; 5=82.0±19.6°; $p<.05$). In the temporal domain, each group was found to be significantly different from the other for ACC (C1=0.082±0.089s; C2=0.176±0.045s; C3=0.293±0.099s; $p<.05$); while C3 was different from other groups for PREC (C1=0.126±0.179s; C2=0.171±0.068s; C3=0.303±0.183s; $p<.05$). Additionally, trial effects were observed with trials 1 and 2 found to be different from trials 3-5 for ACC (1=0.229±0.144s; 2=0.196±0.136s; 3=0.167±0.097s; 4=0.159±0.103s; 5=0.169±0.094s; $p<.05$); while trial 1 was different from all other trials for PREC (1=0.309±0.280s; 2=0.194±0.152s; 3=0.162±0.107s; 4=0.156±0.089s; 5=0.181±0.104s; $p<.05$). **CONCLUSION:** Altering VT pattern complexity by increasing the number of temporal components for users to match negatively influences temporal performance. Without explicit spatial instruction no group differences were observed for performance in the spatial domain. Results also suggest participants quickly adopted a preferred movement pattern that then persisted for the remaining trials. **SIGNIFANCE/NOVELTY:** As VT tools become more popular among rehabilitation specialists to guide movement, it is important to better understanding how users are able to interpret and respond to such interventions.

The Association Between Cardiovagal Baroreceptor Sensitivity and Hippocampal Tissue Integrity in Young and Middle-aged Adults

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Prior research has investigated the association of cardiovagal baroreceptor sensitivity (BRS) with white matter neuronal integrity and cerebral perfusion using magnetic resonance imaging (MRI) techniques such as diffusion tensor imaging (DTI) and arterial spin labeling (ASL); however, less is known about the association with specific regions of gray matter (i.e, hippocampus) involved in memory formation and recall. MR elastography (MRE) has emerged as a constructive tool for assessing the viscoelastic mechanical properties of the brain which are believed to reflect the microstructural integrity of neuronal tissue. **PURPOSE:** To investigate the association between cardiovagal BRS and the viscoelastic properties of the brain, with a sub goal of examining how advanced age affects this association. We hypothesized that there would be a positive relation between cardiovagal BRS and hippocampal (HC) viscoelastic properties that strengthens with age, indicating a greater influence of blood pressure control on HC microstructural integrity. **METHODS:** Ten young (Yng, 25 ± 2 years) and ten middle-aged adults (MA, 55 ± 3 years) laid in supine position for 10 minutes while arterial blood pressure (ABP) and heart rate (HR) were measured. R-R intervals and systolic blood pressures were plotted within a linear regression to calculate the spontaneous baroreflex slope. Subjects went in an MRI scanner to measure hippocampal viscoelastic properties using MRE. **RESULTS:** As expected, we observed a lower cBRS in the middle-aged group compared with young (MA: 12.51 ± 4.41 vs. Yng: 25.21 ± 8.77 ms/mmHg, $p \leq 0.05$). There were no significant differences in HC stiffness or damping ratio when comparing between age groups (MA: 3.06 ± 0.32 kPa vs. Yng: 3.02 ± 0.09 kPa, $p = 0.69$; MA: 0.2 ± 0.02 vs. Yng: 0.2 ± 0.03 , $p = 0.56$). However, a multiple linear regression with age included as a categorical covariate revealed a trend towards a stronger association between HC stiffness and cBRS in the middle-aged compared to the young group ($p = 0.07$). **CONCLUSION:** In contrast to our hypothesis, preserved BRS was associated with lower HC stiffness in the middle-aged group; however, the physiological importance of this finding needs to be more completely explored. Our findings indicate that the association between short-term blood pressure regulation via cardiovagal BRS may be more closely linked to HC tissue integrity with advancing age. These mechanisms should be explored in a larger cohort including older individuals. **SIGNIFICANCE /NOVELTY:** Previous studies have yet to determine whether cardiovagal BRS and hippocampal (HC) viscoelastic properties are correlated. Our findings show that as an individual ages, short-term blood pressure regulation via cardiovagal baroreceptors is more strongly associated with maintaining HC tissue integrity.

The Effects of Cellphone Usage on Cognitive Function in College-Aged Individuals

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The technological advancement of cellphones has prompted young adults to spend an average of nine hours a day on their device, increasing their risk for a dependency syndrome called nomophobia. The prevalence of nomophobia amongst young adults is between 77-99%. Research has shown that nomophobia creates recognizable mood fluctuations such as depression, stress, anxiety, loneliness, and fear of missing out. There are growing concerns on how cellphone usage affects individuals' cognitive function; however, little research has been done assessing cellphone usage on cognitive performance. **PURPOSE:** To assess the cognitive effects of cellphone usage in college-aged individuals. **METHODS:** Forty-nine subjects (age 19.6 ± 0.82 yrs, body mass index 26.3 ± 6.1 kg/m², weight 75.7 ± 18.0 kg) completed a randomized, cross-over study. Individuals reported to the exercise science laboratory on two separate occasions, for 60 minutes, and were either allowed unlimited access to their cellphone or were separated from their device. Before and immediately after each experimental session subjects completed the congruent and incongruent Stroop as well as the Switching cognitive tests. For each cognitive test, the mean reaction time for all responses and only for correct responses were recorded. **RESULTS:** There was a significant ($p=0.04$) condition*time interaction for mean reaction time in correct responses for the switching test. Individuals who were separated (PRE: 1693.7 ± 7 ms; POST: 1486.1 ± 55.9 ms) from their cellphone showed a greater improvement in reaction time than individuals with unlimited access (PRE: 1655.8 ± 78.3 ms; POST: $1561.70.2$ ms) to their device. There was a significant main effect of time for mean reaction time in switching ($p \leq 0.001$; PRE: 1665.3 ± 60.9 ms; POST: 1507.5 ± 53.1 ms), incongruent stroop ($p=0.03$; PRE: 689.9 ± 25.7 ms; POST: 670.61 ± 23.9 ms), and congruent stroop ($p < 0.001$; PRE: 575.86 ± 14.9 ms; POST: 552.6 ± 14.1 ms). There was a significant ($p < 0.001$) main effect of time (PRE: 574.3 ± 14.6 ms; POST: 552.9 ± 14.0 ms) for mean reaction time in only correct responses for the congruent stroop test. **CONCLUSION:** The results of this study showed that cellphone usage impaired college-aged students' cognitive function. Specifically, college-aged students may benefit from not having access to their cellphone on tasks that require cognitive flexibility and divided attention. **SIGNIFANCE/NOVELTY:** This is one of the first studies to assess cellphone usage on cognitive function. College-aged students are repeatedly told to get off their cellphones in academic settings. The results of this study support the notion that cellphone usage over a period of time may impair brain activity and decrease cognitive performance on certain tasks that require higher-order thinking.

Supported by Grove City College Exercise Science department

Effects of Slow Breathing During Inter-set Recovery on Power Performance in the Barbell Back Squat

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Slow breathing (SB) techniques (e.g., 4-7-8 breathing) tend to reduce sympathetic nervous system activity, heart rate (HR), and blood pressure (BP) while increasing parasympathetic nervous system (PNS) activity, heart rate variability, and oxygen saturation. This may lead to quicker recovery between bouts of exertion and therefore attenuate normal performance decrements during resistance training. **PURPOSE:** To examine whether a SB technique using the 4-7-8 method between sets of barbell back squats (SQ) would attenuate drops in power and bar velocity in moderately trained college aged men. **METHODS:** In a randomized crossover design 18 healthy resistance-trained (4.5 ± 2.4 years of experience) college-aged (20.7 ± 1.4 years) males (height: 178.6 ± 6.4 cm, mass: 82.2 ± 15.0 kg) performed 5 sets of 3 repetitions of SQ at 80% 1RM with either normal spontaneous breathing (CON) or SB (using 4 second inhale, 7 second hold and 8 second exhale) during the 3-minute inter-set recovery period between sets. Peak and average power and bar velocity were assessed using a linear positioning transducer. HR recovery (HR immediately post-set – HR at end of recovery period), systolic BP (SBP: SBP immediately post – SBP at end of recovery period), RPE and rating of perceived recovery score (RS) were assessed after each set. **RESULTS:** There were no significant differences between conditions for peak and average power and bar velocity, SBP, RPE or RS (p 's >0.05). There was a significant interaction between condition and sets for heart rate in which SB resulted in improved HR recovery for sets 2 (SB: 51.0 ± 14.9 bpm vs CON: 44.5 ± 11.5 bpm, $p=0.025$) and 3 (SB: 48.3 ± 13.5 bpm vs CON: 37.7 ± 11.7 bpm, $p=0.006$) compared to CON. **CONCLUSION:** A SB strategy between sets of SQ was well tolerated, did not hinder nor improve performance and improved HR recovery during sets 2 and 3 in moderately trained men. **SIGNIFICANCE/NOVELTY:** SB using the 4-7-8 method is a potential inter-set recovery strategy that may improve HR recovery. Further investigations are warranted to determine SB's overall effect on different training stimuli (e.g., hypertrophy or endurance) as well as its effects over an entire workout and post-workout recovery metrics.

Supported the Grove City College Exercise Science Department

Limb and Sex, but Not Dietary Capsaicin, Modulate the Near-Infrared Spectroscopy-Vascular Occlusion Test Estimated Metabolism

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Assessing muscle metabolism is essential for physiological understanding, as well as studying the effects of deteriorating factors (e.g. age, disease, etc.) and mitigating strategies (e.g. exercise training). Near-infrared spectroscopy (NIRS) is known to provide a valid estimate of muscle oxidative capacity. Recently, the NIRS-vascular occlusion test (NIRS-VOT) has been purported as a simplified estimate of both metabolism and vascular reactivity, but little is known about sex/limb specificity, or whether it may be acutely altered. **PURPOSE:** Thus, we investigated the effects of acute dietary capsaicin treatment on muscle metabolism using tissue deoxygenation rates (DeO₂) during a NIRS-VOT, and if there is limb- or sex-specificity in this assessment. **METHODS:** Forty-five young healthy men (n=25, 21±4yr) and women (n=20, 20±1yr) ingested either placebo or capsaicin, in a counterbalanced, blinded, placebo-controlled, crossover design after which a simplified NIRS-VOT was conducted to determine the DeO₂ (change in tissue oxygen saturation, StO₂, %/s), as an estimate of oxidative muscle metabolism, in both the forearm (FA) and quadriceps (Q, vastus lateralis). Slope was derived during the initial 10 s of rapid occlusion. Handgrip maximal voluntary contraction (MVC), site skinfold thickness, and body mass index (BMI) were measured to determine relation to DeO₂. **RESULTS:** There was a significant limb effect with the Q having a greater DeO₂ than the FA (-2.31±1.34 vs. -1.78±1.22%/s, $p=0.01$, $\eta_p^2=0.19$). There was a significant effect of sex on DeO₂ ($p=0.01$, $\eta_p^2=0.20$) with men exhibiting a lesser DeO₂ than women (-1.73±1.03 vs. -2.36±1.32%/s, respectively). This manifested in significant interactions of limb and capsaicin ($p=0.00$, $\eta_p^2=0.26$) as well as limb, capsaicin, and sex on DeO₂ ($p=0.01$, $\eta_p^2=0.16$) being observed. In the FA under placebo, modest positive relation between DeO₂ and MVC ($r=0.37$, $p=0.02$) but negative relations with skinfold thickness ($r=-0.34$, $p=0.02$). However, there were no significant relations between DeO₂ in both FA and Q with weight ($p>0.92$, $r<0.13$), Skinfold Q ($p=0.43$, $r=0.13$) or BMI ($p>0.89$, $r<-0.27$). **CONCLUSION:** Capsaicin treatment does not induce favorable changes in O₂-dependent metabolism in muscle, but there are apparent limb and sex specificity in such NIRS-derived assessments. **SIGNIFICANCE/NOVELTY:** A simplified integrated vascular occlusion test, using near infrared spectroscopy has been suggested to provide estimate of oxidative muscle metabolism and vascular reactivity. If such a test is to be adopted, understanding how factors such as sex or limb may alter the results is paramount. Further, whether dietary capsaicin acutely impacts this estimate of metabolism is unknown. We demonstrate that sex and limb, but not acute capsaicin, significantly influence the deoxygenation slope, and needs to be considered in the design of studies using the NIRS-VOT.

Examining the Cardiovascular Response to Blood Flow-Restricted Resistance Exercise

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Low-intensity, blood flow-restricted (BFR-LI) resistance training has become popular in rehabilitation and sport performance settings. BFR-LI protocols occlude venous return to an active muscle during repeated contractions, and have been reported to achieve similar strength and hypertrophy outcomes as high-intensity (i.e., high load) resistance training (HI) over time. While the outcomes seem promising, evidence regarding the expected cardiovascular response to these interventions is limited. **PURPOSE:** To determine the effect of an acute bout of BFR-LI, compared to traditional low-intensity (LI) and HI protocols, on blood pressure (BP) and hemodynamic variables in normotensive, college-aged males. **METHODS:** Apparently-healthy college-aged males were recruited. Participants completed a 3-5 repetition maximum (RM) test to estimate their 1RM on a leg extension machine. Participants randomly completed three volume-matched training sessions: 4 sets each of 1) HI- 70% 1RM for 8 reps; 2) LI- 35% 1RM for 16 reps, 3) BFR-LI- 35% 1RM with venous occlusion for 16 reps. Rapid-inflation cuffs were used to induce venous occlusion in the BFR-LI condition by inflating to a value halfway between systolic and diastolic BP. Sets were separated by 1-minute rest periods. Bilateral BP and non-invasive hemodynamic measures were taken pre-exercise, after each set, and 2 minutes post-exercise. A within-subjects, repeated-measures ANOVA was used to compare pertinent cardiovascular variables across conditions. **RESULTS:** Bilateral differences in SBP and DBP were not present ($P>0.05$). Expectedly, a time effect was observed in both SBP and DBP ($P<0.05$). No interactions (time X condition) were observed in SBP ($P>0.05$), however, interactions existed in both the right and left DBP ($P<0.05$). Participants reported that the BFR-LI condition required more exertion than the LI or HI conditions ($P<0.05$; RPE Set 4-LI Δ 2 ± 1.37 and RPE Set 4-HI Δ 1.52 ± 1.3 , respectfully). There were no significant differences noted in the heart rate ($P>0.05$). **CONCLUSION:** Arm selection may not be critical when assessing blood pressure during blood flow restricted or traditional resistance training. With subsequent sets, the blood pressure response was remarkable. **SIGNIFICANCE/NOVELTY:** To our knowledge, this is the first investigation to report the simultaneous bilateral blood pressure response to acute exercise with blood flow restriction.

Adherence to a 12-week Summer Exercise Protocol Among ROTC and VWIL Cadets: A Pilot Study

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PURPOSE: This study examines adherence to a 12-week exercise protocol for Virginia Women's Institute for Leadership (VWIL) and Reserve Officers' Training Corps (ROTC) cadets. **METHODS:** Twelve healthy VWIL/ROTC cadets provided informed consent to participate in 12-weeks of structured exercise during summer semester (M=1, F=10, NB=1; 20±1 years; 39.2±9.3cm; 165±9.3 kg; mean±SD). Each weekly exercise protocol dictated 2 days of resistance training (RT), 3 days of cardiorespiratory training (CT), and 2 days of rest. Email reminders prompting participants to engage in, document, and upload weekly exercise logs were sent to each participant twice weekly. Each day, participants reported engaging in some volume of RT, CT, or rest, counting towards a percentage of their weekly prescribed total. Additionally, overall adherence to the weekly exercise protocol was assessed by combining RT and CT results. **RESULTS:** Of the 12 participants ~ 5, ~ 3, and ~ 2 reported engaging in prescribed exercise during month 1, 2, and 3 respectively. Month 1 RT adherence was reported as 91±11; % (mean ±SE), CT as 54±7%, rest as 118 ±10%, and overall, as 65±6%. Month 2 RT was reported as 68±10%, CT as 82±7%, rest as 127 ±12%, and overall, as 75±5%. Month 3 RT was reported as 57±13%, CT as 76±10%, rest as 157 ±13%, and overall, as 69±7%. **CONCLUSION:** The study team was surprised by the overall low response and high attrition rates among VWIL/ROTC cadets, which ultimately limited our ability to run inferential statistical analyses. However, these limitations also provided the opportunity to explore data trends more globally among cadets' reported exercise adherence. These results indicate overall poor engagement in our prescribed plan as less than 50% of our participants reported some level of compliance during the first month, falling to ~16% by the end of the study period. However, this limitation could also be due to our chosen method of reporting. The decreased reporting when paired with the increased over-adherence to prescribed rest may also indicate protocol fatigue. Despite limited reporting, the relatively higher adherence to CT over RT with overall exercise levels remaining relatively stable throughout testing seems to indicate a preference among cadets for CT. Future studies should explore additional protocols and reporting methodologies with the aim to improve reporting and exercise adherence. **SIGNIFICANCE/NOVELTY:** Understanding exercise preferences among military personnel is critical as physical fitness, and thus physical training, are essential requirements for service. However, there is limited exercise research among ROTC or military collegiate cohorts, especially among female cadets. Improving exercise engagement among these groups will help to ensure their readiness for future service.

Non-Dominant Arm Bone Loading Index Predicts Grip Strength in Adolescent Females

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Mechanical loading from exercise may increase bone strength, particularly during puberty. The same exercise is not necessarily associated with growth in muscular strength. We investigated associations between a validated osteogenic exercise index and grip strength in circum-menarcheal females. **PURPOSE:** We aimed to determine whether our validated bone loading index predicts independent changes in grip strength for the non-dominant arm in the same cohort of adolescent females. **METHODS:** Forty-nine adolescent females met inclusion criteria. Detailed physical activity records were collected for the three years prior to the circum-menarcheal study visit, with height and non-dominant arm grip strength measured at study visit. We calculated our previously reported bone-loading index to represent exercise loading doses over 50 physical activities, reflecting magnitude, frequency, and velocity of loading (arm totBLI). Regression models were run to determine the predictive value of arm totBLI on non-dominant arm grip strength, accounting for height (Ht) and non-dominant arm fat free mass (NONarmFFM). **RESULTS:** The overall model was significant, including Ht, arm totBLI and NONarmFFM ($R^2 = 0.315$, $p < 0.001$). Within the model, arm totBLI showed independent negative predictive value for non-dominant arm grip strength (unstandardized B coefficient = -0.201; zero order $r = -0.272$; semi-partial $r = -0.283$, $p < 0.05$). **CONCLUSION:** Our bone loading index reflects many high-impact sports, as well as recreational physical activities. The current study indicates that forces reflected by arm totBLI may have a negative influence on non-dominant arm grip strength, as seen through a zero-order correlation and persisting after accounting for height and fat-free mass. This finding contrasts with our prior work showing positive correlations of totBLI with DXA bone properties and arm non-bone lean mass. Further research is needed to confirm this pattern and identify why increased bone loading may be associated with inhibited development in grip strength. **SIGNIFANCE/NOVELTY:** Our study uses a unique bone-loading index variable that was previously created and validated by our research team to indicate osteogenic loading; it has not been tested as an indicator of exercise to promote muscle function. Here, we demonstrate the negative predictive value of this exercise loading index for circum-menarcheal grip strength in adolescent females.

Supported by NIAMS R03 AR47613; NIAMS R01 AR54145

Circulating extracellular vesicle characteristics differ between men and women following 12-weeks of concurrent exercise training.

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Concurrent resistance and endurance exercise training (CET) have numerous health benefits; however, hormonal and genetic differences exist that alter responses to CET between sexes. These include greater muscle mass, type II fiber area and higher release of IL-6 and testosterone following exercise in men and greater relative increases in upper body strength in women. Extracellular vesicles (EVs) are small membrane bound signaling factors that contribute to the adaptive signaling environment following exercise. Little is known of the EV response to long term exercise training and whether it differs between men and women. **Purpose:** To determine if EV concentration, subpopulations, miRNA contents, and signaling potential differ between men and women following acute and chronic exercise training. **Methods:** 18 participants (age: 27.3, Body fat: 27.8%, female n=9) underwent 12-weeks of CET consisting of resistance followed by interval training. Prior to and following the 12-week CET, subjects performed an acute bout of heavy resistance exercise (AHRET). Blood draws were taken at rest and following AHRET. EVs were isolated from plasma using size-exclusion chromatography. EV concentration, size, surface markers, and miRNA contents were analyzed via nanosight tracking analysis, imaging flow cytometry, and small RNA sequencing respectively. Data were analyzed via three-way [Sex x AHRET x chronic training] repeated-measures analysis of variance (ANOVA), significance: $p=0.05$. **Results:** AHRET elevated circulating [EV] (+51%, $p=0.04$) and EV protein content (+108%, $p=0.02$) in trained men only. AHRET decreased muscle-derived (SGCA⁺) EVs (1.05% vs 0.52%, $p=0.02$) and increased microvesicles (VAMP3⁺) EVs (2.5% vs 3.1% $p=0.02$). There were considerable sex-specific effects of CET on EV miRNAs, highlighted by greater miRNA in women (2,852 pg/ml vs 1,208 pg/ml $p=0.01$) and a larger variation in differentially expressed EV miRNAs at rest following CET in men (39 vs 12). This pattern was inverted following AHRET (7 vs 32). Pathway analysis predicted that AHRET and 12-weeks of CET in men positively regulates resistance training related pathways (including PI3K/Akt, mTOR, IGF-1 and IL-6 signaling pathways) more so than in women, **Conclusion:** Acute resistance exercise increased EVs following 12 weeks of CET in men only. EV subpopulations are sensitive to acute exercise independent of sex and training. Lastly, EV miRNA contents differ greatly between men and women and exercise training causes miRNA contents to be more supportive of exercise related pathways in men compared to women. **Significance/Novelty:** This report highlights several novel sex-based differences in the EV response to concurrent exercise training between men and women. It is becoming clear that circulating EVs may be important sex-specific adaptive signaling molecules following exercise training. Supported by UKMOD, Award No. WGCC 5.5.6

Muscular Fitness and Throwing Qualities in Collegiate Ultimate Frisbee

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PURPOSE: To compare measures of muscular fitness and throwing quality between collegiate ultimate frisbee athletes and collegiate non-players. **METHODS:** Forty-eight college students (23 women; 25 men) volunteered to participate in this study. Students were categorized as experienced ultimate frisbee players (UF) (n = 15, 2 women) or non-players (NP) (n = 33, 21 women) using a questionnaire. UF consisted of collegiate club ultimate frisbee players and/or students with at least 6 months of ultimate frisbee experience. NP consisted of exercise science students who have little to no prior experience with ultimate frisbee (less than 6 months). During visit 1, percent body fat (%BF) and body mass (BM) were measured using a Tanita Bioelectrical Impedance Analyzer. Wingspan was measured using a wall-mounted measuring tape. Grip strength was measured using a Grip-A hand grip dynamometer. Upper body muscular endurance was measured using the FitnessGram cadence push-up test. During visit 2, disc throwing accuracy and distance were measured using a throwing test consisting of targets at different ranges (5m, 15m, 25m). Subject characteristics, fitness assessments, and throwing measures were compared between UF and NP using independent samples *t*-tests. **RESULTS:** Statistically significant differences were found between UF and NP for height (177.8 ± 9.9 vs. 168.0 ± 9.8 cm, $p = .003$), BM (83.5 ± 16.7 vs. 68.8 ± 13.9 kg; $p = .003$), BMI (26.4 ± 4.4 vs. 24.1 ± 3.0 kg·m⁻², $p = .04$), wingspan (180.9 ± 11.6 vs. 167.5 ± 14.9 cm, $p = .003$), grip strength (42.8 ± 7.8 vs. 34.6 ± 10.2 kg, $p = .008$), 5m accuracy (9.3 ± 1.0 vs. 7.4 ± 2.5 throws, $p = .006$), 5m distance (11.1 ± 1.8 vs. 9.2 ± 1.4 m, $p < .001$), 15m accuracy (3.0 ± 1.6 vs. 1.1 ± 1.3 throws, $p < .001$), 15m distance (21.6 ± 2.6 vs. 17.3 ± 3.8 m, $p < .001$), 25m accuracy (1.1 ± 1.2 vs. 0.5 ± 0.1 throws, $p < .001$), and 25m distance (27.4 ± 1.7 vs. 21.3 ± 5.4 m, $p < .001$), respectively. Values were similar between UF and NP for age (21.9 ± 2.3 vs. 21.5 ± 2.0 , $p = .593$), %BF (22.6 ± 8.5 vs. 24.3 ± 8.2 ; $p = .501$), and upper body muscular endurance (19.3 ± 7.2 vs. 20.6 ± 9.0 push-ups; $p = .608$), respectively. **CONCLUSION:** UF had greater height, BM, BMI, wingspan, grip strength, as well as all throwing accuracy and distance measures when compared to NP. However, no differences were found for age, %BF, and upper body muscular endurance. Future studies should aim for closer male to female and UF to NP ratios with larger sample sizes. Future studies should also measure additional variables, including but not limited to throwing velocity, running speed, vertical jump height, and differences between UF position players (e.g. handler, cutter). **SIGNIFICANCE/NOVELTY:** Ultimate frisbee is a sport which has been gaining in popularity, particularly in the United States among college student populations. However, very little research has studied the fitness levels and throwing characteristics of these athletes.

Alanine Aminotransferase in Emerging Black Individuals: A Potential Biomarker for Early Aging?

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INTRODUCTION: Chronic psychological stress continues to emerge as contributor to racial health disparities. Black women in particular experience an accelerated pattern of aging, driven partly by perceived stress. Low levels of serum alanine aminotransferase (ALT) are reportedly associated with age-related frailty, sarcopenia, and all-cause mortality, conditions typically correlated with lower bone mineral density (BMD). Conversely, elevated ALT is also associated with decreased BMD as well as vascular dysfunction in the context of liver pathologies such as nonalcoholic fatty liver disease. **PURPOSE:** To assess the relationships between perceived stress, ALT, BMD, and vascular function in emerging Black individuals. **METHODS:** A total of 86 participants (male=34, female=52) completed the Perceived Stress Scale (PSS), blood serum analysis by Quest diagnostics, DEXA scan, and brachial-artery flow-mediated dilation (%FMD) during the same visit. **RESULTS:** PSS scores were inversely correlated with ALT ($r = -0.273$, $p = 0.048$) only in women. However, PSS scores in both men and women inversely correlated with BMD (men: $r = -0.474$, $p = 0.005$; women: $r = -0.271$, $p = 0.05$). ALT negatively correlated with %FMD in men but not in women ($r = -0.515$, $p = 0.003$). ALT was weakly predictive of %FMD in men ($R = 0.370$; $R^2 = 0.137$, $p = 0.041$). **CONCLUSION:** Recent studies report low levels of ALT to be associated with an increased prevalence of cardiovascular mortality, frailty, and sarcopenia. In Black emerging women, decreased serum ALT and BMD may be related to perceived stress. Conversely, the inverse relationship between ALT and %FMD observed in emerging Black men may present novel sex differences when considering the risks of liver and vascular dysfunction in response to stress. The collective decline in BMD associated with greater perceived stress in both men and women could support evidence of the weathering hypothesis in primary adulthood. **SCIENTIFIC NOVELTY:** ALT may prove a useful biomarker when assessing premature physiological decline in Black individuals given the context of weathering. Evaluating these relationships in an older population is critical to further elucidate whether age-related pathological trends are impacted by perceived stress, and if the observed sex differences persist into mid and later adulthood.

