

**Mid-Atlantic Regional Chapter
of the
American College of Sports Medicine
(MARC-ACSM)**

41th Annual Scientific Meeting - 2018

ABSTRACT BOOKLET

**Friday, November 2nd, 2018
and
Saturday, November 3rd, 2018**

**Sheraton Harrisburg-Hershey Hotel
Harrisburg, PA**

RESEARCH ABSTRACTS

Comprehensive Physical Activity Assessment of U.S. Army Initial Entry Training Using a Three-Tier Model

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Initial entry training (IET) is a physically demanding environment that is the basis for ones' military career. Yet, despite the need for a better understanding of actual physical demands to help understand functional outcomes (e.g., injuries, attrition), quantifiable physical activity (PA) outcomes and qualitative contextual information is limited. **PURPOSE:** Characterize daily (0500 – 2000 h) IET-associated PA using a three-tier PA assessment: pedometry, accelerometry, and direct observation. **METHODS:** Over two distinct, 10-week IET cycles (n = 40 Trainees/Cycle), PA was quantified via hip-worn accelerometers (with pedometry), and direct observation (e.g. activity type, location, equipment carried/worn). Data were analyzed using mixed-model ANOVA with Bonferroni adjustments and presented as mean \pm SD. **RESULTS:** Of the intended 900 monitoring-min/d, 798 \pm 173 min/d (~89%, Cycle 1) and 821 \pm 76 min (91%, Cycle 2) were valid for analysis. Mean daily step count for Cycle 1 was 13,818 \pm 4,441 steps/d and 13,135 \pm 4,396 steps/d for Cycle 2. Mean daily accelerometer-assessed PA intensity was (aggregated between Cycle 1 and 2): Sedentary (1 – 2 METS): 505 \pm 96 min/d (55% of daily); Light (2 – 3 METS): 210 \pm 49 min/d (24%); Moderate (3 – 5.99 METS): 168 \pm 47 min/d (20%); Vigorous (> 6 METS): 13 \pm 12 min/d (1%). The MVPA accounted for ~20% of daily PA (180 \pm 68 min/d). Time on feet (~50%) and sitting (20 – 25%) accounted for most of the daily activity types for both Cycles with no external load for 44% of the monitored day and daily loads of 2 – 13 kg carried 56% of monitored time. **CONCLUSION:** Daily step count was approximately 2-3 times higher than its civilian counterparts. Additionally, MVPA was 850-900 min/wk, satisfying weekly recommendations (150 min/wk) within one day. Trainees experienced a very high volume, physically active environment in IET. Next steps forward would entail merging actual IET outcomes (e.g., injury, lost duty time, attrition) with PA during IET to observe the mediating effect to these outcomes.

Supported by Department of Defense Grant: W81XWH-08-C-0747

Validity of Fitness Watches for Cadence Measurement in Collegiate Runners

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Providing feedback on running mechanics is commonly used as a method to reduce the risk of injury and restore running etiquette post injury. Acquiring accurate running cadence data (steps per minute) while training outside of laboratory setting is a challenge. While fitness watches may be useful in providing real-time data to coaches, athletes, and clinicians, the validity and reliability of these devices are limited. **PURPOSE:** The purpose of this study was to identify the reliability and validity of cadence measurements obtained from fitness watches. **METHODS:** A convenience sample of sixteen (16) NCAA Division I track and field runners participated. Participants were video recorded running on a treadmill while wearing a fitness watch (Garmin, Ltd). Data from the watches were downloaded and compared to manual counts of cadence obtained from watching the video recordings. Reliability and validity of the fitness watch compared to the standard (video analysis), which was determined through intra-class correlation coefficient (ICC_{3,1}). **RESULTS:** Average watch cadence was 175.2 \pm 8.58 steps per minute. Average video cadence was 174.1 \pm 8.22 steps per minute. The ICC_(3,1) value for the watch was 0.95 (p < 0.001). **CONCLUSION:** Commercial fitness watches provide a valid and reliable measure of running cadence in collegiate runners.

Effects of Environmental Temperature on Physiologic Measures and Reaction Time During Graded Leg Ergometry

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Exercise performed in a hot environment creates a variety of physiologic challenges. It is less clear, though, whether thermal conditions affect reaction time, a key component of success in many sporting tasks. **PURPOSE:** The study was designed to investigate whether thermal conditions might affect simple reaction time (SRT) and choice reaction time (CRT). **METHODS:** Ten college-aged (19-22 yrs.) female and male subjects performed a test battery on two occasions: hot environment (temperature 90°F) and room temperature environment (temperature 72°F). Subjects completed graded leg ergometry until 55% of heart rate reserve (HRR) was reached on both trials. Subjects performed a battery of tests three times on a testing day (baseline: upon arrival at the lab; after a 15-min seated acclimation period; and post-exercise) involving a collection of multiple physiological variables. The SRT test was

computer based. The CRT test used a laser system that required hand or foot motions to stop a timer that was activated by verbal cues. **RESULTS:** Tympanic temperature was significantly elevated ($p < 0.05$) in the warm environment following the acclimation period and at post-exercise. Heart rate was significantly higher in the hot environment at min 4 of exercise (133.2 ± 2.8 vs. 124.9 ± 2.5 bpm). Post-exercise lactate was significantly greater in the room temperature environment (7.77 ± 0.7 vs. 6.0 ± 0.6 mmol/L). There was a trend ($p = 0.051$) for exercise duration to be longer in the room temperature environment (8.2 ± 0.5 vs. 7.0 ± 0.3 min). However, neither SRT nor CRT was affected by environmental conditions or the accompanying physiologic stress. **CONCLUSION:** Based on the results of this study, thermal condition was not found to significantly alter reaction time at rest or following acute exercise despite effects on other physiologic variables. A longer exercise testing session should be used to further assess whether thermal environmental conditions affect reaction time.

Multi-ingredient Pre-workout Supplement Improves Cycling Anaerobic Power in Recreationally Active Men

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Multi-ingredient pre-workout supplements (MIPS) have become an increasingly popular ergogenic aid among fitness enthusiasts to improve explosive power. Previous research has primarily focused on the effectiveness of individual ingredients, rather than the complete supplement. **PURPOSE:** To examine the effectiveness of two MIPS, one with beta-alanine and caffeine (BAC) and one without (NBAC), vs. placebo (PLA) on anaerobic performance. **METHODS:** Fourteen recreationally active men (24.6 ± 5.0 years, 179.2 ± 5.9 cm, 84.3 ± 14.3 kg) participated in a randomized, counterbalanced, double-blind, placebo controlled cross-over design to assess anaerobic power and capacity. On three separate occasions (≥ 7 days between trials), subjects completed vertical jump (VJ), 30 repeated ballistic squats (RBS) with a load equal to 30% of their pre-determined one repetition maximum, and a 30 second Wingate anaerobic cycle test (WAnT) 30 minutes after ingestion of BAC, NBAC, or PLA. RBS peak power (RBS_{PP}) was determined as the highest peak power repetition (rep) and mean power (RBS_{MP}) was calculated as the average peak power across the 30 reps using a position transducer. Relative peak (RBS_{PPkg}) and mean (RBS_{MPkg}) power were also calculated. WAnT anaerobic power ($WAnT_{AP}$) was calculated as the peak power relative to body weight and anaerobic capacity ($WAnT_{AC}$) was calculated as the average power relative to body weight over the duration of the 30 second test. Comparisons across supplements were determined using one-way repeated measures ANOVA ($p < 0.05$) and Bonferroni adjusted pairwise comparisons when appropriate. **RESULTS:** $WAnT_{AP}$ was significantly different across supplements ($p = 0.019$). BAC $WAnT_{AP}$ (11.95 ± 0.85 W) was significantly higher than PLA (11.35 ± 0.66 W, $p = 0.037$), but not NBAC (11.54 ± 0.84 W, $p = 0.319$). There were no significant differences in $WAnT_{AP}$ between NBAC and PLA ($p = 0.703$). Additionally, no significant differences were observed across supplements in $WAnT_{AC}$, RBS_{PP} , RBS_{MP} , RBS_{PPkg} , RBS_{MPkg} or VJ. **CONCLUSION:** A MIPS can improve cycling anaerobic power during a Wingate test, however improvements in anaerobic power and capacity may be less apparent in squat jump and vertical jump type movements. Supported by an industry sponsored grant through Isagenix International LLC.

Lower Extremity Motor Evoked Potential Latency as a Biomarker for Warfighter Fatigue: Preliminary Data

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Single pulse transcranial magnetic stimulation (TMS) non-invasively characterizes corticospinal system function *in vivo*, inducing multiple successive excitatory volleys observed as motor evoked potentials (MEP). Latency of the MEP is a relatively stable measure, providing evidence of differences in direct and transcallosal pathways, with longer latencies indicative of stress. Observation of the differences between target (T) and non-target (NT) muscles may provide insight into use of MEP latency as a biomarker for fatigue. **PURPOSE:** To analyze preliminary observations of MEP latency as a biomarker for fatigue within military warfighters. **METHODS:** Three warfighters (25.01 ± 3.5 years) were recruited to identify individual markers of cognitive degradation during operational stressors. Subjects completed physical and mental tasks for 5 consecutive days, testing TMS each afternoon to assess the motor cortical excitability as a biomarker for fatigue. During a seated isometric squat at 15% ($\pm 5\%$), 40 stimuli were delivered to the dominant vastus lateralis (VL) or first dorsal interosseous (FDI), two at each 5% interval from 5% to 100% stimulator output. During days 2 and 3, subjects were limited to 50% of normal sleep and calorie intake, with normal sleep and food during days 0, 1, and 4. MEP latency was measured from TMS to peak of MEP, if present, in the T and NT FDI and VL. The difference between T and NT MEP were analyzed across days

for mean, standard deviation, and graphic representations. **RESULTS:** The differences in VL T and NT MEP latencies were greatest on day 0 (2.63 ± 1.3 ms) decreased day 1 (1.58 ± 0.7 ms) increased on fatigued days 2 (3.31 ± 0.9 ms) and 3 (3.19 ± 0.8 ms), with a slight decrease on day 4 (2.90 ± 0.9 ms). The latencies between T and NT FDI presented with minimal differences across days. **CONCLUSION:** The increased latency on day 0, as compared to day 1, is suggested to be due to task familiarization. The increased differences in VL T and NT latency during days 2 and 3, compared to 1 and 4, may be due to interhemispheric signaling, as increased fatigue stresses the transcallosal pathways. Lack of differences during FDI activation may be due to the increased lateralization of the hand. However, more trials are necessary to assess familiarization and difference between T and NT MEP latency as a fatigue biomarker.

Supported by Department of Defense Grant W81XWH-16-PHTBIRP-CR3A

The Effects of High-Intensity Treadmill-Running on the Stomach in a Rodent Model

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PURPOSE: Exercise is known for beneficial effects it provides to systems of the body; improving cardiovascular and neural function, reducing adipose tissue, and lowering the risk of developing certain metabolic disorders. The effect of exercise on the gastrointestinal (GI) tract remains controversial; studies have reported increases, decreases, and no changes in gastric emptying (GE) rate following running. We evaluated the effects of high-intensity treadmill-training on GE rate in rats. We hypothesized that exercise increases autonomic activity and will contribute to increased vagal tone leading to increased GE. By developing an understanding of the relationship between exercise and GI function, exercise may be medicine in treating a number of GI health dysfunctions (e.g. gastroparesis). **METHODS:** Male Wistar rats ($n = 8$) ran on a treadmill at 23.0m/min, five days/week, for 4-weeks; controls ($n = 8$) were placed on the powered off treadmill. For GE measurements, fasted rats were placed in collection chambers, baseline air measurements collected, and rats received 1g of pancake containing $5\mu\text{L}$ of the stable isotope [^{13}C]-octanoic acid. Exhaled breath was collected and analyzed to determine the [^{13}C]- to [^{12}C]- CO_2 ratio. **RESULTS:** After 4-weeks, anthropometric factors remained similar between exercise and control: mean energy intake (29.92 ± 0.44 vs 29.59 ± 0.53 kcal/100g/day; $p > 0.05$), body mass (85% increase; 325.83 ± 3.30 vs 330.28 ± 3.48 g; $p > 0.05$), food intake (24.38 ± 0.29 vs 24.48 ± 0.35 g; $p > 0.05$). Cumulative percent recovery of the administered [^{13}C]-octanoic acid dose was reduced in exercise vs control 6-hours following GE testing (11.70 ± 0.83 vs 13.29 ± 0.60 ; $p > 0.05$). Peak fractional dose per hour of $^{13}\text{CO}_2$ during the breath test was the same between groups (6.96 ± 0.89 vs 7.61 ± 0.40 ; $p > 0.05$), but there was a rapid reduction of [^{13}C] values following peak over several time points of the exercise group. **CONCLUSION:** We previously validated moderate-intensity treadmill running has no significant effect on gastric emptying. By increasing the intensity of running, we found a reduction in GE in the exercise group, contrary to what we hypothesized. We believe this reduction may be a result of reduced mesenteric blood flow, increased inflammation, or an alteration in the GI microbiome.

Supported by Gettysburg College Start-up Funds

Relative Age Effects in Men's Collegiate Soccer are Influenced by Nationality, Position, Class, and Success

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Relative age effects (RAEs) refer to an unequal birth-date distribution within cohort of individuals, typically due to selection bias. RAEs have been shown to exist in sports, specifically youth soccer and elite professional soccer. However, no study has assessed the prevalence of RAEs at the collegiate level. **PURPOSE:** To evaluate the existence of RAEs in Division I Men's collegiate soccer. Additionally, the study assessed the impact of nationality, position, class, and post-season tournament qualification on the prevalence of RAEs. **METHODS:** Birth-dates from Division I Men's collegiate soccer athletes ($n=4,082$) from the 2017-2018 season were categorized into calendar quarters (CQ1: January–March; CQ2: April–June; CQ3: July–September; and CQ4: October–December) and scholastic quarters (SQ1: September–November; SQ2: December–February; SQ3: March–May; and SQ4: June–August). All athlete birth-date distributions were compared with the expected birth-date distributions for the United States. All data were assessed using χ^2 goodness of fit tests. **RESULTS:** International-born athletes (INT) displayed a significant ($p < 0.001$) difference in birth-date distribution when assessed with calendar quarters, with an over-representation in CQ1 ($31.2 \pm 2.8\%$) and an under-representation in CQ4 ($20.0 \pm 2.4\%$). However, American-born athletes (USA) showed a significant difference ($p < 0.001$) in birth-date distribution when assessed with scholastic quarters, with over-representation in SQ1 ($27.6 \pm 1.6\%$) and an under-representation in SQ4 ($23.0 \pm 1.5\%$). Furthermore, INT showed significant ($p \leq 0.001$) RAEs for midfielders and defenders, while USA showed significant

RAEs midfielders ($p=0.009$) and goalkeepers ($p=0.004$). In terms of class, INT had significant ($p\leq 0.045$) RAEs for all classes, while USA had significant RAEs only for freshmen ($p=0.001$) and sophomores ($p=0.007$). All INT had significant ($p\leq 0.003$) RAEs regardless of tournament qualification; however, USA had significant RAEs only for non-tournament teams ($p<0.001$). **CONCLUSION:** Significant RAEs exist in Division I Men's collegiate soccer; however, the presence of RAEs are influenced by nationality, position, class, and on-field team success. Coaches should be aware of RAEs during the recruitment process to avoid potential selection bias.

The Impact of Anxiety and Knowledge in College-Aged Students on Attendance of a Fitness Facility

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Anxiety is the most common mental illness in the United States of America. On average, one in five people have an anxiety disorder. With those affected by anxiety, only 36.9% people receive treatment in the form of exercise. Exercise has been shown to reduce symptoms of anxiety thus allowing subjects to become more resilient to stress levels. With exercise being a primary form of treatment for anxiety disorders, how are individuals who suffer anxiety from being in an exercise facility supposed to utilize exercise as a form of treatment? **PURPOSE:** To analyze the anxiety levels and knowledge of exercise among different majors in college-aged students. Answering the question, do higher levels of anxiety and less knowledge about exercise prevent individuals from attending fitness facilities? **METHODS:** A survey was created based on anxiety and knowledge in college aged students with attendance in a fitness facility. The researchers handed out 250 surveys on the campus of East Stroudsburg University of Pennsylvania. Once completed, the surveys were collected, analyzed and sorted for the results. The researchers divided the results into two groups, including health majors, and other general majors. The main question looked at for the purpose of the research is "Has any anxiety prevented you from going to a fitness facility in the past? (If yes, please explain)" **RESULTS:** 126 surveys were returned. 20.63% of the total students surveyed reported to have anxiety. 2.97% more people in non-health majors answered yes to having so much anxiety in attending a fitness facility that it has prevented them from going. 33.33% of Biology and Chemistry majors answered yes, 25% of public health, speech pathology, and teaching majors reported yes to having anxiety in attending a fitness facility. 20% of students in general studies, 18.87% of exercise science majors, and 18.18% of business majors also reported yes. **CONCLUSION:** Majors such as art, computers, biology, chemistry, teaching, business, and general studies majors are to be more anxious in going to a fitness facility than health science majors. A higher number of people in non-health majors answered yes to having too much anxiety in attending a fitness facility that it has prevented them from going. Students did not feel an increase in knowledge of exercise lowered their anxiety levels.

Association Between Objectively Measured Body Fat Percentage and Two Indirect Measures of Adiposity

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Body mass index (BMI), calculated using height and weight, is used clinically to diagnose obesity. The ability of BMI to estimate adiposity is limited in the general population and unknown in college aged individuals. Relative fat mass (RFM) has been proposed as an alternative technique to BMI for diagnosis of obesity. RFM accounts for mass stored in the lower portion of the torso by incorporating height and waist circumference into the equation. **PURPOSE:** The purpose of this study was to compare rates of obesity determined by BMI, RFM and objectively measured percent body fat (BF%) via bioelectrical impedance analysis (BIA) in a large cohort of college aged men and women. **METHODS:** 3804 college students completed an objective fitness assessment, where they self-reported their age and sex, and height, weight, waist circumference, and BF%, were assessed. Correlation and chi-square tests for independence analyses examined the relationships and differences in rates of obesity between each method. **RESULTS:** The mean age of the sample was 21.2 ± 1.1 , and the majority ($n = 2406, 63\%$) identified as male. Significant correlations were found between BMI and BF% for men ($r=0.79, p<0.001$) and women ($r=0.84, p<0.001$); BMI and RFM for men ($r=0.85, p<0.001$) and women ($r=0.83, p<0.001$); and, BF% and RFM for men ($r=0.74, p<0.001$) and women ($r=0.76, p<0.001$). Differences were found between the observed and expected classification of normal adiposity or obesity by BMI, RFM and BF% for men and women (for all $p<0.001$). Among men, comparing BF% vs. BMI and RFM vs. BMI, more obese men via BF% or RFM were classified as normal via BMI (BF%; $\chi^2=665, p<0.001$; RFM; $\chi^2=1189, p<0.001$). For women, comparing BF% vs. BMI and RFM vs. BMI, more women who were obese via %BF and RFM were classified as normal via BMI (%BF $\chi^2=576, p<0.001$; RFM $\chi^2=108, p<0.001$). Comparing RFM and BF%, more men and women classified as obese by RFM were considered

normal by %BF ($\chi^2=626$, $p<0.001$; $\chi^2=246.5$, $p<0.001$). **CONCLUSION:** Strong associations are observed among BMI, RFM and objectively measured %BF in college students. Despite these strong relationships, discrepancies were observed between obesity classifications between BF%, B Active and Passive

Recovery Impact on Muscular Measures of Female Soccer Players

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Female soccer players are at a higher risk for injury because of their hip and knee structures. Injuries are also far more likely to occur in the second half of soccer games due to fatigue and lack of re-warm up after half time.

PURPOSE: To investigate the effects of passive and active recovery on different muscular measures to see if injury could be prevented and performance improved. **METHODS:** Ten Shippensburg University Women's Soccer team players (age 19.2 ± 1.1 yrs) completed a battery of tests on two separate days; passive and active recovery days. Each day consisted of a warm up, two-eight minute 5v5 short sided games, and four of the same test batteries. Each test battery was measured: 1) after warm up, 2) after first half of game, 3) after the recovery period, and 4) after the second half of game. Each test battery consisted of measuring rate of perceived exertion (RPE), hamstring flexibility, and anaerobic power. Anaerobic power was measured using the Margaria-Kalamen Power Test and hamstring flexibility was measured using a sit and reach test. Two-way ANOVA with repeated measures was used to compare active versus passive data during multiple time points. **RESULTS:** The RPE after active recovery was significantly higher than during passive recovery (9.6 ± 1.4 vs. 6.9 ± 1.7 $p<0.05$). Hamstring flexibility was similar at baseline on both days of testing (passive= 27.1 ± 9.0 cm, active= 27.4 ± 10.4 cm, $p>0.05$), however after active recovery hamstring flexibility was 1.4 cm greater than after passive recovery (28.6 ± 9.4 vs. 27.2 ± 10.0 cm), although this difference was not statistically significant ($p>0.05$). Both passive and active recovery resulted in an improvement of anaerobic power from the end of the first half to after recovery, with only active recovery showing a significant improvement. With passive recovery, anaerobic power increased slightly from 849.7 ± 188.5 to 858.5 ± 214.8 W ($p>0.05$), while active recovery resulted in a significant anaerobic power increase from 779.1 ± 234.6 to 805.6 ± 205.0 W ($p<0.05$). **DISCUSSION:** The increase in hamstring flexibility as well as anaerobic power seen with active recovery, during half time, could help to prevent injuries as well as increase athletic performance in the second half of game. If athletes are unable to participate in active recovery they should at least be rewarming up after half time. MI and RFM.

Effects of an Exogenous Ketone Supplement on Five-Kilometer Running Performance

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Athletes of all varieties are constantly trying to find ways to improve their performance. Recently, ketone supplements have emerged and may be used to rapidly increase ketone body availability, without the need to first adapt to a very low carbohydrate ketogenic diet. However, the extent to which these ketone bodies affect substrate metabolism during exercise and athletic performance remains to be determined. **PURPOSE:** To assess exercise performance time and related physiological, metabolic and perceptual responses of recreational endurance runners after ingestion of a commercially available oral ketone supplement. **METHODS:** Recreational endurance runners ($n = 10$; age: 20.8 ± 1.03 years; weight: 68.9 ± 5.6 kg; height: 175.6 ± 4.9 cm) participated in a double-blind, crossover, repeated-measures study where they were randomized to 300 mg·kg⁻¹ body weight of an oral ketone supplement (KS) or a flavor matched placebo (PLA) 60 minutes prior to performing a 5-km running time trial (5KTT) on a treadmill. Time, heart rate, RPE, and affect, were recorded at 500-m intervals during the TT. Session RPE and affect were obtained post TT. Metabolic measures (RER, VO₂, VCO₂, and V_E) were measured during the 5-km. Plasma glucose, lactate and ketones were measured at baseline, 60 minutes post-supplement, and immediately following the TT. **RESULTS:** Plasma β-hydroxybutyrate (βHB) was elevated from baseline and throughout entire protocol in the KS condition ($p < 0.05$). Although, no significant differences ($p = 0.100$) were observed in TT performance, 8 of the 10 subjects ran faster ($p = 0.001$) during the KS (1443.9 ± 208.5 s) compared to PLA (1543.5 ± 242.2 s). No other differences ($p > 0.05$) were noted in any of the other physiological, metabolic or perceptual measures. **CONCLUSION:** Ingestion of a commercially available ketone supplement prior to exercise resulted in a significant elevation of plasma βHB within 60-min of consumption. No significant differences were noted in time for the 5-km between trials, however 80% of the subjects performed the TT faster during the KS condition and were deemed responders. When comparing KS to PLA in responders only, significantly faster times were noted when consuming the KS compared to PLA.

Supported by Grove City College Exercise Science Department

Mechanical Constraints of Force Production during a Stationary Sprint-Start

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The ability to accelerate is a desirable attribute for competitive sprinters and can be affected largely by the amount of force produced through the initial push out of the blocks, or step-0. It is widely accepted in the literature that more force is always better for block performance. **PURPOSE:** To explore the limits of force production by the musculoskeletal system at a forward-oriented ground-reaction-force angle, like ones seen in sprint events, when not limited by friction, balance, and trajectory. **METHODS:** Four experienced adult male sprinters (height= 1.7 ± 0.1 m, mass= 82.9 ± 4.3 kg) volunteered and provided informed written consent. Horizontal and vertical ground-reaction-force data was collected at 1,000 Hz as subjects performed three variations of the sprint start using track blocks. Each subject performed three trials of a Normal Track Start (NS), Mat Dive (MD), and an In-line Mat Dive with a side-by-side block configuration (IMD). Resultant vector angles and magnitudes (normalized to body weight) were calculated for each trial and averaged for each condition, as well as block-clearance and post-block aerial times. **RESULTS:** The average vector magnitude for the three conditions were 1.46, 1.56, and 1.77 x body weight for the NS, MD, and IMD, respectively, while aerial times were 0.059, 0.055, 0.062 seconds for the same conditions. Vector angles for NS, MD, and IMD were 52.0, 47.5, and 43.3, respectively. **CONCLUSION:** Since subjects were able to increase their total force production without significantly increasing aerial time, we conclude that athletes produce force sub-maximally to perform a successful sprint start, resulting from the requirement for balance.

Supported in part by US Army Medical and Materiel Command award [W81XWH-12-2-0013] to P.G.W.

Inter- and Intra-rater Reliability of B-mode Ultrasound to Assess Body Fat Percentage

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Body fat percentage (%BF) assessment is used to evaluate overall health, nutritional status, and body composition changes over time. The most accurate assessment tools (i.e. DEXA and MRI scans) are not widely accessible due to high costs, while less-expensive field measures (i.e. skinfold calipers) have limited reliability. Ultrasound (US) is proposed as a relatively inexpensive, portable tool for %BF assessment, as results are shown to correlate with those from validated laboratory methods. However, technician skill-level and amount of previous experience using US may impact reliability of this tool. **PURPOSE:** To assess inter- and intra-rater reliability between experienced (ET) and novice technicians (NT) using brightness mode (B-mode) US to assess %BF. **METHODS:** Two technicians, one ET and one NT, scanned participants (n=17; $M_{age}=27.6 \pm 7.9$ yr; $M_{height}=171.1 \pm 7.6$ cm; $M_{weight}=71.7 \pm 12.0$ kg; $M_{BMI}=24.4 \pm 3.2$ kg/m²) in triplicate at seven pre-determined skinfold sites using B-mode US. Jackson-Pollock skinfold equations were used to estimate %BF. Reliability was assessed by intraclass correlation coefficients (ICC) and 95% confidence intervals (CI). **RESULTS:** The ICC for %BF via US was 0.983 (CI 0.946-0.994) and $R^2=0.94$, indicating a high level of agreement between ET and NT. There was better agreement among female (ICC= 0.992; CI: 0.963-0.998) compared to male participants (ICC= 0.867; CI 0.430-0.970) across both technicians. Inter-rater reliability was also high at each measurement site, with the exception of subscapular (ICC=0.858; CI 0.491 -0.953) and chest (ICC=0.807; CI 0.437-0.932). Intra-rater reliability was high for both ET (ICC= 0.997; CI 0.992-0.999; $R^2=0.977-0.982$) and NT (ICC= 0.998; CI 0.996-0.999; $R^2=0.990-0.998$). Technicians had high intra-rater reliability at individual sites for both sexes. **CONCLUSION:** B-mode ultrasound is a reliable %BF assessment tool regardless of technician experience level, indicated by the high inter- and intra-rater reliability found in this study. However, additional training- even for experienced technicians- may be necessary when imaging males. Future studies should investigate the validity of US to determine potential use and replacement of common laboratory and field techniques used to assess %BF.

Extra- and Intra- Renal Vascular Responses to Sympathetic Activation are Not Modified Following Cooling Recovery

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Elevated renal vascular resistance (RVR) during heat stress may provoke localized ischemia, especially when exposed to multiple sympathetic stressors. Whole-body cooling reduces risks associated with heat stress. However, this cooling raises RVR and could therefore exacerbate increases in RVR caused by prior heat stress, particularly during sympathetic activation. **PURPOSE:** To test hypotheses that increases in both extra- and intra- RVR to the cold pressor test (a sympathoexcitatory stimulus, CPT) are exacerbated by whole-body cooling following heat stress. **METHODS:** Nineteen healthy adults (22 ± 2 y) underwent passive heat stress sufficient to raise core temperature 1.2°C above normothermic baseline (NT), after which they underwent passive cooling recovery (CR) to within 0.2°C of NT. Participants completed a 2 min CPT at NT and at the end of CR. Changes in body weight provided an indication of dehydration. Heart rate (HR), mean arterial pressure (MAP), and renal blood velocity (RBV) were measured pre-CPT (Pre) and at the end of the CPT (End). RBV was measured using the coronal approach with Doppler ultrasound at the distal segment of the right renal artery (Extra-, $n=11$) or in the same segmental artery within participants in the right kidney (Intra-, $n=8$). RVR was calculated as MAP/RBV . Data are presented as mean \pm SD. **RESULTS:** The change in body weight was $-1.2 \pm 0.5\%$. In Extra- at Pre, MAP was elevated in CR compared to NT (95 ± 9 vs. 85 ± 7 mmHg, $P<0.01$) with no differences in HR (58 ± 7 vs 56 ± 9 bpm, $P=0.24$). MAP and HR in Intra- at Pre did not differ from Extra- ($P\geq 0.72$). In Extra- at Pre, RBV (33 ± 4 vs 36 ± 5 cm/s, $P=0.01$) and RVR (0.35 ± 0.06 vs 0.43 ± 0.08 mmHg/cm/s, $P<0.01$) were lower in CR compared to NT. RBV was lower and RVR was higher in Intra- compared to Extra- ($P\leq 0.02$) at Pre. At End, increases in HR (12 ± 9 vs 14 ± 7 bpm, $P=0.50$) and MAP (24 ± 16 vs 24 ± 16 mmHg, $P>0.99$) were not different between CR and NT in Extra-. Changes in RBV (-3 ± 5 vs -2 ± 7 cm/s, $P=0.59$) and increases in RVR (1.24 ± 0.97 vs 0.95 ± 0.99 mmHg/cm/s, $P=0.29$) did not differ between CR and NT in Extra- at End. There were no differences in the HR, MAP, RBV, or RVR response to CPT in Intra- compared to Extra- ($P\geq 0.10$). **CONCLUSION:** Whole-body cooling following passive heat stress does not affect the extra- or intra- renal vascular responses to sympathetic activation.

Arterial Stiffness and Wave-Reflection in African-American and Caucasian-American Men After Acute Aerobic Exercise

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PURPOSE: Maximal aerobic exercise results in differential central stiffness responses but not wave reflection in African-American individuals (AA) as compared to Caucasian-American individuals (CA). However, the effect of race on changes in central stiffness and wave reflection have not been completely elucidated. Therefore, the purpose of the study was to evaluate the effects of acute high-intensity (HI) and sub-maximal continuous (CONT) cycling bouts on central pulse-wave velocity (cPWV), augmentation index (AIx) and augmentation index normalized to heart rate of 75 beats per minute (AIx75) in AA and CA men. **METHODS:** Six AA and five CA recreationally active men (22 ± 2 years) participated in this study. Each participant underwent a HI and a CONT exercise bout in a randomized cross-over design. PWV, AIx and AIx75 were measured at baseline, ten- and sixty-minutes post cycling exercise. **RESULTS:** There was no significant difference in cPWV responses following HI (-0.1 ± 0.3 vs. -0.4 ± 0.3 m/s) and CONT (0.1 ± 0.3 vs. 0.1 ± 0.3 m/s) at 10-minute post-exercise between AA and CA respectively. Similarly, there were no significant differences between AA or CA following HI (-0.6 ± 0.3 vs. -0.4 ± 0.3 m/s) and CONT (-0.1 ± 0.3 vs. -0.1 ± 0.3 m/s) at 60-minute post-exercise. Additionally, there were no significant differences in AIx at 10 and 60-minute post HI or CONT. Additionally, there was no significant difference in AIx75 response to either of the acute aerobic exercise bouts. Among AA and CA, 10-minute post HI (7.7 ± 7.1 vs. $11.2 \pm 4.2\%$) or CONT (14.8 ± 5.5 vs. $16.6 \pm 4.5\%$), and 60-minute post HI (-4.8 ± 5.1 vs. $7.8 \pm 2.8\%$; $p=0.07$) or CONT (0 ± 6.4 vs. $-3.6 \pm 6.5\%$). **CONCLUSION:** Central stiffness and wave-reflection are not affected by race following acute sub-maximal aerobic exercise.

2 Minute Walk Distance as a Predictor of VO₂peak in Non-Dialysis CKD

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Reduced exercise capacity, as assessed by VO₂peak, is a common characteristic among chronic kidney disease (CKD) patients that independently predicts quality of life and mortality and contributes to the disease related cardiovascular disease burden. The measurement of VO₂peak is not always feasible and therefore functional tests that predict VO₂peak in this group are needed. The NIH toolbox motor measures includes the 2 minute walk test (2MWT) as a measure of cardiorespiratory endurance, but it is yet to be elucidated whether this is a valid method of

predicting VO₂peak in CKD. **PURPOSE:** To assess the potential clinical utility of the 2MWT as a predictor of VO₂peak in a non-dialysis CKD population. **METHODS:** 27 participants (59 ± 11 years) with non-dialysis CKD performed cardiopulmonary exercise testing (CPET) on a cycle ergometer and, on a separate day, the 2MWT. Multiple regression analyses were performed to develop a VO₂peak prediction model using the 2 minute walk distance (2MWD) combined with 30 second sit-to-stand (STS), Body Mass Index (BMI), Age, and Hemoglobin (Hb). Bland-Altman analysis was utilized to assess the agreement between both methods. **RESULTS:** Participants covered an average distance of 580 ± 112 meters during the 2MWT and achieved an average VO₂peak of 16.7 ± 5.6 mL·kg⁻¹·min⁻¹ during CPET. Based on univariate correlates of VO₂peak, the following model was developed to predict VO₂peak from 2MWD: Predicted VO₂Peak (mL·kg⁻¹·min⁻¹) = -12.585 + (0.012 x 2MWD) + (-0.013 x BMI) + (-0.33 x Age) + (0.723 x STS) + (1.427 x Hb) (r= 0.7; r²= 0.5; p<0.05). Bland-Altman plots revealed a mean VO₂peak difference of 0.08 ± 3.85 mL·kg⁻¹·min⁻¹ (95% limits of agreement, -7.47 and 7.64 mL·kg⁻¹·min⁻¹). A proportional bias (p<0.05) was observed suggesting the predictive model was less accurate in persons with greater VO₂peaks. **CONCLUSIONS:** With a significant proportional bias and large limits of agreement, the 2MWT does not appear to be appropriate for predicting VO₂peak in non-dialysis CKD patients.
Supported by NIH Grant HL113514

Differences in Lower-Extremity Kinematics Among Female Collegiate Soccer and Volleyball Players

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Joint angles and leg stiffness play a role in an athlete's Reactive Strength Index (RSI), which is a measure that can be used to determine an athlete's ability to produce force or explosiveness over a short period of time. **PURPOSE:** To evaluate the differences in RSI, knee joint angular displacement (KD), and ankle joint angular displacement (AD) among soccer and volleyball female athletes during a landing task. **METHODS:** A total of 14 healthy, NCAA Division III female athletes (19.79 ± 1.12 years) volunteered for this study. The subjects jumped over a hurdle with subsequent maximal vertical jump (using Vertec). The maximal vertical jump landing was video recorded and analyzed using Hudl technique app. A one-way ANOVA was used to determine differences among soccer and volleyball athletes for RSI, KD, and AD. **RESULTS:** RSI was significantly higher in soccer (1.78±0.39 vs. 1.32±0.23, p<.05). There were no significant differences observed between soccer and volleyball athletes for KD (30.12°±12.55° vs. 37°±18.52°, p=.422) and AD (40.37°±6.5° vs. 43.83°±9.02°, p=.419). **CONCLUSION:** There is an observable difference in ground force attenuation strategies by sport. Future studies should explore lower-extremity absorption strategies using bigger sample size, NCAA Division I or II athletes, and comparing genders during sport-specific tasks. Further investigation may examine landing angles in both the frontal and sagittal planes.

Mission Profile Characteristics of a Special Forces Deployment in Afghanistan

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U.S. Army Special Operations Forces (SOF) undergo difficult missions in extreme environments, oftentimes while carrying heavy loads, the combination of which results in a high energy output. Energy expenditure in excess of intake may result in weight loss and impaired performance. In a scenario where energy demands consistently exceed intake, Soldiers are at increased risk of injury and mission compromise. **PURPOSE:** To determine the energy expenditure of SOF Soldiers based on present-day missions in the Central Command (CENTCOM) region. **METHODS:** Demographics of the participants were as follows: age (yrs) 30±3.5, height (in) 70.65±2.8, weight (lbs) 195.2±24, enlisted (86%), officer (7%), warrant officer (7%), years in the Army 8.3±3.9, and total time deployed during career (yrs) 1.26±1.2. Surveys were collected from 46 SOF Soldiers operating in eight locations in the CENTCOM theater of operations during February 2018. Information from the surveys revealed the mission energy requirements and difficulty of exertion pre-, during-, and post-mission. A physical activity factor was determined based on multiple factors surrounding mission intensity and used to calculate energy expenditure

estimations based on a SOF-specific equation developed by Barringer et al., 2018. **RESULTS:** During a six-month deployment, participants underwent a multitude of missions (17.25 ± 8.66). Ninety percent of respondents reported carrying a load 40% heavier than the recommended fighting load (32.9 ± 8.62 vs. 21.8 kg, respectively) based on military doctrine. Average estimated energy expenditure (4848 ± 525 kcal/day) far exceeded the military dietary reference intake of 3400 kcal/day. All but three respondents reported a rate of energy expenditure exceeding the benchmark of 300 kcal/hr necessary to maintain adequate energy reserves upon enemy contact. **CONCLUSION:** The heavy loads carried by SOF Soldiers appear to exceed the recommendations in Army doctrine. Additionally, their high energy expenditure, if not matched by an equally high energy intake, has been shown to result in performance decrements and may compromise mission success. Special attention must be given to pack weights during pre-mission planning and nutrition strategies aimed at meeting mission demands and recovery from strenuous activity.