Funding – UMD Human Integrative Physiology and Resilient Adaptation across Culture and Context Laboratories

Dietary Intake, Dietary Protein Source, and Metabolic Syndrome Risk in Division III Offseason Female Athletes

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Metabolic syndrome (MetS), identified by blood pressure, waist circumference, blood glucose, triglycerides, and high-density lipoprotein, can increase risk for morbidity and mortality. College athletes are often overlooked for MetS as their increased physical activity and exercise is assumed to reduce disease risk. However, over- or underconsumption of energy intake, including macronutrient balance, based on body mass, age, and sex has been shown to increase risk. As not all athletes have access to a sports nutritionist, a need exists for more research into athlete nutrition and cardiometabolic health, especially in females where a knowledge gap exists. **PURPOSE:** To determine the relationship of dietary intake and protein source, animal- (ABP) and plant-based (PBP), with MetS as estimated by Simple Method for Quantifying Metabolic Syndrome (siMS) score and risk score in Division III female athletes. **METHODS:** Waist circumference was measured with a spring-loaded measurement tape. Blood pressure was assessed supine after a five-minute rest. Dietary intakes were estimated with three-day logs and ESHA software. Blood samples were collected via fingertip capillary drops with a single-use cassette and Cholestech LDX System. Stepwise linear regression models determined whether dietary intake and protein source were associated with siMS score and risk score. Age (yr), body mass (kg), body mass index (kgm^2), ABP (g/d), PBP (g/d), ABP:PBP, and energy (kcal/d), protein (g/d), carbohydrate (g/d), and fat intake (g/d) were included in each regression. **RESULTS:** A total of 13 athletes (mean \pm SD; age 19.7 ± 1.4 ; body mass 66.4 ± 8.4 ; BMI 23.1 ± 2.1 ; ABP 75.9 ± 28.2 ; PBP 29.2 ± 12.2) were included in the analyses. Only PBP, not ABP, was predictive of siMS score and risk score. For every 1 g increase in PBP, siMS score was lowered by 0.029 and risk score by 0.013. The siMS score regression model explained 31.5% of the variance ($F_{1, 11} = 5.052$, $R^2 = 0.315$, adjusted $R^2 = 0.252$, $p = 0.046$) and the regression model for siMS risk score explained 36.9% of the variance ($F_{1, 11} = 6.438$, $R^2 = 0.369$, adjusted $R^2 = 0.312$, $p = 0.028$). **CONCLUSION:** PBP was associated with a lower risk of MetS via siMS score and risk score in Division III female athletes, while ABP was unrelated. **SIGNIFICANCE/NOVELTY:** The health benefits of plant-based (PB) diets appear to be due to the increased nutritional quality of PB foods and simultaneous removal of animal-based (AB) products, specifically red and processed meat. However, removing AB foods may make it more difficult for athletes to meet energy and protein requirements needed to support muscle hypertrophy and strength due to the digestible indispensable amino acid score differentiation of PBP compared to ABP. Our findings show that increasing PBP intake may help reduce MetS risk in female athletes without needing to remove ABP from their diet.

Support provided by the Skidmore College Faculty Development Grant

Influence of Individual Characteristics on Critical Environmental Limits in Middle-aged and Older Adults (PSU HEAT Project)

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Critical environmental limits represent the temperature/humidity combinations at which heat balance can no longer be maintained for a given metabolic rate. Individual characteristics (e.g., sex, body weight and size, and aerobic fitness) are known to alter environmental heat exchange as well as thermoregulatory effector responses and therefore may modify critical environmental limits. **PURPOSE:** To determine which individual characteristics, if any, may be associated with higher or lower critical environmental limits [combinations of ambient dry-bulb temperature (T_{db}) and relative humidity (rh)] in middle-aged and older adults. **METHODS:** Forty-eight male (n=16) and female (n=32) participants (63 ± 11 yrs; range: 40-92 yrs) were exposed to progressive heat stress at a low metabolic rate designed to reflect activities of daily living. Experiments were conducted in both hot-dry (HD; up to 53°C ; $\leq 25\%$ rh) and warm-humid (WH; $\sim 35^{\circ}\text{C}$; $\geq 50\%$ rh) environments. After determining critical limits for each age group and condition, forward stepwise multiple linear regression analyses were conducted with net metabolic rate (M_{net}) and age entered into the model first, followed by sex, body mass, $\dot{V}O_{2max}$, body surface area, and LDL cholesterol. **RESULTS:** After accounting for M_{net} and age, both sex and body mass further significantly improved the regression model in the HD environment ($R^2_{adj} = 0.41$, $p < 0.001$) whereas only sex ($R^2_{adj} = 0.51$, $P < 0.001$) added significantly to the WH model. Sex explained 11% of the variance in critical environmental limits in HD conditions and 14% of the variance in WH conditions. In both WH and HD environments, females exhibited lower critical combinations of T_{db} and rh than their male counterparts. Additionally, body mass was negatively related to critical environmental limits in the HD environments and accounted for 8% of the variance after metabolic rate and age were accounted for. **CONCLUSION:** These data indicate a modest influence of individual characteristics, specifically sex and body mass, on critical environmental limits in both WH and HD environments in adults between the ages of 40 and 92. **SIGNIFICANCE/NOVELTY:** These results contrast previously published data in young adults showing no significant contribution of individual characteristics to the upper limits of heat balance at low metabolic rates reflecting activities of daily living. This reflects the heterogeneity of thermal-balance thresholds associated with aging relative to those seen in young adults.

The Biological Sex of an External Observer Does Not Influence Participant RPE

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Some studies have shown that the presence of an external observer can influence participant-reported ratings of perceived exertion (RPE) during a bout of exercise. Studies have investigated the impact of female observers on male participants but have not compared the general effect of same-sex and opposite-sex observers. **PURPOSE:** To investigate the impact of same-sex and opposite-sex external observers on reported RPE during a bout of exercise. **METHODS:** Thirteen subjects, six recreationally active males (Age: 21.0 ± 0.9 yrs, Height: 177.7 ± 7.2 cm, Mass: 87.6 ± 18.1 kg, Body Fat: $19.0 \pm 4.6\%$, Workload_{max}: 220.8 ± 71.4 watts) and seven recreationally active females (Age: 20.4 ± 1.5 yrs, Height: 164.2 ± 5.4 cm, Mass: 70.1 ± 7.8 kg, Body Fat: $30.5 \pm 7.3\%$, Workload_{max}: 160.7 ± 24.4 watts) participated in the study. The first visit consisted of a body composition assessment and a maximal workload test on the cycle ergometer. On three more visits, subjects were asked to complete a 5-minute warmup on a cycle ergometer, followed by a 20-minute bout at a constant workload equal to 70% of their maximum workload. In each visit, subjects were exposed to a different observer condition: no external observer (C), a same-sex observer (S), and an opposite-sex observer (O). The observers were of similar age to the participants. The testing order of the trials was determined by counterbalanced assignment. RPE overall (RPE-O), peripheral (RPE-P), and heart rate (HR) were assessed every minute. Blood lactate was assessed pre- and post-exercise. Delta-lactate was calculated as the difference between pre- and post-lactate. Repeated measures ANOVAs were used to compare the different observer conditions. **RESULTS:** Average RPE-O (C: 14.6 ± 2.0 , S: 13.9 ± 3.0 , O: 14.0 ± 1.9 ; $p = .267$), peak RPE-O (C: 17.1 ± 2.1 , S: 16.5 ± 2.9 , O: 16.8 ± 2.0 ; $p = .564$), average RPE-P (C: 15.4 ± 2.1 , S: 14.5 ± 2.7 , O: 14.6 ± 2.0 ; $p = .108$), and peak RPE-P (C: 17.7 ± 2.0 , S: 17.2 ± 2.6 , O: 17.4 ± 2.1 ; $p = .555$) were not significantly different across conditions. In addition, no significant differences were observed for average HR (C: 162.9 ± 12.4 , S: 161.7 ± 15.0 , O: 161.4 ± 13.7 bpm; $p = .792$), delta-lactate (C: 4.4 ± 2.2 , S: 3.9 ± 2.1 , O: 3.5 ± 3.1 mmol·L⁻¹; $p = .435$), or post-lactate (C: 5.5 ± 2.2 , S: 5.5 ± 1.8 , O: 5.1 ± 2.4 mmol·L⁻¹; $p = .560$). **CONCLUSION:** The presence of an external observer during the exercise bout did not impact participant RPE, regardless of the sex of the observer. **SIGNIFICANCE:** Previous studies have shown that the addition of female and male observers with male participants has influenced reported RPE of exercise, perhaps due to a desire to appear as if they are working harder and over-report, or the opposite, that they are more physically capable and then under-report. This study demonstrates that in this population of female and male college-aged students, the addition of a peer observer did not influence reported RPE.

Effects of Tempol on Microvascular Function in Men and Women on Habitual High Sodium Diets

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PURPOSE The average American consumes 3400 mg of sodium per day and thus far exceeds the recommended intake of 2300 mg/day. High sodium diets reduce nitric oxide (NO)-mediated vascular function, but this effect has been shown to be attenuated in women. The superoxide dismutase mimetic Tempol has been demonstrated to mitigate sodium-induced reductions in microvascular function, suggesting that high sodium diets impair vascular function via excess superoxide. We hypothesized that 1) Tempol would augment cutaneous vasodilation in response to local heating in healthy young adults who habitually consume 3400 mg or more of sodium per day, and 2) Tempol-induced improvements would be greater in men than women. **METHODS** We studied 83 healthy adults (39M/44W; 29±8 y) who self-reported sodium intake of ≥3400 mg/day via a 3-day diet record. Intakes were confirmed via 24h urinary sodium excretion. Two intradermal microdialysis fibers were inserted into the forearm for infusion of Ringer's solution (control) and 10 μM Tempol. A laser Doppler flowmeter probe was placed in a local heater and secured above each site, and a standard 42 °C local heating protocol was used to assess the plateau in cutaneous vasodilation in response to local heating which is largely dependent on NO. Sodium nitroprusside was then infused to induce maximum dilation. All data are presented as a percentage of maximum cutaneous vascular conductance (%CVCmax; CVC= LDF/mean arterial pressure) obtained at each site. A two-way ANOVA was used to analyze the sex by treatment interaction and main effects. **RESULTS** Self-reported sodium consumption was 4329±1180 mg/day and 24 h urinary sodium excretion was 143.3±65.4 mmol/24h. There was no significant interaction between sex and treatment (control: men 87.1±16.8, women 81.9±18.3 %CVCmax; Tempol: men 87.6±17.5, women 83.0±17.8 %CVCmax; p=0.90). Additionally, cutaneous vasodilation was not different between treatment sites (control: 84.3±17.7, Tempol: 85.2±17.7 %CVCmax; treatment effect, p=0.74) or between sexes (men: 87.4±17.0, women: 82.4±18.0 %CVCmax; sex effect, p=0.10). **CONCLUSION** Contrary to our hypothesis, Tempol did not augment cutaneous vasodilation in response to local heating. Furthermore, there were no sex differences in the response to local heating. **SIGNIFICANCE** The novelty of this study is that we examined sex differences in microvascular function under high sodium conditions reflective of the typical American diet. Since high sodium diets are a known risk factor for cardiovascular disease, future studies should explore its effects on NO-mediated microvascular function in older populations.

Funded by: NIH 5R01HL104106

Gut Microbiota Removal Eliminates Enhanced Exercise Capacity Mediated by Skeletal Muscle Metabolome and Mitochondrial Proteins

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The Regulator of G Protein Signaling 14 knockout (RGS14 KO) mouse is a model for healthful aging and has unique brown adipose tissue and skeletal muscle mechanisms mediating its phenotype of improved exercise performance i.e., a $51 \pm 8\%$ increase in running distance (meters/min) and a $44 \pm 7\%$ increase in work to exhaustion compared to wild type (WT) mice. We also found that eliminating the RGS14 KO microbiota with antibiotic treatment (ABX) abolished the enhanced exercise capacity (EXC) in the RGS14 KO mice. **PURPOSE:** The goal of this investigation was to determine if the distinct gut microbiota and skeletal muscle (SKM) metabolism in the RGS14 KO mice mediate its enhanced EXC. Accordingly, we examined 1) EXC and tissue (quadriceps) metabolomes of RGS14 KO mice before and following ABX, and 2) SKM for markers linked to exercise performance before and after ABX. **METHODS:** Thirty-eight mice (n=14 RGS14 KO, n=10 WT, n=8 RGS14 KO+ABX, n=6 WT+ABX) were used to examine EXC, identify predominant metabolites in SKM and analyze the expression/activity of proteins linked to EXC, e.g., nitrate/nitrite (NO), citrate synthase (CS), complex IV, AMP-activated protein kinase (AMPK), and sirtuin-3 (SIRT3) before and following ABX. Student's T-test was used to compare two groups and ANOVA was used for multiple group statistical comparisons. **RESULTS:** We found that ABX eliminated the enhanced running distance and work to exhaustion in the RGS14 KO mice. Significant baseline SKM metabolite pathways included purine (p<0.001) and phenylalanine (p<0.01) metabolism, branched-chain amino acid (BCAA) metabolism (p<0.01) and pentose phosphate pathway (p<0.05). No significant SKM metabolite pathways were detected after ABX. Mitochondrial protein analysis showed that RGS14 KO had significantly higher NO, CS, AMPK and SIRT3 (77%, 77%, 20% and 265% respectively) relative to WT before ABX. After ABX, the significant decreases in these proteins were augmented in RGS14 KO mice compared to WT, such that the greater levels in RGS14 KO vs WT were no longer observed. **CONCLUSION:** Our findings demonstrate that RGS14 KO SKM responds to changes in resident microbiota that are beneficial to EXC and, upon removal of the microbiota with ABX, the enhanced EXC in RGS14 KO compared to WT was no longer observed. **SIGNIFICANCE:** These findings support the multi-axis communication of the gut microbiota with host muscle and EXC via metabolites and mitochondrial proteins. Additionally, our research contributes to the fast-growing field demonstrating that the alterations to the gut microbiota can affect exercise performance. Future work will translate these findings from the RGS14 KO mouse into human athletes.

Supported by ONR Grant #826640

Cardiometabolic Risk Factors in Hispanic College Aged Women

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Cardiovascular disease is the number two cause of death for Hispanics in the United States. Cardiovascular disease is closely related to high blood pressure, diabetes, hyperlipidemia, and obesity. The Center for Disease Control reported that in 2017-2018, 44.8% of Hispanics met the criteria for obesity. Current literature is unclear regarding the prevalence and severity of cardiometabolic risk factors in Hispanic women between the ages of 18-24. **PURPOSE:** The purpose of this study was to evaluate cardiometabolic risk factors in Hispanic women between the ages of 18-24. **METHODS:** Participants completed an informed consent, IPAQ, Par-Q and medical family history. Participants came to the lab on two different days. During one session, participants arrived 7:00-9:00am following a 12 hour fast; first, participants rested for 5 minutes, and resting heart rate and blood pressure was measured. We then assessed height (free-standing stadiometer), weight (digital scale), hip and waist circumference (Gullick tape), and body composition (bioelectrical impedance). We used a finger stick to assess fasted blood glucose (OneTouch glucometer) and blood lipids (Cardiochek). The second session took place between 10am-2pm as participants needed to be 2-3 hours post-fed. Participants completed two different exercise tests. Participants completed a Bruce protocol on the treadmill; heart rate and rate perceived exertion were recorded. VO_{2max} was calculated from ACSM metabolic equations. After, they completed a pushup test per ACSM Guidelines. Data are presented as means \pm SD. **RESULTS:** We evaluated 12 females (21.00 \pm 0.95 years old) in this study. Our participants had a BMI of 31.5 \pm 8.65 kg/m², a body fat of 35.10 \pm 8.69 %, and waist circumference of 38.07 \pm 5.74 in. Resting blood pressure was 130.67 \pm 13.30 mmHg (systolic) and 58.00 \pm 4.67 mmHg (diastolic). Fasted blood lipids were 150.09 \pm 24.47 mg/dl (TC), 54.18 \pm 10.15 mg/dl (HDL), 94.00 \pm 30.74 mg/dl (TG), and 77.09 \pm 22.31 mg/dl (LDL). Fasted blood glucose was 93.00 \pm 8.83 mg/dl. Calculated VO_{2max} was 30.88 \pm 7.09 ml/kg/min. Participants completed 18.00 \pm 7.93 push-ups. **CONCLUSION:** In conclusion we can see an increase in glucose counts as well as an increase in body mass index, waist circumference, and waist to hip ratio and a low VO_{2max} . **SIGNIFICANCE/NOVELTY:** Our results shows that Hispanic women between the ages of 18-24 have higher than recommended fasted glucose, systolic blood pressure, and body composition along with a low VO_{2max} . This is something that has not been researched and is going to help bring awareness to Hispanic women between the ages of 18-24 and help them to understand the risk factors that are very common in the Hispanic population and these risk factors began early and in order to decrease the risks and understand the importance of keeping track of your health.

Elite Collegiate Swimmers do not meet Carbohydrate Intake and Timing Recommendations During Heavy Training

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Athletes require both increased energy and macronutrient intakes to sustain training and to optimize training adaptations for performance benefits. The International Olympic Committee (IOC) and International Society for Sports Nutrition (ISSN) have established recommendations for the nutrient intakes for athletes, the literature has demonstrated that many athletes do not even meet the recommended daily allowance (RDA) of nutrient intakes (USDA) set for the general population. Research shows that female athletes are at an increased risk of nutrient deficiencies. As well, current exploration of within-day energy balance (WDEB) demonstrates that while athletes may achieve end-of-day energy balance, they may present with poor WDEB. Limited research exists evaluating the nutrient timing strategies of endurance athletes, and it is unclear whether athletes meet sport-specific nutrient recommendations. **PURPOSE:** Secondary to our previous WDEB analysis, assess dietary and macronutrient intake as related to RDAs (USDA, and IOC/ISSN), and timing in swimmers. **METHODS:** In elite male and female swimmers (n=25; 18-22 yr), we assessed energy intake (EI), energy expenditure (EE), macronutrient intake (fat (FAT), protein (PRO) and carbohydrates (CHO)) and macronutrient timing during two weeks of heavy training. Frequency analysis was utilized to determine the number meeting general and athlete-specific RDAs. Repeated-measures ANOVA was used to assess nutrient timing across sex groups. **RESULTS:** Only 6/25 met FAT intake, 7/25 met CHO intake, and 24/25 met PRO intake IOC/ISSN daily recommendations for athletes. PRO consumption was a larger percentage of total EI in male vs female swimmers ($28 \pm 5\%$ vs $23 \pm 3\%$; $F=2.996$; $p=0.014$). No athletes met CHO recommendations pre-, during-, or post-exercise for the first daily training session. 13/25 met pre-exercise CHO recommendations, while only 6/25 and 11/25 met during and post-exercise CHO recommendations for the second training session, respectively. **CONCLUSION:** Macronutrient intake and timing analysis in elite swimmers indicate significant sex differences between male and female swimmers, and that the majority of athletes meet daily recommendations for PRO, but not CHO intake. Similarly, nutrient timing recommendations for CHO pre-, during-, and post-exercise were only met by at best 52% of athletes. Results suggest that during heavy training, swimmers should prioritize further increased CHO nutrient intake, emphasized around and during sport training. Elite collegiate swimmers do not meet carbohydrate intake and timing recommendations during heavy training. **SIGNIFICANCE/NOVELTY:** This study highlights that during heavy training elite swimmers fail to meet CHO intake requirements and nutrient timing is poor. These findings further emphasize the need for sport specific research to aid healthy performance of athletes.

Intermittent Hypoxia Decreases Carotid Artery Stiffness in Men But Not Women

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Sleep apnea (OSA) is linked to an increased risk for dementia. In healthy individuals, both acute and chronic exposure to low oxygen (hypoxic) air increases central aortic stiffness, increases carotid artery lumen size, and decreases carotid artery intima media thickness. In contrast, acute cyclic exposures to low oxygen (intermittent hypoxia, IH) increase blood flow and shear rate in the carotid artery, thereby increasing shear-mediated dilation. IH also causes cerebrovascular vasodilation, suggesting the cerebral vasculature and critical feed arteries are particularly sensitive to IH. However, data come from a primarily male cohort. Thus, the sex-specific effect of IH on carotid artery stiffness, carotid artery hemodynamics, and central aortic stiffness is unknown. **PURPOSE:** To evaluate carotid artery stiffness, carotid artery hemodynamics, and central aortic stiffness before and after IH in young men and women. **METHODS:** In a study of 18 young, healthy participants (10M/8F; 23 ± 5y), carotid artery b-stiffness, arterial compliance (AC), forward wave energy (W1) and carotid-femoral pulse wave velocity (cfPWV) were measured before (BL) and 30 minutes (30P) after IH. IH consisted of 16 cycles of 25 seconds (s) of low oxygen air followed by 90s of room air for 30 minutes. **RESULTS:** Participants achieved an average nadir pulse oxygen saturation (SpO₂) of 92±3% during IH. There was no effect of sex or IH on AC (Women 0.99±0.22 vs 1.06±0.18mm²/kPa; Men 1.05±0.30 vs 1.06±0.27mm²/kPa; p>0.05). Further, cfPWV was unaffected by IH in either sex (Women 5.3±0.2 vs 5.6±0.4m/s; Men 5.7±0.5 vs 5.9±0.7m/s; p>0.05). Men exhibited higher W1 than women at 30P (BL: Women 6,571±1,081mmHg/m/s³, Men 10,000±3,641mmHg/m/s³; 30P: Women 6,057±1,597mmHg/m/s³, Men 9,857±3,799mmHg/m/s³; BL: p=0.06, 30P: p=0.004). Men (5.8±2.5 vs 4.5±1.1 mmHg/m/s³, p=0.046), but not women (5.9±1.5 vs 4.8±0.8 mmHg/m/s³, p>0.05), exhibited a significant decrease in carotid artery b-stiffness after IH. **CONCLUSION:** Whereas acute IH does not impact AC, cfPWV, or W1, we observed a reduction in b-stiffness following IH in men only, suggesting sex influences the relationship between IH and carotid artery stiffness. **SIGNIFICANCE/NOVELTY:** Acute IH is a novel, non-invasive technique capable of influencing cerebrovascular and carotid artery function, both of which are particularly sensitive to hypoxia and are deleteriously impacted by OSA. Further, both IH and OSA exhibit sex differences yet IH is largely conducted in primarily male cohorts. Thus, studying the impact of acute IH on carotid artery stiffness, carotid hemodynamics, or central aortic stiffness and the potential influence of sex on these relationships is critical.

Funded by American Physiological Society (APS) Research Career Enhancement Award.

Exploring a Potential Relation Between Autonomic and Myocardial Function in Duchenne Muscular Dystrophy

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Duchenne muscular dystrophy (DMD) is a rare muscle wasting disorder with a high cardiovascular mortality rate. Structural remodeling of the myocardium is present early in the disease as fibrosis, later progressing to left ventricular (LV) dysfunction and dilated cardiomyopathy. Heart rate variability (HRV) is a robust measure of cardiac autonomic balance impaired in boys with DMD. However, the relation between cardiac autonomic and mechanical function in DMD is not yet understood. **PURPOSE:** To (1) characterize cardiac autonomic balance and LV function in boys diagnosed with DMD (n=8; 15±6 yrs. old) as compared to typically developing controls (n=20; 14±5 yrs. old) and (2) explore a potential relation. **METHODS:** Error-free HRV during quiet breathing was assessed using 3-lead electrocardiogram for 5 continuous minutes. HRV was calculated from heart rate recorded on an individual beat basis in the time-domain as root mean square of the successive differences (RMSSD). Mitral early (E) and late (A) diastolic filling velocities, and E-wave deceleration time (DTE), were measured using pulsed-wave Doppler echocardiography. Early diastolic tissue velocity $e\phi$ was measured as the average of the septal and lateral region using tissue Doppler imaging and used to calculate the E/ $e\phi$ ratio. The mitral E/A ratio was calculated by the division of the highest E and A measured using a sample of 3-5 cycles. Group differences were compared using Mann-Whitney *U* tests and correlations using Pearson's test. **RESULTS:** Parasympathetic activity, as assessed by RMSSD, was reduced in the boys with DMD (DMD: 33±21 vs. Con: 87±42 ms, p=0.002). The mitral E/A ratio was also significantly reduced in the boys with DMD (DMD: 1.51±0.26 vs Con: 2.51±0.66, p <0.001), driven by a significant increase in the A wave velocity (DMD: 0.51±0.10 vs Con: 0.33±0.08 m/s, p<0.001). Although no difference in the E wave velocity was observed, the DTE was significantly lower in the DMD group (DMD: 150±25 vs Con: 194±47 ms, p=0.008). Average $e\phi$ was reduced in the DMD group (DMD: 0.11±0.02 vs Con: 0.15±0.02 m/s, p<0.001), which translated to an augmented E/ $e\phi$ (DMD: 7.33±2.19 vs Con: 5.29±1.06, p=0.007). Importantly, RMSSD was moderately associated with DTE (r=0.58;p=0.003), A wave velocity (r=-0.45,p=0.02), average $e\phi$ (r=0.63;p<0.001), and average E/ $e\phi$ (r=-0.63;p<0.001) when all data were pooled. **CONCLUSIONS:** Preliminary findings suggest reduced vagal tone and impairments in global LV diastolic function in patients with DMD, with a possible relation between cardiac autonomic and mechanical function. **SIGNIFICANCE/NOVELTY:** The identification of a relation between parasympathetic control of the heart and global diastolic function in DMD is of clinical importance in establishing non-invasive, early markers of cardiac dysfunction in this patient population. Larger scale longitudinal studies are indicated for further investigation.