Psychological Effects of Pre-Workout Supplement vs. Placebo on Strength Training

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Extensive research on sports supplements has shown the impact that taking pre-workout has on performance, but little research has been done to determine if the positive results could be due to the placebo effect. Past research has shown that exercise influences mood, but it is less clear if a placebo affects those results. **PURPOSE:** The purpose of this study is to test how pre-workout and a placebo affects performance and the mood of participants. **METHODS:** Nineteen college students (21.47 ± 1.47 yrs), 9 male and 10 female, were recruited for this study. Students came in for a baseline test day, and two other test days in which they consumed either a pre-workout supplement or a placebo. Mood was assessed by using the Positive and Negative Affect Schedule (PANAS) and Felt Arousal Scale before and after participants performed knee extensions until failure at a predetermined weight. Prior to testing, subjects consumed 8 ounces of a pre-workout solution or a placebo. A repeated-measures ANOVA was used to assess performance data, while factorial ANOVAs were used to assess arousal and mood. **RESULTS:** Subjects performed significantly more reps ($F(2,36)=8.48, p<.01$) after consuming a placebo (13.58 ± 2.27) and after consuming pre-workout (12.63 ± 2.81) compared to their baseline day (11.32 ± 2.83). There was a main effect for arousal ($F(1,54)=140.88, p<.001$), such that post-exercise arousal was higher (4.33 ± 0.91) compared to pre-exercise arousal (3.00 ± 1.28). Similarly, there was a main effect for positive affect ($F(1,54)=38.48, p<.001$), with post-exercise positive affect (33.11 ± 10.92) being higher than pre-exercise positive affect (29.95 ± 10.67). There were no significant interaction or main effects for negative affect. **CONCLUSION:** Results showed increases when both pre-workout supplements and a placebo were consumed, increasing their max repetitions from their baseline day. This shows that consumption of pre-workout supplements does not significantly increase performance. This raises the question of whether or not pre-workout supplements actually increase performance, or just the belief that it will increase performance. Subjects' arousal and positive affect increased from beginning to end but was not influenced by the pre-workout or placebo. Exercise was the cause of the significant main effects for time.

A Comparison of Self-Reported Pain Levels in Minimally-Shod vs Traditionally Shod Runners with Different Arch Characteristics

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Minimalist running has recently become popular with the intention of lowering overuse injury rates seen in distance running. The efficacy of wearing minimalist shoes to prevent injury has been greatly debated. We previously reported that arch height (pes cavus, normal, pes planus) affects lower extremity pain in minimalist runners; however, no clear relationship has been established between either arch height index (AHI) or arch rigidity index (ARI) and running shoe type, and pain. The **PURPOSE** of this study was to examine self-reported pain in the lower limbs in minimally and traditionally shod runners with various AHIs and ARIs. **METHODS:** Following consent, 60 experienced runners (age 26.88 ± 9.2 yrs, hgt 171.6 ± 9.8 cm, mass 68.7 ± 15.1 kg, gender: 40F/20M) completed a visual analog scale (VAS) about pain in five common sites of injury: knee, ankle, calf, shin, and foot (VAS $\geq 3/10$ was considered pain). AHI was categorized as high (n=30), normal (n=60), and low (n=30). ARI was categorized as rigid (n=30), normal (n=60), and flexible (n=30). A series of 3-factor chi-square analyses determined if shoe type (minimalist, traditional) and AHI (high, normal, and low arch) were related to overall and site specific pain (yes, no). ($\alpha=0.05$). Additional 3-factor chi-square analyses determined if ARI (rigid, normal, and flexible) and shoe type (minimalist, traditional) were related to pain (yes, no). ($\alpha=0.05$). **RESULTS:** More minimalist runners with a

normal AHI (70.%; $p=0.028$) reported pain in at least one site when compared to traditional runners with a normal AHI (40.0%; $p=0.028$). All minimalist runners with a rigid arch reported pain in at least one site (100%, $p=0.003$) while reported pain in traditional runners was less common (28%; $p=0.003$). However, the interaction between site specific pain, arch characteristics, and shoe type is not as clear as the results varied between the different AHI/ARI, shoe type, and site specific pain combinations. **CONCLUSIONS:** Generalizations about site specific pain in minimally or traditionally shod runners with high/low or flexible/rigid arches are difficult because the results are combination specific. Runners with a rigid arch may not be able to absorb ground reaction forces as well when wearing minimal shoes and may fare better in a traditional shoe that offers more support during ground contact.

How Does Sleep Affect Body Mass Index in College Students?

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PURPOSE: To compare sleep quantity and body mass index in college students. **METHODS:** A convenience sample of 99 college students participated in a free comprehensive physical fitness assessment which included measurement of height and weight to determine body mass index. Body mass index was categorized as normal ($< 25 \text{ kg/m}^2$) or overweight/obese ($> 25 \text{ kg/m}^2$). Participants also completed an online health survey which included questions pertaining to the number of hours of sleep per night during the week. Sleep quantity was categorized as 1-3 hours, 4-5 hours, 6-7 hours, and 8 or more hours per night. An unpaired t-test was used to examine the relationship between sleep quantity and body mass index. **RESULTS:** Average body mass index for all participants was 24.99 kg/m^2 ($SD=4.69$) and hours of sleep per weeknight was 7.0 ($SD=3.06$). The average body mass index for participants categorized as overweight/obese was 28.67 kg/m^2 ($SD=4.22$) and the number of hours of sleep per weeknight for the same group was 6.8 ($SD=1.29$). The average body mass index for participants categorized as normal was 21.96 kg/m^2 ($SD=2.18$) and the number of hours of sleep per weeknight for the same group was 6.61 ($SD=1.18$). Male participants had an overall average body mass index of 25.44 kg/m^2 ($SD=4.63$) and slept an average of 7.3 hours ($SD=4.08$). Female participants had an overall body mass index of 25.5 kg/m^2 ($SD=4.67$) and the number of hours of sleep per weeknight for the same group was 6.67 hours ($SD=1.40$). **CONCLUSION:** The results showed that, participants categorized as overweight/obese, had slightly more hours of sleep per weeknight compared to participants categorized as normal per body mass index standards. However, findings were not significant ($t=0.72$; $p>.05$).

A Backpack Hip Strap Does Not Influence Oxygen Consumption or Blood Pressure in 30 minutes of Walking

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Energy expenditure increases when carrying a loaded backpack. However, it is unclear what effects, if any, the use of a backpack hip strap has on metabolic and cardiovascular stress during exercise. **PURPOSE:** To determine if a backpack hip strap has any beneficial physiological effects while walking. **METHODS:** Thirteen subjects (23 ± 4.8 yrs; 5 females, 8 males) walked for 30 minutes on a treadmill with a backpack containing 30% of the wearers bodyweight. The treadmill was set to 3% grade with a speed eliciting a heart rate reserve of 40-50%. Two trials were performed: unstrapped (UnST) and strapped (ST). Heart rate (HR), oxygen consumption (VO_2), and systolic blood pressure (SBP) were measured throughout each trial. Five minute averages were calculated for each variable from baseline (BL) to 30 minutes. SBP measures were calculated as change scores from the first 5 minutes of baseline. A repeated measures ANOVA was used to evaluate the differences between conditions at each time point. **RESULTS:** HR beginning at 10mins (UnST: 131 ± 4 bpm; ST: 130 ± 4 bpm) was elevated compared to BL (UnST: 81 ± 4 bpm; ST: 80 ± 4 bpm) and 5mins (UnST: 121 ± 4 bpm; ST: 120 ± 3 bpm). All other HR measures were similar. No difference in HR was found between trials ($p=0.912$) at any point. VO_2 at 5mins (UnST: 1.6 ± 0.1 L/min; ST: 1.5 ± 0.1 L/min) was elevated ($p<0.001$) compared to BL (UnST: 0.38 ± 0.02 L/min; ST: 0.38 ± 0.03 L/min), but was similar to all other time points. There was no difference in VO_2 between trials ($p=0.317$). The change in SBP at 0-5 min (UnST: 26 ± 8 mmHg; ST: 31 ± 6 mmHg) was similar to the rest of the time points throughout the trial ($p=0.115$) and did not differ between trials ($p=0.224$). **CONCLUSION:** These results indicate that use of a backpack hip strap has little effect on oxygen consumption or systolic blood pressure during 30 minutes of walking with a load of 30% the wearers body weight.

Oral Saline Consumption and the Exercise Pressor Reflex

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The average American consumes far more sodium than is recommended. Consuming high amounts of sodium may augment blood pressure (BP) responses to physical stress like exercise. Exaggerated BP responses to exercise are thought to be an early symptom of some cardiovascular diseases like hypertension. **PURPOSE:** This analysis contains two studies. The purpose of study one was to determine at what time point both blood plasma and serum sodium would be consistently elevated following sodium and water consumption. The purpose of study two was to examine if elevated plasma and serum sodium result in an elevated BP response to handgrip (HG) exercise and the cold pressor test (CPT). **METHODS:** Study 1: Eight participants drank 423mL of normal saline (sodium 154mmol/L) and had repeat blood draws every 30min for 3hr. Study 2: Sixteen different participants underwent two randomized data collection visits; an experimental (EXP) visit 90min following normal saline consumption and a control (CON) without saline consumption. At each visit beat-by-beat BP and heart rate were recorded during a 5min rest period followed by 2min of isometric HG at 30% maximal voluntary contraction. Two minutes of post exercise ischemia (PEI) were performed immediately following HG. After a ≥ 10 min rest, participants underwent a 2min CPT. **RESULTS:** Study 1: Both plasma volume ($+6.8 \pm 1.3 \% \Delta$) and serum sodium ($+3.5 \pm 1.3 \% \Delta$) were elevated ($p < 0.05$) at or before the 90min time point and remained elevated throughout the 3hr follow-up period. Study 2: There were no significant differences in mean arterial pressure (MAP) during HG (EXP: 17.4 ± 2.1 mmHg; CON: 19.1 ± 1.5 mmHg), PEI (EXP: 16.9 ± 2.9 mmHg; CON: 16.9 ± 1.9 mmHg), or the CPT (EXP: 20.3 ± 2.7 mmHg; CON: 20.9 ± 2.9 mmHg) between conditions ($P > 0.05$). MAP recovery from the CPT was significantly slower in the saline condition (1min recovery: EXP; 15.7 ± 2.0 mmHg, CON; 12.3 ± 2.2 mmHg, $P < 0.05$). **CONCLUSION:** The current data found no significant differences in cardiovascular responses during handgrip or the cold pressor test between conditions. However, a modest delay in the recovery of blood pressure was found following the cold pressor test during sodium and volume loading. This suggests acute salt and water consumption increases cardiovascular strain following an intense physical stressor.

Ambulatory Blood Pressure Monitoring Tracks Alarm-activated Blood Pressure Surges in Control vs Firefighter Populations

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Hypertension is one of the leading risk factors for cardiovascular disease (CVD). There are many things that cause hypertension, including work related stress. In a previous HEART lab study, volunteer firefighters were studied to measure the surge in blood pressure (BP) after their pager alarm sounded. **PURPOSE:** To analyze BP surges in a control population and compare it to the BP elevations previously discovered in the firefighters. **METHODS:** Participants wore an ambulatory blood pressure (ABP) monitor to track BP for a full 12 hours. During that time period, they were "paged" using the OnPage cellphone app, and when the app alarm sounded they forced a BP measurement on the ABP monitor. For further CVD analysis, fasted levels of glucose and cholesterol were assessed for relationships to the BP surge. Central BP was also recorded using pulse wave analysis to detect arterial stiffness. **RESULTS:** To date, 10 participants have completed the study (38.4 yrs; 7M, 3W). With the cellphone pager 'alarm', the average systolic BP surge measured was 7.4 mmHg, and the average diastolic BP surge was 7.1 mmHg. These alarm surge values appear to be lower than the previously measured systolic and diastolic BP in the volunteer firefighter population, who had BP surge measurements of 23.5 mmHg and 14.8 mmHg respectively. **CONCLUSION:** The study is ongoing, but preliminary data shows that the firefighter population have higher average surges than the control group when compared to their pre-alarm BP for both systolic and diastolic measurements.

Apple Watch's Breathing Application for Stress Management

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Stress can trigger a number of psychological, physiological, and behavioral responses. Yoga and meditation are popular in alleviating stress. A modified version of Durga Pranayama or three-part yogic breath seems to alter physiological responses. More recently, technological advancements provide opportunities to affect health and wellbeing. One such application is Apple Watch's *Breathe* app that guides users through a timed deep breathing session using onscreen graphics and vibrational cues. **PURPOSE:** The purpose for this study was to assess the effectiveness of stress relief applications that assist in deep breathing and compare with that of in-person three-part yogic breath, Durga Pranayama, on altering heart rate (HR) and blood pressure (BP). **METHODS:** Ten (7M/3F) seemingly healthy students were recruited from the Penn State Berks campus. Each participant completed six deep breathing sessions (3 in-person sessions/week and 3 Apple Watch based sessions/per week) over a two-week period. HR and BP were measured before and after each session. **RESULTS:** Participants' average HR: 74.25 ± 11.98 bpm, systolic BP 112.93 ± 14.34 mmHg, diastolic BP: 73.55 ± 13.28 mmHg were assessed. A paired-samples t-test was conducted to compare the absolute differences (pre - post) in HR, systolic BP, diastolic BP measured during in-person and during the Apple Watch deep breathing sessions. Although HR & BP noticeably decreased from Apple Watch breathing sessions when compared with in-person sessions, there was no significant absolute differences in HR (2.3 ± 4.9 vs. 1.6 ± 3.4) bpm, SBP (5.1 ± 4.7 vs. 2.4 ± 5.8) mmHg and DBP (1.8 ± 5.3 vs. -0.7 ± 4.6) mmHg; $p > 0.05$. **CONCLUSION:** Even though HR & BP were evidently decreased during the Apple Watch deep breathing sessions; they were not statistically significant which could be due to relatively small sample size. Technology assisted meaningful reductions in HR & BP might be congruous for stress reductions and perhaps could impact health. This study was partly funded by the Penn State Berks Research Development Grant.

Ethnicity Does Not Affect Large Elastic Artery Stiffness After Acute Aerobic Exercise in Young Men.

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PURPOSE: Young healthy African-American individuals (AA) have significantly higher aortic stiffness as compared to Caucasian-American individuals (CA) at rest and a differential response post maximal exercise. However, there is limited data comparing the large elastic artery responses post-submaximal exercise between AA and CA. The purpose of the present study was to compare the carotid artery stiffness post-acute high intensity interval (HII) and continuous (CONT) aerobic exercise in AA versus CA. **METHODS:** Six AA and five CA young (age, 22 ± 1 years), healthy men underwent an acute CONT and an a HII bout of exercise on a cycle ergometer in a randomized cross-over design. Carotid β -stiffness, elastic modulus (Ep), and arterial compliance were determined at rest and 10 and 60 minutes post-exercise via ultrasonography of the right common carotid artery. **RESULTS:** There were no significant difference in β -stiffness responses for AA as compared to CA following CONT at 10 min (changes = -0.50 ± 0.84 vs. 0.78 ± 0.50) and 60 min (changes = 0.20 ± 1.09 vs. 0.65 ± 0.79), or HII at 10 min (changes = 0.33 ± 0.72 vs. 0.26 ± 0.36) and 60 min (changes = 0.93 ± 0.28 vs. -0.44 ± 0.69 , $p = 0.08$). Similarly, there were no significant differences in Ep responses for AA or CA following CONT at 10 min (changes = -4.67 ± 8.90 vs. 9.40 ± 3.23) and 60 min (changes = 3.83 ± 12.27 vs. -2.0 ± 10.15) or HII at 10 min (changes = 3.67 ± 7.39 vs. 11.2 ± 10.86) and 60 min (changes = 4.33 ± 3.37 vs. 9.80 ± 11.66). There were no significant differences in arterial compliance response for AA as compared to CA following CONT at 10 min (changes = -0.65 ± 0.12 vs. -0.14 ± 0.06) and 60 min (changes = -0.12 ± 0.11 vs. 0.11 ± 0.09), or HII at 10 min (changes = -0.04 ± 0.09 vs. -0.05 ± 0.09) and 60 min (changes = 0.15 ± 0.06 vs. 0.13 ± 0.14). **CONCLUSIONS:** There are no racial differences in large elastic artery stiffness following acute bouts of submaximal aerobic exercise. These results are in contrast to previous studies showing differential responses to maximal exercise in aortic and peripheral stiffness in AA as compared to CA.

Leveraging Machine Learning Techniques to Reveal Relationships between Neuromuscular Traits in Previously Concussed Warfighters

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Military personnel are at higher risk for concussion than civilians. Recent studies have demonstrated an increased risk of musculoskeletal injury following concussion, but the underlying mechanisms are still unknown. Changes in neuromuscular function following concussion may be implicated. **PURPOSE:** To compare military personnel with a concussion history in the previous 2 years (CH) with matched controls (NCH) in physiological, musculoskeletal and biomechanical performance using independent samples statistics (Aim 1) and using a machine learning decision

tree algorithm (Aim 2). **METHODS:** Air Force Special Operations Command Operators and Naval Special Warfare Operators self-reported injury history, and completed physiological, musculoskeletal, and biomechanical analysis. The physiology testing battery included body composition, anaerobic power/capacity, and aerobic capacity. Testing included lower extremity strength, including time to peak torque for each muscle group, and balance using the Neurocom. Biomechanical analysis consisted of a single-leg jump and landing task, including landing kinematics of the hip, knee and ankle. A one-way Analysis of Variance (ANOVA) was used to compare CH (n=24) to NCH (n=24; Aim 1), as well as the C5.0 decision tree algorithm (Aim 2). **RESULTS:** No differences were demonstrated using one-way ANOVA. The C5.0 algorithm revealed CH demonstrated quicker time to peak knee flexion angle during the single-leg landing task (≤ 0.170 secs; CH: n=22 vs. NCH: n=14), longer time to peak torque in knee extension isokinetic strength testing (> 500 msec; CH: n=18 vs. NCH: n=4) and larger knee flexion angle at initial contact ($> 7.7^\circ$; CH: n=18 vs. NCH: n=2). **CONCLUSION:** This study revealed differences between Warfighters in neuromuscular traits based on CH using the C5.0 machine learning algorithm. Future research should validate these findings in larger sample sizes and assess if neuromuscular changes following concussion are related to injury risk.

This study was funded by Air Force Special Operations Command (#FA8650-12-2-6271) and Office of Naval Research (#N00014-11-1-0929). Opinions, interpretations, conclusions, and recommendations are those of the authors and not necessarily endorsed by the Department of Defense, US Navy, US Air Force or Naval Special Warfare.

Fatigue Induced Changes in Dynamic Balance in Trained Ballet Dancers

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Previous studies have found no relationship between core muscle endurance and dynamic balance. However, the protocols of these studies did not stress muscular endurance. **PURPOSE:** The purpose of this study is to describe the relationship between core muscular endurance and changes in dynamic balance as measured using the star excursion balance test (SEBT) following a demanding dance routine in trained ballet dancers. **METHODS:** Nine female participants (20.2 ± 1.2 years, 162.6 ± 8.5 cm, 60.5 ± 15.7 kg) were recruited from a university ballet class. The participants began by performing their customary warm-up before completing the SEBT with both legs in three directions: anterior (ANT), posterior-medial (PM), and posterior-lateral (PL). Following the SEBT, core muscular endurance was measured by having the participants perform a prone plank (PP), a right lateral plank (RP), and a left lateral plank (LP) for time. Next, the participants executed a grand allegro (a short ballet with fast movements and high jumps) to music four times with a short rest between each repetition, and then the SEBT was repeated immediately following the final repetition. Comparisons between the right and left ANT, PM, and PL, and between RP and LP were made using paired samples t-tests. The changes in all three components of the SEBT (Δ ANT, Δ PM, and Δ PL) performance were calculated by subtracting the pre-test from the post-test, and correlation coefficients were calculated between Δ ANT, Δ PM, and Δ PL, and the PP, RP, and LP. **RESULTS:** No significant differences between right and left sides were found for any variable, and so only the right side SEBT variables were used to calculate Δ ANT, Δ PM, and Δ PL. Although there were no statistically significant comparisons, there were moderately positive correlations between Δ PL and RP ($r = 0.64$, $p = 0.0654$) and between Δ PL and LP ($r = 0.53$, $p = 0.1438$). All other correlations were negligible. **CONCLUSION:** Lateral plank performance appears to be related to fatigue-induced changes in dynamic balance when reaching in the posterior-lateral direction. This result is consistent with existing literature that suggest hip abductor and lateral rotator muscles are more important to dynamic balance than abdominal muscles. Further research is needed to determine if this relationship has value as an injury screening tool.

Effects of Oral Saline Consumption on Heart Rate Variability and Cardiovascular Baroreflex Sensitivity

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Large doses of dietary sodium raise blood sodium concentration and plasma osmolality resulting in increased water consumption and plasma volume. Acutely increased serum sodium concentration can increase sympathetic activity while increased plasma volume can load the baroreflex suppressing sympathetic activity and increasing parasympathetic activity. Therefore, the impact on autonomic nervous system activity of a simultaneous oral sodium and volume load is unclear. **PURPOSE:** To examine autonomic function and its control by the baroreflex in healthy adults following oral saline consumption. **METHODS:** Healthy subjects participated in two randomized data collection visits. During the experimental visit (EXP) participants orally consumed 423mL of normal saline (sodium

154mmol/L) and waited 90min before data collection. During the control visit (CON) no saline was consumed. Beat-by-beat systolic blood pressure, electrocardiogram derived R-R interval, and heart rate were recorded during 5min of supine rest. Heart rate variability was analyzed to assess resting autonomic function. Cardioagal baroreflex sensitivity was analyzed using the sequencing method which analyzes cardiac cycles where R-R intervals and systolic blood pressure change in unison for at least four sequential beats. **RESULTS:** Twelve healthy participants (age 25.6 ± 1.0 years; body mass index 24.6 ± 1.1 kg/m²) were studied. Heart rate significantly decreased during EXP (60.3 ± 3.3 BPM) vs CON (63.6 ± 3.8 BPM, $p < 0.05$), with no condition effect on systolic blood pressure (EXP 117 ± 4.5 mm Hg, CON: 128.4 ± 6.7 mm Hg, $p > 0.05$). There were no significant differences between conditions for all sequences of cardioagal baroreflex sensitivity (EXP: 24.92 ± 3.79 , CON: 22.34 ± 3.53 , $p > 0.05$). High frequency heart rate variability showed no significant difference (EXP: 3048.63 ± 789.08 ms², CON: 2963.88 ± 787.13 ms², $p > 0.05$). Low frequency heart rate variability (EXP: 2738.74 ± 590.07 ms², CON: 2761.61 ± 568.78 ms², $p > 0.05$) and low frequency to high frequency ratio (EXP: 1.10 ± 0.14 , CON: 1.78 ± 0.71 , $p > 0.05$) also showed no significant differences. **CONCLUSION:** This preliminary data suggests that although heart rate was suppressed by simultaneous sodium and volume loading, there were no differences in the control of, or resting levels of, autonomic activity.

Comparing Perceived Effects and Usage of Creatine between Division 2 Athletes and Recreationally Active Individuals

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Creatine is a natural substance that can be found in the body in very small doses. Creatine has been proven to help muscle cells produce more energy through the PCr system, in turn improving high intensity exercise performance, speeding up muscle growth, and offering other potential health benefits as preventive measures. **PURPOSE:** This study aimed to gauge the use and knowledge of creatine in NCAA division 2 college athletes (n=56) and compare these results to recreationally active individuals (n=59) at East Stroudsburg University of Pennsylvania. **METHODS:** A survey was used in order to gauge Division 2 collegiate athletes and recreationally active individuals on their usage and knowledge of creatine supplementation. A total of 6 demographic based questions were used, and 6 knowledge-based questions were used making 12 questions total. Potential subjects were recruited at both recreational gyms found on the campus of East Stroudsburg University; as well as Koehler fieldhouse which is home to all of the NCAA division 2 athletic teams on campus. **RESULTS:** Recreationally active individuals used creatine more for muscle hypertrophy, where as athletes predominantly used creatine for increases in strength. Results indicated that athletes had a greater knowledge (64.6%) and understanding of creatine than did recreationally active individuals (56.2%). **CONCLUSION:** Division 2 collegiate athletes had more knowledge on creatine supplementation than recreationally active subjects who were found to have a higher rate of creatine supplementation.

Circulating Angiogenic Cell and Microparticle Response to Prolonged Sitting

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Prolonged sitting increases the risk for cardiovascular disease. However, markers of vascular repair and damage such as circulating angiogenic cell (CAC) populations and microparticles (MP) have not been characterized with prolonged sitting or sitting with intermittent activity. **PURPOSE:** To examine the effects of 3h of sitting with or

without calf raises on CD34⁺, CD62E⁺, and CD31⁺/42b⁻ MP populations which are linked to endothelial activation, apoptosis and CAC paracrine activity, respectively, and CD14/31⁺, CD3/31⁺, and CD34⁺ CACs which are linked to endothelial repair. **METHODS:** After familiarization, sedentary subjects (n=18) sat still for 180 minutes (control condition) or sat for 180 minutes but performed 10 calf raises every 10 minutes (experimental condition) in a random order. Blood samples were obtained at baseline and at 180 minutes for analyses. CACs and MPs were isolated and analyzed using multicolor fluorescent flow cytometry. Data were analyzed with repeated measures ANOVA and are presented as mean \pm standard error. **RESULTS:** There was a main effect of sitting to decrease CD34⁺ MPs (119 \pm 36 vs. 106 \pm 30 events/ μ l, p<0.01) and CD62E⁺ MPs (51 \pm 29 vs. 34 \pm 16 events/ μ l, p<0.001) regardless of condition. There were no significant differences in CD31⁺/42b⁻ MPs (49 \pm 5 vs. 38 \pm 12 events/ μ l), CD14/31⁺ cell frequency (85 \pm 3 vs. 87 \pm 2 % of parent), or CD3/31⁺ cell frequency (52 \pm 3 vs. 50 \pm 2 % of parent population) after sitting or between conditions. **CONCLUSION:** Contrary to our hypothesis, a three-hour bout of sitting with or without calf raises was not sufficient to affect CAC numbers. Furthermore, sitting decreased MP markers linked to endothelial activation and CAC paracrine activity, and calf raises did not ameliorate these changes. Future studies assessing longer durations of sitting with a more potent stimulus (e.g., intermittent walking) should be done to further understand the effects of sitting on the CAC and MP response.

Evaluating Collagen Matrix Degradation after ACL Reconstruction using Quantitative MRI

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Forty percent of individuals who undergo anterior cruciate ligament (ACL) reconstruction develop knee osteoarthritis (OA) within eight years of the procedure. T2 magnetic resonance imaging (MRI) can be used to assess the cartilage's collagen matrix health. Higher T2 times, when compared to healthy cartilage, are indicative of cartilage matrix degradation. When the ACL is injured, a bruise develops on the central and posterior regions of the tibial plateau. It is not known if this bruising has a long-term effect on the cartilage health in this region.

PURPOSE: To determine if T2 values at the site of initial ACL injury (central and posterior regions of tibial cartilage) would be higher in the involved vs. uninvolved limb, three months post ACL reconstruction. **METHODS:** Ten participants (8 men/2 women, age = 22 \pm 5 years) underwent T2 MRI testing and analysis. Menisci boundaries were used to establish regions of interest (ROI). These ROI were further divided into deep and superficial sub-layers. The average T2 value for each ROI was calculated and each was compared in the involved vs. uninvolved limb using a paired t-test (α = 0.05). **RESULTS:** For the tibial central deep region, the inter-limb difference (involved vs. uninvolved) approached significance (36 \pm 4 SD vs. 33 \pm 6 SD; p = 0.06, (Cohen's *d* = .59)), with higher T2 values in the involved limb cartilage. No statistically significant results were found for the other ROI.

CONCLUSION: While not statistically significant, higher T2 values within the involved limb's central tibial cartilage indicate that bone bruising may result in collagen matrix degradation three months post ACL reconstruction. Future studies should include followup time points and a larger sample size.

Supported by NIH R25-NS095371 and NIH R01-HD087459

An Examination of Physiological Responses in EMT Students During Occupational and Heat Stress

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PURPOSE: The purpose of the present study is to observe the impact of a hyperthermic environment on physiological responses in EMT students performing a simulated occupational task. **METHODS:** Ten EMT students reported to the lab for a familiarization session and maximal exercise test to determine proper intensity for subsequent trials. Participants rested 48 hours between sessions. Experimental condition was assigned in counterbalanced fashion; a thermoneutral environment, or hyperthermic condition (100°F, 60-70% RH). Baseline values were assessed outside of the environmental chamber and again immediately upon entering for the following dependent variables; heart rate (HR), mean arterial pressure (MAP), rating of perceived exertion (RPE), oxygen consumption (VO₂), thermal sensation (TS), core temperature (T_c), mean skin temperature (MST), and mean body temperature (MBT). Following 30 minutes of acclimation participants completed an aerobic bout of exercise followed immediately by an anaerobic bout of exercise. This process was repeated for a total of two aerobic bouts of exercise, and two anaerobic bouts of exercise. The aerobic exercise consisted of a 10-minute treadmill walk at 70%-80% of their previously determined maximal heart rate. The anaerobic exercise consisted of lifting a 50 lb. sandbag to a metronome over the course of 5 minutes, until 15 lifts were successfully completed. Upon completion of the

final sandbag lift, participants exited the chamber for a ten-minute passive recovery to conclude the protocol. **RESULTS:** A two condition by nine time point analysis of variance (ANOVA) was conducted on all dependent variables. Post hoc analysis via paired samples t-test were conducted to further explain all main effects and interactions. A main effect of time was found for HR ($p = 0.006$), MAP ($p = 0.024$), RPE ($p = 0.035$), VO_2 ($p = 0.009$), TS ($p = 0.051$), T_c ($p = 0.022$), MST ($p = 0.000$) and MBT ($p = 0.003$). A main effect of condition was found for HR ($p = 0.001$), RPE ($p = 0.004$), TS ($p = 0.000$), T_c ($p = 0.033$), MST ($p = 0.015$) and MBT ($p = 0.010$). A significant time by condition interaction was seen in TS ($p = 0.043$) and MST ($p = 0.033$). **CONCLUSION:** Future research should emphasize a focus on maintaining a lower core and skin temperature under occupational and heat stress in order to improve physiological and motor performance.

Acute Changes in Positive Well-being, Psychological Distress, and Fatigue after Group Exercise in Older Adults

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Previous research has shown that long-term participation in aerobic group exercise (Williams & Lord, 2008), tai chi (Bohannon et al., 1999), and yoga (Dehen et al., 2006) have positive impacts on mood in older adults. Few studies have examined whether group exercise has an impact on acute mood changes in older adults. **PURPOSE:** This study examined acute changes in positive well-being, psychological distress, and fatigue in older adults after one group exercise class. **METHODS:** Data were collected from a total of 27 participants (average age 70.35 ± 6 years; 18 females, 4 males; 5 did not identify sex) who participate in group exercise on a regular basis at a local senior center. Data were collected at the following classes: Tai Chi, Fit for Life and Cardio Fitness. Mood variables (positive well-being, psychological distress, and fatigue) were assessed pre- and post-class using the Subjective Exercise Experience Scale (SEES). Significant changes in mood scores were determined using dependent (paired) t -tests. **RESULTS:** There was a significant (9%) increase in positive well-being from pre- to post-testing for all classes, $t(26) = 2.561$, $p < 0.05$, but no significant changes were observed for psychological distress or fatigue. When the classes were examined separately, participation in the Tai Chi class yielded a significant decrease (-36%) in fatigue after the class $t(10) = 2.055$, $p < 0.05$. Positive well-being increased significantly by 20% from pre- to post-test ($t(9) = 2.16$, $p < 0.05$) for the Fit for Life class, and a 9% change in positive well-being for the Cardio Fitness class, $t(5) = 2.06$, $p < 0.05$. **CONCLUSION:** Positive well-being increases with participation in group fitness classes for older adults after only one session. Improvements in positive well-being are greater in classes with a cardiovascular component. Decreases in fatigue were observed for the Tai Chi class only, which may be attributed to the mind-body experience and flow movements the class incorporates. Thus, group fitness classes are beneficial for improving acute mood states in older adults.

Effects of Running in Solo, Partnered, and Group Conditions on Half Mile Completion Time

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The quest to find various forms of performance enhancement is never ending. Many people tend to run alone. Training to run any distance with a partner or within a group can have additional benefits to an individual's performance. Running under these conditions can add extra pressure or motivation to run at a faster speed. **PURPOSE:** The purpose of this study was to compare performance times while running alone, with a partner, and within a group. **METHODS:** Twenty-six participants (20.5 yrs), 24 male and 2 female, completed three half-mile runs around an outdoor track on three separate days. The first day, subjects ran three half-miles alone. On the second day, participants were paired with another individual who ran a similar time during their solo runs. For the final set of runs, groups of 3-5 were made in the same fashion. To analyze the data collected, a one way ANOVA with repeated measures was completed on the fastest time under each condition. **RESULTS:** The analysis did not reveal any significant interaction or main effects ($F(2,50)=2.37$, $p=.11$), meaning participants performed approximately the same when running alone (171.27 ± 18.05 sec), with a partner (176.81 ± 20.00 sec), and within a group (180.07 ± 14.89 sec). **CONCLUSION:** Though no significance was found between the running conditions, running solo had faster times than running within a group. A larger sample size may have allowed the difference between running alone and running with a group become statistically significant. Running as a group can add a social factor that causes participants to approach this condition differently than running solo. When running alone, participants were more focused on the run itself causing a faster time.

Effects of a multi-ingredient pre-workout supplement on the changes in hydration status following exercise

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Caffeine has been shown to have an acute diuretic effect when consumed in moderate to large quantities. Proper hydration status is important for individuals to perform exercise safely and effectively. Therefore, individuals who use pre-workout supplements should choose one that improves performance without negatively affecting hydration status. **PURPOSE:** To determine the effects of a multi-ingredient pre-workout supplement (MIPS) on the changes in hydration status following exercise. **METHODS:** Fourteen college-aged participants (8 men, 6 women) were tested on two occasions separated by 48 hours. On each day participants consumed either the MIPS or placebo then completed a maximal aerobic treadmill exercise protocol and 10 6-second repeated sprints on a cycle ergometer. During each visit, subjects provided a pre- and post-exercise urine sample to determine urine specific gravity, refractive index, and percent total using a digital fiber optic refractometer. Additionally, bioelectrical impedance analysis was conducted pre- and post-exercise to determine changes in body mass, total body water, intracellular water, and extracellular water. Data were analyzed using a trial \times time repeated measures ANOVA. The alpha level was set *a priori* to $p \leq 0.05$. **RESULTS:** Regardless of trial (MIPS or placebo), there was a significant ($p = 0.001$) decrease in body mass of 0.5 ± 0.4 kg from pre- to post-exercise. No other main effects of time were noted. Furthermore, there were no significant trial \times time interactions or main effects of trial for any of the tested variables. **CONCLUSION:** The current exercise protocol elicited an acute decrease in body mass. However, consumption of this MIPS had no effect on fluid loss or changes in hydration status. Therefore, this MIPS should be considered safe to use for individuals interested in taking a pre-workout that does not influence fluid loss.

Assessing the Correlation Between Functional Fitness and Living Arrangements in Older Adults

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As people age, they typically lose the ability to perform basic functional tasks and activities of daily living (ADLs). Physical activity has shown to improve balance, stability, strength and aerobic fitness in older individuals. This will in turn help with maintaining their functional abilities and contribute to independence in their later years. In addition, the early onset of physical activity during young adulthood has been positively correlated with long term health and the prevention of falls in older adults. **PURPOSE:** To explore this topic further we investigated and compared the effects of two different types of site locations on the functional ability of older adults. We also assessed the role of exercise program engagement during the ages of 18-24 on the functional retention rates in older adults who were active during that time period. We predicted that older adults that lived outside of a senior living facility and had engaged in an exercise program from the ages of 18-24 would retain function later in life than those that were in a senior living facility and/or those seniors who were not engaged in an exercise program during early adulthood. **METHODS:** Fourteen older adults (age: 73.93 ± 6.70 yr) were recruited from three different senior adult facilities. They performed four different function tests; 30-Second Chair Stand Test (30-CST), 4-Stage Balance Test (4-STB), 6-Minute Walk Test (6-WT), and Timed Up and Go (TUG). Current physical activity patterns and physical activity habits during the ages of 18-24 years were assessed via questionnaire. **RESULTS:** Neither site location (30-CST $F(2,11) = 2.40, p > 0.05$, TUG $F(2,11) = 2.95, p > 0.05$, 6-WT $F(2,10) = 0.28, p > 0.05$) or previous exercise history (30-CST $r_s = -.41, p > 0.05$, TUG $r_s = .26, p > 0.05$, 6-WT $r_s = -.13, p > 0.05$) had a significant impact on current functional ability in the older adult subjects. **CONCLUSION:** There was no evidence for differences in site location and the early onset of exercise and its impact on functional ability in older adults. Additional research that examines adherence rates at a variety of age spans as well as examining the relationship between a wider variety of potential living sites and conditions could yield helpful evidence for geriatric rehabilitation specialists. A larger sample size should be included in future studies.