Supported by NIH 1R01HLI55764

Change in Levels of Circulating Angiogenic Proteins in Response to an Acute Bout of HIFT

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High Intensity Functional Training (HIFT) includes multimodal movements emphasizing functional outcomes. While the number of individuals participating in HIFT has increased, little is known about the acute and chronic changes it triggers. Exercise can induce micro-trauma to the muscle that is followed by a well-orchestrated systemic and local response that allows skeletal muscles to properly regenerate and adapt to the stimulus. This response involves the activation of circulation factors involved in angiogenesis. While previous studies have evaluated changes in levels of circulating angiogenic factors in response to an acute bout of exercise, no study has evaluated the responses due to HIFT. **PURPOSE:** to evaluate changes in circulating levels of angiogenic proteins in response to an acute bout of HIFT. **METHODS:** Recreationally active men (n = 7) and women (n = 6) (age: 27.1 ± 9.2 years and body mass index: $23.6 + 2.5$ Kg/m²) completed four sets of a dynamic exercise bout consisting of high-intensity movements targeting eccentric contraction of the lower extremity. Plasma samples were collected before exercise (pre), 15 min post- (post) and 24 h post-completion (24h) of the training session and frozen until analysis using the Angiogenesis 18-Plex Human Panel which allowed simultaneous evaluation of 18 different proteins in each sample. **RESULTS:** Subjects completed the workout in 23.4 ± 5.3 minutes. We reported an increase in bone morphogenetic protein-9 (BMP-9) from pre vs. post (45% increase, p=0.02), while three other proteins showed a decrease from pre vs. post [platelet endothelial cell adhesion molecule-1 (PECAM-1): 25%, p=0.01; vascular endothelial growth factor-A: 19%, p=0.03; Tie-2: 39%, p=0.001]. Leptin levels increased by 37% (p=0.01) from post vs. 24h. Three proteins showed an increase from pre vs. 24h (epidermal growth factor: 33%, p=0.02; granulocyte colony-stimulating factor: 29%, p=0.01; vascular endothelial growth factor-D: 34%, p=0.02), while two proteins showed a decrease (PECAM-1: 19%, p=0.004; lymphatic vessel endothelial receptor-1: 13%, p=0.02). **CONCLUSION:** Our results suggest that acutely (pre vs. post), HIFT induces a systemic decrease in angiogenic circulating factors (BMP-9 has been shown to be both pro- and anti-angiogenic). Additionally, our data shows that HIFT induces varied responses in levels of different proteins from pre vs. 24h. **SIGNIFICANCE/NOVELTY:** This is the first report evaluating the acute changes in levels of multiple angiogenic proteins in response to HIFT.

Supported by Towson University Department of Kinesiology (RQL, DAGM), Towson University Faculty Development & Research Committee (DAGM) and Towson University Research Impact Award (DS).

Fetal Heart Rate During Moderate to High Intensity Resistance Exercise in Pregnant Women

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Fetal heart rate (FHR) is an indicator of fetal stress and has been observed following high intensity aerobic training (>90%Vo₂max), but the effects of resistance training are relatively unknown. **Purpose:** The purpose of this study was to investigate a progressive resistance exercise program on FHR. It was hypothesized that FHR would stay below the 160 beats per minute (BPM) threshold at intensities up to 85% max. A second exploratory aim was to compare FHR response between physically active and sedentary pregnant women to determine if training status influences degree of change during exercise. **Methods:** Healthy pregnant women between 28-32 weeks gestation were recruited to participate. Participants attended three visits over two weeks. Visit 1 included a physical activity questionnaire and exercise familiarization for the squat, incline bench, deadlift, lat pull down (LPD), leg press, and seated row. Visit 2 included 8-RM testing for each exercise. On Visit 3, participants performed 3 sets of 8 repetitions at 50% 8RM, 75% 8RM, and 85% 8RM. Maternal heart rate (MHR) and FHR were recorded after each set, and blood pressure after each exercise. If FHR dropped below 120 BPM or exceeded 160 BPM for greater than 1 minute, the exercise was discontinued. Descriptive statistics, Shapiro-Wilk normality tests, and MANOVAS were used to analyze the data and compare groups. **Results:** Thirty pregnant women participated in the study (31.8 ± 4 yo, pre-pregnancy BMI 24.6 ± 5.5). Sixteen of the 30 women were frequent exercisers (>150 min MVPA/wk) while the rest were not physically active (<90 min MVPA/wk). FHR exceeded 160 BPM in 10 participants but was transient and no participant experienced fetal tachycardia for >1 minute or experienced any other adverse complications. Of the 13 occurrences (3 participants experienced fetal tachycardia twice) 4 occurred after the LPD, 6 after the row, 2 after the deadlift and 1 after the leg press. The active group had a lower resting MHR ($p=0.063$), and a lower FHR change during the squat ($p=0.060$) and the LPD ($p=0.058$). For all other exercises, neither MHR change nor FHR change was different between groups ($p>0.05$). **Conclusion:** Fetal heart rate can increase following resistance exercise >75% max but is transient and returns to normal levels following exercise cessation. Similar MHR and FHR responses were observed for most of the exercises between groups, but the inactive group experienced a greater FHR increase in the squat and LPD exercise. The LPD and row exercise appear to cause greater increases in fetal heart rate possibly due to the increased intrathoracic and intraabdominal pressure produced by the exercise. **Significance:** Results from this study support the safety of resistance exercise up to 85% max on FHR and highlight that being physically active during pregnancy positively influences cardiovascular dynamics to exercise stress.

Support by the ACSM Foundation Doctoral Student Research Grant from the American College of Sports Medicine

Applications of a Pose-Detection Algorithm for Measuring Hip Impact Velocity During a Fall

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Falls are the leading cause of injury among athlete and elderly populations. The direct cause of fall-induced injury is a mechanical load that exceeds the injury threshold and is applied to the body upon impact. The biomechanical features of a fall have been studied in motion capture environments; however, this method is restricted to experimental settings and has limited applicability to real-life scenarios. The recent emergence of a machine learning based pose-detection algorithm offers a promising solution, as it can be applied directly to video recordings to estimate the orientation and position of human joints. **PURPOSE:** To validate the capabilities of OpenPose, a human pose-detection algorithm, when measuring hip impact velocity of falls. **METHODS:** We used a secondary dataset containing 147 videos of 13 older adults ($n = 10$ male, $n = 3$ female, mean age = 64.0 ± 5.9 years) falling in an experimental setting. These videos were accompanied by synchronous motion capture data (VICON), which served as the gold standard reference for the estimation. OpenPose was applied to each video to generate body key points, including the ankle, knee, and hip joints. A MATLAB code was applied to OpenPose and VICON data to calculate fall velocity, defined as instantaneous hip velocity when the hip impacted the ground. To measure agreement between VICON (truth value) and OpenPose (estimated value), the absolute difference of fall velocity (ABS_Diff) was calculated as $(\text{OpenPose} - \text{VICON})$, and relative difference (REL_Diff) was calculated as $[(\text{ABS_Diff}/\text{VICON}) \times 100\%]$. These data were grouped based on relative difference (i.e., less than 10% REL_Diff, less than 15% REL_Diff, and all data). Pearson's correlation analyses were performed for each group to determine associations between the fall velocities measured by VICON and OpenPose. **RESULTS:** Overall, the hip impact velocity measured by OpenPose had strong agreement with VICON (ABS_Diff: 0.17 ± 0.13 m/s; Rel_Diff: 7.7 ± 5.3 %). Among 147 videos, 106 videos (72% of data) had less than 10% REL_Diff, revealing a strong and positive correlation between VICON and OpenPose (Pearson's $r = .929$, $p < .01$). 139 videos (95% of data) demonstrated less than 15% REL_Diff, showing a strong and positive correlation between the measures (Pearson's $r = .88$, $p < .01$). When including all data, Pearson's r was $.831$ ($p < .01$). **CONCLUSION:** OpenPose can accurately measure hip impact velocity during a fall. The pose-estimation algorithm could offer a more feasible approach to quantifying biomechanical features of falls. **SIGNIFICANCE/NOVELTY:** To our knowledge, this is the first study that applies a pose-estimation algorithm to estimate fall biomechanics. Validating this technology in falls could offer a more feasible approach to understanding the mechanisms behind injurious falls and developing interventions to reduce fall-related injuries in both athletes and among the elderly.

Heart Rate Variability Following Blood Flow Restriction Resistance Exercise and Traditional Resistance Exercise

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The autonomic system is influenced by blood flow restriction (BFR) at rest primarily through increases in sympathetic activity. The effect of BFR on the autonomic system in conjunction with resistance exercise is not well known. Autonomic function can be non-invasively assessed by frequency-domain analysis of heart rate variability (HRV). While imperfect, low-frequency (LF) HRV is an index of sympathetic activity, and high-frequency (HF) HRV is an index of parasympathetic activity. **PURPOSE:** To compare the effects of a single BFR resistance training session and a traditional resistance exercise (TRE) session on HRV. **METHODS:** Twenty-five adults (M=14, F=11, age: 22±3yrs, body mass: 71.7±14.5kg, height: 170±10cm) participated in the study. Participation included an enrollment visit with barbell back squat 1 repetition maximum (1RM) testing followed by two randomized and counterbalanced barbell back squat exercise visits ≥ 48 hrs apart. The BFR exercise visit consisted of 4 sets of 30-15-15-15 repetitions at 30% 1RM with 60s rest intervals. The TRE exercise visit consisted of 4 sets of 10 repetitions at 70% 1RM with 60s rest intervals. During both exercise visits, a chest strap heart rate monitor was worn which wirelessly transmitted an electrocardiogram signal to a recording computer. Pre- and post-exercise resting electrocardiograms were analyzed in the frequency-domain using fast Fourier transformation. **RESULTS:** Two-way repeated measures ANOVA found an interaction effect for LF HRV (pre-TRE 48.98±17.71nu; post-TRE 80.39±11.86nu; pre-BFR 49.06±20.72nu; post-BFR 72.07±14.76nu; interaction p = 0.039), as well as HF HRV (pre-TRE 49.82±16.92nu; post-TRE 19.72±11.05nu; pre-BFR 49.68±19.03nu; post-BFR 27.709±14.30nu; interaction p = 0.046). Bonferroni post hoc analysis showed increased LF and decreased HF HRV post-exercise in both conditions (each p < 0.05). Additional post hoc analysis examined the change from baseline and displayed attenuated changes in LF (TRE +30.90±14.42Δnu; BFR +23.01±18.82Δnu; p = 0.039) and HF HRV (TRE -29.67±14.01Δnu; BFR -22.00±18.15Δnu; p = 0.046) in BFR vs TRE. **CONCLUSION:** Both TRE and BFR resistance exercise increased sympathetic activity and decreased parasympathetic activity indices of HRV, but the changes were attenuated for BFR. **SIGNIFICANCE/NOVELTY:** This preliminary investigation suggests that BFR resistance exercise causes less autonomic stress on the body than TRE. This may have beneficial implications for exercise training and recovery.

Physiological, Perceptual and Performance Effects of a Novel Energy-dense Ketogenic Bar

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We recently demonstrated that a novel ketogenic nutrition bar (KB), consumed 3h before rucking exercise (~50% of VO_{2max} ; 14% grade, 2mph, 30% of body weight rucksack), produces similar time-to-exhaustion results to isocaloric high carbohydrate bars (CB). Based on our prior findings, we hypothesized that these results could be extrapolated to a 5-km running time trial (TT). **PURPOSE:** To explore whether acute ingestion of carbohydrate or lipid-based nutritional bars before a 5-km TT elicit unique advantages that can augment aerobic exercise performance. **METHODS:** In a randomized single-blind crossover design, recreational male distance runners ($n = 11$; age: 22 ± 4 yrs., height: 180.1 ± 10.2 cm, mass: 80.1 ± 12.3 kg, VO_{2max} : 58.0 ± 6.9 ml/kg/min) completed two sessions – a 5-km running TT familiarization and a VO_{2max} test – followed by two subsequent 5-km TTs, 3h after consuming 1000 kcal from a novel energy-dense KB (%en from carbohydrate/fat/protein: 5/83/12) or isocaloric CBs (52/30/18). Conditions were separated by a 1-week washout. Blood R - β HB, glucose, lactate, plus subjective measures of fullness and thirst, were measured at baseline, 30 min post-ingestion, pre-exercise, and post-exercise. Total time to completion, heart rate (HR), rating of perceived exertion (RPE), affect, respiratory exchange ratio (RER), oxygen consumption (VO_2), carbon dioxide production (VCO_2) was measured throughout exercise. **RESULTS:** The 5-km TT performance was similar between conditions (CB: 23.9 ± 2.5 min, KB: 23.4 ± 2.6 min, $p = 0.177$). No differences were detected in HR, VO_2 , VCO_2 , RPE, and affect (all $p > 0.05$). The RER was significantly higher after CB ingestion (CB: 0.95 ± 0.04 , KB: 0.90 ± 0.04 , $p = 0.002$). Substrate oxidation rates for fat (CB: 0.3 ± 0.3 g/min; KB: 0.6 ± 0.3 g/min; $p = 0.003$) and carbohydrate (CB: 5.7 ± 0.9 g/min; KB: 6.2 ± 0.9 g/min; $p < 0.0001$) were augmented by KB ingestion. Capillary R - β HB increased modestly after the KB ingestion ($p = 0.009$), while blood glucose increased after CB only ($p = 0.010$). Lactate increased during the TT independent of the condition ($p < 0.0001$). Participants perceived the KB as 59% more filling than the CB ($p = 0.002$). **CONCLUSION:** A novel KB produced equivalent 5-km TT results and elicited greater metabolic flexibility compared to an isocaloric CB. **SIGNIFICANCE/NOVELTY:** Individual responses to alternative, pre-race nutritional snacks – varying in lipid and carbohydrate content – may prospectively help coaches to develop precision nutrition strategies for athletes who wish to maximize their 5-km TT performance.

Supported the Grove City College Exercise Science Department and Keto Brick Inc. (Bryant, AR, USA).

6 Months of Aerobic Exercise Training Preserves Central Pressure Wave Indices in Older Adults

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With advancing age, arterial stiffness increases, leading to faster aortic forward wave transmission and intensified wave reflection. Regular exercise, particularly aerobic exercise, exerts distinct beneficial effects not only on blood pressure but also on pressure wave reflection in younger individuals. Specifically, aerobic exercise enhances arterial compliance in young individuals, thereby reducing wave reflection. Improved arterial elasticity and reduced arterial stiffness contribute to the mitigation of reflected wave intensity, positively affecting cardiovascular efficiency. In older individuals, regular aerobic exercise reduces central arterial stiffness and improves blood pressure. However, the impact of aerobic exercise on pressure waveform indices using wave separation analysis in older individuals is unknown. **PURPOSE:** To evaluate brachial blood pressure and pressure waveform indices in older individuals before and after 6 months of aerobic exercise training. **METHODS:** In a study of 34 older individuals (70±7y; 6M/28F), brachial systolic blood pressure (bSBP), brachial diastolic blood pressure (bDBP), forward pulse height (Pf), reflected pulse height (Pb), and reflection magnitude (REF MAG) were measured before (BL) and after 6 months (6mos) of an at-home, virtual aerobic exercise training intervention. **RESULTS:** There was no significant difference in bSBP and bDBP before and after the aerobic exercise training intervention (bSBP: BL 134±14mmHg, 6mos 133±13; bDBP: BL 74±7, 6mos 74±8mmHG; p>0.05 for both). Further, there was no significant difference in Pf, Pb, or REF MAG (Pf: BL 31±7mmHg, 6mos 31±6mmHg; Pb: BL 20±4mmHg, 6mos 19±3mmHg; REF MAG: BL 65±8%, 6mos 65±2%; p>0.05 for all). **CONCLUSIONS:** 6 months of aerobic exercise training preserves indices of pressure wave reflection in older individuals. **SIGNIFICANCE/NOVELTY:** This is the first study to look at the efficacy of an at-home, virtual aerobic exercise training intervention on blood pressure waveform indices in older adults. The pressure waveform indices provide a novel and detailed insight into blood pressure dysregulation and aberrant wave reflection that occurs with aging. As aerobic exercise influences and modulates blood pressure and, thus the waveform, studying the effect of aerobic exercise training on these indices is particularly relevant to aging and cardiovascular health.

Funded by NIH R01AG0557552 (PI – Smith, Co-I – Ranadive and Prior)

The Effect of Academic Year and Major on Nutritional Knowledge in Division II Female Athletes

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Athletes should make dietary decisions with the intent of fueling their bodies with the appropriate nutrients to maximize performance. Assessing nutritional competency allows sport scientists to gauge the perceived importance of nutrition and identify deficiencies. Current research suggests that collegiate student athletes have nutrition knowledge similar to their non-athlete peers. This is problematic due to the increase metabolic demands placed on athletes during competition and practice. Formal nutritional programming may be the solution to deficits in knowledge, this type of programming could come from a singular class or as part of a student athlete's curriculum. **PURPOSE:** To assess year in school, area of study and history of previous nutrition class on sports nutrition knowledge. **METHODS:** All subjects were currently rostered DII athletes in Northeastern PA, 278 student athletes were identified as potential participants with 119 subjects completing the survey. The survey instrument used was the Sports Nutritional Knowledge Questionnaire. Data was collected using google sheets, scored by the PI (passing score >75%) and analyzed using SPSS V29. **RESULTS:** Results indicate that year in school underclassmen (n=73) and upperclassmen (n=46) show a non-significant (p=0.071) positive trend in nutrition scores of $51.3\% \pm 10.9$ and $60.1\% \pm 13.2$ for underclassmen and upperclassmen respectively suggesting more time in school may lead to greater exposure to nutrition information. Formal nutrition education amongst our subjects did result in significantly (p=0.006) higher scores on the survey. Those students with a formal nutrition class had a mean score of $63\% \pm 14$, while those athletes who have not taken a nutrition course had a mean score of $51\% \pm 10.1$. Lastly, those students in a major related to the health sciences (n=45) had a mean score of $62.71\% \pm 12.7$ with a range of scores from 38%-88%. In contrast, those outside of the Health Sciences (n=74) achieved a mean score of $50.29\% \pm 10.23$ with a range of score from 27%-77%. Further analysis revealed a p-value of .038 which indicated a statistically significant difference between these groups. Although we did uncover significance to higher scores, it is still important to note that only 8.4%, (n=10) of the population passed the survey suggesting there are significant delinquencies in nutritional knowledge. **CONCLUSION:** Data suggests that female student athletes with formal nutrition education and/or are majoring in the Health Sciences have significantly better comprehension of nutritional needs for sport. **SIGNIFICANCE/NOVELTY:** This study agrees with current research suggesting that collegiate female athletes do not have adequate knowledge in regard to nutrition, however those who have had formal nutrition education show greater competency. As a result, this study supports the idea that athletes should have formal education on the topic of nutrition.

The Physiological & Performance Effects of Different Tempos of Music during Exercise

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Music is commonly perceived to enhance exercise performance. Music tempo may also influence exercise performance. **PURPOSE:** To evaluate the effects of music tempo on exercise performance, blood pressure (BP), heart rate (HR), blood lactate, and rate of perceived exertion (RPE) during leg ergometry exercise. **METHODS:** Twelve male and female individuals between the ages of 18 to 23 years were asked to participate in a 4-week study. The subjects were given a Health History Questionnaire to assess their health. Prior to the exercise, the subjects had their resting HR, BP, and blood lactate level measured. After a 3-minute warm-up on the Monark 828e Ergometer with no load, subjects pedaled at a specified resistance ($k_p = 1.5\%$ of body mass). Subjects performed at 10-min cycle session for each of three tempo conditions: slow (S), medium (M), fast (F); and a no music control trial (C). The tempo of the music was randomly assigned for each trial. Subjects were instructed to maintain a minimum of 50 rpm for each trial. Upon completion of each cycle test, the subjects' HR, BP, RPE and distance traveled were recorded. A One-Way Analysis of Variance was used to compare the differences in the measures under four different conditions. **RESULTS:** As expected, there were differences in pre- and post-exercise systolic BP (131.28 ± 14.07 vs. 138.38 ± 14.22 mmHg) and blood lactate levels (5.55 ± 4.78 vs. 7.63 ± 4.28 mmol/L), although these differences were not statistically significant. When comparing music conditions, there were no significant differences in HR (S = 108.7 ± 20.2 ; M = 114.9 ± 15.2 ; F = 118.1 ± 26.3 ; C = 123 ± 14.2 BPM), diastolic BP (S = 72.2 ± 16.7 ; M = 74.2 ± 8.6 ; F = 78.9 ± 15.1 ; C = 82.6 ± 19.2 mmHg), or RPE (S = 10.9 ± 1.7 ; M = 10.4 ± 1.3 ; F = 10.4 ± 1.5 ; C = 11.4 ± 1.8). There were no differences in distance covered based on tempo: $4.83 \pm .48$ km for C; $4.82 \pm .20$ km for F; while the M and S conditions covered $4.56 \pm .48$ km and $4.62 \pm .23$ km, respectively. **CONCLUSIONS:** When looking to maximize exercise performance, fast-paced music seems to yield more of a benefit than medium or slow-paced music. However, no music at all yields the same amount of benefit in exercise performance as fast-paced music. **SIGNIFICANCE/NOVELTY:** Anyone who wants to accomplish the most production from their exercise session may benefit from this study. While the differences were not significant, the fast tempo and control condition did travel about 5% farther than the slower tempos. Had the exercise been longer or more difficult, more substantial differences may occur.

Adrenal Hormone Changes and Associations with Injury during Marine Corps Officer Candidates School

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Marine Corps Officer Candidates School (OCS) is an arduous, multi-stressor 10-week military training program. Exposure to stress can influence the neuroendocrine system, increasing concentrations of adrenal hormones, such as cortisol (CORT) and dehydroepiandrosterone (DHEA), potentially impacting physical performance. **PURPOSE:** Examine changes in CORT, DHEA, and the DHEA:cortisol ratio (DCR) among men and women, and their relation to injury during OCS. **METHODS:** 1006 OCS candidates (age: 24.8 ± 3.2 yrs; BMI: 25.3 ± 2.3 kg/m²; 20.5% women) completed a blood collection before and after the 10-week training program. Musculoskeletal injury (MSKI) data was obtained from OCS staff records. Serum CORT and DHEA concentrations were analyzed using enzyme-linked immunosorbent assays. Statistical analysis was conducted using two-way mixed-measures ANOVAs (time*sex) for CORT, DHEA, and DCR. Biomarker concentrations were compared to injury occurrence using independent samples *t* tests; $\alpha = 0.05$. **RESULTS:** DHEA and DCR had no significant time*sex interactions or main effects. There was a significant interaction effect for CORT concentrations ($p < 0.001$, $\eta^2 = 0.027$). Both men and women illustrated a significant decrease in CORT concentrations from pre- to post-testing, with significantly lower CORT concentrations at post-testing in women compared to men (men: pre = 10.673 ± 3.772 $\mu\text{g/dL}$, post = 9.559 ± 0.198 $\mu\text{g/dL}$, $\Delta = -10.44\%$; women: pre = 11.059 ± 4.750 $\mu\text{g/dL}$, post = 7.900 ± 0.385 $\mu\text{g/dL}$, $\Delta = -28.56\%$; $p < 0.001$). None of the analytes were significantly different between MSKI and non-MSKI participants. **CONCLUSION:** Decreases in CORT, but not DHEA, were observed in men and women following the 10-week training program. These changes were increasingly evident among women, indicating that changes in stress among Officer candidates may be sex-dependent. **SIGNIFICANCE/NOVELTY:** Sex-dependent stress responses provides valuable insights into soldier readiness and could influence physical and physiological performance. Moreover, decreases in CORT concentrations could be indicative of adrenal fatigue caused by chronic stress throughout training.

ONR N00014-21-1-2725

Hippocampal Glucose Transport and Oxidation in Response to Disrupted Blood Flow in an Aging Rat Model of Heart Failure.

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It is well established that cardiovascular pathologies are primary risk factors for the development neurodegenerative diseases, and cardiovascular disease may facilitate neurodegenerative processes by predisposing neurons to impaired substrate metabolism due to chronic hypoperfusion. However, hypoperfusion may stem either from 1) a decrease in perfusion caused by a limitation in cerebral blood flow or 2) from mechanical damage resulting from higher cerebral blood flow and/or pulsatility. However, it remains poorly understood whether these distinct hypoperfusion mechanisms differentially affect substrate metabolism in the brain.

Purpose: Address whether the transport and oxidation of glucose in the brain is differentially affected by high (right) and low (left) cerebral blood. **Methods:** 4-week-old male and female Sprague-Dawley rats underwent transverse aortic constriction (TAC, n=13) or control (SHAM, n=18) surgeries. Rats were sacrificed at 44 weeks, and right and left hippocampal samples were isolated: ~1 mg was homogenized in respiration media and the remainder was homogenized in RIPA buffer. Hippocampal mitochondrial oxygen consumption rate was measured via liquid-phase respiration and a substrate-uncoupler-inhibitor titration (SUIT) protocol. Protein expression of glucose transporters (GLUT1, GLUT3) and markers of mitochondrial quality control (HSP-60, FIS1, DRP1, MFN2, and L-, S-OPA1) were measured via western blot. A two-way ANOVA was used to determine the effects of Condition (TAC v SHAM) and Hemisphere (right v left) on mitochondrial respiration and protein expression of target proteins. **Results:** There was a significant main effect of Hemisphere for complex I-linked respiration ($p=0.02$), with simple main effects revealing TAC animals have higher respiration in the left (low flow) hippocampus when compared to the right (high flow) (4.1 ± 0.22 v 3.4 ± 0.21 nmol/ml/min, $p=0.04$). There was a significant interaction effect ($p=0.04$) in complex II-linked respiration and simple main effects showed lower ($p=0.015$) complex II-linked respiration in the right hippocampus compared to the left (3.4 ± 0.27 v 2.5 ± 0.25 nmol/ml/min, $p=0.015$) in TAC but not SHAM. Lastly, TAC animals had higher expression of S-OPA1 and HSP-60 when compared to SHAM (1.09 ± 0.07 v 0.89 ± 0.06 AU, $p=0.024$, 0.97 ± 0.09 v 0.71 ± 0.05 AU, $p=0.008$, respectively). **Conclusion:** Hypoperfusion from high pulsatile blood flow impairs hippocampal respiration more than hypoperfusion from low cerebral blood flow and upregulation of mitochondrial quality control markers in TAC (compared to SHAM) is similar regardless of cause of hypoperfusion. **Novelty:** The mechanisms behind brain hypoperfusion may induce specific brain metabolic changes during cardiovascular disease, and may help better understand the intersection between cardiovascular disease and neurodegeneration.

Supported by AHA Grant 23PRE1020728

Microvascular Reactivity During a Vascular Occlusion Test Following Blood Flow Restriction Resistance Exercise

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Chronic blood flow restriction (BFR) resistance exercise can improve muscular strength, hypertrophy, and microvasculature function, but the acute microvascular effects are unknown. Microvascular function can be assessed by measuring skeletal muscle oxygen (SmO₂) reactivity following a vascular occlusion test (VOT). **PURPOSE:** To compare the effects of a single BFR resistance training session and a traditional resistance exercise (TRE) session on acute microvascular reactivity in exercising and non-exercising muscle. **METHODS:** Twenty-five adults (M=14, F=11, age: 22±3yrs, body mass: 71.7±14.5kg, height: 170±10cm) completed barbell back squat 1 repetition maximum (1RM) testing followed by two randomized and counterbalanced resistance exercise visits separated by ≥ 48 hrs. Exercise visits consisted of barbell back squat exercise utilizing either BFR; (4 sets of 30-15-15-15 repetitions at 30% 1RM, with 60s of rest intervals), or TRE; (4 sets of 10 repetitions at 70% 1RM, 60s of rest intervals). During both exercise visits, a near infrared spectroscopy sensor (NIRS) measured SmO₂ during a VOT pre-and-post exercise in the vastus lateralis (VL) and flexor carpi radialis (FCR). **RESULTS:** Two-way repeated measures ANOVA found an interaction effect ($p = 0.020$) for SmO₂ reactivity in the VL (pre-TRE 2.94±1.10; post-TRE 3.11±1.30; pre-BFR 2.64±1.00; post-BFR 3.74±1.23). Post hoc analysis found a greater reactivity post-exercise in the VL for the BFR condition ($p < 0.001$), but not the TRE condition ($p \geq 0.05$). There were no time, condition, or interaction effects (all $p > 0.05$) for the same analysis in the FCR. **CONCLUSION:** This analysis suggests that BFR, but not TRE, resulted in acutely improved microvasculature function. Moreover, it suggests that the effects are local to the exercised/occluded limb and not systemic. **SIGNIFICANCE/NOVELTY:** The current study found that BFR resistance exercise improves acute local microvascular function, which may be beneficial to those attempting to improve muscle blood flow and oxygenation while achieving muscle hypertrophy (e.g., during injury rehabilitation).