The Effect of Cognitive Strategies on Brain Dynamics and Muscular Force during Maximal Voluntary Movement

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Self-initiated cognitive strategies for movement preparation include arousal, attentional focus, visualization, and imagery. Torque output responses to mental preparation prior to strength tasks has shown to be elevated when compared to distracting conditions. Understanding this brain-body relationship may yield insights into the dynamics of the cortical processes that underlie the quality associated with musculoskeletal activity and performance outcomes. **PURPOSE:** To investigate using self-initiated arousal, the influence of cerebral cortical activation and networking with musculoskeletal activity and maximal voluntary isokinetic contraction. **METHODS:** Ten healthy young adults (19-30 years of age), were recruited and required to have a minimum of one year strength training experience. Electroencephalography (EEG), electromyography (EMG) and torque output (Isokinetic) were measured. Visit one consisted of informed consent, background questionnaires and baseline measures. EEG, EMG and Isokinetic data were conducted during visit two and participants were exposed to three cognitive conditions, psyching (PSY), mental arithmetic (MA), and reading comprehension (RC). Each condition (PSY, MA, RC) consisted of three maximal effort trials with a 20-second task period provided prior to movement. **RESULTS:** EEG analysis revealed PSY (-6.611 ± 1.539) having greater cerebral activation in the central region compared to MA (-5.111 ± 1.628) and RC (-5.592 ± 1.423) as indexed by alpha band power and lessened levels of networking in PSY (0.187 ± 0.004) compared to MA (0.214 ± 0.20) and RC (0.188 ± 0.008) as indexed by alpha band coherence. Average peak torque output within participants for PSY (110.697 ± 7.49) was higher compared to MA (106.135 ± 9.01) and RC (104.823 ± 8.30). **CONCLUSION:** Average peak torque output following PSY exceeded torque following distraction conditions. Cerebral cortical activity in the central motor regions exhibited elevated activation for PSY compared to MA and RC. Heightened cortico-cortical networking was displayed in MA and RC conditions from the frontal region to all regions of the cortex compared to PSY. The study suggests promising results in the use of cognitive strategies (psyching) as a method to improve performance during maximal effort movement.

Positive Reward System Encourages Student Engagement in Anatomy Courses

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University instructors are being encouraged to move away from traditional lecturing styles and instead use active learning strategies, such as flipped classrooms, to enhance student engagement. It can be difficult to implement these teaching styles without students completing in and out of class assignments. Grading extra assignments can be time-consuming for the instructor and inflate the students' course grades. A token economy, which is used widely in primary school settings but rarely reported in higher educational settings, can be used to help instructors reinforce the student behaviors needed to successfully implement engaged classrooms without spending a lot of time grading. However, there is very little data reported in the literature regarding college students' perceptions of a token economy. **PURPOSE:** To determine the Kinesiology students' perceptions of a token economy in flipped Human Anatomy and Physiology I and II courses. **METHODS:** This study was designed as a single case study of two undergraduate classrooms at one university. The participants completed a survey that contained Likert-type and opened-ended questions, and they participated in focus groups. SPSS was used to analyze the quantitative data using descriptive statistics. The researchers used NVivo to organize and code the qualitative data, as well as thematic and axial triangulation methods. **RESULTS:** There were 47 participants with an average age of 21 years old (± 2.1 years). Fifty-three percent (53%, $n=25$) were sophomores and 68% ($n=32$) were females. Over 90% ($n=43$) of the students participated in the token economy and "making up a missed assignment" was the reward redeemed with the highest frequency (85%, $n=40$). Eighty-five percent (85%, $n=40$) *agreed or strongly agreed* that the reward system reinforced the student behaviors necessary for an effective flipped classroom. Themes that emerged from the qualitative coding suggested the token economy increased motivation, provided additional opportunities to master course content, decreased student anxiety, and enhanced the student-teacher relationship. **CONCLUSION:** Providing students with rewards to reinforce targeted student behaviors may be useful in the flipped classroom model to reinforce student engagement and enhance the instructor's pedagogical approach.

Effects of Caffeinated Chewing Gum on Repeated Sprint Performance in Recreationally Active Individuals

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Caffeine is frequently consumed by athletes as an ergogenic aid during training and competition. It has been shown to improve performance in moderately intense-long duration endurance exercise. The mechanisms to explain caffeine's performance enhancing effects include improving nervous system activation, muscle contraction, and fuel delivery to the muscle. However, the effects of caffeine on singular or repeated bouts of short term high-intensity

exercise are less clear. **PURPOSE:** To investigate the effects of caffeinated chewing gum on performance during repeated high-intensity sprints in active individuals. **METHODS:** Six recreationally active subjects (Age = 21 ± 1 yr) completed two high-intensity experimental sessions, consisting of two sets of 60 meter sprints with three sprints per set. Caffeine (240 mg) or placebo was administered via chewing gum following the first set of sprints of each experimental session. Middle 20 meter sprint times, post sprint heart rates and post sprint ratings of perceived exertion (RPE Scale 1-10) were measured. **RESULTS:** There were no significant changes in 20 meter sprint times between the two experimental conditions across the six sprints; 2.69 ± 0.08 secs (placebo) vs. 2.74 ± 1.6 secs (caffeine). However, sprint times were maintained in the caffeinated trial when compared to the placebo condition across the six sprints. There was a trend for post sprint heart rates to be lower following the fourth sprint performed (144 ± 13 bpm placebo vs. 125 ± 11 bpm caffeine, $P = 0.07$) but the effect did not carry over into the fifth and final sprint. There was a trend for RPE to be lower following the fifth sprint (6.33 ± 0.5 placebo vs. 4.83 ± 0.3 caffeine, $P = 0.06$) and it was significantly lower (6.5 ± 0.5 placebo vs. 5.1 ± 0.4 caffeine, $P \leq 0.05$) following the final sprint. **CONCLUSIONS:** The acute ingestion of caffeine via chewing gum appears to maintain speed during repeated, high-intensity sprints in recreationally active individuals. Furthermore, caffeinated chewing gum seems to lower post sprint heart rates and ratings of perceived exertion. Further research with additional subjects is needed to ascertain if caffeinated chewing gum taken during the later stages of high-intensity exercise helps to maintain exercise performance and attenuate fatigue.

Effects of an Eight Week Periodization Training Program in Adolescents

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Periodization training provides the basis for athletic performance by facilitating the attainment of specific physiological adaptations prior to competition for athletes. This training model is traditionally used for adult athletes, but may have positive implications in an adolescent population. **PURPOSE:** To determine if an abridged periodization training program of 8 weeks will produce performance changes in adolescents. **METHODS:** Eight (7 males, 1 female) individuals, aged 13.3 ± 1.0 years, and BMI 25.9 ± 6.0 kg/m² were tested on percent body fat (%BF), lean body mass (LBM), Functional Movement Screen (FMS), single leg hop (SLH), lower limb symmetry calculated as percent difference between right and left leg SLH, SLH relative to height, bench press reps at 25% of weight, squat reps at 50% of weight, T-test for agility, 40-yard sprint, and a half mile. Training was completed centering around the above tests. The training included 90 minute sessions, three days a week (Monday, Wednesday, and Friday). These sessions consisted of 60 minutes of technique and resistance training, 15-20 minutes of speed and agility training, and 10-15 minutes of flexibility training. Post-testing was completed after 8-weeks. **RESULTS:** Paired sample t-tests showed significant improvements from pre- to post-test in FMS scores (16.5 ± 2.7 to 20.0 ± 0.8 , $p < 0.01$), right SLH (48.2 ± 15.6 in to 51.6 ± 16.2 in, $p < 0.05$), left SLH (43.0 ± 16.0 in to 50.1 ± 15.7 in, $p < 0.01$), limb symmetry (88.5 ± 6.5 % to 95.3 ± 4.8 %, $p < 0.01$), right SLH relative to height (73.3 ± 20.4 % to 78.1 ± 21.3 %, $p < 0.05$), left SLH relative to height (65.4 ± 21.3 % to 76.8 ± 22.2 %, $p < 0.01$), bench press (21.5 ± 14.6 reps to 29.5 ± 14.1 reps, $p < 0.05$), and squat (12.9 ± 8.8 reps to 20.6 ± 10.0 reps, $p < 0.05$). BMI, %BF, LBM, T-test for agility, 40-yard sprint, and half mile changes were not significant ($p > 0.05$). **CONCLUSION:** Significant changes were observed in technique as shown by FMS scores. Muscular power and endurance also improved, thus representing the specificity principle of exercise training as this received the most attention (60 min/session). No significant changes were observed in LBM, suggesting that the changes in muscular power and endurance may have been from neurological adaptations. This conclusion is further supported given the maturity status and duration of the training program.

Greater Forearm Blood Flow is Associated with Better Walking Economy and Gait Speed in Older Adults

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Gait speed decline is a well-established predictor of disability and mortality in older adults. Compromised energetic efficiency (i.e. walking economy) is a strong contributor to gait speed decline, but the underlying mechanisms influencing walking economy are undefined. Impaired vascular function is common with aging and thus may be an important contributor to the development of compromised walking economy and slow gait speed, yet the relationships among blood flow within skeletal muscle, walking economy, and gait speed in older adults are unknown. **PURPOSE:** To examine the relationship between measured forearm blood flow and (i) walking economy and (ii) gait speed in older men and woman. **METHODS:** Resting arterial inflow and reactive hyperemic blood flow (RHBF) of the left forearm was measured in 55 participants of the Longitudinal Aging Study at Towson (LAST;

53% male, mean age 70, range 51-91 years) using venous occlusion plethysmography. Walking economy was measured as the average rate of oxygen consumption during the final 2 minutes of a 5 minute standardized treadmill-based walking test at 1.5 mile per hour. Gait speed was assessed during 2.5 minutes of normal-paced walking over a 20-meter course. The association between RHBF and walking economy and RHBF and gait speed was modeled using linear regression, adjusting for age, height, and fat-free mass. Sobel tests were used to assess possible mediating effects. **RESULTS:** In fully adjusted models, RHBF (mean RHBF: $18.0 \pm 5.9 \text{ mL} \cdot 100 \text{ mL tissue}^{-1} \cdot \text{min}^{-1}$) was negatively associated with oxygen consumption ($\beta = -7.5, p < 0.01$), indicating that walking economy was 7.5 mL/min lower for each one-unit increase in blood flow. Gait speed (mean $1.3 \pm 0.2 \text{ m/s}$) was positively associated with blood flow ($\beta = 0.01, p = 0.05$), indicating that gait speed was 0.01 m/s faster for each one-unit increase in blood flow. Mediation analyses further suggested that blood flow may mediate the association between walking economy and gait speed ($p=0.06$). **CONCLUSION:** RHBF is a significant predictor of both walking economy and gait speed in older adults, suggesting that better overall vascular health is related to enhanced walking economy and gait speed. Therefore, interventions aimed at improving vascular health in the aging population may be beneficial in maintaining gait speed and mobility with age.

The Cardiorespiratory Response of Qigong Performed at Different Intensities

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Qigong is a traditional Chinese mind-body exercise that incorporates the components of concentration, focused breathing, body posture, and slow coordinated movements to improve balance and fitness. **PURPOSE:** The purpose of this study was to compare the cardiometabolic response of two different intensities of Qigong. **METHODS:** Ten subjects ($19.6 \pm 0.69 \text{ yrs}$) volunteered and attended a familiarization session to learn the stances and forms of a Qigong sequence, 8 Piece Brocade, at lower and higher intensities. For the lower intensity, the subjects stood with an open-stance to maintain postural stability and performed movements that emphasized bending/rotation of the axial skeleton and ROM movements of the appendicular system. The higher intensity exercises used similar movements; however, the center of gravity was lowered in many of the stances (e.g. half squat position) and the arms extending the ROM. During data collection, the participants performed the Qigong sequence with a video developed specifically for this project that included 8 minutes at low intensity, a 5-minute break, and 8 minutes at higher intensity. Oxygen consumption (VO_2) was collected continuously using breath-by-breath analysis and heart rate was recorded at the end of each minute. The data were analyzed using paired t-tests ($p < 0.05$) for each of the 8 progressive movements. **RESULTS:** The results indicated that the Qigong sequence used in this study achieved mean MET levels of $1.96 + 0.31$ and $2.68 + 0.43$ for low and high intensity, respectively. 5 of the 8 movements demonstrated a higher MET ($\Delta \text{ range} = 1.8 \text{ to } 4.42$) and HR b/min ($\Delta \text{ range} = 5.4 \text{ to } 24.2$) for higher intensity ($p < 0.05$). In addition, the cumulative calories Kcals used for the 8-min set was significantly different for low intensity ($20.30 + 2.87$) vs high intensity ($25.90 + 3.73$). **CONCLUSION:** The Qigong set of exercises used in this study showed a significant cardiorespiratory and metabolic response for the different intensities; however, the lower MET values achieved for both intensities categorize this mind-body activity as low intensity exercise, as indicated by the ACSM Position Stand. As such, Qigong may be appropriate for special populations that require lower intensity exercise or for apparently healthy individuals seeking a mind-body exercise to accumulate prescribed $\text{MET} \cdot \text{min} \cdot \text{week}^{-1}$.

The Effects of Caffeine Ingestion and the -163A>C CYP1A2 Polymorphism on Long Anaerobic Exercise Performance

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Caffeine is a stimulant commonly used in athletics and recent research suggests that variants of the CYP1A2 genotype, AA (responder) and AC/CC (non-responder), may influence the ergogenic effects of caffeine on exercise performance. **PURPOSE:** To examine the ergogenic effects of caffeine and CYP1A2 polymorphisms on long-anaerobic exercise. **METHODS:** 34 subjects (19 male, 15 female) provided buccal cells via a saline mouth rinse and practiced all-out cycling during an initial familiarization session. During two subsequent visits, subjects ingested a gelatin capsule containing maltodextrin (placebo, PLC) or $6 \text{ mg} \cdot \text{kg}^{-1}$ caffeine anhydrous (CAF), administered in a double-blinded, randomized and counterbalanced manner. One-hour post-ingestion, subjects completed an all-out 90-sec Wingate test on a Velotron Cycle Ergometer (resistance = $0.055 \cdot \text{kg}^{-1}$). Peak power (PP) and total work (TW) were analyzed by the Velotron software. Genomic DNA was extracted from cheek cells and a region of the CYP1A2 gene containing the -163 A>C polymorphism was amplified via PCR and genotyped by digestion with *ApaI*. A 2 (condition) x 2 (genotype) x 3 (time) repeated measures ANOVA with Fisher LSD post-hoc ($p <$

0.05) was used to compare PP and TW. **RESULTS:** The main effects of condition (PLC vs CAF) showed no difference in PP, 510.3 ± 119.1 W vs 510.9 ± 119.4 W, respectively. The main effect of genotype showed a non-significant decrease in PP for AA (516.6 ± 117.3 W) compared to AC/CC, (495.4 ± 130.4 W). The main effect of time showed significant decrease in PP in each 30-sec segment; however, there were no interaction effects of time for condition ($p=0.60$) or genotype ($p=0.40$). Total work yielded similar results. There was no difference in TW over the 90-sec, 2.92×10^5 J for PLC and 3.00×10^5 J for CAF, and no significant difference in total power for genotype, 3.00×10^5 for AA and 2.99×10^5 for AC/CC. TW significantly decreased over each 30-sec phase; however, there were no interaction effects for condition ($p=0.63$) or genotype ($p=0.87$). **CONCLUSION:** The results indicate that CAF did not impact PP or TW during long-anaerobic testing. In addition, neither the AA nor the AC/CC genotype influenced PP or TW following the ingestion of CAF.

Anterior vs. Posterior Approach Total Hip Arthroplasty: A Critically Appraised Topic

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Total hip arthroplasty (THA) has been shown to consistently improve function and quality of life in patients with late stage degenerative joint disease. Conflicting opinions exist regarding the efficacy of the direct anterior approach (DAA) and posterior approach (PA) for THA on satisfactory patient outcomes. The Harris Hip Score (HHS) is a commonly used patient-related outcome measure to assess both pain and function pre- and post-operatively. Using the HHS to compare DAA and PA may be beneficial in determining which surgical method is more efficacious for patient satisfaction. **PURPOSE:** The purpose of this investigation was to determine if the literature supports the use of HHS to identify better patient-related outcomes among patients who have undergone either DAA or PA for THA. **METHODS:** A computerized search of MEDLINE, PubMed, and Science Direct was conducted to identify pertinent references. The inclusion criteria were: (1) patients who underwent THA using the DAA or PA; (2) Centre for Evidence Based Medicine (CEBM) Level 3 or higher; (3) published in English language in peer-reviewed sources within the last 10 years; and (4) reported composite HHS for both surgical approaches. **RESULTS:** The literature search revealed sixty-four (64) studies for review; 5 met all inclusion criteria. Specific data extracted included the study design, surgical approach used, the HHS score pre- and post-operatively, and the length of time of follow up. No significant differences were found in the mean difference of HHS between DAA and PA at 2-3 weeks (25.55 ± 18.07 ; 23.7 ± 16.76 , $t(172) = -0.07$, $p=0.48$); 6 weeks (37.8 ± 26.7 ; 37.7 ± 26.66 , $t(172) = -0.07$, $p=0.99$); 8-12 weeks (30.86 ± 21.88 ; 29.25 ± 20.67 , $t(210) = -0.55$, $p=0.58$); nor 6 months (52.01 ± 36.78 ; 46.79 ± 33.09 , $t(118) = -0.82$, $p=0.41$). **CONCLUSION:** The literature does not support a difference between DAA and PA for patient pain and function based on HHS at multiple follow up points from two weeks through six months. The preferred surgical approach should be determined in conjunction with physician comfort and preference as well as other clinician and patient related outcomes.

Handgrip Strength Positively Correlates With Percent Fat Free Mass in Students at Messiah College

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Anthropometric measures are important in understanding components of health in individuals. Handgrip dynamometry is used to measure handgrip strength as an indicator of overall body strength. Fat free mass provides a more accurate assessment of body composition than other measurements, such as body mass index. Calculating fat free mass and handgrip strength may provide markers for potential issues related to malnourishment and sarcopenia. **PURPOSE:** Determining if there is a positive correlation between handgrip strength and fat free mass may enhance the ability of handgrip strength to be an indicator for those conditions. **METHODS:** An observational study of 45 college aged students ($M=17$, $F=28$) was conducted to determine the relationship between fat free mass and handgrip strength. Percent fat free mass was measured using a medical body composition analyzer. Handgrip strength was measured (in pounds) by a digital smart handgrip dynamometer. The average of three trials was recorded for each hand, and the two values were averaged together. **RESULTS:** A moderate, positive correlation between percent fat free mass and handgrip strength was found ($r=0.47$). **CONCLUSION:** A positive correlation between fat free mass and handgrip strength may enhance the ability of handgrip strength to be an indicator for sarcopenia and malnourishment. Further research testing a larger group of subjects in this population may provide evidence for a stronger positive correlation between handgrip strength and percent fat free mass.