More Barriers, Less Benefits: LGBTQ+ College Student's Perceptions Impacting Physical Activity Participation

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College years are formative in developing health behaviors that present post-graduation, with physical activity (PA) participation being no exception. However, sexual minority college students continue to report reduced levels of PA compared to heterosexual students. **PURPOSE:** To examine current PA levels and perceived benefits and barriers to PA among college students, by sexual orientation. **METHODS:** This was a cross-sectional survey with a volunteer sample of college students from a large, Northeastern university. The Global Physical Activity Questionnaire (GPAQ) assessed PA levels and a modified Exercise Benefits and Barriers Scale (m-EBBS) assessed perceived benefits and barriers to PA (18 items). The m-EBBS utilizes a 4-point Likert scale of 1 (strongly disagree) to 4 (strongly agree). An exploratory factor analysis, involving a principal factor analysis with a quartimax rotation, of the m-EBBS condensed the 18 items into 3 factors: 1) Barriers to PA, 2) Physical and mental benefits of PA, and 3) Social outcomes of PA. The following criteria were used to determine inclusion of items: communalities >0.30 , a primary factor loading >0.40 , and Cronbach's alpha >0.80 . Kaiser criterion and the scree test informed preferred factor solution. **RESULTS:** Among participants ($n = 114$), a Mann-Whitney U test revealed heterosexual students had significantly higher weekly minutes of active transportation (AT) (Mean [M] = 196.95; standard deviation [SD] = 167.83; $p = 0.05$) and vigorous-intensity PA (VPA) (M = 148.37; SD = 133.13; $p = 0.03$) compared to sexual minority students. A multivariate analysis of variance (MANOVA) evaluated differences in mean scores of the three factors by sexual orientation status, revealing heterosexual students (H) reported less perceived barriers to PA ($M_H = 1.96$, $SD_H = 0.64$ vs. $M_{SM} = 2.55$, $SD_{SM} = 0.77$; $p < 0.001$), more perceived physical and mental benefits of PA ($M_H = 3.65$, $SD_H = 0.46$ vs. $M_{SM} = 2.38$, $SD_{SM} = 0.49$; $p = 0.002$), and more perceived social outcomes of PA ($M_H = 2.85$, $SD_H = 0.72$ vs. $M_{SM} = 2.34$, $SD_{SM} = 0.67$; $p = 0.002$) compared to sexual minority students (SM). **CONCLUSION:** Sexual minority students participate in less weekly minutes of AT and VPA and perceive more barriers to PA and less health benefits (physical, mental, and social) to PA compared to heterosexual students. Future research is needed to examine why these disparities exist and best practices to reduce PA barriers faced by sexual minority students. **SIGNIFICANCE/NOVELTY:** These findings provide further evidence of barriers to PA unique to LGBTQ+ persons with an overall goal of improving health intervention strategies for this marginalized group.

The Effects of Heel Elevation on Back Squat Performance

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Heel-elevated back squats have been used in rehabilitative settings, research has suggested that the exercise promotes less trunk inclination and a more stable posture. Furthermore, the restricted state of plantar flexion during exercise requires less dorsiflexion, a common restriction preventing a complete back squat. There is little research that support these suggested biomechanical effects may have an impact on back squat performance. **PURPOSE:** to examine the differentiating effects of muscle activation and barbell metrics at different heel elevations (0.0 in., 0.5 in., and 1.0 in.). **METHODS:** Utilizing a repeated measures design, 10 resistance-trained (RT) individuals (N = 10, RT years: 4.85 +/- 2.789) performed three sets of 10 repetitions at 70% of their 1RM at the 3 predetermined heel positions. Testing days were randomized, participants were given at least 24 hours in between each session, and participants performed the exercise barefooted to avoid any additional heel elevation. Surface electromyography was used to obtain activation for the knee extensors (RF, VM, VL) and a single inertial measurement unit (IMU) centered on the barbell was used for force-velocity metrics. Mean muscle activation normalized to participants maximum voluntary contraction (MVC), movement velocity (m/s), peak power (W), peak force (N), and concentric distance (in.) were analyzed. **RESULTS:** Paired samples and repeated measures tests analyzed for differences in muscle activation comparing a participant's testing day at 0.0 inches to the days with heel elevations and if there were any enhancements in performance during heel raised conditions. Paired sample results showed significance in RF activation at 0.5 inches ($p = 0.035$; $SD = 2.166\%$), VM activation at 0.5 inches ($p = 0.018$, $SD = 7.151\%$) and slight significance comparing 1.0 inches ($p = 0.055$, $SD = 9.544\%$), all showing a significant reduction in activation. Repeated measures showed a significant decrease in VM activation between sets 1 and 3 ($MD = 4.115$; $SE = 1.126$; $p = 0.001$). **CONCLUSION:** These findings support that in resistance-trained individuals, biomechanical changes can affect muscle activation though not enough to alter performance. **SIGNIFICANCE/NOVELTY:** Muscle activation changes during heel elevated back squats have yet to be researched extensively along with how these changes may relate to an individual's actual performance of the movement.

Psychophysiological Assessment of Workload Under Varying Degrees of Demand and Controllability: A Validation Study

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The efficient execution of intended actions within the tactical athlete can oftentimes impact the overall safety and effectiveness of a mission. While the quality of human performance is known to be impacted by task demand, one dimension far less understood is the controllability of a system (e.g., flight platform responsiveness and handling qualities (HQ)). Traditionally, the assessment of system controllability has been conducted through subjective ratings, which are limited by a lack of objectivity, reliability, and reduced sensitivity to dynamic changes in human workload. Consequently, studies are lacking in the assessment of the objective brain dynamics associated with varying degrees of system controllability and their relation to subjective ratings of workload. **PURPOSE:** To further understand human operator workload and performance through the combined assessment of objective brain dynamics and subjective ratings during varying levels of task demand and controllability. **METHODS:** Fourteen subjects in the Naval Reserve Officers' Training Corps completed a compensatory tracking task under two conditions of task demand (Single-axis, Multi-axis) and three levels of HQ (Easy, Mild, Hard). Electroencephalograms (EEG) and subjective ratings (i.e., Bedford Workload Scale (BWS), NASA Task Load Index (TLX)) were recorded during and following each trial, respectively. Mental workload was computed as the ratio of the EEG theta (θ) and alpha (α) power spectra. Workload comparisons were made using two-way ANOVA with repeated measures. **RESULTS:** BWS ratings were significantly lower for the Easy, compared to the Hard HQ, for both the Single- (3.43 ± 0.35 vs. 5.36 ± 0.4 , $p < 0.05$) and Multi-axis (4.5 ± 0.49 vs. 7.21 ± 0.42 , $p < 0.05$) conditions. TLX ratings were significantly lower for the Easy, compared to the Hard HQ, for both the Single- (35.86 ± 4.45 vs. 58.7 ± 4.23 , $p < 0.05$) and Multi-axis (50.73 ± 5.13 vs. 73.55 ± 2.95 , $p < 0.05$) conditions. Workload indicated by θ/α ratio was significantly lower in the Easy, compared to the Hard HQ for the Single-axis condition (0.91 ± 0.41 vs. 1.08 ± 0.05 , $p < 0.05$). Contrary to expectation, θ/α ratio was significantly higher in the Easy, compared to the Hard HQ for the Multi-axis condition (1.1 ± 0.05 vs. 0.95 ± 0.32 , $p < 0.05$). **CONCLUSION:** Challenging handling qualities significantly increased subjective ratings of workload in addition to objective brain dynamics. Future studies will examine the time-frequency elements of workload to capture the dynamic nature of the brain state with increased temporal resolution. **SIGNIFICANCE:** This study is a first step in further understanding objective biomarkers of operator workload and their relation to subjective ratings of task load and human performance; the results of which ultimately will help inform aircraft engineers in the safe and efficient design of new aircraft.

Supported by Naval Air Warfare Aircraft Division, Sponsor Award Number: N00421-21-1-0003, Award Number: 304805-00001

Multisystem Regulatory Capacity of Exogenous Ketone Administration at Rest

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Acute ingestion of exogenous ketone supplements (EKS) in the form of a (R)-3-hydroxybutyl (R)-3-hydroxybutyrate (R-BD R- β HB) ketone monoester (KME) has demonstrated the ability to alter metabolism and acid/base balance at rest. **PURPOSE:** To explore how a variety of new, yet unstudied, forms of commercially-available EKS modulate metabolism and acid/base balance pharmacokinetics at rest. **METHODS:** Utilizing a single-blind, placebo-controlled, randomized crossover design, twenty healthy participants (M: 10, F:10; age: 20.6 \pm 2.0 y, height: 171.7 \pm 7.5 cm, weight: 67.9 \pm 10.2 kg) visited the laboratory on 5 separate occasions, comprising one familiarization and four main experimental sessions with \geq 7-day wash-out period between experimental sessions. The four main experimental sessions (visits 2 to 5) consisted of metabolic, cardiac (autonomic & hemodynamic), blood gases (acid-base & gas exchange) and cognitive evaluation at rest measured at various time points. The visits differed only in the randomly assigned drink consumed, which included various EKS (395 mg/kg), namely KME, KME+sodium bicarbonate (KME+BIC), and a non-racemic ketone salt (KS), and were compared to a non-caloric taste-matched placebo (PLA). **RESULTS:** All EKS significantly increased blood R- β HB concentration (30 min, KME: 2.6 \pm 0.7 mM; KME+BIC: 3.2 \pm 0.9 mM; KS: 1.5 \pm 0.4 mM; all p <0.001) and reduced blood glucose concentration (30 min, KME: -15.8 \pm 14.7 mg/dL, p <0.01; KS: -11.6 \pm 10.3 mg/dL, p <0.05) compared to PLA. KME ingestion decreased pH (-0.04 \pm 0.03, p <0.001), whereas KS (60 min, 0.03 \pm 0.03, p <0.05) and KME+BIC (120 min, 0.05 \pm 0.05, p <0.001) increased pH compared to PLA. Cognitive performance during the Stroop color word test and switching task did not differ at any time point within or between conditions (all p >0.05). **CONCLUSION:** Exogenous ketosis produced by the ingestion of KS or KME alone (~2-4 mM) does not affect indirect calorimetry, HRV, hemodynamics, or cognition at rest in young healthy males and females. KME+BIC increased the degree of ketosis (~0.5 mM), altered HRV, and increased pH. The non-racemic KS produced a more rapid and higher peak blood ketone concentration compared to previous work in racemic KS, suggesting that such formulations warrant further investigations. **SIGNIFANCE/NOVELTY:** A novel finding is that a non-racemic KS increased blood R- β HB concentration >2.0 mM. This finding warrants future work into comparing KME and non-racemic KS at similar concentrations of EKs to elucidate any further differences or best application for either exogenous ketone source.

Supported by Grove City College Swezey Fund

Associations Between Exercise and Inhibitory Cognitive Control in Young Adult Binge Drinkers

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Physical exercise and alcohol misuse result in opposing effects on numerous health outcomes. However, studies have demonstrated a paradoxical positive association between these health enhancing (exercise) and health compromising (alcohol use) behaviors. The influence of these co-occurring health behaviors on cognitive regulatory mechanisms has not been investigated. **PURPOSE:** To characterize associations between exercise behaviors and inhibitory cognitive control in young adults who endorse binge drinking. **METHODS:** Forty-six participants (28 females; age = 20.9 ± 2.1 years) reported their exercise and alcohol use behaviors and completed an alcohol-cued Go/No-Go task while electroencephalography (EEG) was recorded. Stimulus-locked N2 and P3 event-related potential (ERP) components were recorded to index inhibitory cognitive control. **RESULTS:** Exercise and typical alcohol use were not associated in this sample. No significant differences were found in the N2 component between participants classified as high versus low exercisers; however, lower P3 amplitude and shorter P3 latency was found in the high versus low exercise group, $ps < .10$. Amount of exercise performed per week, but not alcohol use, was also associated with enhanced (more-negative) N2 amplitude, attenuated P3 amplitude, and faster P3 latency, $rs < -.3$, $ps < .10$. **CONCLUSION:** No association was found between exercise and alcohol use. Greater weekly exercise participation was associated with greater inhibitory control; however, the impact of these health behaviors across the lifespan should be studied. **SIGNIFICANCE/NOVELTY:** These findings contrast previous studies suggesting an association between exercise and alcohol use in young adults. Associations were found between exercise and inhibitory cognitive control as indexed by No-Go N2 and P3 ERP components, suggesting a potential cognitive benefit of exercise despite concurrent alcohol binge drinking.

Supported by NIH Grant R21 AA029604

Pushing Beyond the Limits: Disordered Eating, Compulsive Exercise, and Body Image Dissatisfaction in Collegiate Athletes

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Disordered eating is highly prevalent among National Collegiate Athletic Association (NCAA) athletes (Meeusen et al., 2013). Up to 84% of female and 72% of male collegiate athletes reported eating disorder symptoms, such as binge eating, fasting, restricted dieting, compulsive exercise, or using weight loss supplements (Chatterton & Petrie, 2013). These behaviors can contribute to poor health as well as suboptimal athletic and academic performance (Joy et al., 2016). Most individuals suffer with these symptoms in isolation, as these behaviors are often undetected by athletic trainers and coaches (Watson, 2006). **PURPOSE:** To examine the prevalence of eating disorders and compulsive exercise in a sample of collegiate athletes; and to investigate the differences in athletes' disordered eating, compulsive exercise, and body image by gender, sport type, age, and level of athletic participation. **METHODS:** 128 NCAA Division I varsity and club athletes completed the Eating Disorder Examination Questionnaire (EDE-Q), Compulsive Exercise Test (CET), and Multidimensional Body Self-Relations Questionnaire – Appearance Scales (MBSRQ-AS). Correlational analysis, Independent two-sample, and Welch's t-tests were conducted to establish statistical significance for the relationships of interest. **RESULTS:** Eleven athletes (8.6%) met criteria for a clinical eating disorder, while 40 athletes (31.3%) reported subclinical symptoms of an eating disorder. Nineteen athletes (14.85%) scored above the clinical cut-off score for compulsive exercise. In contrast to athletes with no symptoms of an eating disorder, athletes with symptoms of an eating disorder reported using exercise as a weight control measure. Female and lean-sport athletes reported greater disordered eating and body image dissatisfaction than male and non-lean sport athletes, respectively. **CONCLUSION:** Collegiate athletes suffer from a high prevalence of disordered eating due to substantial time demands and socio-cultural pressures associated with their sport participation. **SIGNIFICANCE/NOVELTY:** In addition to focusing on disordered eating, this study explored the frequency of compulsive exercise, a compensatory behavior which is highly prevalent, but often overlooked among varsity athletes. The study findings and implications may aid coaches, athletic administration, and mental health professionals in promptly identifying at-risk athletes through screening protocols and helping them seek professional assistance.

Supported by the Temple University CPH Visionary Research Fund.

Physical Activity and Health Outcomes Among College Students Who Use Cannabis

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Recent changes in legality have made recreational cannabis use more common among college students. Cannabis is commonly perceived to improve sleep and increase sedentary behavior, but studies examining the relationship between cannabis use, physical activity and sleep outcomes are limited, particularly among college students. **PURPOSE:** To determine if there is a significant difference among college students who use cannabis and those that do not in self-reported daily physical activity levels, sleep quality, and blood pressure. **METHODS:** N=246 college students (65% female, 17-23 y) were recruited into a two-year longitudinal study measuring the cardiovascular effects of college lifestyle behaviors. Students completed the International Physical Activity Questionnaire (IPAQ), Pittsburgh Sleep Quality Index (PSQI) and study staff measured systolic and diastolic blood pressure. IPAQ and PSQI questionnaires were scored using standard procedures to calculate IPAQ total Mets and PSQI global score. Participants were queried on their recreational drug use which included asking the number of days they used cannabis/marijuana/THC products in the past 30 days. Those who reported using cannabis products at least one time were compared to those who reported zero days of use. T-tests were conducted to compare outcomes measures between groups and Pearson's correlation coefficients examined the relationship between frequency of cannabis use and outcomes among users. **RESULTS:** Cannabis users had slightly higher average physical activity (3728.2 ± 2639.2 METs) as opposed to non-users (3345.0 ± 2406.2 METs). On average, non-users' sleep score (6.83 ± 2.7), systolic blood pressure (114.9 ± 14.2 mm/Hg), and diastolic blood pressure (78.3 ± 9.2 mm/Hg) were slightly higher than those of cannabis users, respectively [(6.79 ± 2.5) , (113.2 ± 14.0 mm/Hg), (77.1 ± 9.3 mm/Hg)]. No significant differences were found between cannabis users and non-users for physical activity [total METs, $t(239) = -1.18$, $p = 0.24$], sleep quality [$t(1210) = 0.09$, $p = 0.93$], systolic blood pressure [$t(240) = 0.92$, $p = 0.36$], and diastolic blood pressure [$t(240) = 1.05$, $p = 0.30$]. Among users, frequency of cannabis use was not associated with physical activity [$r(128) = 0.027$, $p = 0.76$], sleep quality [$r(81) = 0.11$, $p = 0.34$] or blood pressure (systolic [$r(128) = 0.023$, $p = 0.70$], diastolic [$r(128) = 0.035$, $p = 0.69$]). **CONCLUSION:** Contrary to public belief, cannabis users did not differ from non-users in terms of their physical activity levels, sleep quality or blood pressure. Furthermore, outcomes were not affected by frequency of use. **SIGNIFANCE/NOVELTY:** These findings contribute to the growing body of literature on cannabis use and its potential health effects, emphasizing the need for continued research to comprehensively understand the impact of cannabis on various health domains among college populations.

Supported by NIH Grant R01AA027017

Baseline Biomarkers do not Discriminate Bone Stress Injury Risk during Marine Corps Officer Candidates School

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Bone stress injuries (BSI) are burdensome to military and athletic populations. Efforts to understand early signals or risk factors may help mitigate injury by allowing for prevention and early intervention strategies to be employed. **PURPOSE:** To compare baseline differences in biomarker concentrations between individuals who experience a BSI while attending Marine Corps Officer Candidates School (OCS) and those who do not (Non-BSI). **METHODS:** OCS candidates completed a blood collection at the start of the 10-week training program. Of those who completed pre-training blood collection, 17 suffered a BSI (age 25.0 ± 0.1 yrs; height 171.2 ± 8.8 cm; weight 73.0 ± 11.8 kg; BMI 24.9 ± 2.4 kg/m²) as identified by OCS medical staff. A control group, matched for age, sex, and BMI, but that did not suffer a BSI during training, was also assessed (n=21, age 24.9 ± 2.9 yrs; height 171.8 ± 10.5 cm; weight 73.5 ± 12.3 kg; BMI 24.9 ± 2.1 kg/m²). Blood samples were analyzed via commercial ELISA for sclerostin, osteocalcin, tartrate-resistant acid phosphatase 5b (TRAcP5b), procollagen 1 N-protease (P1NP), and cortisol. Group differences were assessed using an independent samples t-test or Mann-Whitney U test; $\alpha = 0.05$. **RESULTS:** As designed, there were no significant differences in age, height, weight, or BMI between the two groups ($p > 0.05$). Furthermore, there were no differences observed between the Non-BSI and BSI groups for sclerostin (Non-BSI: 23.61 ± 12.28 pmol/L, BSI: 22.68 ± 11.99 pmol/L, $p = 0.78$), osteocalcin (Non-BSI: 18032.8 ± 6102.9 pg/mL, BSI: 18053.6 ± 5964.8 pg/mL, $p = 0.97$), TRAcP5b (Non-BSI: 2.8 ± 0.9 U/L, BSI: 3.0 ± 0.7 U/L, $p = 0.51$), P1NP (Non-BSI: 36899.5 ± 30240.3 pg/mL, BSI: 35494.2 ± 29828.6 pg/mL, $p = 0.41$), or cortisol (Non-BSI: 11.1 ± 4.9 ug/mL, BSI: 9.2 ± 2.8 ug/mL, $p = 0.21$) concentrations. **CONCLUSION:** Baseline concentrations of bone related biomarkers, such as sclerostin, osteocalcin, TRAc5b, P1NP, and cortisol, did not discriminate between those who did and did not suffer a BSI during OCS. These particular biomarkers may have limited utility in anticipating or forecasting the occurrence of BSIs, and thus, may not be reliable tools for proactively preventing such injuries. **SIGNIFICANCE/NOVELTY:** This data may help to refine potential determinants for the prevention of BSIs in military personnel. By identifying individuals at increased risk for certain injuries, enhanced injury prevention strategies and the provision of tailored care to mitigate these risks can be developed. The implementation of such measures holds the potential to reduce the financial burden incurred by the military in treating these injuries, as well as the necessity for rescheduling or repeating training cycles.

Supported by ONR Grant N00014-21-1-2725

Effects of High-Intensity Exercise on Individuals With Parkinson's: A Case Study

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Various forms of exercise have been shown to slow the disease progression and improve physical function in those with Parkinson's disease, one of these forms being non-contact community-based boxing programs. However, there are still inconsistent recommendations for exercise prescription. **PURPOSE:** Parkinson's disease is a progressive neurological disorder, without a cure nor any disease-modifying treatments currently available. Though it is generally accepted that regular exercise should be a component of care for people with Parkinson's (PWP), there currently is a lack in the literature regarding the optimal exercise dose for PWP. This study seeks to determine if there is any additional benefit for PWP from performing high-intensity exercise in a community-based boxing program, which is typically self-paced using an RPE scale. **METHODS:** Two subjects with a diagnosis of Parkinson's disease participated in a community-based exercise session twice a week for six weeks. Each sixty-minute exercise session consisted of a 10-minute warm-up, 30 minutes of boxing drills, 10 minutes of strength and endurance exercises, and a 10-minute cool-down. Subjects wore heart rate (HR) monitors, performed the same exercises, and were also cued by investigators to maintain an HR of 70-85% of the age-predicted max HR. Both subjects completed pre- and post-testing, including Functional Gait Assessment (FGA), Five Time Sit to Stand (5XSTS), Timed Up and Go (TUG), and Activities-Specific Balance Confidence Scale (ABC). Data were analyzed using descriptive statistics, and are reported as mean \pm SD. To determine the efficacy and effect size of the program, results were compared to the minimal clinically important difference (MCID) for each outcome measure. **RESULTS:** Both participants completed twelve exercise sessions without any adverse events. The participants also demonstrated improvements in the FGA (pre 21 ± 1 , post 28 ± 2), 5XSTS (pre 12.9 ± 0.84 sec, post 10.7 ± 1.8 sec), TUG (pre 9.3 ± 0.8 sec, post 7.9 ± 0.6 sec), ABC (pre $84.7 \pm 0.4\%$, post $89.1 \pm 4.0\%$) over the baseline at the post-testing session. Additionally, both participants demonstrated improvements surpassing the MCID for the FGA and the 5XSTS. **CONCLUSION:** Patients with Parkinson's disease participating in a 6-week community-based boxing program demonstrated improvements in four outcome measures related to balance and functional lower extremity strength, and surpassed the MCID for the FGA and 5XSTS, reflecting improvements that are clinically meaningful for the participants. **SIGNIFICANCE/NOVELTY:** Despite the progressive nature of the disease, patients with Parkinson's disease may improve balance and functional strength with a high-intensity exercise program provided in a community-based boxing program. This is the first instance of a community-based boxing program for PWP incorporating an objective measure of exercise intensity.

Behavior Outcomes and Student Learning Resulting From Working with Individuals with Disabilities in Fitness Setting

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It is well-documented that nearly 50% of individuals with mobility impairing disabilities do not engage in any form of exercise, primarily due to accessibility barriers within fitness facilities. One of the major obstacles is the limited access to knowledgeable fitness trainers who are willing and comfortable working with individuals with disabilities (IwD). To address this challenge, a university in Pennsylvania collaborated with a local community program offering group exercise classes for IwD. Students from occupational therapy and exercise science participated in this program for one semester, aiming to enhance their knowledge and comfort in working with IwD in a fitness setting. **PURPOSE:** This study aims to examine the impact of a community-based adapted fitness program on student learning and behavior when serving IwD. **METHODS:** An explanatory single case study design was employed to investigate the learning process and behavior changes of student participants, utilizing Albert Bandura's Social Cognitive Theory as the primary framework. After obtaining IRB approval, student participants that joined in the community-based adapted fitness program were invited to take part in voluntary semi-structured interviews. Each interview was audio-recorded and transcribed. Data analysis was completed by evaluating the transcribed interviews through a categorical aggregation approach to identify patterns, emerging themes, and develop broad and naturalistic generalizations. **RESULTS:** The four primary themes identified were collaboration, comfort, competence, and experience. These themes presented themselves in the student participants as they joined in interprofessional collaboration. The collaboration forced them into a cycle of increased or decreased comfort, competence, and reciprocal learning that ultimately led to an effect on their self-efficacy. **CONCLUSION:** Providing allied health students with an experiential learning opportunity significantly enhanced their comfort, capability, and confidence in working with IwD in a fitness setting. This experiential learning in an adapted fitness setting presents a valuable opportunity to improve the knowledge of future fitness trainers and mitigate one of the reported accessibility barriers experienced by IwD in fitness facilities. **SIGNIFICANCE/NOVELTY:** The experience and learning of the student participants led to increased willingness and ability to work with IwD in a fitness setting, improving accessibility.

25-HydroxyvitaminD Concentration is Not Associated with Central or Peripheral Blood Pressure in Young Black Women

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Vitamin D deficiency is common among U.S. adults and population-based studies have implicated low serum 25-hydroxyvitamin D concentration ([25(OH)D]) in the development of hypertension and other cardiovascular diseases (CVD). Black women (BLW) have a higher prevalence of vitamin D deficiency, hypertension, and CVD than women of other races/ethnicities, and these disparities emerge in young adulthood. Higher brachial (peripheral) blood pressure (BP) has been observed in vitamin D insufficient/deficient ([25(OH)D] < 30 ng/ml) compared to sufficient ([25(OH)D] > 30 ng/ml) older adult BLW. However, not known is if this relation exists in young adult BLW, or if [25(OH)D] is linked to central BP which has been shown to more strongly predict future CVD than the traditionally assessed peripheral BP. **PURPOSE:** To determine if serum [25(OH)D] is associated with peripheral and central BP in young adult BLW. **METHODS:** Participants included young (18-40 years), apparently healthy, nonobese, non-hypertensive, BLW (self-identified). Serum [25(OH)D] was clinically quantified via a fasted venous blood sample. Morning resting supine peripheral BP was measured and central BP was estimated using pulse wave analysis. Pearson Correlation Coefficients were used to evaluate associations between [25(OH)D] and peripheral and central systolic and diastolic BP. **RESULTS:** Fourteen BLW (26±6 years) completed the study. Serum [25(OH)D] ranged between 8.2-55.3 ng/ml. Serum [25(OH)D] was not associated with peripheral systolic ($r = -0.06$, $p = 0.85$) or diastolic ($r = 0.05$, $p = 0.86$) BP, nor central systolic ($r = -0.11$, $p = 0.70$) or diastolic ($r = 0.03$, $p = 0.92$) BP. **CONCLUSION:** Preliminary data suggest low serum [25(OH)D] is not associated with peripheral or central BP in otherwise healthy young adult BLW. A larger sample size is needed to strengthen study findings. **SIGNIFICANCE/NOVELTY:** Vitamin D deficiency and hypertension disproportionately affect young BLW compared to women of other races and ethnicities. Hypertension is one of the strongest independent predictors of CVD, thus, determining if low [25(OH)D] is linked to increased BP in young adult BLW may help mitigate the CVD burden later in life. As compared to investigations in older populations, determining if this relation exists at an earlier age may increase our understanding of associated health risks of low [25(OH)D] in young BLW prior to the development of hypertension and other overt CVDs.