Carotid Body Chemosensitivity to Hypoxia is Attenuated during Hyperbaric Hyperoxia

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Water immersion causes CO₂ retention, thus increasing the risk of CO₂ toxicity. Hyperoxia reduces carotid body (CB) tonic activity, which reduces the ventilatory response to hypercapnia. However, it is not known if CB chemosensitivity is altered during the high partial pressure of oxygen associated with hyperbaria. **PURPOSE:** We tested the hypothesis that oxygen breathing would lower CB chemosensitivity more than breathing air at 6.1 msw depth. **METHODS:** Five subjects (age: 23±2 y; BMI: 28±5 kg/m²) completed two, four-hour dry dives at 6.1 msw (1.6 ATA) breathing either 100% O₂ or air. CB chemosensitivity was assessed using hypoxic ventilatory response (CB_{O₂}) and brief hypercapnic ventilatory response (CB_{CO₂}) tests pre-dive, 75 and 155 min into the dives, immediately post-dive, and 60 min post-dive. CB_{O₂} consisted of inhaling 100% N₂ for 2-6 breaths, repeated four times, with 2 min between hypoxic exposures. CB_{CO₂} consisted of inhaling 13% CO₂, 66% N₂, 21% O₂ for one breath, repeated four times, with 2 min between hypercapnic exposures. CB chemosensitivity was calculated as the slope of the linear regression line of the peak minute ventilation (MV) in three consecutive breaths vs. the nadir oxygen saturation (pulse oximetry; SpO₂) or peak end tidal CO₂ tension (capnography; PETCO₂) for CB_{O₂} and CB_{CO₂}, respectively. Data are reported as a change from pre-dive (mean±SD). **RESULTS:** SpO₂ was higher than pre-dive at all time points (all p<0.02), but was not different between conditions (p=0.46). The change in MV was not different over time (p=0.22) or between conditions (p=0.90). PETCO₂ increased during the dive at 75 (Air: 8±5 vs. O₂: 6±4 mmHg) and 155 min (Air: 7±5 vs. O₂: 4±2 mmHg; p<0.01), but did not differ between conditions (p=0.34). CB_{O₂} was lower in the 100% O₂ condition at 75 min (-0.73±0.66L/min/%SpO₂; p<0.01) but returned to pre-dive values thereafter (all p>0.05). There were no changes in CB_{O₂} during the air condition (all p>0.05). There were no changes in CB_{CO₂} at any time point (p=0.38) or between conditions (p=0.92). **CONCLUSION:** These data indicate CB chemosensitivity to hypoxia is briefly attenuated during hyperbaric hyperoxia but this reduction does not appear to contribute to CO₂ retention.

Supported by Office of Naval Research Award N000141612954

Skin Erythema and Blood Flow Responses to Acute Ultraviolet Radiation Exposure

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Skin exposure to ultraviolet (UV)-B light elicits an inflammatory response, resulting in increased skin blood flow and erythema (reddening) over the next 24 h, but the initial time course is unclear. It is likewise unknown whether these responses differ after exposure to broad spectrum UV (UV-AB) light and how they are impacted by sunscreen on the skin. **PURPOSE:** To examine 1) the time course of skin blood flow and erythema after acute UV-B and UV-AB exposure, 2) the relation between peak blood flow and erythema, and 3) the impact of sunscreen application on these responses. We hypothesized that 1) the blood flow and erythema responses would be greater after UV-AB compared to UV-B exposure, 2) the peak responses would be related, and 3) sunscreen would attenuate responses to both UV-AB and UV-B. **METHODS:** The ventral aspect of both forearms of 7 healthy adults (23±3yrs; 5M/2F) were exposed to either UV-B (75 sec, 6 mW/cm² UVB) or UV-AB (75 sec, 6 mW/cm² UVB + 8 mW/cm² UVA). One 2-cm² site on each arm was pre-treated with topical SPF-50 sunscreen. Red cell flux (laser-Doppler flowmetry) and erythema index (EI; reflectance spectrometry) were measured at each site before, immediately after, and 2, 4, 6, and 8 hours post-exposure. Cutaneous vascular conductance was calculated (CVC=flux/MAP) for each time point, and both CVC and EI were expressed as change from baseline. **RESULTS:** EI increased from baseline after exposure to UV-B (4 h, p=0.04; 6 h, p<0.01; 8 h, p<0.01) and UV-AB (6 h, p=0.02; 8 h, p<0.01), but increases in CVC (UV-B, 6 h: p=0.02; 8 h: p<0.01; UV-AB: 8 h, p=0.07) were delayed by ~2 h. EI and CVC responses were not different between UV-B and UV-AB (p>0.05) and there was no relation between peak EI and CVC following exposure to either UV-B (R²=0.08; p=0.55) or UV-AB (R²=0.03; p=0.70). Sunscreen blunted the CVC responses to UV-B (6 h, p=0.04; 8 h, p=0.003) and UV-AB (8 h, p=0.02), and reduced the EI response such that it was not different from baseline after UV-B or UV-AB (p>0.05). **CONCLUSION:** Exposure to UV-B or UV-AB induced a linear increase in EI and a delayed increase in CVC, with no direct relation between these responses. Sunscreen blunted the EI and CVC responses. These data suggest that an erythema-independent inflammatory response to UV occurs in the cutaneous microvasculature, and that sunscreen may protect against this response.

Upper Body Training Methods and their Effect on Lower Body Performance Tests

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There is considerable literature reinforcing the fact that lower-body resistance training will increase lower-body power. However, there is little research on the effect of upper-body training on lower-body performance tests. Both plyometric (PLYO) and resistance training (RT) are viable options for inducing neurological and muscular adaptations; yet it is unknown as to which method applied to upper-body training will have more or less of an effect on lower-body performance tests. **PURPOSE:** To assess the effects of upper body RT versus upper-body PLYO training on short sprint performance, vertical jump height and peak power. **METHODS:** Six recreationally active males were randomly selected and placed into one of the following groups: control (30±7yrs), RT (23±1yrs) or the PLYO (20±2yrs) training group. The duration of the study design was four weeks, with two training sessions per week. Each group underwent specific training methods for a total of eight sessions, with the sessions lasting roughly one hour. Each group had similar exercises to work the same muscles and used the same set and repetition structure of 3x5. All subjects did a pre and post baseline testing, which included: two trials of 40-yard-dash and three trials of vertical jump (best trials taken). **RESULTS:** Both PLYO protocol subjects lowered their 40-yard dash time by an average of 0.235 seconds, while the resistance training protocol had a 0.065 second increase in 40-yard time. The PLYO group also increased their jump height by an average of 2.15 inches while the resistance training group only improved on average by 0.45 inches. Power in Watts was calculated using the Harman Equation. The PLYO group increased by an average of 26.295 Watts while the resistance training group increased on average by 44.16 Watts. **CONCLUSION:** While both training protocols demonstrated improvements, the PLYO training subjects elicited the most improvements compared to the other two training protocols.

Obesity and Functional Status Predict Liver Transplant Waiting-List Death

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In the US, organ demand for life-saving liver transplantation greatly outweighs supply. While the relationship between obesity and transplant outcomes remains controversial, impaired functional status pre-transplantation is an established predictor of waiting-list and immediate post-transplantation mortality. Whether or not functional status is compounded by obesity remains unexplored. **Purpose:** We aimed to evaluate the risk of transplant waiting-list death and post-transplantation survival based on both obesity and functional status. **Methods:** Data from adult patients wait-listed for liver transplant between February 2002 and September 2016 were obtained with permission from United Network Organ Sharing. Patients were categorized into one of four groups: Non-Obese and Normal Functioning (NONF), Obese and Normal Functioning (ONF), Non-Obese and Impaired Functioning (NOIF) or Obese and Impaired Functioning (OIF). Competing risks cox proportional hazards models were constructed to assess risk factors for both waiting-list mortality and post-transplantation survival. **Results:** Of the 110,303 subjects, 36.0% were NOIF, 28.2% NONF, 21.1% OIF and 14.6% ONF (p<0.001). In general, subjects with impaired functional status had more severe disease (e.g., greater rates of hemodialysis, higher MELD scores). Unadjusted waiting-list mortality was significantly different and greatest for NOIF 24.5% followed by 22.3% OIF. Unadjusted one- and three-year survival was also the lowest in the NOIF group 82.9%. When compared to NONF, OIF had the greatest adjusted waiting-list mortality (HR 1.33, 95% CI 1.30-1.36, p=0.026) followed by NOIF (HR 1.29, 95% CI 1.27-1.32, p<0.001). NOIF had the greatest adjusted post-transplantation mortality with a HR 1.10 (1.10-1.15, p<0.001). OIF had similar survival to the reference group. **Conclusion:** Liver transplant recipients who are obese with impaired functional status have a significantly greater risk of waiting-list death but similar survival to normal weight, normal functional status recipients. Our findings suggest that pre-habilitation with exercise intervention with the goal of improving both functional status and obesity may improve waiting-list mortality in liver transplant candidates. Future prospective study is needed to validate this important finding.

Conflicts of Interest:

No conflicts of interest relevant to the proposed work but Dr. Stine has research support from TARGET Pharma Solutions, Inc and has served as a consultant for Bayer

Knowledge of Nutritional Habits in NCAA Division I Female Athletes

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College student-athletes often lack the nutritional knowledge and practical skills to optimize their nutrition for health and performance. While the benefits of optimal nutrition for athletic performance are well established, implementation of nutritional programming in smaller athletic departments has been slow. Following recommendations from the literature, and in order to increase the knowledge of appropriate nutritional strategies and skills of female student-athletes, an educational program to enhance athletic performance was developed and implemented. **PURPOSE:** The purpose of this investigation was to assess the effect of the nutrition education program. **METHODS:** Fifteen (n=15) NCAA Division I female student-athletes volunteered to participate. The investigation consisted of a pre-intervention assessment of knowledge related to proper nutrition for athletic performance, educational programming, and a post-program assessment. Participants completed a daily food/liquid log for a period of three weeks. The participants were provided with educational information via email covering topics including appropriate hydration, fueling during exercise, eating while traveling, identifying and selecting macronutrient sources, eating for top performance, and forming beneficial nutritional habits. Participants' daily food logs were reviewed periodically to identify potential implementation of the provided nutrition education sources. A post-program assessment was administered to determine changes in knowledge of nutrition related to athletic performance. **RESULTS:** All (n=15) of the participants completed the daily food logs. The mean pre-intervention knowledge score was $76.6\% \pm 7.32$. The mean post-intervention knowledge score was $83.32\% \pm 5.00$. Paired t-test revealed a significant difference between pre-intervention and post-intervention knowledge of nutrition for athletic performance ($t(12)=-2.86, p=0.01$). Qualitative review of the food logs revealed an overall increase in the quality of completion. **CONCLUSIONS:** Knowledge of nutrition for athletic performance increased as a result of a three week program. Interventions focused on education providing an opportunity to positively influence nutritional knowledge and skills of female student-athletes.

Biomechanical Mediators of the Relationship Between the Knee Osteoarthritis Phenotype and Knee Joint Compressive Forces

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Pain, due to increased knee joint compressive forces resulting from increased body weight, is likely the driving factor that alters gait for those with knee osteoarthritis (OA), thus, a need exists to determine what can reduce these forces. OA patients may exhibit a specific phenotype of high fat mass and bone mineral density (BMD) that is associated with increased knee forces and disease progression. Whether this relationship is mediated by biomechanical factors has not been investigated. **PURPOSE:** To investigate the associations between leg BMD, fat mass, and lean mass on knee joint compressive forces in older adults with knee OA, and to determine whether these relationships are mediated by stride length, knee stiffness, and/or leg strength. **METHODS:** Baseline DXA scans, knee extensor strength, and gait data from 75 participants (66.8 ± 6.7 years) from the Strength Training for Arthritis Trial (START) were analyzed. **RESULTS:** Average BMI was $30.8 \pm 5.4 \text{ kg/m}^2$. DXA characteristics revealed an average leg BMD of $1.24 \pm 0.16 \text{ g/cm}^2$ and a % body fat of 70.7 ± 7.9 . Average stride length was $1.33 \pm 0.12 \text{ m}$, knee stiffness was $4.2 \pm 2.1 \text{ Nm/}^\circ$, leg strength was $74.2 \pm 25.6 \text{ N}$, and knee compressive force was $2117.2 \pm 622.6 \text{ N}$. Leg BMD ($p=0.006$) and fat mass ($p<0.001$) were positively correlated with knee joint compressive forces. Stride length, average knee stiffness, and leg strength were partial mediators for the relationship between percentage body fat and knee forces. Leg strength was also a partial mediator for the relationship between leg BMD and knee force. **CONCLUSIONS:** The OA phenotype is associated with increased knee joint compressive forces. Reductions in body fat percentage and stride length, or alterations in leg strength and knee joint stiffness can potentially lower knee joint compressive forces, and pain, in older adults with knee OA.

Supported by NIH Grant 1R01AR059105-01, P30 AG21332

Taxane Based Chemotherapies Impact on Balance and VO_2 in Female Cancer Survivors.

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Purpose: The purpose of this study was to determine if taxane based chemotherapies have an impact on VO_2 and or balance versus non-taxane based chemotherapies in female cancer survivors. **Methods:** Twenty-six females (Avg. 58.11 years 29-72), enrolled in a cancer rehabilitation program underwent a treadmill assessment of VO_2 and four measures of balance (TUG, 4stage, sittostand, 6MWT). **Results:** No differences were found in measures of balance or VO_2 between those who received taxane based chemotherapies vs. non-taxane based chemotherapies ($p>0.05$). Significant increases in HR ($t=10.71, p=0.000$) and Dyspnea ($t=5.96, p=0.000$) occurred with significant correlations between pre-exercise ($r=0.605, p=0.001$) and post-exercise ($r=.729, p=0.001$) Dyspnea and RPE. Trends in

associations between TUG and 6MWT ($p=0.073$), 4stage and VO_2 ($p=0.057$), 6MWT and 4stage ($p=0.08$) were also observed. Significant positive correlation between 6MWT and VO_2 ($r=0.487$, $p=0.012$) and a negative correlation between %change in Dyspnea and VO_2 ($r=-0.474$, $p=0.014$) were found. A negative correlation between pre-exercise HR and 6MWT speed ($r=-.441$, $p=0.027$) and strong positive correlation between 6MWT distance and 6MWT Speed ($r=.968$, $p=0.000$). 6MWT distance moderately predicted VO_2 ($r=0.487$, $F=7.461$ $p=0.012$).

Conclusion: The data does not support the hypothesis that taxane based chemotherapies affect VO_2 values, or measures of balance. However, trends suggest a larger population might detect an association among the balance measures and VO_2 and therefore perhaps detect a difference. Expected changes and associations between RPE and Dyspnea were found, with lower scores likely associated with higher fitness as evidenced by negative correlation between %change in Dyspnea, 6MWT speed and pre-exercise HR and 6MWT speed and distance.

The Prevalence of Hypertension Among University Students Using Both Old and New Guidelines: Comparative Study

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Hypertension (HT) is highly prevalent and associated with non-communicable diseases and increased mortality risk. New diagnostic criteria for HT have been published. Limited research has addressed the prevalence of HT among college students, and none since the change in diagnostic criteria. **PURPOSE:** To determine the prevalence of HT via The 7th Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (OLD) and the American College of Cardiology /American Heart Association Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults (NEW) and to examine differences in health outcomes by HT status using both. **METHODS:** Participants were 5945 college students who completed an assessment including: anthropometric measures, a predicted aerobic fitness test, blood pressure, lipids and glucose. Chi-square tests for independence examined differences between HT guidelines; differences in health outcome variables between HT categories were assessed with ANOVA. **RESULTS:** The mean age of participants was 21.30 ± 1.05 years, and the majority identified as men (60.5%). Men were found to have significantly higher systolic ($p < .001$, $\eta^2 = .10$) and diastolic ($p < .001$, $\eta^2 = .04$) blood pressure, so all analyses were separated by sex. HT guideline changes resulted in significant changes in HT categorization of both men, $\chi^2 = 7178$, $p < .001$, $\Phi_c = .816$ and women, $\chi^2 = 4670$, $p < .001$, $\Phi_c = .816$. Under the OLD guidelines, 292 (8.2%) men and 67 (2.8%) women were hypertensive. Using the NEW guidelines, 1455 (40.5%) men and 521 (22.3%) women were hypertensive. Regardless of the guidelines used, those classified as having HT had lower levels of fitness, and less favorable anthropometry and blood profiles (for all, $p < .001$). **CONCLUSION:** HT guideline changes had a significant increase on the prevalence of HT among college students. Under both guidelines HT was linked with a less favorable health profile. The increased prevalence of HT among college students indicates the need for targeted prevention programs focused on increasing physical activity and improving healthy eating in college students.

Sleep Metrics are Associated with Markers of Cardiovascular Disease Risk in Youth

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There is accumulating evidence identifying relationships between insufficient sleep in children and adolescents and negative cognitive, psychosocial, and metabolic health consequences. However, the relationship between childhood sleep metrics and cardiovascular (CV) risk profile is less clearly defined. **PURPOSE:** To characterize the relationship between sleep and CV health in young, healthy children through traditional risk factor assessment and vascular function assessments. **METHODS:** Sleep metrics and habitual physical activity assessments were performed on 12 young, healthy boys and girls (12.3 ± 1 years) using wrist-worn accelerometry for 7 days and nights. Sleep onset latency (SL) was calculated as the mean time of transition from wakefulness to sleep, while sleep efficiency (SE) was calculated as the mean percentage of time spent asleep between sleep onset and wake onset. Central blood pressures and markers of wave reflection were assessed using pulse wave analysis (PWA) with an oscillometric device. Arterial stiffness was assessed through pulse wave velocity (PWV) measurements obtained using applanation tonometry and volumetric displacement. Vascular function was assessed using Doppler ultrasound measurements of femoral artery hemodynamics and diameter during passive leg movement (PLM). **RESULTS:** SL was significantly associated with body mass index ($r=0.66$, $p<0.05$) and PWV ($r=0.64$, $p<0.05$) and tended to show moderate relationships with leg blood flow (LBF) responses during PLM (Δ LBF from baseline to peak, $r=-0.45$; LBF area under the curve, $r=-0.50$). SE was significantly associated with systolic blood pressure (SBP) ($r=-0.58$, $p<0.05$) and aortic SBP ($r=-0.57$, $p=0.05$). Subjects whose SE was $>85\%$ had lower aortic SBP (86.9

± 1 vs. 93.7 ± 2 , $p < 0.05$) and tended to have lower percent body fat, more steps per day, and better blood flow responses during PLM compared to those whose SE was $< 85\%$. **CONCLUSIONS:** Preliminary findings suggest that metrics indicative of better sleep quality, such as greater SE and reduced SL, are associated with more favorable CV profiles in children. These results support the usefulness of assessing sleep as a potential approach for early prevention of CV disease risk during youth.

Seasonal Differences in Active Transport among College Students

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Insufficient physical activity is prevalent among college students, which is of concern given the associated negative health outcomes. Active transport (AT, walking or biking) to, from, and on campus represents a way in which students can accumulate the levels of physical activity necessary to benefit their health, whilst also benefiting the environment. However, among other things, active transport is, by nature, influenced by the environment, including the weather. **PURPOSE:** To examine how active transport varied based on the time during the semester and by season. **METHODS:** Students completed an online survey assessing where they self-reported demographics, residence location (on/off-campus) distance from campus, and AT (walking or biking) behaviors, including weekly minutes, and trips walking or biking to, from, and on-campus. A series of paired samples t-tests were used to examine differences in AT behaviors over time. **RESULTS:** 1,291 participants provided data at two of the three time points, the majority of whom were women (62%). Differences were revealed when analyses were split by semester. Over the course of the fall semester (September vs. December), there was a significant decline in weekly AT minutes (304.2 ± 235.4 vs. 262.5 ± 215.8 , $p < .001$), AT trips to campus (5.4 ± 2.7 vs. 4.7 ± 2.9 , $p < .001$), AT trips from campus (5.4 ± 2.7 vs. 4.7 ± 2.9 , $p < .001$), and AT trips on campus (6.6 ± 1.7 vs. 6.4 ± 1.8 , $p = .019$). By contrast, AT remained unchanged over the course of the spring semester (January vs. April). **CONCLUSION:** Findings indicate that season influences the college students' AT behaviors. The decline in AT behaviors during the fall semester could be due to the colder weather in the later part of the semester. Universities located in cooler climates should strongly encourage physical activity during the winter period given the benefits of physical activity to increase mental and physical health.

The Relationship Between Body Mass Index and Aortic Stiffness in Females Across the Lifespan

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Obesity, classified by a body mass index (BMI) greater than 30 kg/m^2 , continues to be a problem for women in the United States across all ages. Prevalence of obesity is a traditional risk factor for the development of cardiovascular disease (CVD). One novel non-traditional risk factor for assessing CVD risk is aortic stiffness. Previous literature has identified that obese individuals have increased aortic stiffness compared to those of normal body size.

PURPOSE: Determine the relationship between body mass index and aortic stiffness in females across the lifespan. **METHODS:** Children ($n = 121$, age 9-12, BMI $20.65 \pm 4.93 \text{ kg/m}^2$), adults ($n = 122$, age 18-39, BMI $25.64 \pm 4.88 \text{ kg/m}^2$), middle age adults ($n = 138$, age 40-59, BMI $26.70 \pm 4.21 \text{ kg/m}^2$), and elderly women ($n = 79$, age 60-83, BMI $26.39 \pm 4.40 \text{ kg/m}^2$) participated in the study for a total of 460 females. BMI was calculated by measuring barefoot standing height to the nearest 0.1 centimeter and measuring weight to the nearest 0.1 kilogram while wearing light clothing. Aortic stiffness was measured as carotid-femoral pulse wave velocity (PWV) using applanation tonometry (SphygmoCor; Sydney, Australia). **RESULTS:** BMI was a significant predictor of PWV for the children ($\beta = 0.365$, 95% CI 0.028 – 0.077), adults ($\beta = 0.524$, 95% CI 0.103 – 0.189) and middle age adults ($\beta = 0.506$, 95% CI 0.117 – 0.212). BMI was not a significant predictor of PWV in the elderly women ($\beta = 0.109$, 95% CI -0.063 – 0.180). **CONCLUSION:** Our data suggests that BMI is a significant predictor of aortic stiffness in women between the ages of 9-59. Interestingly there was no relationship between BMI and aortic stiffness in the elderly women (60+). In older women changes in body comp (i.e. increases in body fat and decrease in muscle mass) may change the relationship between BMI and aortic stiffness.

Effects of two Multi-ingredient Pre-workout Supplements on VO_{2peak} in healthy recreationally active Males

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Multi-ingredient pre-workout supplements (MIPS) are used to improve aerobic and anaerobic performance, however numerous formulations on the market pose many questions about their effectiveness. **PURPOSE:** To assess effects of two MIPS, one with beta alanine and caffeine (BAC) and one without (NBAC) compared to placebo (PLA) on peak oxygen uptake (VO_{2p}), peak heart rate (HR_p), peak power output (PPO), and lactate. **METHODS:** Recreationally active males ($N=14$, 24.6 ± 5.0 y, 179.2 ± 5.9 cm, 84.3 ± 14.3 kg) participated in a randomized, counterbalanced, double blind, placebo-controlled cross-over study. During the first visit DEXA was used to assess body composition and subjects were familiarized to testing procedures. While controlling for diet and exercise, subjects returned for three experimental trials, separated by ≥ 7 days. The testing sessions included a series of anaerobic performance tests prior to assessing VO_{2p} . Participants cycled for 2 min at 50 Watts (W) before resistance increased by 30 W/min until volitional fatigue. Respiratory gases were collected using a metabolic cart. HR_p and PPO were recorded as well as lactate at 2-min post exercise. Separate repeated measures ANOVA were used to assess differences in VO_{2p} , HR_p , PPO, and lactate within subjects, between the three experimental trials, followed by Bonferroni adjusted pairwise comparisons as needed. **RESULTS:** There was a main effect of treatment on VO_{2p} ($p = 0.048$; BAC: 42.46 ± 8.73 , NBAC: 41.14 ± 9.01 , PLA: 40.66 ± 8.59) but none of the post hoc pairwise comparisons were statistically significant. There was no effect of treatment on PPO ($p = 0.875$). There was a main effect of treatment on HR_p ($p < 0.001$; BAC: 181 ± 6 , NBAC: 176 ± 7 , PLA: 175 ± 8), with difference between BAC vs PLA ($p = 0.008$), BAC vs NBAC ($p = 0.002$) but not for NBAC vs PLA ($p = 0.550$). There was main effect of treatment on lactate ($p = 0.003$; BAC: 11.3 ± 2.7 , NBAC: 9.8 ± 2.4 , PLA: 9.5 ± 2.6), with difference between BAC vs PLA ($p = 0.016$), BAC vs NBAC ($p = 0.031$) but not for NBAC vs PLA ($p = 1.0$). **CONCLUSION:** Preliminary data suggest BAC leads to increased HR_p and post-exercise lactate when compared to PLA or NBAC. These findings may be explained by the stimulatory effect of BAC or a higher intensity that is not yet apparent statistically in PPO or VO_{2p} .

Supported by an industry sponsored grant through Isagenix International LLC

Effects of Limb Dominance and Sex on Upper Extremity Tissue Composition

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PURPOSE: To determine the effects of limb dominance and sex on upper extremity tissue composition.

METHODS: Fifty-four college-aged individuals (22 males and 32 females) were recruited to participate in this investigation. All participants identified their dominant arm based on writing preference. Participants completed a Dual Energy X-Ray Absorptiometry (DXA) scan to assess tissue composition. Bone, lean, fat, and total tissue mass were recorded from the DXA scan for both arms. Tissue differences were calculated by subtracting the non-dominant arm values from the dominant arm values. Percent fat of the arm was calculated for each arm by dividing the fat tissue mass by the total tissue mass. Limb and sex differences were analyzed using mixed-factorial ANOVAs. **RESULTS:** There was a statistically significant sex \times limb interaction ($p=0.031$) for bone mass. There was significantly ($p=0.001$) greater bone mass in the dominant arm when compared to the non-dominant arm for men (280.0 ± 53.1 and 266.7 ± 55.0 grams, respectively) and women (161.9 ± 24.7 and 156.1 ± 24.2 grams, respectively). Regardless of sex, the dominant arm had significantly ($p \leq 0.001$) greater lean, fat, and total tissue mass than the non-dominant arm. Moreover, there were trends for men to have greater limb asymmetries in lean mass ($p=0.057$) and total tissue mass ($p=0.094$) than women. However, no sex \times limb interaction or main effect of limb were observed for percent fat of the arm. **CONCLUSION:** Limb dominance influenced bone, lean, fat and total tissue mass with the dominant arm exceeding the non-dominant arm for all tissues. However, there was not a significant limb difference in percent fat of the arm for men or women. The dominant arm had greater absolute tissue mass than the non-dominant arm, potentially due to greater usage; however, relative tissue composition is similar between arms.

The Relationship between the Inter-arm Systolic Blood Pressure Difference, Vascular Health, and Cognitive Function

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Associations between vascular health and cognitive function in the elderly are documented; however, cognitive decline may begin in the second or third decade of life. In support of this, measures of vascular health (i.e. pulse wave velocity (PWV)) and cognitive function have been linked in young individuals. PWV may be useful in determining the risk of cognitive decline, however, its clinical use is not well-established. Blood pressure measurement, particularly the inter-arm difference in systolic pressure (IAD), may provide further insight into vascular function and complement PWV measurement. **PURPOSE:** To determine if a link exists between IAD, vascular health, and cognitive function in a well-characterized, young cohort. **METHODS:** Following informed consent, participants completed the Trails A and B tests. After a ten-minute rest, resting blood pressure, resting heart rate variability, and central PWV were attained using standardized procedures. Subsequently, each participant completed a peak aerobic capacity test (PEAK) on a cycle ergometer. **RESULTS:** On average, participants (n=62) completed Trails A in 17.1 ± 5.5 s and Trails B in 35.5 ± 13.3 s. Individuals with a higher central PWV completed Trails A test more rapidly (-0.252 , $p < 0.05$) than those with a lower central PWV. In the present cohort, the only significant predictors of performance in the Trails A test were PEAK (male and female) and resting heart rate (female). Further, PEAK and resting heart rate variability predicted Trails B performance, but only in females. There were no associations observed between IAD and cognitive function. **CONCLUSION:** The relationship between IAD, vascular health, and cognitive function may have been overpowered by sample homogeneity. The present findings suggest that additional factors related to heart rate variability may impact cognitive function, particularly in females.

Hydrodynamic Flow Velocity Changes with Linear Increase in Flume Speed

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Research using recirculating swimming flumes (RSF) have made assumptions regarding hydrodynamic flow characteristics. Knowledge of hydrodynamic flow characteristics absent of a swimming body is required to enable analysis of aquatic based biomechanical data. **PURPOSE:** To determine hydrodynamic flow characteristics of a swim flume at set 'speeds' around the centroid of flow projection. **METHODS:** Utilizing a RSF (1.7m wide, 4.25m long, 1.2m deep), hydrodynamic velocity profiles were collected via 3D profiling velocimeter, sampling at 200Hz. Data were recorded 0.5m and 1.5m from the start point at arbitrary designated flume 'speeds' of 30-95 (+99) in 5 unit increments. Velocity data were collected for 1min per trial (location x speed), to determine mean flow velocity (MFV) for 10cm^2 , 20cm^2 , 30cm^2 and 40cm^2 cross-sectional areas (CSA). A multifactorial RMANOVA was conducted comparing CSA from the surface by distance from current channel (4x2). Separate RMANOVAs were conducted to assess differences in MFV across each CSA. **RESULTS:** There was a main effect for distance ($F_{1,14} = 203.52$, $P < .001$, $\eta^2_p = .93$). Post hoc yielded MFV at 0.5m to be significantly ($P < .001$, 95% CI, .07 - .1 m/s) greater than at 1.5m. RMANOVA revealed CSA at .5m had different effects on mean flow velocity (MFV) ($F_{3,42} = 114.77$, $P < .001$, $\eta^2_p = .89$). Post hoc yielded greater MFV for 10cm^2 than 30cm^2 ($P < .001$) and 40cm^2 ($P < .001$), 20cm^2 was greater than 30cm^2 ($P < .001$), 20cm^2 was greater than 40cm^2 ($P < .001$), and 30cm^2 was greater than 40cm^2 ($P < .001$). RMANOVA revealed CSA at 1.5m had different effects on MFV ($F_{3,42} = 118.15$, $P < .001$, $\eta^2_p = .89$). Post hoc yielded greater MFV for 10cm^2 than 30cm^2 ($P < .001$) and 40cm^2 ($P < .001$), 20cm^2 was greater than 30cm^2 ($P < .001$) and 40cm^2 ($P < .001$), and 30cm^2 was greater than 40cm^2 ($P < .001$). **DISCUSSION:** Significant differences between flow CSAs indicate that MFV is less for larger area at the same speed, indicative of variable and turbulent flow characteristics across the respective CSAs. MFV is further diminished by the distance from the flow channel as supported by the significant interaction, thus exposing an individual to variant flow velocities simultaneously. Limited stability of the flow velocity centroid could impact swim mechanics making the movement pattern no longer analogous to traditional pool or open water swimming.

Supported by Office of Naval Research, MARSOC award (#N00014-14-1-0022)

Impact of Estrogen on Low-Flow-Mediated Constriction

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Low-flow mediated constriction (L-FMC) is a complementary measure to flow-mediated dilation (FMD) and can provide additional insight on vascular health. L-FMC is blunted in patients with cardiovascular disease. While it is well known that 17β -estradiol (E2) exerts positive effects on vascular endothelial health and increases FMD, to our knowledge, the impact of E2 on L-FMC is not known. **PURPOSE:** The purpose of this study was to test the hypothesis that E2 administration would augment L-FMC in young women. **METHODS:** Eleven young women (24 ± 1 years, 24 ± 1 kg/m²) have completed the study. To isolate the impact of E2, endogenous ovarian hormone production was suppressed with daily subcutaneous injections of a gonadotropin releasing hormone antagonist (GnRH_{ant}, 0.25 mg/day) for 10 days. E2 (0.1mg/day patch) was administered during the last 7 days of GnRH_{ant}. We measured changes in brachial artery diameter via ultrasound on day 3 of GnRH_{ant} and day 7 of E2 add-back. A blood pressure cuff was placed just distal to the olecranon process and inflated to 200mmHg for five minutes. Images were recorded continuously at baseline (1-minute), during occlusion (5-minutes), and after cuff deflation (2-minutes). L-FMC was determined from the last 30 seconds of cuff inflation using the lowest average value and was reported as percent change from baseline diameter. FMD was calculated as a percent change from baseline to peak diameter after cuff deflation. Total vessel reactivity was calculated as the absolute value of L-FMC and FMD. Results are reported as mean \pm standard error. **RESULTS:** Baseline diameter was similar between GnRH_{ant} (3.14 ± 0.12 mm) and E2 (3.08 ± 0.11 mm; $p=0.3$). L-FMC tended to be greater during E2 administration (GnRH_{ant} $-2.5 \pm 0.5\%$ vs. E2 $-3.8 \pm 0.5\%$; $p=0.11$). However, FMD (GnRH_{ant} $7.5 \pm 0.7\%$ vs. E2 $7.6 \pm 1.1\%$; $p=0.92$) and total vessel reactivity (GnRH_{ant} $10.0 \pm 0.7\%$ vs. E2 $11.5 \pm 1.2\%$; $p=0.26$) were not altered by E2. **CONCLUSION:** These preliminary findings suggest that short term E2 administration may augment L-FMC in young women. Additional data are needed to understand the impact of ovarian hormones on L-FMC and its role in regulating vascular health.

Supported by NIH Grant P20 GM 103446, U54 GM 104941, The University of Delaware Research Foundation, and AHA Award 16SDG30700015.

Can Alexa Influence Physical Activity in the Office Setting?

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Prolonged sedentary behavior is associated with increased risk for chronic conditions, and due to technological advances, the working population is in office settings with high occupational exposure to sedentary behavior. Recent technological innovations in conversational artificial intelligence have also made possible to likely influence activity patterns. These activity patterns can be objectively measured using an Actigraph. **PURPOSE:** The purpose of this study was to estimate the physical activities in response to conversational artificial intelligence stimuli-Alexa's voice activated commands using Amazon Echo. **METHODS:** Fifteen (24 ± 12.58 years, body mass index: 25.07 ± 5.05 kg/m²) sedentary female office workers were recruited from Berks community office locations. Each participant wore an Actigraph Link GT9X wrist accelerometer for the entire workweek to measure physical activity patterns. After obtaining baseline activity levels every half hour over an 8-hour work day for the first 2 days, participants responded to Alexa's pre-set voice commands which progressed from generic "stand-up" to more specific "walk to the bathroom" for the next three workdays. Commands were programmed every half hour for an 8-hour workday for the last 3 days. **RESULTS:** Participant's average HR: 74.4 ± 11.72 bpm, systolic BP: 120.51 ± 12.71 mm/Hg, and diastolic BP: 76.62 ± 6.08 mm/Hg was assessed. A paired-samples t-test was conducted to compare the number of steps taken during baseline (without Alexa) and with Alexa settings. There was a significant increase in the steps for Alexa (234.58 ± 78) steps compared to baseline (150.45 ± 39.93) steps; $t(11)=-4.29$, $p=0.001$. **CONCLUSION:** There was a 56% increase in the number of steps with Alexa prompts. This suggests that conversational AI, voice-enabled devices like Amazon Echo could potentially influence physical activity patterns.

The Effect of Quadriceps Femoris and Gluteus Strength on the Star Excursion Balance Test

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The Star Excursion Balance Test (SEBT) is used to evaluate balance and lower extremity function. Performance in the three reach directions: posteromedial (PM), posterolateral (PL), and anterior (ANT) requires coordination, balance, and flexibility. It is not known how strength relates to reach performance in the SEBT. **PURPOSE:** The purpose of this study was to analyze SEBT reach distance and muscle strength. **METHODS:** Twenty-four healthy college aged adults with no history of ankle injury or balance impairments participated in the study. Each participant completed the SEBT and had their quadriceps (Quad) and gluteus medius (GM) maximum isometric strength measured with a handheld dynamometer. Three trials were completed bilaterally for the SEBT and strength testing. Leg lengths were measured and used to normalize reach distances. Subject mass was measured and used to normalize strength scores. Averages of the three trials of each test were taken. Pearson-product moment correlations were calculated between the average normalized strength scores (Quad and GM) and the average normalized PM, PL, and ANT reach distances. **RESULTS:** There was a moderate significant negative correlation between QUAD strength and ANT reach for the right leg ($r = -0.49$, $p = 0.015$) and a weak negative correlation for between QUAD strength and ANT reach for the left leg ($r = -0.26$, $p = 0.219$). There was a moderate significant positive correlation between GM strength and PL reach for the left leg ($r = 0.41$, $p = 0.045$) and a weak to moderate correlation between GM strength and PL reach for the right leg ($r = 0.37$, $p = 0.079$). GM strength was weakly related to PM reach for right ($r = 0.25$, $p = 0.238$) and left legs ($r = 0.33$, $p = 0.120$). All other correlations were less than $r = 0.15$. **CONCLUSIONS:** GM strength explained an average of 8% of the variation in PM reach and 15% of the variation in PL reach performances. The weak to moderate positive correlation between GM strength and posterior reaches suggests that stronger proximal stabilizers allow for further reaches in the posterior direction. Quad strength explained an average of 15% of the variation for ANT reach performance. The negative correlation between quadriceps strength and ANT reach could be related to flexibility or quadriceps:hamstring ratios (Q:H) in people with greater Quad strength.

Action Boundary Perception Across 30 Days in an Isolated and Confined Environment

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Successful execution of operational tasks requires accurate and efficient action boundary perception. An action boundary is the task- and individual-specific threshold where an action is possible. The inability to accurately perceive changes in action possibilities due to changing action boundaries may increase the risk adopted during a task, possibly compromising mission success. Astronauts must maintain effective operational performance in isolated, confined and extreme (ICE) environments for extended time periods, similar to those expected on the proposed mission to Mars. It is unknown how these environments affect action boundary perception. **PURPOSE:** Investigate changes in action boundary perception behavior during a 30-day Human Exploration Research Analog (HERA) mission. **METHODS:** Sixteen subjects completed six trials of the perception-action coupling task (PACT), a novel tablet-based action boundary perception task, in the afternoon of days 3, 10, 17, 24 and 5 days post-mission. The 15-minute PACT presents a series of virtual balls and apertures varying in ball to aperture size ratio (B-AR) from 0.2 to 1.8 with a ratio of 1.0 representing the action boundary. Subjects determined whether the ball could fit through the aperture, then responded based on their perception of this action possibility. 8 (ratio) x 5 (time) repeated measures ANOVAs were performed to assess changes in response time (RT), accuracy (ACC) and lapses. **RESULTS:** No significant ratio x time interactions were observed. RT ($F_{4,60} = 3.631$, $p = 0.010$, $n^2_p = 0.195$) was faster on day 24 (0.738 ± 0.088 s) than day 17 (0.768 ± 0.092 s). No differences were observed between other timepoints. ACC and lapses did not vary during the mission ($p > 0.05$). RT ($F_{2,583,38,742} = 42.815$, $p < 0.001$, $n^2_p = 0.741$) and ACC ($F_{1,423,21,341} = 42.815$, $p = 0.002$, $n^2_p = 0.407$) were sensitive to changes in B-AR; responses were slower and less accurate near the action boundary. **CONCLUSION:** Minimal change in action boundary perception performance was observed in HERA ICE analog, with improvements in RT detected. Faster RT may reflect more efficient responses or behavioral changes due to ICE environments, suggesting action boundary perception is not compromised by a 30 day ICE analog assessment.