Gait Quality Changes During an Instrumented Six Minute Walk Relate to Function but not Activity Level

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Walking performance is an indicator of overall mobility. Changes in walking speed and capacity can predict musculoskeletal, cardiorespiratory, and metabolic morbidities. Prolonged walking ability evaluated with the Six Minute Walk Test (6MWT) provides summary measures of gait performance over the assessment period. Instrumenting the 6MWT allows clinicians to evaluate stride-to-stride gait quality and changes in gait performance throughout the test. **PURPOSE:** To evaluate how measures of gait performance change during the 6MWT in aging Veterans, and how these changes relate to physical performance and health measures. **METHODS:** Twenty-one Veterans (age: 62.2 ± 6.4 y/o, BMI: 34.0 ± 6.4 kg/m², 12 Male/9 Female) completed self-report (SF-36) and performance-based (four square step test (FSST), gait speed) measures of mobility and health. Veterans then completed the 6MWT with an accelerometer attached to their left ankle. Physical activity level was evaluated with 24 hours of at-home activity monitoring. **RESULTS:** Participants had an average gait speed of 1.2 ± 0.4 m/s and walked 430.6 ± 111.6 m on the 6MWT. There was no significant effect of time on gait performance measures across the minutes of the 6MWT (stance time: $P=0.95$, stance time coefficient of variation (COV): $P=0.93$, stance percent: $P=0.89$, stride time: $P=0.96$, stride time COV: $P=0.91$, swing time COV: $P=0.99$). Having larger increases in stride time ($\rho=-0.59$, $P=0.005$) and stance time ($\rho=-0.66$, $P=0.001$) during the 6MWT were associated with lower self-reported function on the SF-36. Veterans with greater increases in stride time COV ($\rho=0.61$, $P=0.005$) and stance time COV ($\rho=0.51$, $P=0.03$) also took longer to complete the FSST. Larger changes in stride time COV during the 6MWT were related to having a slower gait speed ($\rho=-0.59$, $P=0.005$), and covering less distance on the 6MWT ($\rho=-0.45$, $P=0.04$). Neither sedentary time nor daily moderate-vigorous activity time were significantly related with gait measures during the 6MWT. **CONCLUSION:** Demonstrating greater changes in gait quality throughout the 6MWT is associated with having lower self-reported and objectively measured physical functioning. Summary measures of physical activity were not meaningfully related with gait performance during the 6MWT; future work should explore more granular measures of physical activity mode and timing. **SIGNIFICANCE/NOVELTY:** Adding a single accelerometer to the lower leg during the 6MWT provides insight into gait quality changes during the test. Changes in gait performance during this prolonged walking assessment related with poorer balance and mobility. This may indicate motor control endurance deficits; this mechanism for morbidity development should be explored in future work. The instrumented 6MWT can be used to sensitively track changes in mobility in clinical settings.

Supported by the VA Maryland Health Care System.

Pancreatic β cell Hypersecretion of Insulin in Intermediate versus Morning Chronotype

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Insulin resistance promotes hypersecretion of insulin from pancreatic β cells to maintain normoglycemia. However, declines in pancreatic β cells cause Type 2 Diabetes (T2D). While evidence suggests disruption of circadian rhythms may lead to impaired β cell function and evening chronotypes are at greater risk of developing T2D, no data is available testing the association of chronotype with β cell function. **PURPOSE:** To assess pancreatic function in relation to incretin hormones in morning (MC) and intermediate (IC) chronotypes with obesity. **METHODS:** Adults with obesity were grouped into MC (n=25(4M), MEQ=63.6 \pm 0.9, 52.4 \pm 1.2y, 36.5 \pm 1.0kg/m²) or IC (n=21(5M), MEQ=51.5 \pm 1.1, 56.4 \pm 1.9y, 36.2 \pm 1.2kg/m²) per Morningness-Eveningness Questionnaire (MEQ). Glucose, insulin, C-peptide, GIP, and GLP-1 were collected in 30min intervals during a 120min 75g OGTT. Total area under the curve (tAUC) during the OGTT was calculated using the trapezoidal method. Early (0-30min) and total-phase (0-120min) incremental glucose-stimulated insulin secretion (GSIS: C-peptide/Glucose) and β cell function (disposition index (DI): GSIS scaled to insulin sensitivity) were determined. Peripheral insulin sensitivity (glucose infusion rate (GIR)) and hepatic insulin resistance (HOMA-IR) were assessed during a 120min euglycemic hyperinsulinemic clamp (40mU/m²/min, 90 mg/dl). Body composition (DXA) and aerobic fitness (VO₂max) were also assessed. **RESULT:** No difference in body composition, peripheral insulin sensitivity or incretins were observed, though IC had higher hepatic insulin resistance ($P=0.03$) and lower VO₂max ($P<0.01$) compared with MC. However, IC had higher early phase C-peptide tAUC_{0-30min} ($P=0.04$) and early phase DI_{0-30min} when corrected to peripheral insulin sensitivity ($P=0.059$). Early phase C-peptide tAUC_{0-30min} associated with lower peripheral insulin sensitivity ($r=-0.38$, $P<0.01$) and VO₂max ($r=-0.40$, $P<0.01$), but higher lean body mass ($r=0.47$, $P<0.01$). Hepatic insulin resistance correlated with early phase C-peptide tAUC_{0-30min} ($r=0.35$, $P<0.02$) and lower GLP tAUC_{0-120min} ($r=-0.40$, $P=0.04$). **CONCLUSION:** IC demonstrate early phase hypersecretion of insulin to potentially compensate for peripheral and hepatic insulin resistance for post-prandial glucose regulation compared to MC. Additional β cell function investigation across chronotypes is warranted to optimize treatments that reduce T2D risk. **SIGNIFICANCE/NOVELTY:** This study compared pancreatic function in response to a 75g glucose load between morning and intermediate chronotype in adults with obesity. We provide evidence that adults that identified as IC compared with MC have higher pancreatic insulin secretion in relation to insulin resistance and low GLP-1. Given chronotype reflects unique circadian rhythms, these data suggest chronotype plays a role in T2D development.

Supported by NIH RO1-HL130296

Acute Physiologic Responses Between Voluntary Exercise and Electrical Stimulations

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Electrical stimulations (E-STIM) have been proposed as a feasible alternative for those unwilling or incapable of performing resistance exercise. Studies comparing the efficacy of E-STIM and voluntary exercise have employed different exercises for both conditions (i.e. comparing isometric E-STIM with isotonic voluntary exercises). This makes it difficult to make a fair comparison as the results are contingent upon the arbitrarily chosen voluntary exercises to be completed. **PURPOSE:** To assess differences in physiologic responses to isometric knee extensions completed either voluntarily or via E-STIM. **METHODS:** Two testing sessions were completed each separated by 48h. Each session involved three sets of 10 isometric leg extensions completed on a dynamometer. One leg completed maximal voluntarily isometric contractions and the opposite leg completed E-STIM with the amplitude increased to the maximal tolerable intensity. Before and after each of the exercises, individuals had their muscle thickness measured using B-mode ultrasound and isometric torque measured via dynamometry. **RESULTS:** Twenty-nine individuals (10 females and 19 males) completed the study. Results are expressed as mean (95% confidence interval). The magnitude of torque production during the exercises was greater ($p < 0.001$) in response to voluntary exercise [258 (227, 290) Nm] as compared to E-STIM [34 (13, 54) Nm]. There was no condition x day interaction ($p = 0.112$) nor were there main effects for muscle thickness which increased to a similar extent in response to both E-STIM [0.10 (0.02, 0.18) cm] and voluntary [0.15 (0.08, 0.23) cm] exercise. For isometric strength, there was no interaction ($p = 0.104$) nor were there main effects. Isometric strength did not change in response to either E-STIM [-1.4 (-11.5, 8.7) Nm] or voluntary [-6.5 (19.5, 6.4) Nm] exercise. **CONCLUSION:** Despite substantially greater torque production resulting from voluntary exercise, there were no differences in muscle swelling or fatigue between protocols. These results may suggest that long-term adaptations between voluntary exercise and E-STIM may be similar when the same exercises are employed. **SIGNIFICANCE/NOVELTY:** This is the first study to our knowledge to compare physiologic responses between E-STIM and voluntary exercise that incorporate the exact same exercise (isometric knee extensions). These results provide some support for the efficacy of E-STIM for those who cannot or are unwilling to perform resistance exercise.

Ascorbic Acid Infusion Improves Cerebrovascular Reactivity in Middle-Aged and Older Adults

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Aging is associated with reductions in cerebral blood flow and reduced cerebrovascular reactivity (CVR), both of which may contribute to the development of Alzheimer's Disease. In the peripheral vasculature, increased oxidative stress is associated with aging, and is linked to vascular dysfunction. Infusion of the antioxidant ascorbic acid (AA) has been shown to ameliorate peripheral vascular dysfunction in older adults; however, its effect on cerebrovascular function in humans is not entirely understood. **PURPOSE:** To determine whether oxidative stress reduces CVR in middle-aged and older adults (MA/O). We hypothesized that AA infusion would increase CVR in MA/O but not young adults (YA). **METHODS:** Young (18-29 years) and middle-aged and older (55-79 years) adults were recruited for two identical experimental visits. Each visit consisted of the same measures performed both before and after the infusion of either AA or a control solution (SAL). Infusions were administered in a random order and researchers were blinded to the treatment. CVR was defined as the change in mean middle cerebral artery blood flow velocity (MCAv) during hypercapnia, which was achieved using a computer-based gas blender that increased the subjects' end-tidal partial pressure of carbon dioxide ($P_{ET}CO_2$) 9 mmHg above baseline for a 3-minute period. MCAv was recorded using a transcranial Doppler ultrasound probe placed over the temporal window. Two-way ANOVAs were used to assess the effect of AA and SAL on CVR. Fisher's LSD tests were used to assess main effects when necessary. **RESULTS:** 8 YAs (25 ± 2 years) and 14 MA/Os (65 ± 6 years) completed the experimental visits. No main effect of either age or condition (pre/post) was observed in response to hypercapnia following either AA or SAL infusion. However, a significant age x condition interaction effect was observed for CVR ($p = 0.016$) following the infusion of AA, but not following infusion of SAL. Post hoc testing indicated that the difference in CVR was due to an increase in CVR the MA/Os (3.3 ± 1.7 %/mmHg pre vs. 4.1 ± 1.9 %/mmHg post, $p = 0.006$) following AA infusion. **CONCLUSION:** Our main finding is that AA infusion restores CVR in MA/Os, but not YAs. This suggests that age related increases in oxidative stress may impair cerebrovascular function and contribute to the development of cognitive impairment. **SIGNIFICANCE/NOVELTY:** These findings are significant as they indicate that oxidative stress may impair the functioning of cerebral blood vessels, providing a potential therapeutic mechanism for future interventions to delay or prevent the development of age-related cognitive impairment.

Supported by NIH Grant P20 GM113125

The Encoding Specificity Principle in a Stressful Motor Sequence Learning Context

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PURPOSE: The Encoding Specificity (ES) Principle by Thompson and Tulving (1970), describes the notion that learner should practice a to-be-learned skill under conditions similar to those in which the skill is to be later performed. While the basic premise of ES seems reasonable, it does not seem to be a guiding force when it comes to building practice regimens. Many practice sessions are conducted under circumstances of relatively low stress. If ES is broadly applicable accurate, one would imagine that such a discrepancy between practice and performance conditions would be counterproductive compared to instances in which the conditions were comparable. In this investigation, we will seek to explore this possibility. We specifically hypothesize that individuals who practice a novel skill under congruent conditions (both practice and performance conditions were conducted under similarly stressful conditions) compared to those individuals who practiced under incongruent conditions (practice and performance conditions were conducted under dissimilarly stressful conditions). **METHODS:** On Day 1 of this two-day study, after completing a block of familiarization trials, participants were asked to complete ten practice blocks of a motor sequence learning task using a standard computer keyboard, the ninth block of which contained a random sequence. On Day 2, participants returned for a posttest and to complete another random sequence block. On both days, self-report data was also gathered to assess the quality of the manipulation. All participants provided informed consent. **RESULTS:** Contrary to our hypothesis, no significant difference was seen between groups in terms of task performance during the posttest ($t(45)=-0.764$, NS [one-tailed]). Furthermore, and also counter to expectation, we observed that the congruent group did not display greater performance improvement from Day 1 to Day 2 relative to the incongruent group ($t(45)=-1.95$, NS [one-tailed]). Indeed, in opposition to ES, the incongruent group displayed marginally greater performance enhancements from Day 1 to Day 2 (16712 ± 5042) than the congruent group (13611 ± 5829 ; $t=-1.95$, $p=0.057$ [two-tailed]). **CONCLUSIONS:** Our hypothesis was not supported, and our findings are indicative of results counter to the predictions of the ES principle. **SIGNIFICANCE/NOVELTY:** These unexpected results may point to a limitation in the generalizability of ES to stressful contexts. Indeed, the effects of stress during learning and performance may provide unique effects which overshadow and/or contradict any potential benefit derived from ES. Further work is needed to examine the interrelationships between these variables.

This research was not supported by any external funding agency.

Affective and Perceptual Responses Between Voluntary Exercise and Electrical Stimulations

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Despite the known health benefits associated with resistance exercise, most individuals do not meet established guidelines. One proposed alternative involves electrical stimulations (E-STIM), but it is unknown how individuals perceive E-STIM relative to that of voluntary exercise. Affective and perceptual responses are important to consider as they are good determinants of long-term adherence. **PURPOSE:** To compare affective and perceptual responses between voluntary resistance exercise and E-STIM. **METHODS:** Individuals completed two testing sessions involving three sets of 10 isometric leg extensions. One leg completed voluntarily isometric contractions producing as much force as possible against an immovable lever arm. The opposite leg completed the same exercises involuntary via E-STIM with the stimulation amplitude set to the maximal tolerable intensity. After each exercise, individuals provided affective (ratings of enjoyment) and perceptual (discomfort and perceived fatigue) responses. At the end of each session individuals rated which exercise they preferred to complete. 48h later a second session was completed to determine if these responses changed after repeated use. **RESULTS:** Twenty-nine individuals (10 females and 19 males) completed the study. Results are expressed as mean (95% confidence interval). For discomfort, there was no condition x day interaction ($p=0.124$), nor were there main effects. Discomfort in the E-STIM condition averaged 6.0 (5.3, 6.7) as compared to 5.5 (4.7, 6.3) for the voluntary exercise. There was also no interaction ($p=0.367$) nor were there main effects for enjoyment with both voluntary exercise [0.6 (-0.5, 1.6)] and E-STIM [0.6 (-0.5, 1.7)] rated as “neutral”. For perceived fatigue, there was no condition x day interaction ($p=0.961$), but there was a main effect of condition ($p<0.001$), with perceived fatigue greater in the voluntary [5.5 (4.7, 6.3)] as compared to the E-STIM [4.2 (3.4, 5.0)] condition. For participant preference, there were no differences on day 1 ($p=0.122$) with 17% of individuals having no preference, 35% preferring voluntary exercise, and 48% preferring E-STIM. On day 2, there was a difference ($p=0.021$) with 10% having no preference, 38% preferring voluntary exercise and 52% preferring E-STIM. **CONCLUSION:** E-STIM may be a feasible alternative to voluntary resistance exercise as it may reduce sensations of fatigue and tends to be preferred over that of voluntary exercise. Future studies may wish to seek how long-term adaptations compare between these two protocols. **SIGNIFICANCE/NOVELTY:** This is the first study to our knowledge to compare affective and perceptual responses between E-STIM and voluntary exercise that incorporate the exact same exercise (isometric knee extensions). These results provide support that E-STIM may be a feasible alternative for those unwilling or incapable of performing resistance exercise.

The Relationship of the FMS to Anthropometric Markers in Women with Breast Cancer

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The functional movement screen (FMS) is a pre-participation screen comprised of seven movements, each scored from 0 to 3. Exercise practitioners can use an individual's FMS screen to tailor a specific exercise regimen to eliminate movement imbalances, potentially reducing risk of injury. Previous literature suggests that FMS scores negatively correlate with body mass index (BMI), body fat percentage (BF%), and age, and positively correlates with activity levels (AL), in healthy middle and older aged adults. However, to our knowledge, no study has assessed the FMS in a breast cancer (BC) population, potentially limiting the FMS's ability to guide exercise programs in individuals with BC. **PURPOSE:** The aim of this study was to assess the relationship of FMS to BMI, BF%, age, and AL, in individuals with BC. **METHODS:** Forty women being treated for BC underwent a 3-month thrice weekly dose-escalated exercise regimen utilizing multi-joint compound movements and linear progression exercise regimen, in an exercise oncology facility. Pre- and post-workout assessment of body composition, functional mobility and balance, and activity levels were measured. **RESULTS:** The FMS score negatively correlated with BMI, AL, and age, and positively correlated with activity level ($r = -0.22, -0.35, -0.10, 0.41$, respectively). However, a significant relationship was found with BF% and AL (both $p < 0.05$), and not BMI or age. **CONCLUSION:** With the exception of age, the relationship of the FMS to BMI, BF% and AL in women with BC was similar to that of individuals without BC, seen in previously published literature. Therefore, our data suggest that the FMS screen could be used as a pre-participation screen for individuals with BC undergoing an exercise intervention. **SIGNIFICANCE/NOVELTY:** This was the first study to assess the relationship of the FMS to BMI, BF%, age, and AL in women with BC. Women with BC often present anthropometrically similar to individuals without BC. However, due to the potential morbidity of BC diagnosis and the subsequent treatment, the relationship of FMS to anthropometric markers could not be assumed. Our data suggests that the FMS can be implemented in women with BC undergoing an exercise intervention in a similar manner to those individuals undergoing an exercise intervention without BC.

Relationship Between Isometric Inter-Limb Asymmetry and Strength of the Lower Extremity in Military Personnel

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Isometric (IM) muscle force measures for single and multi-joint assessments have been previously measured using isokinetic machine and hand-held dynamometry in military personnel. Differences between the left and right limbs (inter-limb asymmetry, ILA) are expressed using equations with cutoffs indicative of performance decrement and increased injury risk. Recently, there has been an increase in the usage of portable fixed dynamometry to assess single-joint ILA (sILA) as well as multi-joint ILA (mILA) on force plates via the IM mid-thigh pull (IMTP). However, the relationship between sILA and mILA has yet to be investigated utilizing these techniques. **PURPOSE:** To assess the correlation of the peak force and magnitude of sILA IM methods using portable fixed dynamometry compared to the mILA using the IMTP in military personnel. **METHODS:** 22 men (age: 30.3 ± 4.9 years, height: 178.6 ± 7.7 cm, weight: 86.0 ± 9.9 kg, body fat percentage: 16.9 ± 5.4 %) volunteered. Single joint peak force and sILA were assessed with a portable fixed dynamometer where participants produced 3-5 second maximal IM contraction in the ankle plantar- and dorsi-flexor (ankle DF, PF), knee extensor and flexor (knee EXT, FLEX), and hip ab- and ad-ductor (hip AB, AD) muscle groups. An IMTP implemented with dual force plates captured multi-joint peak and mILA force data from 3-5 s maximal IM contraction for at least 2 reps. Peak force from both techniques was normalized to body mass (N/kg). ILA was expressed as $((\text{right limb peak force} - \text{left limb peak force}) / (\text{greatest limb peak force}))$. A composite score of all sILAs was reported as the mean of all sILAs and reported as a single score, which was compared with the IMTP mILA. Spearman's correlation coefficients (ρ) were conducted to estimate the association between sILAs and mILAs ($\alpha = 0.05$, 2-sided). **RESULTS:** All single-joint peak force values, except ankle DF, were significantly associated with IMTP values, (ankle PF; $\rho = .499$, $p = 0.018$, knee FLEX; $\rho = .688$, $p < 0.001$, knee EXT; $\rho = .483$, $p = 0.023$, hip AB; $\rho = .668$, $p < 0.001$, hip AD; $\rho = .462$, $p = 0.030$). None of the individual sILA analyses were significantly correlated with IMTP mILA, but sILA composite was positively correlated with the IMTP ($r = .469$, $p = 0.028$). **CONCLUSION:** A composite sILA score may have utility in associating all the joints compared to isolated percentiles, given that the IMTP is a multi-joint test. **SIGNIFICANCE/ NOVELTY:** These methods allowed for field-expedient and standardized sILA and mILA testing. These results demonstrate the relationship between peak single and multi-joint force tests that appear to be moderate to strongly correlated. However, ILA between the single and multi-jointed techniques do not appear to be related. Task specific techniques may be warranted for a more appropriate evaluation of performance and injury risk.

ONR #N00014-22-1-2769

Improving Physical Literacy and Increasing Physical Activity Participation of Youth for Better Health Outcomes

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The World Health Organization (WHO) has identified physical inactivity as the fourth leading risk factor for global mortality. There is a positive correlation between physical literacy (PL) and engagement in physical activity (PA) **PURPOSE:** The purpose of this program was to improve PL through education and motor skill competencies to increase physical activity participation in youth. **METHODS:** Six PL lessons were conducted over the course of six weeks to 3-5th grade students in a New Jersey public school. The lessons included the following topics: health introduction, cardiovascular, strength, coordination, fine motor skills and balance. Each lesson started with an instructional video, then physical lessons on the topic, followed by physical games and/or challenges and ended with a group discussion on the topic. A subset of students filled out a physical literacy and confidence survey and completed a battery of movement skills (jumping jacks, squats, target throw and balance) pre and post educational intervention. Assessments were conducted by trained practitioners who focused on movement quality. Descriptive statistics and paired sample T tests were conducted on the assessment and survey scores. **RESULTS:** A total of 18 students completed the assessments. Squat quality ratings improved following the intervention ($p=0.052$), no change was observed for jumping jacks and balance ($ps>0.05$), and ball throw ability decreased ($p=0.01$). Skill quality among the group was low with only 46.7% being able to score sufficient for jumping jacks, 17.6% for squat, 41.2 and 35.3 for right and left sided balance but 76% of the students reported feeling very confident about their gym class scores. **CONCLUSION:** Statistics did not show a consistent overall change from pre to post test. Skill quality for all activities was low in general yet the majority of students reported feeling confident about their movement scores. **SIGNIFICANCE/NOVELTY:** Students reported high confidence in their movement abilities yet scored poorly on tests of physical skills. This disconnect between perception of physical abilities and actual abilities may contribute to lower levels of participation in PA. When individuals are not competent in motor skills, they have lower PL, and engage in less PA. Further study is needed using a larger sample size and grades other than 3-5 to determine how best to improve motor competencies with the goal of increasing PA for students.

Supported by Horizon Grant AWD00010814

Effects of Different Muscle Recovery Techniques following a Delayed Onset Muscle Soreness-Inducing Exercise Protocol

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Muscle recovery following a muscle damage-inducing protocol is often difficult to quantify. Muscle recovery is subjective and each individual who experiences muscle damage is likely to report a greater or lesser degree of soreness depending on their tolerance to pain. While numerous muscle recovery techniques exist to help alleviate soreness, the most effective technique is unclear. **PURPOSE:** To quantify muscle recovery following a damage-inducing exercise protocol by examining the effects of static stretching, foam rolling, and electrical stimulation and their effect on muscle swelling, range of motion, and perceived pain following exercise. **METHODS:** Subjects were randomly divided into four groups; passive recovery (PR), static stretching (SS), foam rolling (FR), and electrical stimulation (ES). All subjects completed a standardized lower body exercise protocol aimed at inducing delayed onset muscle soreness (DOMS) and measurements of thigh girth, range of motion of the knee, and perceived pain were assessed before (Pre), immediately post (IP), 24, 48, and 72 hours following the lower body workout. Comparisons were made using a two-way ANOVA with repeated measures. $P \leq 0.05$ was considered statistically significant. **RESULTS:** There were no significant differences with regards to range of motion or thigh circumference between any of the experimental groups or times examined. However, there was a significant difference in perceived pain ($P=0.012$). The SS group saw a 4.5 decrease in perceived pain from IP to 72 hours post lower body workout when compared to the ES (-3.5), FR (-3), and PR (-1.5) groups, respectively. **CONCLUSION:** Static stretching following exercise appears to improve perceived pain of DOMS better than foam rolling, electrical stimulation, or passive recovery. **SIGNIFICANCE/NOVELTY:** The novelty of this study was that it examined multiple muscle recovery techniques across time instead of just one recovery technique versus a control group.

Implementation of Physician Referral Process Into an Established EIM-OC Program at Slippery Rock University

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Promoting physical activity and exercise has become essential with the rising incidence of sedentary behavior and its associated health risks. Although exercise offers many benefits and reduces the risk of chronic disease, people often struggle with maintaining exercise programs. Through receiving referrals from local physician offices, the Exercise Is Medicine on campus (EIM-OC) at SRU aims to reach community members who can benefit from exercise. To date, referrals have only been received from the Student Health Center. **PURPOSE:** The purpose of this project was to evaluate the referral process from Slippery Rock Family Medicine (SRFM) into the established EIM-OC program at Slippery Rock University. **METHODS:** The EIM-OC referral program at SRU has expanded to partner with SRFM. Healthcare providers agreed to screen patients for exercise participation at every visit. Patients who were eligible were given medical clearance and referred to EIM-OC. Exercise sessions were supervised by an EIM-OC Graduate Assistant or Exercise Science Intern and consisted of a one-hour individualized exercise prescription, three days per week. Health/wellness questionnaires, volume of exercise, and exercise adherence were assessed pre-post 8-week exercise intervention and at 2 and 3-month follow-ups. **RESULTS:** Referrals were accepted for 15 participants (7 males, 8 females; age 52.5 ± 7.3 y). Average weekly aerobic volume significantly increased (PRE- 37.7 ± 81.2 v. POST- 196.1 ± 68.9 min/week; $P < 0.05$) by the end of the exercise intervention, whereas self-reported sedentary time remained the same (PRE- 10.6 ± 3.9 v. 9.0 ± 2.9 hours/day; $P > 0.05$). There was 97.5% compliance to the exercise intervention in our cohort, though the average body weight remained the same (PRE- 102.8 ± 20.5 v. POST- 101.6 ± 20.0 kg; $P > 0.05$). Eight of 15 participants submitted two-month follow-up data compared to 5 who submitted three-month follow-up data. Self-reported physical activity at two months (176.9 ± 84.4 min/week; $P < 0.05$) and three months (201.0 ± 89.6 min/week; $P < 0.05$) was significantly greater than baseline (37.7 ± 81.2 min/week). However, self-reported physical activity remained the same at two months (176.9 ± 84.4 min/week; $P > 0.05$) and three months (201.0 ± 89.6 min/week; $P > 0.05$) compared to post (196.1 ± 68.9 min/week). **CONCLUSIONS:** Incorporating physician referrals into the EIM-OC program was feasible and created a positive relationship with SRFM. The program was successful in increasing the volume of exercise in adults with various comorbidities. **SIGNIFICANCE/NOVELTY:** To our knowledge, few universities have established an EIM-OC referral program by which members of the community are referred for exercise intervention by their physicians. These findings provide valuable insights for universities looking to promote physical activity within their communities.

The Effects of Core Pre-Conditioning Exercises on Vertical Jump and Dynamic Balance

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Muscular pre-conditioning exercises have been shown to evoke a post-activation performance enhancement (PAPE); however, few studies have assessed PAPE following a warm-up using muscle activation of the anatomical core. **PURPOSE:** The purpose of this study was to examine the immediate effects of implementing core activation (CA) exercises as part of a warm-up on vertical jump (VJ) and single-leg dynamic balance. **METHODS:** Nineteen NCAA or competitive club athletes (9 males and 10 females) aged 18-22, without core or lower extremity injuries limiting participation, volunteered for the study. A familiarization session designed to teach participants the exercises and testing protocols preceded the study. The study utilized a cross-over design for the warm-up treatments. The control warm-up was a light, 4-minute jog on a treadmill at a self-selected pace followed by the testing procedures. The CA program sequence consisted of a matched 4-minute warm-up and 5 exercises designed to systematically progress from the isolated deep, inner core muscles to integrated global/outer core muscles with increasingly complex motor control demands. The CA was comprised of abdominal bracing (1 min), Birdog (30 s/side), side planks (30 s/side), prone plank (1 min), and curl-up (1 min), followed by the testing procedures. Testing included the VJ for lower quarter power and the Y Balance Test (YBT) to assess single-leg dynamic balance with a composite score and sub-scales of anterior reach (AR), posterior medial reach (PMR), and posterior lateral reach (PLR). The differences between treatments for each test and sub-scales were analyzed using a paired t-test ($p < 0.05$). **RESULTS:** CA demonstrated significant improvement in scores over non-treatment in the YBT for the composite score of the right leg, 100.3 ± 5.7 vs 101.7 ± 6.1 , and the left leg 100.2 ± 5.7 vs 101.6 ± 5.8 . CA also increased the sub-scale scores of the YBT for the PLR of both the right and left legs (102.9 ± 9.0 cm vs 106.5 ± 9.1 cm, $p < 0.01$ and 102.9 ± 9.4 vs 105.5 ± 9.5 , $p < 0.01$, respectively). However, no differences were found in the AR and PMR for the right or left leg. CA did not significantly improve VJ. Jump scores for control were 52.6 ± 12.4 cm and with CA were 53.3 ± 13.2 cm. **CONCLUSION:** Results demonstrated that a short CA program did not improve lower quarter power; but may produce a PAPE for tasks and movements that require rotational dynamic stabilization. **SIGNIFICANCE/NOVELTY:** Core exercises have been investigated for years; however, their potential immediate impact on lower extremity power and single-leg balance performance has not. The results of this study appear to move the discussion forward by suggesting that the PAPE principle using the described exercise protocol may be task-dependent. Specifically, tasks such as single-leg asymmetrical and rotational movements may benefit more from this strategy than bilateral leg and non-rotational movements.

Is the Resting Metabolic Rate Ratio a Good Proxy Indicator of Energy Deficiency in Men? A Preliminary Study.

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Active individuals who have low energy availability may experience an energy deficiency, evidenced by low serum total triiodothyronine (TT3). The ratio of measured-to-predicted resting metabolic rate (RMRratio) has been established as a proxy indicator of energy deficiency and metabolic compensation in active women, but parameters for men have not yet been established. **PURPOSE:** To determine if RMRratio is associated with TT3 in active young men and to investigate possible cut-offs of the RMRratio to predict energy deficiency. **METHODS:** Subjects were men aged 22 ± 0.5 years ($n=41$), with a body mass index of $16-29.9 \text{ kg/m}^2$, exercising for a minimum of 150 min/week and who achieved peak oxygen consumption of at least $44 \text{ mlO}_2/\text{kg}/\text{min}$. Dual-Energy X-Ray Absorptiometry (DXA) assessed body composition. RMR was assessed after a 12-h fast via indirect calorimetry and a blood draw was obtained to assess serum TT3. The ratio of the measured RMR to the predicted RMR was calculated using the predictive equations of Cunningham₁₉₈₀, Cunningham₁₉₉₁, Harris-Benedict, and Hayes (DXA-predicted). Pearson's correlation coefficients and simple linear regressions determined the relationship between the RMRratios and TT3. Subjects within the lowest sample tertile of TT3 were categorized as energy deficient. **RESULTS:** The DXA-predicted (0.966 ± 0.014), Cunningham₁₉₈₀ (0.968 ± 0.013), and Cunningham₁₉₉₁ RMRratios (1.019 ± 0.014) were positively correlated with TT3 ($114.4 \pm 3.4 \text{ ng/dl}$) ($r=0.493$, $R^2=0.243$, $p=0.001$; $r=0.351$, $R^2=0.123$, $p=0.025$; and $r=0.379$, $R^2=0.144$, $p=0.015$, respectively), and the Harris-Benedict RMRratio (0.953 ± 0.017) was negatively correlated with TT3 ($r=-0.474$, $R^2=0.225$, $p=0.002$). A cut-off of 0.98 using Cunningham₁₉₈₀ predicted low TT3 with a sensitivity of 78.6% and a specificity of 51.9%, a cut-off of 1.00 using Cunningham₁₉₉₁ yielded 71.4% and 59.3%, respectively. The highest sensitivity and specificity were 78.6% and 66.7%, respectively, obtained with a 0.97 cut-off for the DXA-predicted RMRratio. **CONCLUSION:** The Harris-Benedict RMRratio does not account for body composition differences and does not seem useful to predict TT3. The Cunningham RMRratios and the DXA-predicted RMRratio have the potential to be used as proxy indicators of energy deficiency in men, but more data is necessary to confirm that assumption. **SIGNIFICANCE/NOVELTY:** This is the first study to investigate RMRratio cut-offs of energy deficiency in active young men.

Acknowledgements: Ana Carla Chierighini Salamunes is funded by the Fulbright Commission Brazil and CAPES.

Comparison of Fat Oxidation During Walking on a Normal and Lower Body Positive Pressure Treadmill

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Lower body positive pressure treadmills (LBPPT) decrease ground reaction force by providing a lifting force as the treadmill chamber is inflated. These treadmills can be a beneficial exercise for larger patients with greater body fat. Substrate utilization is reflected in exercise intensity and fat oxidation (FatOx) is a function of intensity and total caloric expenditure. **PURPOSE.** To compare FatOx on a LBPPT and normal treadmill (NT). The first hypothesis tested was that LBPPT would have a significantly lower FatOx at each stage. A second hypothesis was that maximal FatOx would occur at a later exercise time point on the LBPPT compared to NT. **METHODS.** FatOx was measured using indirect calorimetry during a treadmill walking protocol. Seven apparently healthy college-aged female volunteers completed the following 6 stage graded protocol: standing, warm-up at $58.96 \text{ m} \times \text{min}^{-1}$, and exercise at $88.44 \text{ m} \times \text{min}^{-1}$ with a 3% grade increase per stage on NT and LBPPT. Each stage was 3 minutes. The LBPPT was set at 80% of normal body weight. Metabolic data were collected every 15 seconds. Each volunteer fasted prior to participation. Steady state (SS) was considered the last minute of each stage. Volunteers completed all 6 stages or when the respiratory exchange ratio (RER) reached 0.95. **RESULTS.** FatOx rate was calculated based on SS oxygen consumption (VO_2) and carbon dioxide production (VCO_2) values. Average (\pm SD) FatOx rates ($\text{g} \times \text{min}^{-1}$) on the NT were 0.39 ± 0.08 , 0.47 ± 0.08 , 0.45 ± 0.10 , 0.45 ± 0.09 , 0.39 ± 0.21 , 0.44 ± 0.11 , 0.21 ± 0.10 . Average (\pm SD) FatOx rates on the LBPPT were 0.36 ± 0.11 , 0.35 ± 0.08 , 0.32 ± 0.06 , 0.32 ± 0.08 , 0.35 ± 0.06 , 0.34 ± 0.10 , 0.33 ± 0.11 for warm up and stages 1-6, respectively. Repeated measures ANOVA was run on treadmill type and 4 stages of exercise (stage 1, 2, second to last stage, and last stage). There was a statistically two-way interaction between treadmill type and stage, $F(3,18)=22.11$, $p<0.001$. Simple main effects were determined for treadmill type and stage. Pairwise comparison showed mean FatOx did not change over the four different stages on the LBPPT, $F(3,18) = 0.23$, $p = .646$. Mean FatOx was significantly different over treadmill stage on NT, $F(3,18) = 46.679$, $P<0.001$. Pairwise comparisons for NT showed that FatOx was significantly lower for the last stage compared to the three earlier stages ($p<0.05$). There were no significant differences in FatOx for stages 1, 2 and second to last stage on NT. **CONCLUSION.** Current study demonstrates greater FatOx on NT at moderate exercise intensities compared to LBPPT. The first hypothesis is supported for stages 1, 2, and 3 yet not for other stages. The current protocol was not able to elicit an identifiable maximal FatOx on the LBPPT. **SIGNIFICANCE/NOVELTY** Maximal FatOx on NT may need to be individually determined as evidenced by the different stage that volunteers achieved an 0.95 RER value. Future studies are needed to better identify maximal FatOx on LBPPT.

The Effect of Salt Loading on Arterial Stiffness: Potential Role of Aerobic Capacity

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Dietary sodium intake is positively associated with arterial stiffness, and both are known risk factors for cardiovascular disease (CVD). High aerobic capacity is associated with lower arterial stiffness and reduced CVD risk. Therefore, we sought to examine the acute effect of high sodium intake on arterial stiffness and whether this effect is associated with aerobic capacity.

PURPOSE: To test the hypotheses that (1) short-term salt loading (SL) would increase arterial stiffness and (2) aerobic capacity would be inversely related to the effect of SL on arterial stiffness. **METHODS:** Peak oxygen consumption (VO_{2peak}) was determined via a graded exercise test on a cycle ergometer in 26 healthy adults (14F/12M; 27 ± 4 yrs). Participants were studied twice, following 10 days of SL (10g of sodium chloride capsules) or placebo (PL) capsules, in random order. Participants were instructed to maintain their typical diet throughout the study. At each visit, carotid-femoral pulse wave velocity (cf-PWV) was determined via tonometry to provide an index of arterial stiffness and 24-hour urinary sodium excretion was assessed to confirm compliance. Mean arterial pressure (MAP) was measured via brachial sphygmomanometer to account for the influence of blood pressure on cf-PWV. Differences in urinary sodium excretion and cf-PWV across conditions were analyzed via paired sample t-tests. Pearson's correlations were performed to examine the effects of aerobic capacity and changes in MAP on cf-PWV during acute salt loading. **RESULTS:** VO_{2peak} ranged from 20.1 – 69.1 ml/kg/min (mean \pm SD: 37.2 ± 11.7 ml/kg/min). Urinary sodium excretion was greater after SL compared to the PL condition (SL: 286 ± 109 ; PL: 165 ± 73 mmol/24 hr., $p < 0.001$). Cf-PWV was not different between conditions (SL: 5.4 ± 0.9 ; PL: 5.3 ± 0.6 m/s; $p = 0.47$). The change in cf-PWV between conditions was not associated with VO_{2peak} ($r = -0.001$, $p = 0.996$). Notably, the change in cf-PWV was positively associated with the change in MAP between visits ($p = 0.05$). However, the association between VO_{2peak} and cf-PWV remained non-significant after controlling for the change in MAP, via partial correlation ($r = 0.062$, $p = 0.77$). **CONCLUSION:** Contrary to our hypothesis, increased sodium intake in healthy young adults did not increase arterial stiffness and aerobic capacity was not associated with the effect of increased sodium on arterial stiffness. **SIGNIFICANCE:** Our findings are notable as the influence of aerobic capacity on the effects of high sodium diets is not well studied. Although high aerobic capacity is cardioprotective and reduces arterial stiffness, we found that aerobic capacity did not impact the effect of acute salt loading on cf-PWV in young adults; however, this should be tested in older and clinical populations.

Supported by NIH Grants 5R01HL104106 and 5P20GM113125; AHA 20POST35080171; Graduate Scholars Award through the UD Graduate College.

Changes in Vitamin D and Hematological Micronutrients and Association with Skeletal Health During Marine Officer Candidates School

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Changes in micronutrients, including vitamin D and iron, have been observed during military training but are often assessed within a single sex and in isolation. The integral role of vitamin D in maintaining calcium homeostasis and musculoskeletal health is well understood, however, whether iron deficiency affects bone metabolism and further, the confluence of both deficiencies in men and women undergoing the same arduous training and how that may affect the skeleton have yet to be studied. **PURPOSE:** To characterize sex-specific hematological and nutritional status of men and women undergoing 10-weeks of Marine Officer Candidates School (OCS), determine interrelationships of biomarkers included, and examine how alterations to status affect skeletal health. **METHODS:** OCS candidates including 251 men (23 ± 3 y, 177.05 ± 6.74 cm) and 52 women (24 ± 3 y, 165.00 ± 5.87 cm) underwent two assessment time points, Pre (T1) and Post (T2). Iron status, including serum total iron, iron saturation and total iron binding capacity (TIBC), was measured via immunoenzymatic assays. Hepcidin was measured via Simple Plex ELLA. 25-hydroxyvitamin D (25(OH)D) was measured via mass spectrometry. Vitamin D and hematological status changes were assessed with two-way mixed-measures ANOVAs. Volumetric bone mineral density, geometry, and bone strength were assessed via pQCT (XCT2000, Stratec, Germany) at the distal metaphysis, mid-diaphysis and proximal diaphysis. Pearson correlation (r) determined associations between hematological parameters. Multiple linear regression analysis was performed with bone parameters as the outcome variable and absolute change and baseline ferritin—a sensitive marker of iron status—and 25(OH)D, age, sex and BMI as explanatory variables. **RESULTS:** Decreased concentrations (main effect of time) of 25(OH)D (8-10%), total iron (20-35%) ferritin (18-37%), iron saturation (18-37%) and hepcidin (14-26%) were observed following training (all $p < .001$). Main effects of sex were observed such that women exhibited greater 25(OH)D ($p = .019$) and total iron binding capacity (TIBC) while men exhibited greater serum iron, ferritin and iron saturation (all $p < .001$). Change in iron saturation ($r = -.125$, $p = .032$) and baseline hepcidin ($r = -.145$, $p = .032$) were significantly correlated with change in 25(OH)D. Regression analysis revealed 25(OH)D significantly predicted between 26.3% of the variation in cortical density and thickness (both $p < .04$) while ferritin results were nonsignificant. **CONCLUSION:** OCS deleteriously affected micronutrient status similarly in men and women, which were weak, but significantly related. **SIGNIFANCE/NOVELTY:** These results suggest an emerging association between vitamin D and iron status with plausible implications for operationally relevant outcomes such as physical work capacity, energy metabolism and stress fracture risk.

ONR N00014-20-C-2020

Mental Workload Assessment During Performance of Structured and Unstructured Action Sequences Under Different Motor Demands

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Mental workload (MWL) describes the degree of neural resource engagement used to address both high-level cognitive and low-level sensorimotor processing demands. ‘Chunking’ involves consolidation of a set of stored elements, such as actions, into fewer clusters (i.e., ‘chunks’) to reduce working memory recruitment. Despite work in cognitive and motor domains, chunking is not well understood in the context of cognitive-motor tasks requiring high- and low-level processing to execute action sequences (e.g., cooking, mounting/repairing devices). Further, how high- and low-level interactions affect MWL is unclear. **Purpose:** Examine how low- and high-level processing interactions influence performance, MWL and fatigue in an industrial context when imitating action sequences with different demands on both processing levels. **Methods:** Twenty participants watched an action sequence (the reference sequence) video showing how to maintain industrial equipment by removing an object from a PVC pipe with a tool without touching the pipe (i.e., without a touch error). Participants were divided into two groups who had to extract a small (low motor demand; LMD) or large (high motor demand; HMD) object from the pipe. Both groups completed two conditions: an action sequence with an obvious logical order meant to facilitate chunking (structured condition ST) and one with no pattern (unstructured, UN) meant to limit participants’ ability to use chunking, thus increasing working memory engagement. Performance was assessed with sequence completion time (SCT), number of touch errors (TE) and Levenshtein distance (LD), the latter based on comparing the reference sequence to the executed sequences. Surveys were used to assess MWL and mental and physical fatigue (MF, PF). For statistical analyses, all data were log transformed to an approximately normal distribution and subjected to a 2 Group (LMD, HMD) x 2 Sequence (ST, UN) repeated measures ANOVA. **Results:** A main Sequence effect was identified such that SCT (ST = 21.27 ± 5.78 , UN = 28.42 ± 9.48), LD (ST = 0.37 ± 0.66 , UN = 2.17 ± 2.49), MWL (ST = 19.18 ± 18.58 , UN = 45.36 ± 27.6) and MF (ST = 13.21 ± 17.56 , UN = 20.32 ± 18.82) were all significantly lower ($p < 0.05$) for the ST relative to UN sequences. Additionally, a main Group effect was revealed showing higher TE for HMD (0.39 ± 0.44) compared to LMD (0.09 ± 0.15) participants ($p < 0.05$). **Conclusion:** Results suggest that during task execution, level of motor demand did not affect sequence completion, MWL or fatigue, only touch errors. This suggests that the cognitive resource allocation system is robust enough to handle sequences with different degrees of cognitive challenge irrespective of the level of motor demand. **Significance:** This work can inform training and rehabilitation strategies and has implications for system design and human-machine interactions.

Funded by the Office of Naval Research (N00014-19-1-2044).

Perceived Wellness and Common Barriers to Wellness Services and Programming Following COVID-19

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Participation in wellness programming and fitness trends have shifted following the COVID-19 pandemic. Identifying common obstacles to wellness programming may provide clarity on services needed relative to accessibility. **PURPOSE:** The study was designed to identify prominent barriers to participating in wellness services and investigate the current perceptions of personal wellness based on six domains (physical, social, emotional, psychological, intellectual, and spiritual) following the COVID-19 pandemic. **METHODS:** Participants were recruited to complete an online survey from March 2022 to March 2023. Participants (N=356) age ranged from 18-87 years (46.44 ± 18.01 yrs), with 29.3% self-identifying as male (n=104) and 66.8% self-identifying as female (n=237). Participants were primarily from the United States (87.9%, n=313) and were located in New England (65.2%, n=232), Mid-Atlantic (7%, n=25), South 5.1% (n=18), and Mid-West 4.8% (n=17) regions. Key measures included the Perceived Wellness Survey, demographics, and a questionnaire adapted to analyze prominent barriers to participating in wellness services. Perceived wellness (PWS) was calculated as a composite score. Pearson's correlation was utilized to identify the strength and association between PWS, subscales, and demographic variables. **RESULTS:** Mean PWS was 15.238 ± 3.713 (min=5.09; max=28.8). Subscale scores ranked as followed (score range: 1-6): social (4.73 ± 0.86), spiritual (4.72 ± 0.94), intellectual (4.71 ± 0.75), psychological (4.51 ± 0.85), emotional (4.40 ± 0.90), and physical (4.36 ± 1.01). A positive, weak relationship was found to exist between age and physical ($r=.212$; $p<.001$) and intellectual ($r=.195$; $p<.001$); a negative, weak relationship was found to exist between age and social ($r=-.116$, $p<.05$). A negative, weak association was identified between the frequency of identified obstacles to participating in wellness programs and PWS ($r=-0.26$; $p<.001$). Most common obstacles identified were "lack of time" (45.8%), "scheduling conflicts" (34.8%), and "lack of motivation" (33.7%). **CONCLUSION:** These findings suggest that overall decreased perceived wellness may be associated with a higher prevalence of obstacles to participation in services. When planning wellness programs and services a focus should be placed on accessibility relative to time constraints, scheduling, and motivation, while also targeting lower scored dimensions of wellness (e.g. physical and emotional). **SIGNIFICANCE/NOVELTY:** Following COVID-19, shifts in programming needs have been identified but perceived wellness is highly individualized, which can make program development difficult. The aim of the current project was to identify current trends and barriers on a larger, more global scale to provide direction for development of local and regional community wellness needs analyses.

Relevance of Food Labels in Purchasing Habits of University-age Students

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PURPOSE: With rising rates of obesity on college campuses, combined with the high food insecurity simultaneously experienced by college students, the question of food availability and food purchasing behaviors has become even more prominent. This study aimed to examine prominent factors determining food purchasing behaviors in college-aged students (18-25 years). **METHODS:** Participants were drawn from the Food Labels study (PI: Liguori) and recruited online and in person. Data from n=6, 18-25-year-old participants from Phase 1 completed a vignette survey and participated in cognitive interviews to determine survey acceptability and validity. In the vignette survey, participants were randomly shown three food labels and asked how likely they were to purchase the product. The labels varied by: 1) food type (yogurt, cereal, or black beans); 2) cost (25% off coupon vs. no coupon); 3) FDA “Healthy” logo (logo vs. no logo); and 4) shopper rating (3-star rating vs. 5-star rating). Interviews were audio-recorded and transcribed verbatim. Transcripts were coded using qualitative analysis techniques to reveal themes and patterns in the data. **RESULTS:** Qualitative analysis revealed several themes regarding the prominent factors determining food purchasing behaviors in college-aged students. Interviews revealed that “healthy” was primarily defined by the nutrient content of the food and food preference emerged as a primary influence on food choice. Participants in this age group felt confident in their abilities to purchase “healthy” food. Participants food purchasing behavior primarily focused on the convenience of food and whether it fell within the categories of food they typically purchased. **CONCLUSION:** Decisions regarding food choices on college campuses are multifaceted and may be limited by the education and availability of food on campuses. **SIGNIFICANCE/NOVELTY:** This study adds to our limited understanding of food purchasing behavior in college-aged students. Campus food options are limited mostly to dining halls and a few campus restaurants. These menus contain food high in sodium with few “healthy” options, making it difficult for students to focus on health. Campus food environments and policies should support healthier options for college-aged individuals.

Exercise Dose in Relationship to Sleep and Overall Health in University Students

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Fewer than 50% of college students meet physical activity guidelines which recommend at least 150 min/week of aerobic exercise and/or two d/week of resistance exercise. Although it is widely known that physical activity has positive effects on sleep and physical health, it remains unclear how the dose of aerobic and resistance exercise relates to each. **PURPOSE:** To determine how dose of aerobic exercise, with or without meeting resistance exercise guidelines, relates to sleep and overall health in university students. **METHODS:** Participants (N=1773, 70% female) completed a survey that included questions about their physical activity (amount/frequency of aerobic and resistance exercise), overall health, sleep latency, sleep duration, height and weight. Participants were stratified into six groups based on aerobic (Low: <150min/week, Mod: 150-300 min/week, High: >300 min/week) and resistance (Low: <2d/week or High: \geq 2d/week) exercise. ANOVAs and ordinal regressions compared groups. **RESULTS:** There were no group or sex differences in BMI ($p=0.29$). Although groups did not differ in self-reported sleep latency, there was a main effect of sex ($p<0.001$) such that females took longer to fall asleep once they closed their eyes compared to males. There was a significant main effect of group on weeknight sleep duration ($p=0.03$). Post-hoc comparisons between groups revealed that High/Low participants reported less sleep compared to Low/High ($p=0.01$), Moderate/Low ($p=0.07$) and Moderate/High ($p=0.01$) participants. High/High participants also reported shorter weeknight durations compared to Moderate/High participants ($p=0.02$). For students in the Low/Low group, the odds of describing overall health as worse was 2.36 (1.76-3.18, $p<0.001$) times that of students in the High/High group. For students in the Mod/Low group, the odds of describing overall health as worse was 2.21 (1.52-3.22, $p<0.001$) times that of students in the High/High group. For students in the High/Low group, the odds of describing overall health as worse was 1.74 (1.21-2.49, $p=0.003$) times that of students in the High/High group. **CONCLUSION:** Those who engaged in a high level of aerobic and resistance exercise self-reported their overall health as better compared to those who exercised less. Surprisingly, more exercise, particularly aerobic, was associated with less weeknight sleep. This may be due to these two health behaviors competing for time. Additional work is warranted to understand how exercise dose interacts with physical and mental health to optimize well-being in young adults. **SIGNIFICANCE/NOVELTY:** These data highlight that while engaging in high levels of aerobic and resistance exercise benefits overall health, engaging in too much aerobic exercise may reduce sleep duration. Further, 2 d/week or more of resistance exercise is adequate for benefiting overall health and sleep at lower amounts of aerobic exercise.

Markers of Mitochondrial Fusion and Mitophagy are Greater in Old versus Young Rat Skeletal Muscle

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Due to the mitochondria's essential role in energy production and regulation of metabolism, mitochondrial health is linked to skeletal muscle health. In healthy skeletal muscle, mitochondria exist in a dynamic reticulum that shares membrane potential and matrix contents. This reticulum is maintained by a balance of mitochondrial fusion, fission, and mitophagy which ensure adequate energy production is maintained. However, aging may cause detrimental alterations in skeletal muscle mitochondrial structure and function. **PURPOSE:** Determine whether there are age- and sex-related differences in the protein expression of markers of mitochondrial fusion (MFN2, OPA1), fission (Fis1), and mitophagy (Parkin, Pink1) in skeletal muscle. **METHODS:** Tibialis anterior muscles were excised from 16 young (≤ 6 months) and 16 old (≥ 18 months) male and female Sprague-Dawley rats after euthanasia. Western blotting was used to determine MFN2, OPA1, Fis1, Parkin, and Pink1 protein expression, normalized to total protein in each sample. Citrate synthase activity was measured as a surrogate for muscle mitochondrial content. ANOVAs were used to compare protein expression, with age and sex as factors. **RESULTS:** MFN2 expression was elevated 2.6-fold in old compared with young skeletal muscle (0.065 ± 0.006 vs. 0.025 ± 0.004 AU, respectively, $P < 0.001$); however, OPA1 expression did not differ between young and old animals ($P = 0.841$). There was an age*sex interaction for Fis1 expression ($P = 0.049$), however there were no differences between any groups. Parkin expression was >4 -fold higher in old compared with young skeletal muscle (0.120 ± 0.020 vs. 0.029 ± 0.006 AU, respectively, $P < 0.001$); however, Pink 1 expression did not differ between young and old skeletal muscle. Citrate synthase activity did not differ with age ($P = 0.440$). **CONCLUSION:** Specific markers of mitochondrial mitophagy (Parkin) and outer membrane fusion (MFN2) increase in skeletal muscle with age. However, a marker of inner mitochondrial membrane fusion (OPA1) does not change in skeletal muscle with age. While fusion can serve as a compensatory mechanism for dysfunctional mitochondria to preserve membrane potential and energy production, our results indicate the potential for incomplete fusion, with a resultant increase in mitophagy in older skeletal muscle. **SIGNIFICANCE/NOVELTY:** Abnormal mitochondrial fusion and mitophagy may serve as a contributing factor to age-associated detrimental changes in skeletal muscle. Altering these processes may improve mitochondrial health and subsequently skeletal muscle health with age.

Supported by AHA 16SDG30770015 and NIH AG064571

The Relationship Between Physical Activity and Anxiety and its Effect on Quality of Sleep

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PURPOSE: To investigate the relationship between anxiety symptoms, physical activity and sleep in a large diverse sample of college students. **METHODS:** N=246 college students (65% female, 17-23 y) were recruited into a two-year longitudinal study measuring the cardiovascular effects of college lifestyle behaviors. Participants completed the International Physical Activity Questionnaire (IPAQ), the Pittsburgh Sleep Quality Index (PSQI), and the Beck Anxiety Index (BAI). Questionnaires were scored using standard procedures to calculate IPAQ total MET-minutes/week and PSQI global scores. The BAI standard categorizations of 1=minimal, 2= mild, 3=moderate, and 4=severe were recategorized into a new variable which had two categories: not anxious (BAI scores 1 and 2) and anxious (BAI scores 3 and 4). T-tests were conducted to compare outcomes measures between BAI groups, and Pearson's correlation coefficients examined the relationship between anxiety symptom severity and sleep and physical activity. **RESULTS:** There was no significant difference in physical activity between participants who were anxious (3731.9 ± 2743.6 METs) and those who were not anxious (3530.1 ± 2479.0 METs) ($p > 0.05$), and BAI and IPAQ scores were not correlated ($p > 0.05$). Participants who were anxious exhibited significantly higher PSQI global scores (8.2174 ± 2.2202) compared to those who were not anxious (5.9610 ± 2.4519) ($t(121) = -5.11$, $p < 0.0001$), and there was a significant positive correlation between BAI and PSQI scores ($r(121) = 0.46$, $p < 0.0001$). **CONCLUSION:** Participants who were anxious exhibited poorer sleep compared to those who were not anxious, and greater anxiety symptoms were associated with poorer sleep. However, anxiety was not associated with physical activity, as measured in total MET-minutes/week. Future research is needed to determine if intensity or modality of physical activity is associated with anxiety symptoms in this population. **SIGNIFICANCE/NOVELTY:** The majority of college students report experiencing 'overwhelming anxiety'. The effects of anxiety are profound and often include feelings of nervousness, increased heart rate and the inability to relax. Physical activity and high-quality sleep are known to have a positive impact on easing symptoms of anxiety, and lower levels of anxiety are associated with improved sleep.

Supported by NIH Grant R01AA027017

Interlimb Asymmetries in Strength, Balance, and Gait Tasks in Marine Officer Candidates

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Interlimb asymmetry (ILA), the difference in performance or function between limbs, may be associated with injury risk and performance decrements. However, ILA values can vary between tasks and metrics, such as strength, balance, or gait assessments. **PURPOSE** To compare the magnitude and directionality of ILAs in strength and balance assessed by laboratory screening tests with ILAs in gait during an in-field training event. **METHODS** This analysis includes 73 candidates during Marine Corps Officer Candidates School (OCS) (age 24.7 ± 3.6 y; height 173.9 ± 8.8 cm; weight 77.5 ± 11.0 kg; 21 women). Candidates performed laboratory screening tests at the start of OCS: isometric mid-thigh pull (IMTP) and single-limb balance (SLB), and an in-field training event during OCS: 9-mile loaded ruck march carrying 50 lb packs. Candidates performed 2 trials of IMTP on dual force plates with 2 minutes rest between each trial; the trial with the highest peak force (PF; N) was used. Candidates performed 2 trials on each limb of 10 second SLB on a force plate to measure average sway distance (SD; mm), defined as the movement of the center of pressure in the medio-lateral and anterior-posterior planes, to determine postural control. During the march, inertial measurement units (IMUs) were placed above the medial malleolus of each limb and average step intensity (9M-I; g) was determined from impact acceleration. ILA was calculated using the symmetry angle equation and reported as a percent difference (%) between the right and left limbs for PF, SD, and 9M-I. A negative ILA value indicated lower PF and greater SD and 9M-I in the left limb compared to the right. The level of agreement between ILAs in PF, SD, and 9M-I was determined using Pearson correlation coefficients (r). For those with an ILA, Kappa coefficients (κ) were calculated to determine if ILA direction was consistent between measures. Data were reported as mean \pm SD (range); $\alpha = 0.05$, two-sided. **RESULTS** Average ILAs were $0.4 \pm 5.7\%$ (-10.9 - +16.2) for PF, $1.6 \pm 8.1\%$ (-17.3 - +20.2) for SD, and $0.5 \pm 3.2\%$ (-7.8 - +7.2) for 9M-I. These ILAs were not significantly correlated ($r = -0.070$ to -0.041 , $p = 0.567-0.728$) and there was poor agreement in directionality ($\kappa = 0.003-0.052$, $p = 0.656-0.983$). **CONCLUSION** The magnitude and direction of ILAs in strength and balance assessed by laboratory tests were not in concordance with the ILA in gait measured during the in-field training event. **SIGNIFICANCE/NOVELTY** Military training often occurs in the field where it is difficult to quantify ILAs. ILAs in strength and balance measured during laboratory screenings are not effective indicators of ILAs in gait measured during in-field training events. When assessing ILAs, practitioners should be aware of differences in measurement from various tasks and metrics. Future studies should explore ILAs of tasks that are specific to the operational demands of military in-field training.

ONR N00014-21-1-2725

Sweat Electrolytes, Intensity, And History on The Prediction of Exercise-Associated Muscle Cramps: A Multifactorial Approach

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Exercise-associated muscle cramps (EAMCs) are one of the most common conditions to occur during or after physical exercise. The pathophysiology behind these cramps has remained unclear making it difficult for sports medicine personnel to effectively prevent or treat. The fluid and electrolyte theory and the altered neuromuscular control theory are the two main theories circulating in past literature and it was not until recently that some researchers have suggested taking a multifactorial approach. **PURPOSE:** To determine if sweat sodium concentration, self-perceived intensity, and having a history of EAMCs predicted the development of EAMCs in Collegiate American football players. **METHODS:** Forty division three football players were recruited to participate in three trials during the regular football season. Sweat sodium concentration was collected via a sweat patch that was applied to the right forearm and removed after 70 minutes of practice. Sweat sodium concentration was then analyzed using the Horiba LAQUAtwin Salt-22 NaCl Compact Ion Meter (LAQUAtwin-Salt-22, Horiba Scientific). Self-perceived intensity was measured post-practice using the Borg RPE score. History of EAMCs was measured prior to trial participation using a History of EAMCs questionnaire. A post-practice questionnaire was used to determine if the participants experienced an EAMC or not after each trial. **RESULTS:** None of the predictor variables had a significant effect on the development of EAMCs for any trial ($p > .05$). Only two EAMCs were reported between the three trials with one EAMC reported after the second trial and one EAMC reported after the third trial. For trial 2, 62% of the outcome variable (EAMCs) was explained by the predictor variables (Nagelkerke $R^2 = .620$). For trial 3, 49% of the outcome variable (EAMCs) was explained by the predictor variables (Nagelkerke $R^2 = .494$). **CONCLUSION:** This study did not find that sweat sodium concentrations, self-perceived intensity level, and having a history of EAMCs were accurate predictors for the development of EAMCs. Although none of the predictor variables produced a statistical significance ($p < 0.5$), some trends were noticed. The two players that did experience an EAMC cramped during trials where their own individual sweat sodium concentration was higher compared to the other trials. Both participants that did experience an EAMC also reported a higher level RPE and had a history of EAMCs. Future research should continue to investigate a multifactorial approach to identify predictor variables between the two popular EAMCs theories. **SIGNIFANCE/NOVELTY:** To the best of the researcher's knowledge, there has been no published study investigating a multifactorial approach to predicting exercise-associated muscle cramps. Previous research has explored possible predictors associated with the fluid and electrolyte theory and the altered neuromuscular control theory, but not combining possible predictors from both theories.

Effects of A Betalain-Rich Concentrate on Respiratory Exchange Ratio, Lactate, and Skeletal Muscle Oxygen Uptake

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Beetroot juice (BRJ) has become a popular supplement for improving athletic performance during exercise. Betalains, bioactive pigments contained within BRJ, have been shown to improve vascular function due to their antioxidant and anti-nitrosative properties; however, these effects have not been substantiated in response to acute running exercise on substrate utilization, lactate (LAC) accumulation, and localized skeletal muscle oxygen (SMO₂) consumption. **PURPOSE:** To determine whether consuming a betalain-rich concentrate (BRC) improves respiratory exchange ratio (RER), LAC, and SMO₂ compared to a placebo in college-age students. **METHODS:** Seventeen college-age male students consumed 100 mg of freeze-BRC containing 25% betalains and 100 mg of dextrose (placebo, [PLAC]) in a randomized, counterbalanced, double-blinded, placebo control trial. Participants were instructed to consume BRC or PLAC 2 hr before completing a running economy protocol, where participants ran at submaximal velocities corresponding to 60% and 80% of their peak oxygen consumption (VO_{2max}) for 5 min, and a VO_{2max} test immediately thereafter. Respiratory exchange ratio (RER) was recorded during the last 30 s of each velocity of the running economy protocol. SMO₂ was recorded at the end of every min for 5 min following the VO_{2max} test. LAC was measured at 3-, 6-, 9-, and 12-min post-exercise. Repeated measures analyses of variance were performed with posthoc pairwise comparison, simple effects tests, and Bonferroni adjustments to assess differences between BRC and PLAC and protect the familywise error rate at $p < .05$. **RESULTS:** On average, participants were younger (19.0 ± 1.8 years), normal weight (70.6 ± 8.1 kg) and had good body composition (12.80 ± 0.03 %). SMO₂ was statistically significant between BRC and PLAC between minute 4 (SMO₂: 68.47 ± 9.80 , $p = .017$) and 5 (SMO₂: 69.06 ± 9.85 , $p = .014$) post-exercise. No other mean differences were observed for SMO₂, RER, or LAC between BRC and PLAC during exercise testing, and furthermore, no differences were observed between BRC and PLAC for LAC post-exercise ($p > .05$). **CONCLUSION:** We found significant post-exercise differences in SMO₂ between BRC and PLAC but neglected to find differences for RER or LAC at any time point. **SIGNIFICANCE/NOVELTY:** Our findings indicate that a 100 mg BRC supplement may enhance post-exercise blood flow, and perhaps recovery following exhaustive running exercise. Replication studies exploring the acute and chronic effects of BRC in larger and more diverse samples with varying interventions are encouraged and warranted.

The Effects of Exercise on Mental Health Among College Students

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The prevalence of mental health (MH) disorders among college-aged, young adults is alarmingly high, with many also experiencing poor physical health and comorbidities. **PURPOSE:** To examine the effects of exercise on MH among college students. **METHODS:** Fifteen participants (60% males, 20.0±2.0 years) volunteered to participate in this 8-week study. Nine participants completed the exercise (EX) intervention, while six formed the non-exercise control (CON) group. The pre/post mixed methods design collected and analyzed both quantitative and qualitative data. The Depression Anxiety Stress Scores (DASS-21) instrument was used to collect quantitative data, analyzed using a repeated measures analysis of variance (ANOVA). Qualitative data were obtained from open-ended responses and semi-structured interviews and analyzed with a coding framework in DeDoose 9.0. **RESULTS:** No statistically significant differences were found in depression ($F=0.038$, $p=0.849$), anxiety ($F=0.535$, $p=0.478$), and overall MH ($F=0.452$, $p=0.513$) scores between or within groups. The EX group's pre/post scores (mean ± standard deviation) for depression (pre: 1.11±2.62, post: 2.44±5.34), anxiety (pre: 1.00±0.87, post: 3.11±2.52), and overall MH (pre: 3.33±5.34, post: 8.55±13.06). The CON group's pre/post scores for depression (pre: 0.66±1.21, post: 2.32±3.83), anxiety (pre: 1.67±2.40, post: 5.16±6.49), and overall MH (pre: 4.33±4.23, post: 13.33±16.91). However, qualitative insights revealed that acute and chronic bouts of exercise improved MH in both groups. The EX group highlighted the additional benefit of social interaction during exercise, while the CON group reported improved MH as motivation for future exercise. Themes from interviews included various health benefits of exercise (38%), exercise improved sense of self (25%), and lack of exercise negatively impacted health (19%). **CONCLUSION:** Exercise interventions are promising for preventing and treating MH disorders, supported by the EX group's unanimous improvements in MH, highlighting the significant role of social interaction in enhancing well-being. Additionally, exercise positively influenced sense of self among both groups, with immediate improvements observed following acute exercise in the CON group. **SIGNIFICANCE/NOVELTY:** This study underscores the need for holistic approaches to enhance college students' mental and physical health. It expands current knowledge by demonstrating the immediate and long-term benefits of exercise on MH, emphasizing social interaction as motivation for exercise adherence. Conversely, the CON group's inactivity not only adversely affected MH but also amplified stress levels, and impaired academic performance, focus, and relationships. Integrating quantitative and qualitative data offers a comprehensive view of exercise's effects on MH.

Sex Differences in Body Composition Adaptations during Military Training and their Association with Physical Performance

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Individuals participating in military training are subject to physical training that can affect body composition and physical performance. However, changes in body mass may not reflect changes in body composition and may affect men and women differently. **PURPOSE** Examine changes in body composition between sexes and associations between baseline body composition and physical performance. **METHODS** 19 men (age: 26±3 yrs; BMI: 26.4±1.9 kg/m²) and 11 women (age: 25±2 yrs; BMI: 23.7±2.4 kg/m²) completed bioelectrical impedance analysis to assess body composition and performed an isometric mid-thigh pull (IMTP) to assess peak force (PF) prior to and upon completion of Marine Corps Officer Candidate School (OCS). During OCS, candidates receive age/sex adjusted scores on two fitness tests: Physical Fitness Test (PFT) and Combat Fitness Test (CFT). Higher scores on both tests indicate better performance. Two-way mixed measures ANOVAs (time*sex) were performed on body mass index (BMI), lean body mass (LBM), percent body fat (%BF), body fat mass (BFM), fat mass index (FMI), lean body mass index (LBMI), and IMTP PF. Pearson's correlations examined the association between body composition and performance metrics (PFT, CFT, IMTP PF); $\alpha=0.05$. **RESULTS** There were significant interaction effects for LBM ($p=0.005$, $\eta^2=0.005$), %BF ($p=0.005$, $\eta^2=0.020$), and LBMI ($p<0.001$, $\eta^2=0.015$). While LBM (50.1±5.7 kg to 54.5±6.3 kg, $p<0.001$) and LBMI (18.1±1.5 kg/m² to 19.7±1.7 kg/m², $p<0.001$) both increased in women, neither changed in men. %BF decreased in men (14.3±4.8 to 10.3±3.1, $p<0.001$) and women (23.6±5.0 to 15.9±4.2, $p<0.001$). No interaction effects were observed for body mass, BMI, IMTP PF, BFM, or FMI. Main effects of time and sex were observed for body mass, BMI, and IMTP PF ($\Delta 6\%$), which decreased through OCS and were higher in men, as well as BFM and FMI, which decreased through OCS and were higher in women (all $p<0.05$). Body mass, IMTP PF and LBM were positively correlated in men ($r=0.697$, $p<0.001$) and women ($r=0.607$, $p<0.047$). In men, IMTP PF was positively correlated with LBMI ($r=0.692$, $p<0.001$) and BMI ($r=0.558$, $p=0.013$); PFT score was negatively correlated with %BF ($r=-0.734$, $p<0.001$), BFM ($r=-0.797$, $p<0.001$), and FMI ($r=-0.745$, $p<0.001$); CFT score was negatively correlated with %BF ($r=-0.491$, $p=0.033$). In women, PFT score was positively correlated with LBMI ($r=0.624$, $p=0.04$). **CONCLUSION** Despite similar reductions in body mass and body fat, only females experienced increases in lean mass during training. Increased lean mass and decreased body fat may relate to improved military physical performance. **SIGNIFICANCE/NOVELTY** This study serves as a model of body composition changes in response to military training without deliberate weight loss or dietary restriction and aligns with the Marine Corps' efforts to incorporate advanced methodologies for assessing body composition standards.

ONR N00014-21-1-2725

Relationship Between Exercise Motivation and Physical Activity Among College Students

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Regular physical activity promotes health benefits; however, many college students are not meeting physical activity recommendations. Furthermore, the transition to college life may have a negative impact on exercise motivation. According to the Social Cognitive Theory, motivation and self-efficacy may influence health behaviors. However, limited research has investigated this potential relationship among college students. **PURPOSE:** To determine if there is a significant relationship between exercise motivation and physical activity among college students. **METHODS:** In this quantitative cross-sectional survey study, a volunteer sample of 307 undergraduate students (75.2% White, 68.7% Female), enrolled in health and fitness courses at a Mid-Atlantic region University and Community College, completed an online demographic questionnaire, International Physical Activity Questionnaire-Short Form (IPAQ-SF), and Behavioral Regulations in Exercise Questionnaire (BREQ-3). A linear regression analysis was conducted to assess the relationship between relative autonomy index (RAI) and MET-minutes/week. **RESULTS:** RAI was a significant predictor of total MET-minutes/week ($p < .001$). A correlation coefficient value of .389 indicated a moderate, positive, linear relationship between total MET-minutes/week and RAI. Predicted physical activity, measured in MET-minutes/week, was equal to $1748.972 + 271.869(\text{RAI})$. **CONCLUSION:** There is a significant relationship between exercise motivation and physical activity among college students. **SIGNIFICANCE/NOVELTY:** In light of this relationship, physical activity interventions designed for college students should focus on improving self-regulation skills and self-efficacy. The BREQ-3 appears to be a useful tool that provides an accurate measurement of exercise motivation in the college student population, identifying specific regulations of exercise behavior.

Effects of an Acute Dose of Betalain Rich Concentrate on Determinants of Running Performance

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Beetroot juice (BRJ) has been shown to enhance exercise performance due to its high nitrate content, but the role of other compounds such as betalains, remains unclear. Betalain dosing has shown improvement in running performance following a seven-day loading scheme; however, the effects of betalains on predictors of running performance remain unknown.

PURPOSE: To examine the acute effects of a betalain-rich concentrate (BRC) on running economy and maximal oxygen consumption (VO_{2max}). **METHODS:** Seventeen college-age males (19 ± 1.75 yrs) consumed 100 mg of BRC containing 25% betalains and 100 mg of dextrose (placebo, [PLA]) in a randomized, counterbalanced, double-blinded, placebo-controlled trial. Participants were instructed to consume BRJ or PLA 2 hr prior to completing a running economy protocol, in which participants ran at submaximal speeds corresponding to 60% and 80% of their VO_{2max} for 5 min, before proceeding with a VO_{2max} test. Heart rate (HR), skeletal muscle oxygen consumption (SMO₂), and rating of perceived exertion (RPE) were recorded during the last 30 seconds of each velocity and at the end of each stage of the VO_{2max} test. Repeated measures analyses of variance were performed with post-hoc pairwise comparison and simple effects tests to assess differences between BRC and PLA. Alphas were set *a priori* to $p < .05$. **RESULTS:** Peak HR (BRC: 188 ± 5.65 vs. PLA: 191 ± 5.43 bpm) and RPE (BRC: 8.59 ± 1.62 vs. PLA: 9.59 ± 1.70) were significantly lower after BRC supplementation compared to PLA ($p = .010$ & $p = .019$, respectively) at 60% VO_{2max}). A trend toward significance was observed for HR at 80% VO_{2max} ($p = .051$). No statistically significant differences in SMO₂ or VO_2 were observed between treatments, nor were there observed differences between treatments for VO_{2max} ($p > .05$). **CONCLUSION:** BRC reduced HR_{max} and RPE during submaximal running exercise but did not improve running economy or VO_{2max} compared to PLA. **SIGNIFICANCE/NOVELTY:** We examined the effects of an acute dose of BRC on running performance. Our findings suggest that BRC may be useful in reducing perceived exertion during exercise and may confer cardiovascular benefits such as enhanced vasodilation, supporting our HR findings at submaximal and maximal intensities. Larger, more controlled studies exploring mechanisms underlying our observations are warranted and encouraged.

CAREGIVER'S PERCEPTION OF OBESITY RISK FACTORS IN CHILDREN ENROLLED IN AN AFTER-SCHOOL ACTIVITY PROGRAM

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Childhood obesity is a complex problem as it is a culture-bound syndrome with biological (genetic), psychosocial, and environmental factors that contribute to the disease. Obesity is a modifiable disease that can be prevented and treated even though there is no single or simple solution treatment. **PURPOSE:** To address parent/guardian's perception of the risk factors that contribute to childhood obesity and the effects of structured daily physical activity (SDPA), a pre/post mixed method quasi-experimental research design was performed. **METHODS:** An 8-week SDPA program was tested on male (n=5) and female (n=5) school-aged children and adolescents (SACA) enrolled in an after-school program. A 13-item Likert scale questionnaire was completed by the parents/guardians (n=14) before SACA participated in the five times/week SDPA program. The 13-item questionnaire was based on the constructs of outcome expectations, situation, and behavioral capability. The SACA's age-adjusted body mass index (BMI) (kg/m²) and body fat (%) was measured pre-and-post intervention. After-school personnel led the SDPA sessions, which lasted 30-60 minutes and included cardiovascular, muscle-and-bone-strengthening, and flexibility activities. Following the 8-week SDPA, a semi-structured interview was performed with one of the after-school personnel. **RESULTS:** The quantitative core component of this study revealed that caregivers were more likely to agree with statements regarding the construct of outcome expectations (i.e., "Eating foods that have too much fat and sugar increase the risk of childhood obesity") (96%) rather than statements about the constructs of behavioral capability or situation (i.e., "The close ties of a community are a factor in the risk of childhood obesity") (54%). Four themes emerged from the thematic analysis that professional staff needs to consider when developing and implementing an after-school SDPA program for SACA. The four themes included (1) communication, (2) level of success, (3) structure-management, and (4) motivation-interest. **CONCLUSION:** Upon completing the data analysis, the primary researcher deemed that most parents/guardians are aware of the risk factors contributing to the problem of childhood obesity. However, how prevalent the risk factors are for obesity determines the caregiver's level of awareness. **SIGNIFICANCE/NOVELTY:** Limiting the prevalence of childhood obesity can help negate many other comorbidities that stem from the disease and help increase life expectancy. Exposing school-aged children and adolescents to structured daily physical activity while educating parents/guardians about the risk factors is one of the few ways to help prevent and assist the problem of childhood obesity.

Effect of Exercise and Weight Loss Intervention on Epigenetic Age Amongst Overweight Breast Cancer Survivors

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Excess weight and insufficient physical activity are associated with higher risk of breast cancer recurrence and death in breast cancer survivors. Epigenetic age clocks, assessed by DNA methylation, may capture intervention effects. **PURPOSE:** Examine the effect of a randomized control trial of exercise and weight loss on epigenetic age clocks among breast cancer survivors with overweight or obesity (n=20). **METHODS:** Participants in the intervention group (n=10) underwent a 1-year weight loss and exercise training program. DNA was collected from whole blood samples at baseline and 1-year post-intervention. Whole-genome methylation (EPIC V2 array) was used to calculate five separate measures of epigenetic age: the Horvath clock, Hannum clock, GrimAge, PhenoAge, and the DunedinPACE. Intrinsic Epigenetic Age Acceleration (IEAA), a measurement of the Horvath epigenetic age acceleration, controlling for immune cell proportions, was also computed. Associations between epigenetic age and fitness capacity and body composition at baseline and post-intervention were assessed using linear regressions. Effect of intervention on epigenetic age was measured by mixed regression models with the adjustment of age at baseline and immune cell proportions. Correlations of changes in epigenetic age with changes in body composition and fitness capacity were assessed. **RESULTS:** At baseline, there was a positive association between IEAA and lean mass ($\beta=0.23$ year/kg, $p=0.05$), as well as muscle mass ($\beta=0.25$ year/kg, $p=0.04$). At 1 year, there was a positive association between IEAA and lean mass ($\beta=0.34$ year/kg, $p<0.02$), muscle mass ($\beta=0.34$ year/kg, $p<0.02$), as well as fat mass ($\beta=0.22$ year/kg, $p<0.03$). Changes in epigenetic age in the intervention group was significantly lower than the control groups of several clocks ($p<0.05$): Hannum clock: mean change (standard error) for intervention was 0.28 (0.55), control 2.02 (0.37). GrimAge clock: intervention 0.10 (0.67), control 1.30 (0.36). Horvath clock: intervention -1.01 (0.86), control 1.91 (0.67). PhenoAge: intervention 0.28 (0.55), control 2.01 (1.07). Lastly, the change in age calculated by the Horvath clock is highly positively correlated with change in fat mass ($r=0.47$, $p<0.05$) and % body fat ($r=0.49$, $p<0.05$). **CONCLUSION:** In this pilot study, combined weight loss and exercise intervention slowed epigenetic aging in breast cancer survivors with overweight or obesity. **SIGNIFICANCE/ NOVELTY:** A younger epigenetic age following the combination of exercise and weight loss intervention represents a favorable modulation because of its association with lower risk of breast cancer recurrence and mortality. Encouraging breast cancer survivors with excess weight to lose weight and exercise more may decrease the risk of breast cancer recurrence and mortality.

Randomized Control Trial Supported by National Cancer Institute Grant U54CA155850

The Effect of Aerobic Training Intensity on Stress and Mood

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Dealing with stress is a common occurrence for college students, and their mood state may provide an accurate representation of how it affects them. One of the more widely used methods for dealing with stress is exercise. **PURPOSE:** to examine the effects of intense aerobic training on stress levels in college students. The secondary purpose was to investigate the effects of aerobic training intensity on mood in college students and whether intensity differently affects stress and mood levels. **METHODS:** The study included 25 college student track athletes between the ages of 18 and 23. Student athletes were training and actively competing in the season's track races. The control group consisted of 25 college-aged students between the ages of 18 and 23 who were not college athletes. Every two weeks over a four-week period, an online survey was sent out to gauge participants' stress levels and mental health. A baseline survey asked participants their gender/age, their running group intensity based on their event (High: 800–1500m; Medium: 3k-5k; Low: 5k-10k), their year in school/college major, average sleep, and a baseline stress ranking (1-10). Participants then completed the Perceived Stress Scale and selected questions from the Recovery-Stress Questionnaire (RESTQ)-76 - Sport Scale (items 6,7,10,12,14,15,16,17,18,19). These surveys were repeated two more times separated by two weeks. The survey for the control group was slightly different in that it did not include questions specific to aerobic running training. However, it asked participants about their level of fitness and how much time they exercise. They also completed the Perceived Stress Scale but only a portion of the RESTQ-76 Sport Scale (items 6,7,10,12). **RESULTS:** Females had a noticeably higher perceived stress score ($p < 0.05$) than men. Males had a mean of 13.8 and females had a mean of 17.9. The 800m/1500m group reported feeling vulnerable to injury at the highest rate (more than twice that of the other groups) ($p=0.003$). There was no significant difference on the perceived stress scale between training groups as well as the control group. **CONCLUSION:** After analyzing the results of the surveys, we can conclude that there was no significant difference in stress levels between the three aerobic training groups that we tested. The training groups themselves showed little to no effect on stress levels in collegiate athletes over the course of 4-week period and results were reflected similarly in the control group. **SIGNIFICANCE/NOVELTY:** The training groups had little to no effect on stress levels in collegiate athletes. Trends within the data show stress levels may be more closely linked to other aspects of life. This implies that differences in exercise volume and intensity may have little bearing on stress perceptions in a well-trained population of track athletes.

Similar Carotid Pulsatility with Oral Contraceptive Use During Low- and High-Hormone Menstrual Cycle Phases

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INTRODUCTION: Approximately 65% of women ages 15-49 in the United States use birth control, with approximately 14% of women choosing oral contraceptives (OCPs) as their preferred method. However, the impact of OCPs on the vasculature across the menstrual cycle has been debatable, in part due to changes in formulation. Previous studies suggest central stiffness and macrovascular function are similar across low and high-hormone phases of the menstrual cycle, although the potential impact of OCPs on local carotid pulsatility is understudied. Understanding the potential impact of OCPs on local carotid pulsatility is important due to its association with cognitive diseases/overall brain health. **PURPOSE:** To evaluate the effect of OCPs on local carotid pulsatility. **METHODS:** Carotid ultrasound was performed on six women taking oral contraceptives (OCP; 23 ± 4 y) and on five naturally menstruating women (NAT; 22 ± 3 y) during the low-hormone (follicular) and high-hormone (luteal) phases of the menstrual cycle. Carotid measurements included pulsatility index (PI), forward-traveling compression wave (W1), backward-traveling compression wave (NA), and reflection index (RIx; ratio of NA:W1). **RESULTS:** There were no significant interaction between OCP use and menstrual cycle phase for PI [(OCP, low hormone: 4.97 ± 1.59 A.U., high hormone: 5.14 ± 1.05 A.U.; NAT, low hormone: 5.19 ± 0.77 A.U., high hormone: 4.35 ± 0.95 A.U.), (F (1,9) = 1.363, p=0.27)], W1 [(OCP, low hormone: 7.35 ± 2.54 mmHg/m/s³, high hormone: 8.77 ± 2.68 mmHg/m/s³; NAT, low hormone: 5.23 ± 1.37 mmHg/m/s³, high hormone: 5.78 ± 1.37 mmHg/m/s³), (F (1,8) = 0.2938, p=0.060)], NA [(OCP, low hormone: 37.92 ± 23.52 mmHg/m/s², high hormone: 47.25 ± 16.22 mmHg/m/s²; NAT, low hormone: 28.77 ± 9.04 mmHg/m/s², high hormone: 33.86 ± 17.76 mmHg/m/s²), (F (1, 9) = 0.16, p=0.69)], nor RIx [(OCP, low hormone: 4.96 ± 2.08 A.U., high hormone: 5.65 ± 2.26 A.U.; NAT, low hormone: 6.39 ± 1.35 A.U., high hormone: 5.81 ± 2.50 A.U.), (F (1,8) = 1.142, p= 0.32)]. **CONCLUSION:** Carotid pulsatility is similar between women taking OCPs and naturally menstruating women during both low hormone and high hormone phases of the menstrual cycle. **SIGNIFICANCE/NOVELTY:** This study indicates women taking OCPs may not be at a higher risk for cognitive disease, as measured by carotid pulsatility. This is important due to the influence of extracranial vessels, such as the carotid artery, on intracranial hemodynamics and therefore brain health. Older women are at an increased risk for dementia, therefore, understanding the potential impact of OCP use on brain health is crucial as millions of premenopausal women take OCP as their preferred method of birth control.

Supported by University of Maryland Startup Fund (SMR)

Characterizing the Effect of a Sports Bra on Functional Movement in Healthy Women

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Large breasts have been shown to limit movement in healthy women. Support garments such as sports bras may help to enhance movement by providing chest stability. Clinicians often use the functional movement screen (FMS) to assess and identify asymmetries and imbalances in mobility and stability. **PURPOSE:** To characterize the effect of a sports bra on functional movement in healthy women. **METHODS:** Six healthy women completed the seven individual tests of the FMS with and without a sports bra on. During the sports bra trials, each woman had the same brand and type of sports bra on. The seven tests included in the screen were 1) deep squat, 2) hurdle step, 3) in-line lunge, 4) shoulder mobility, 5) active straight leg raise, 6) push-up, and 7) rotary stability. Comparisons between sports bra and no sports bra were made by t-tests. $P \leq 0.05$ was considered statistically significant. **RESULTS:** There were no significant differences in movement scores during the FMS when comparing sports bra on to no sports bra on. Squat (2.33 vs. 2.33), hurdle step (2.33 vs. 2.33), in-line lunge (3 vs. 2.83), shoulder mobility (2.5 vs. 2.17), active straight leg raise (2.33 vs. 2.33), push-up (2.33 vs. 2.33), and rotary stability (2 vs. 2.33) were analyzed and scored by the same investigator across subjects and for both experimental conditions. **CONCLUSION:** A support garment such as a sports bra does not affect functional movement in healthy women. For basic exercises, such as a squat or lunge, a support garment may not be necessary. **SIGNIFICANCE/NOVELTY:** This study is the first that we are aware of that examines the benefits or lack of benefits of wearing a sports bra for functional movement.

A Standardized 5-Sec Alactic Time Does Not Improve The Reliability Of A 15-Sec Maximal Glycolytic Capacity (Vlamax) Test For Cycling

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PURPOSE: Glycolytic (aka, “anaerobic”) ability has been shown to impact endurance performance and could be used to steer training. VLaMax is used to estimate the maximal rate of glycolysis. However, recent work suggests it may not be suitably reliable for some of its applications. The purpose of this study was to ascertain if the reliability of a 15-sec sprint cycling test in men and women could be improved by using a standard 5-sec alactic time (Talac). **METHODS:** Eighteen men and twelve women completed two sprint sessions over 1-week. A 10-min warm-up preceded a pretest 3 μ l blood lactate (BLC) sample, after which a maximal 15-sec sprint was completed; cyclists then rested passively while multiple blood lactate samples were taken until levels peaked. VLaMax was calculated as **(Peak BLC – Pre BLC) * (15-sec – Talac)-1**; in this study Talac = 5 (sec), rather than the time point where power drops to 96.5% of peak. Differences across trials were analyzed using a paired-sample t-test, Pearson correlation, ICC, and Bland-Altman analysis with an α of 0.05 for all tests; data are reported as mean \pm sd. **RESULTS:** Power (W) was similar across trails (773.0 ± 143.5 vs. 758.2 ± 127.4 ; $p = 0.333$) with a coefficient of variation (CV) of 4.7%. VLaMax ($\text{mM}\cdot\text{L}^{-1}\cdot\text{sec}^{-1}$) was also similar (0.727 ± 0.235 vs 0.682 ± 0.237 ; $p = 0.199$), but only moderately reliably across trials with a CV and ICC of $16.6 \pm 13.2\%$ and $0.636 [0.457, 0.765]$, respectively. **CONCLUSION:** Despite using a standard estimate for Talac, the 15-sec VLaMax cycling sprint remains only moderately reliable. It is likely heavily affected by even small variations in the measured lactate values used in the calculation. **SIGNIFICANCE/NOVELTY:** Despite the scientific underpinnings, this study raises further questions about the use of VLaMax for precise athlete screening and training prescription. The reliability of current VLaMax test procedures may not be reliable enough to use as currently suggested.

Sport-Specific Conditioning Test Performance and VO₂max Following Four Sessions of Maximally Explosive Training

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Burgomaster et al. (2005) found significant improvements in aerobic exercise capacity following only two weeks of intense sprint-interval training, demonstrating the potency and efficiency of intense exercise. How these adaptations translate to a more sport-specific conditioning test remain unclear. **PURPOSE:** The purpose of this study was to examine the influence of two weeks of maximally explosive sprint and resistance training on sport-specific conditioning test performance and VO₂max. **METHODS:** Eight men (21±1.9yrs) with >1 year of training experience performed 4 training sessions consisting of 3x10s leg (.075 kg·kg BW⁻¹) and 3x5s arm (.025 kg·kg BW⁻¹) cycling sprints interspersed with 4x10 maximally explosive repetitions (reps) of squat and bench press (50% of 1-RM) with 120s rests between sets over two weeks. During training, peak power (W) was collected for each bench press rep using a weight room accelerometer, and data were summed for each set. Bench press peak power data were analyzed for changes over the four sessions. Before and after training, sport-specific conditioning was tested with a modified yo-yo intermittent recovery test, which required subjects to perform as many reps as possible of a med ball throw (3kg) and 9.14m agility sprint with 20s rests. Participant VO₂max was also tested pre and post training on a cycle ergometer. Two men (20.5±0.7yrs) completed all pre- and post-testing, but did not undergo training. Data were analyzed using ANOVA's and Tukey HSD post hoc analyses. Data are Means±SD (sig. at p<0.05). **RESULTS:** During training, the sum of peak power (W) for each bench press set (of 10 reps) was significantly greater during sets 3-4 compared to set 1 during the last two training sessions. The number of reps completed on the sport-specific conditioning test (pre 14.4±5.0, post 28.9±11.6 reps) and VO₂max (pre 42.3±6.7, post 45.6±5.8 ml/kg/min) increased significantly in the training group but not the untrained control group (yo-yo pre 14.5±5.0, post 15.0±1.5 reps; VO₂max pre 42.5±1.6, post 41.8±1.7 ml·kg·min⁻¹). **CONCLUSION:** Intense exercise training elicited rapid improvements in anaerobic and aerobic fitness, demonstrated by increased sport-specific conditioning test performance and cycling VO₂max following 4 explosive exercise training sessions. Further, muscle power during bench press training was sustained at higher levels by the third training session. **SIGNIFICANCE/NOVELTY:** Our findings demonstrate that sport-specific conditioning test performance can be improved rapidly after only 4 intense training sessions, despite dissimilar testing and training modes. Specifically, sport-specific conditioning testing entailed kneeling med ball throwing, sprinting, and rapid change of direction, while training included short cycling sprints interspersed with lower- and upper-body explosive resistance exercise.

Biological Sex Differences in Exercise-Mediated Femoral Blood Flow and Associations with Intima-Media Thickness

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Peripheral blood flow increases during exercise due to vasodilation. This hyperemic response is considered anti-atherosclerotic and a stimulus for favorable vascular remodeling. As women have a larger vasodilatory response to physiological and pharmacological stimuli compared to men, it is possible that biological sex may also impact the extent of exercise-induced vasodilation. **PURPOSE:** To explore potential biological sex differences in peripheral blood flow in response to moderate-intensity exercise and subsequent associations with arterial wall intima-media thickness (IMT) as a measure of subclinical atherosclerosis risk. **METHODS:** Left superficial femoral artery (SFA) diameter, blood velocity, and IMT were measured by Doppler ultrasound in 20 men (23.85 ± 5.74 years, body mass index [BMI] = 26.00 ± 3.30 kg/m²) and 18 women (22.89 ± 6.53 years, BMI = 25.24 ± 3.81 kg/m²) before, five minutes after, and 25 minutes after 30 minutes of stationary cycling at 65-75% of age-predicted maximum heart rate. SFA diameter and mean blood velocity were used to calculate leg blood flow (LBF), which was expressed in absolute terms and relative to left leg lean mass. Left leg lean mass was estimated via regional bioelectric impedance analysis. Two-way ANOVA with repeated measures was used to analyze biological sex differences. One-tailed Spearman's rank correlation was used to determine the association between IMT and change in LBF from rest to five minutes post-exercise. **RESULTS:** There was a significant biological sex \times time interaction in absolute LBF (men = 66.69 ± 31.21 ml/min, 152.01 ± 71.12 ml/min, and 104.13 ± 52.43 ml/min, respectively; women = 80.63 ± 48.87 ml/min, 130.65 ± 39.18 ml/min, and 83.45 ± 29.90 ml/min, respectively; $p = 0.04$). There was not a significant biological sex \times time interaction in relative LBF (men = 6.85 ± 3.15 ml/min/kg, 15.45 ± 6.83 ml/min/kg, and 10.67 ± 5.60 ml/min/kg, respectively; women = 10.82 ± 5.95 ml/min/kg, 17.97 ± 4.91 ml/min/kg, and 11.44 ± 3.74 ml/min/kg, respectively; $p = 0.20$). There was a significant negative association between IMT and change in relative LBF from pre-exercise to post-exercise in women ($\rho = -0.56$, $p = 0.01$), but not in men ($\rho = 0.02$, $p = 0.47$). **CONCLUSION:** Women had lower absolute post-exercise SFA flow than men, but there were no biological sex differences present when SFA flow was expressed relative to leg lean mass. Greater increases in SFA LBF with exercise was associated with lower SFA IMT in women. **SIGNIFICANCE/NOVELTY:** These results suggest that the absolute hyperemic response to moderate-intensity exercise is lower in young, healthy women compared to men, though sex-specific differences disappear when considered relative to lean tissue mass. Additionally, negative associations between arterial wall thickness and change in peripheral blood flow reveal that a robust vasodilative response to exercise is athero-protective in women.

NFκB Inhibition Negatively Impacts Microvascular Function in Women with Endometriosis

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PURPOSE: Women with endometriosis are at an increased risk of developing cardiovascular disease and demonstrate impaired microvascular function, characterized by reduced nitric oxide (NO)-mediated vasodilation. Endometriosis is a systemic inflammatory disease in which NFκB-mediated cytokine production is upregulated. In clinical cohorts, NFκB inhibition with nonacetylated salicylate (oral salsalate) improves endothelial function. However, the effect of salsalate treatment in women with endometriosis is unknown. We hypothesized that NFκB inhibition with salsalate would improve cutaneous microvascular endothelial function in women with endometriosis. **METHODS:** In a single-blind, randomized, placebo-controlled design two intradermal microdialysis fibers were placed in the forearms of 7 women (34 ± 6.5 years) with laparoscopically diagnosed endometriosis. Local heating units were placed on the skin covering the microdialysis fibers and clamped at 33°C. Laser-Doppler flowmetry probes were placed within the heaters to measure red blood cell flux. Increasing doses of acetylcholine (ACh; 10^{-10} to 10^{-1} M) dissolved in lactated Ringer's solution were perfused through the fibers in 5-minute intervals. In one fiber, NO synthase was continuously inhibited with N^G-nitro-L-arginine methyl ester (15mM L-NAME). At the conclusion of the dose response, maximal vasodilation was induced (local heat to 43°C and 28mM sodium nitroprusside). Data were normalized as a percentage of maximal cutaneous vascular conductance (%CVC_{max}: flux/mean arterial pressure). NO-dependent vasodilation was calculated as the area between the Ringers and L-NAME sites and EC50s were calculated. Participants were tested after 5 days of salsalate (3000 mg/day) and placebo treatments. **RESULTS:** %CVC_{max} during Ach perfusion was decreased following salsalate treatment (site*treatment $p < 0.01$). NO-dependent vasodilation was also reduced following salsalate (291.4 AU v. 78.81 AU, respectively $p = 0.02$). The EC50 of the %CVC_{max} response to ACh was increased in the L-NAME site following placebo (logEC50 -4.936 M vs -2.081 M, respectively, $p < 0.01$), but not altered with salsalate treatment (logEC50 -3.150 M vs. -3.032, respectively, $p = 0.25$). **CONCLUSION:** NFκB inhibition with salsalate treatment impairs NO-mediated vasodilation in the cutaneous microcirculation in women with endometriosis. **SIGNIFICANCE/NOVELTY:** Endothelial dysfunction in women with endometriosis does not appear to be mediated through traditional inflammatory NFκB mechanisms. Other sources of NO including from inducible NO-synthase may be and upregulated as a compensatory mechanism in women with endometriosis. Supported by NIH Grant R01 HL16100

Relationship Between the U.S. Army Combat Fitness Test and Motion Capture Outcomes

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Muscular fitness and functional movement capacity are important in military testing because they allow an individual to use muscular strength and power through full range of motion. DARI Motion Capture is a portable, markerless system that quickly assesses full body mobility and performance abilities. The DARI has not been used to test performance variables in the U.S. Army Combat Fitness Test (USACFT). **PURPOSE:** To examine relationships between the DARI assessment and USACFT in ROTC Cadets. **METHODS:** 17 (3 females, 14 males) Army ROTC Cadets aged 19.5 ± 0.9 years participated in the study. Two weeks elapsed between the USACFT (3 RM Deadlift, Standing Power Throw, Hand Release Push-Ups, Sprint-Drag-Carry, Plank, and 2-mile run) and the DARI assessment. Athletic performance was assessed using nine movements from the DARI: shoulder abduction, shoulder horizontal abduction, shoulder internal and external rotation, shoulder flexion and extension, trunk rotation, bilateral squat, lateral lunge, vertical jump, and single leg multi hop. Pearson Correlations were used to assess relationships between the various USACFT assessments and the power-based movements from the DARI assessment. **RESULTS:** The 3 RM Deadlift showed moderate relationships with Vertical Jump Bilateral Peak GRF ($r=0.536$, $p=0.026$), Vertical Jump Bilateral Net Impulse ($r=0.616$, $p=0.008$), and Vertical Jump Positive Impulse ($r=0.607$, $p=0.010$). The Standing Power Throw showed moderate relationships with Vertical Jump Bilateral Net Impulse ($r=0.736$, $p=0.001$), Vertical Jump Bilateral Positive Impulse ($r=0.738$, $p=0.001$), and Vertical Jump Bilateral Peak GRF ($r=0.593$, $p=0.016$). **CONCLUSION:** Moderate relationships were shown between various USACFT and DARI assessments. Motion capture systems can pick up on performance variables that are present in military testing. Therefore, the DARI assessment may be used to help individualize exercise prescriptions to improve performance on the USACFT. **SIGNIFICANCE/NOVELTY:** DARI Motion Capture is a new system, and the relationship between performance measures and military specific assessments is unclear.

Effect of Acute Arm versus Leg Exercise on Central Blood Pressure

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Regular exercise is an important non-medical intervention to reduce risk of cardiovascular disease (CVD). Aerobic exercises like running, and cycling may lower CVD risk through favorable effects on central blood pressure and vascular function (i.e., reduced pressure from wave reflections). Arm ergometry exercise is a popular exercise mode used for rehabilitation, but little is known about the effect of arm ergometry exercise on CVD risks factors like central blood pressure and vascular function. **PURPOSE:** Compare the acute effect of leg versus arm exercise on central blood pressure and vascular function. **METHODS:** Twenty-one participants (n = 11 female, Age 21 ± 3 , BMI 24.5 ± 3.2 kg/m²) completed two visits to the Human Performance Laboratory. With participants in the supine position at rest, central systolic blood pressure (cSBP), central diastolic blood pressure (cDBP) and augmentation index (AIx, a measure of vascular function related to pressure from wave reflections) was measured using an oscillometric central blood pressure cuff before and immediately after acute exercise. Participants performed either arm or leg cycling exercise at moderate intensity (heart rate between 65%-75% of age-predicted maximal heart rate) for 20 minutes on two separate days in a randomized crossover design. Data were analyzed using a 2-condition (arm vs leg) x 6-time point (2 pre vs 4 post exercise) repeated measures analysis of variance. **RESULTS:** There was a condition-by-time interaction for AIx ($p = 0.011$). AIx slightly increased from $41 \pm 16\%$ at rest to a peak of $43 \pm 13\%$ following arm exercise but decreased from $40 \pm 14\%$ at rest to a nadir of $23 \pm 14\%$ following leg exercise. There was a condition-by-time interaction for cDBP ($p = 0.011$). cDBP decreased from 64 ± 8 mmHg at rest to a nadir of 55 ± 7 mmHg following arm exercise but increased immediately following leg exercise from 63 ± 9 mmHg at rest to a peak of 70 ± 8 mmHg. There was no condition-by-time interaction for cSBP ($p = 0.721$). cSBP similarly increased from 101 ± 10 mmHg at rest to a peak of 104 ± 11 mmHg following arm exercise and increased from 101 ± 9 mmHg at rest to a peak of 108 ± 13 mmHg following leg exercise ($p < 0.001$). **CONCLUSION:** Compared to leg exercise, arm exercise increased AIx and decreased cDBP. Since an increase AIx may increase left ventricular workload and a reduction in cDBP may reduce coronary perfusion, arm ergometry exercise may create an acute mismatch in myocardial supply and demand. **SIGNIFICANCE/NOVELTY:** Leg exercise may be considered as a more effective exercise mode for reducing CVD risk compared to arm exercise.

Effects of Swearing on Strength Test

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PURPOSE: To explore the effects of swearing on the strength via isometric and isokinetic knee extension contractions on a Biodex Isokinetic Dynamometer. **METHODS:** Twelve male college boxer athletes (age: 20.0 ± 0.8 yr, height: 171.3 ± 1.3 cm, weight: 65.2 ± 2.2 kg) voluntarily participated in this study with IRB approval. Participants were asked to perform isometric and isokinetic knee extension contractions at $60^\circ/\text{s}$ in two conditions (swearing and control) by counterbalancing repeated measures design. For swearing condition, participants were asked to swear a common but vulgar word (in Mandarin) during strength test. The control group performed the same contractions without making any sounds or saying any words. The parameters of strength output were compared through paired sample t-test. A value of $p < .05$ was considered statistically significant. All results are presented as mean values \pm standard deviation. **RESULTS:** During isokinetic contraction, swearing yielded significantly higher values in average strength (229.6 ± 94.1 vs. 140.6 ± 87.6 Nm, $p = .001$) and peak strength (256.4 ± 88.5 vs. 182.0 ± 76.1 Nm, $p = .040$). There was no significant difference of average strength (241.5 ± 71.2 vs. 226.3 ± 82.5 Nm, $p = .219$) and peak strength (267.4 ± 97.8 vs. 237.2 ± 86.4 Nm, $p = .098$) during isometric contraction. **CONCLUSION:** Swearing has the potential to enhance strength performance, which explains why athletes and exercise enthusiasts are sometimes seen swearing during game events or their workouts. **SIGNIFANCE/NOVELTY:** While swearing has beneficial effects in respect of strength performance, swearing may give a negative impression to the audience. Based on current findings, it is suggested that swearing could be executed as a tactical strategy during sport or exercise events; however, other similar strategies, for example, yelling, are worth investigating if they also enhance strength performance.

Interrelationship Between Levels of Bisphenol- A and -S, Peak Anaerobic Power and Body Composition

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Bisphenol-A and -S (BPA and BPS) are environmental estrogen often found in manufacturing products, including food/beverage packing, from where it can leach into the food content. Levels of BPA and BPS in human specimens are positively linked with obesity and type 2 diabetes. Our previous study found that BPA levels, not BPS, were negatively associated with aerobic capacity. **PURPOSE:** This study aims to investigate if levels of BPA and BPS are associated with peak anaerobic power, muscle damage, and percentage of muscle and fat. **METHODS:** Healthy young adults (n=34, age 20.35 ± 1.35 , BMI 24.84 ± 0.72 Kg/m²) performed a vertical jumping test, and the peak anaerobic power was quantified. Levels of urinary BPA, BPS, and lactate dehydrogenase (LDH, a marker of muscle damage) were assessed by ELISA assay. Percentage of muscle and fat and fat distribution were calculated. Relationships between variables were examined using Kendall's Tau-b correlation analysis. **RESULTS:** Overall, BPA and BPS levels were not significantly associated with peak anaerobic power and other variables of interest. Levels of LDH were positively associated with the overall percentage of fat, truncal fat, and upper and lower limb fat ($\tau = .39, .35, .42, .37$, respectively $p < .05$) and negatively associated with the percentage of muscle ($\tau = -.4$ $p < .05$). **CONCLUSION:** The results of the present study do not support the initial hypothesis since results indicate that levels of BPA or BPS might not affect peak anaerobic power, body composition, and skeletal muscle damage in healthy, active young adults. **SIGNIFICANCE/NOVELTY:** To our best knowledge, this study was the first to examine the association of environmental estrogen with peak anaerobic power. Despite no effect found in the investigated group, these chemicals are still considered a potential threat to human health.

This study was supported in part by grants from NASA West Virginia Space Grant Consortium.

Effects of Blood Flow Restrictive Bicep Curl Exercise on Arterial Stiffness- Pilot Study

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The use of blood flow restriction (BFR) exercise in athletic and clinical settings has increased in the last five years. **PURPOSE:** To investigate the effects of autoregulated (AR) and non-autoregulated (NAR) BFR bicep curl exercise on arterial stiffness. AR BFR cuffs adjust pressure as the muscle undergoes concentric and eccentric contractions, maintaining a constant pressure in the limb throughout the entire range of motion. NAR BFR training cuffs do not adjust pressure throughout the range of motion thus causing greater pressures in the limb during concentric contraction when the muscle size is enlarged. How this exercise acutely impacts arterial stiffness is not well understood. **METHODS:** Following a randomized familiarization period with AR or NAR BFR bicep curl exercise, 5 adults (23±1 years; 2 female) participated in 3 randomized sessions with AR-BFR, NAR-BFR, and no-BFR (no cuffs) separated by 1-week washout periods. Using 20% of the 1 repetition maximum (1-RM) with 2-second concentric/eccentric cadence, participants performed 4 sets of bicep curls to failure. Training limb occlusion pressure (LOP) was set at 60% of supine LOP for both BFR sessions. Measurements before and immediately following the training session included blood pressure acquisition, arterial tonometry, and ultrasonography of the carotid artery. Between and within effects of treatment on central systolic blood pressure (cSBP), central diastolic BP (cDBP), central pulse pressure (cPP), central mean arterial pressure (cMAP), pulse wave velocity (PWV), beta-stiffness index (β -stiff), and arterial compliance (AC) were analyzed with two-way ANOVAs. **RESULTS:** There were no baseline differences in cSBP, cDBP, cPP, cMAP, cf- (carotid-femoral) PWV, cr- (carotid-radial) PWV, β -stiff, and AC (all $p > 0.05$). cMAP significantly increased in the NAR-BFR (mean difference = 3±3 mmHg, $p = 0.04$), and cDBP significantly increased in the no-BFR (mean difference = 2±2 mmHg, $p = 0.03$). And there was an interaction effect in cPP between AR-BFR and NAR-BFR (mean difference = 31±3 mmHg, $p = 0.03$). **CONCLUSION:** The present findings show acute AR-BFR training did not impact arterial stiffness while acute NAR-BFR training increased central blood pressures. **SIGNIFICANCE/NOVELTY:** This study is the first to show AR-BFR exercise does not acutely influence indices of arterial stiffness. Moreover, it may have a protective effect on changes in blood pressure that were experienced with NAR-BFR exercise, providing a safer alternative for patients with cardiovascular and other clinical diseases.