This material was based on work supported by NASA (NNX15AC13G) PIs: Alfano and Simpson

Renal Vascular Responsiveness to Sympathetic Activation is Not Affected by Prior High Intensity Exercise

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PURPOSE: Orthostatic hypotension is common following a single bout of high intensity exercise. The renal vasculature contributes to blood pressure regulation during orthostasis. Renal vascular resistance (RVR) increases during exercise but is restored to pre-exercise levels shortly following the cessation of exercise. The responsiveness of the renal vasculature to sympathetic stimulation, such as during orthostasis, following exercise is unknown. We hypothesize that prior high intensity exercise attenuates the increase in RVR during sympathetic activation.

METHODS: Ten healthy adults (23 ± 3 y) completed two 2 min cold pressor tests (CPT). The CPT stimulates the sympathetic nervous system. A CPT was completed before and after a Wingate Anaerobic Test that consisted of 30 s of maximal effort cycling exercise at a resistance equal to 7.5% body mass. In both instances, the CPT was administered following 10 min supine rest. Heart rate (ECG), mean arterial pressure (Penaz method, MAP), and renal blood velocity (RBV) were measured pre-CPT, at 1 min and 2 min of the CPT, and 1 min and 3 min post-CPT. RBV was measured via the coronal approach at the distal segment of the right renal artery with Doppler ultrasound. RVR was calculated as MAP/RBV . Data are presented as mean \pm SD. **RESULTS:** Pre-CPT, heart rate was elevated after exercise (60 ± 9 vs. 86 ± 13 bpm, $P < 0.01$), but MAP (85 ± 12 vs. 81 ± 15 mmHg, $P = 0.91$), RBV (34 ± 6 vs. 33 ± 7 cm/s, $P = 0.99$) and RVR (2.6 ± 0.4 vs. 2.6 ± 0.8 mmHg/cm/s, $P > 0.99$) were not different between before and after exercise. Before exercise, heart rate (at 2 min CPT: 66 ± 9 bpm, $P = 0.02$) and MAP (at 2 min CPT: 108 ± 21 mmHg, $P = 0.05$) increased during the CPT, returning to pre- levels 1 min ($P = 0.22$) and 3 min ($P = 0.60$) post-CPT, respectively. After exercise, RBV decreased during the CPT (at 2 min: 29 ± 7 cm/s, $P = 0.03$), returning to pre- levels 1 min post-CPT ($P = 0.61$). RVR increased during the CPT (at 2 min: 4.0 ± 0.7 mmHg/cm/s, $P < 0.01$), returning to pre- levels 1 min post-CPT ($P = 0.28$). Changes in heart rate, MAP, RBV, and RVR during the CPT did differ between before and after exercise (interaction: all $P \geq 0.74$). **CONCLUSION:** Increases in RVR invoked by sympathetic activation are not affected by prior high intensity exercise.

The Impact of Varying Exercise Protocols on Neurogenesis and Angiogenesis in the Dentate Gyrus

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Exercise is being considered for associations with improved neuronal health and longevity, synaptic plasticity, increased cerebral blood volume and angiogenesis, overall brain volume, and neurogenesis which collectively may have the power to forestall neurodegenerative disease. **PURPOSE:** To investigate the effects of varying exercise protocols on indices of neurogenesis and angiogenesis in the dentate gyrus of the hippocampus to inform efforts to forestall cognitive decline associated with neurodegenerative disease. **METHODS:** The indices of neurogenesis and angiogenesis were assessed using the surrogate measures of maximal oxygen uptake (VO_{2max}), cognitive function as assessed by the Rey auditory verbal learning test (RAVLT), and urinalysis of brain-derived neurotrophic factor (BDNF) concentration taken just prior to and just after a six-week training protocol. Twelve college-aged males were randomized into either high intensity interval training group (HIIT) or a steady-state training group (SS) and were compared to six sedentary controls over the course of a six-week supervised training study. **RESULTS:** Findings reflect an association between exercise and improved cognitive function. Specifically, cognitive function improved significantly with HIIT training ($\Delta RAVLT = 3.66$, $p = 0.045$) and a significant correlation between cognitive function and improved VO_2 from HIIT training was also shown ($r = 0.98$; $p = 0.010$). Cognitive function and neurotrophin concentration both increased significantly with steady state training compared to controls ($\Delta RAVLT = 4.40$, $p = 0.011$; $\Delta BDNF = 54.00$ pg/ml, $p = 0.007$). **CONCLUSION:** Varying exercise protocols have a varying impact on cognitive function as assessed by the RAVLT, urine BDNF, and VO_2 . Findings hold implication for pathologies that involve cognitive decline.

Calcium Activation of Mitochondrial Oxidative Phosphorylation is Maintained in Heart Failure Levels of Extramitochondrial Sodium

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Extramitochondrial $[Na^+]$ and $[Ca^{2+}]$ are characteristics of heart failure. It is suggested that high cytosolic $[Na^+]$ inhibits respiration by decreasing mitochondrial matrix $[Ca^{2+}]$ through the Na^+-Ca^{2+} exchanger. However, it is unknown how this elevated $[Na^+]$ affects Ca^{2+} activation of mitochondrial respiration, due to the interplay between the Na^+-Ca^{2+} exchanger and the Ca^{2+} uniporter. **PURPOSE:** First, we determined if the Ca^{2+} concentration needed to

induce maximal mitochondrial respiration differed between healthy (5 mM) or failing (15 mM) Na⁺ concentrations. Second, we examined mitochondrial O₂ consumption rate (J_O), NADH, and mitochondrial membrane potential ($\Delta\Psi$) at intermediate respiration rates to determine the effects of elevated [Na⁺] on the oxidative phosphorylation pathway. **METHODS:** Mitochondria were isolated from adult male rat hearts and J_O was monitored using a Clark-type O₂ electrode at 37°C. Isolated mitochondria were incubated with 5 or 15 mM NaCl and maximal (State 3) J_O was determined with varying [Ca²⁺] (100-1500 nM). Intermediate respiration rates were examined with 5 and 15 mM NaCl with and without Ca²⁺. **RESULTS:** Mitochondrial respiration increased with increasing [Ca²⁺] up to 1000 nM; maximal J_O occurred at the same Ca²⁺ concentration between 5 and 15 mM NaCl incubations. Without additional Ca²⁺, intermediate J_O was no different between 5 or 15 mM NaCl incubations: 162±20 vs. 167±14 nmol O₂/mg/min at ΔG_{ATP} =13.1 kcal/mol and 75±5 vs. 74±4 nmol O₂/mg/min at ΔG_{ATP} =14.4 kcal/mol. The addition of Ca²⁺ activated intermediate respiration rates, but there was no difference in intermediate J_O between 5 or 15 mM NaCl incubations: 319±20 vs. 388±32 nmol O₂/mg/min at ΔG_{ATP} =13.1 kcal/mol and 103±6 vs. 105±8 nmol O₂/mg/min at ΔG_{ATP} =14.4 kcal/mol. **CONCLUSION:** In conclusion, health and failing extramitochondrial [Na⁺] do not alter the necessary Ca²⁺ for optimal respiration. Moreover, the importance of extramitochondrial [Na⁺] appear to be diminished with Ca²⁺ activated respiration, thereby alluding to the greater role of Ca²⁺ import though the mitochondrial Ca²⁺ uniporter.
Supported by The American Heart Association Scientific Development Grant (16SDG30770015)

Resting Systolic Blood Pressure Variability is Predictive of the Pressor Response to Isometric Handgrip in Young Adults

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BACKGROUND: Extensive epidemiological evidence indicates that the adverse cardiovascular consequences of high blood pressure (BP) depend not only on the absolute BP values but also on other indices related to BP regulation. In this regard, increased systolic blood pressure variability (BPV) is associated with an increased risk of cardiovascular events and mortality. In addition, an exaggerated increase in BP during exercise is also predictive of increased cardiovascular risk. However, the relation between BPV and the magnitude of the pressor response to exercise has not been examined. **PURPOSE:** To determine the relation between short-term systolic BPV and the BP response to isometric handgrip. We hypothesized that systolic BPV at rest would be predictive of the pressor response to isometric handgrip in young healthy adults. **METHODS:** Twenty young healthy adults (n=9 women; 22±1 yrs, 24±1 kg/m²; 114±2/74±1 mmHg) participated. Beat-to-beat BP was continuously measured using finger photoplethysmography during a 10 min supine rest and during 2 min of isometric handgrip performed at 30% maximal voluntary contraction. BPV at rest was assessed using peak analysis software (LabChart, ADInstruments). The magnitude of the pressor response to handgrip was calculated as the difference between BP at rest and during the last 30 s of handgrip. BPV was regressed against the pressor response to exercise. **RESULTS:** BP increased during handgrip in all participants (Δ SBP: 27±3; Δ MAP: 23±2 mmHg; p<0.05 for both). Systolic BPV (σ) was related to the increase in both systolic BP (R²=0.33; p=0.008) and mean arterial pressure (R²=0.22, p=0.036). **CONCLUSION:** In young healthy adults, systolic BPV at rest is related to the pressor response to isometric handgrip. Future studies are warranted to determine if this relation differs in young adults with a cardiovascular risk factor, such as family history of CVD or sedentary life style.
American Heart Association Grant #18UFEL33900164

More Cycling, Less Talking: Syllable Production, Attentional Focus, and Affective Responses across Exercise Intensity Levels

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The *Talk Test* appears sensitive to changes in exercise intensity and shows promise as a non-intrusive means of establishing appropriate levels, yet remains to be fully endorsed by ACSM. Further development of relationships between the *Talk Test* and other sensitive measures of exercise intensity, such as affective responses and attentional focus, will only bolster the rationale for its use. To date, however, few investigations have done so. **PURPOSE:** To examine measures of speech production (i.e. longest [LSy], shortest [SSy], and average [ASy] number of syllables per breath), heart rate (%HR_{max}), affect (FS), and attentional focus (AFS) responses across a range of exercise

intensities. **METHODS:** Sixteen participants (Age: 22.68 ± 3.82 yrs; BMI: 25.24 ± 4.56 kg·m⁻²) completed three 15 minute bouts of cycling exercise at (a) a self-selected intensity (as measured by Watts) and (b) randomized intensities of 20% below and 20% above the self-selected intensity. Participants read a paragraph from *The Rainbow Passage* at the end of exercise to measure syllables per breath. %HR_{max}, FS, and AFS were recorded at end of exercise. End of exercise values were compared using one-way repeated measures ANOVAs. **RESULTS:** Exercise intensity produced a significant change in end of exercise LSy ($p = .003$; $\eta_p^2 = .324$), %HR_{max} ($p < .0001$; $\eta_p^2 = .611$), FS ($p = .039$; $\eta_p^2 = .194$), and AFS ($p = .015$; $\eta_p^2 = .245$). LSy was significantly different between 20% below ($M = 31.94 \pm 9.43$) and self-selected ($M = 25.63 \pm 7.87$; $p = .005$) but not 20% above ($M = 27.38 \pm 7.94$; $p = .083$). Differences were observed between 20% below ($M = 62.13\% \pm .08$) and both self-selected ($M = 68.25\% \pm .09$; $p = .005$) and 20% above ($M = 71.69\% \pm .10$; $p < .0001$) self-selected exercise intensity for %HR_{max}. FS evidenced significant differences between 20% below ($M = 3.00 \pm 1.36$) and 20% above ($M = 2.00 \pm 1.75$; $p = .031$) as did AFS between 20% below ($M = 5.69 \pm 2.27$) and 20% above ($M = 4.18 \pm 2.26$; $p = .008$). **CONCLUSIONS:** As exercise intensity levels increased, speech production became more difficult. Likewise, participants evidenced greater physiological strain and reported more associative attentional focus and less positive affective responses to increased demand. Collectively, the *Talk Test* appears sensitive to multiple measures of distress, which may strengthen the rationale for its use in exercise programming.

The Reliability of an Isokinetic Dynamometer and Force Gauge in Measuring Core Strength

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PURPOSE: To determine the test-retest reliability of the isokinetic dynamometer (ID) and a portable analog force gauge when measuring voluntary peak torque and average peak force of isometric trunk flexion and extension. **METHODS:** Eighteen students (aged 19.5 ± 0.9) completed all aspects of the study. Subjects participated in a familiarization session prior to data collection sessions. Testing sessions consisted of three maximal contractions of the abdominals and back extensors (five seconds each) on each device, with 30 seconds of rest allowed in between repetitions and 90 seconds between sets. Subjects were measured with a goniometer for any change in hip-torso angle, and any measurement exceeding 10° of motion was discarded and re-tested. Subjects were asked to return for two subsequent testing days post-familiarization to repeat the protocols. All tests were separated by at least 24 hours and performed at the same time of day. An Intraclass Correlation Coefficient (ICC) was used to determine within-day reliability and dependent t-tests were used to compare day-to-day reliability ($p > 0.05$). **RESULTS:** Results yielded an average peak torque of 14.31 ± 3.42 Nm and 12.45 ± 4.44 Nm on the ID extension and flexion protocols respectively. With the exception of the first day of extension peak torque (ICC=0.500), the ID demonstrated good within-day reliability ($0.914 < \text{ICC} < 0.942$), as well as good day-to-day reliability for both flexion ($p = 0.22$) and extension ($p = 0.11$). The force-gauge measured flexion and extension of the average peak force during the contraction at 7.01 ± 2.53 N and 7.43 ± 2.26 N respectively. The force-gauge demonstrated good within-day reliability on all testing measurements ($0.870 < \text{ICC} < 0.924$), no difference between day-to-day testing for flexion ($p = 0.94$), but not for extension ($p = 0.02$). **CONCLUSION:** This study confirms that the ID is a reliable means of testing isometric trunk strength, and that it has good test-retest reliability. The force gauge apparatus also demonstrated good within day reliability and test-retest reliability with flexion measures. The force gauge apparatus demonstrated test-retest reliability in flexion measures, meaning that it may be used as a potentially more cost-effective measure of strength progression in a clinical setting.

The Acute Effect of Deep Ventilatory Training on Cortical and Cardiovascular Activity

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High-level athletes are generally resilient to stress and show neural efficiency when performing complex tasks (Hatfield, 2018). This state is a consequence of practice but can be facilitated by self-management techniques. One technique to reduce stress levels is the use of deep ventilatory training (DVT). DVT is a ventilatory maneuver that exaggerates inhalation and exhalation to slow the breathing rate to a pace of six breaths per minute. This technique is a conscious approach to manipulate the autonomic balance by engaging the parasympathetic branch. Previously reported, chronic effects of DVT exhibited improvements in mental health. Tactical athletes also utilize DVT as a stress coping mechanism, to improve focus and to maintain composure (Lewis, 2015). **PURPOSE:** To investigate the acute effects of DVT on cortical and cardiovascular activity. **METHODS:** Recruited twenty healthy young

adults (age 18-30). Eligibility requirements included participants to have no prior experience in any mindfulness training, i.e., breathing training or meditation. The study involved two sessions; session order was counterbalanced. Each session participants performed either the DVT or the control condition. The study utilized electroencephalography (EEG) and electrocardiogram (ECG) to measure cortical and cardiovascular activities. Repeated measures ANOVA were conducted for statistical analysis. **RESULTS:** EEG results exhibited an increase in alpha power during DVT compared to the control condition (9.85 ± 4.23 vs. 7.45 ± 2.84 , $F(1, 19)=7.942$, $p<0.05$). ECG results exhibited an increase in SDNN during DVT compared to the control condition (58.68 ± 19.96 vs. 43.13 ± 13.63 , $F(1, 19)=30.004$, $p<0.001$). **CONCLUSION:** Psychophysiological measures of this study provided evidence for an acute effect of DVT through a decrease in cortical activity. Specifically, during DVT, participants exhibited an increase in alpha power. Alpha power reflects inhibition of cortical activity. Along with decreases in cortical activity, cardiovascular measures also suggest an increase in parasympathetic activity. Overall, this study demonstrated an acute positive effect of DVT on cortical and cardiovascular activity, which may promote neural efficiency during competition.

Effects of a Single Dose Multi-Ingredient Pre-Workout Supplement on Aerobic and Anaerobic Performance in Men

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PURPOSE: To assess the effects of a single dose of a multi-ingredient pre-workout supplement (MIPS) on aerobic and repeated anaerobic performance tests. **METHODS:** Eight college-aged men were recruited to participate in a randomized, double-blind, placebo-controlled, crossover study. All participants were tested within the same week separated by 48 hours and were provided either the placebo (PLA) or the MIPS on each day. As per the manufacturer's instructions, the participants waited 25 minutes to begin the tests, following consumption of the drink. Aerobic exercise performance was assessed using the Modified Astrand Treadmill Protocol, during which maximal oxygen consumption ($\dot{V}O_{2max}$) and maximal aerobic exercise time were determined. Following this test, participants were provided a 20-minute seated rest period. After the rest period, participants completed a short warm-up which consisted of 2 minutes of cycling at 50 RPMs against a light resistance, followed by 3, 10-second sprints, to determine the max RPMs. After the warm-up, participants completed the repeated anaerobic power test, which consisted of 10, 6-second sprints, with 45 seconds of active rest in between each sprint. For each sprint, a resistance of 7.5% of the participant's body mass was applied at 90% of their max RPM. Peak power (PP) was determined for each sprint and the percent decline in PP from the first to the last sprint was calculated. $\dot{V}O_{2max}$, exercise time and the percent decline in PP for the sprints were analyzed using a dependent t-test. The peak power of the 10 sprints were analyzed using 2x10 ANOVA. The alpha level was set *a priori* to $p \leq 0.05$. **RESULTS:** There was no significant difference between the PLA and MIPS for $\dot{V}O_{2max}$. However, there was a significant difference in treadmill time ($p=0.005$) with MIPS (10.4 ± 1.6 min) performing better than PLA (10.0 ± 1.6 min). There were no significant differences between the PLA and MIPS when analyzing peak power during the 10 sprints or percent decline in PP. **CONCLUSION:** A single dose of this MIPS improved maximal aerobic exercise time despite no changes in $\dot{V}O_{2max}$. However, this MIPS did not improve performance during a repeated anaerobic power test.

Study supported by Cenegenics®

Cardiovascular Health Improvements with Diet and Exercise Intervention

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Obesity has become an epidemic that can be brought on by genetics, diet, and overall lifestyle. The disease of obesity is associated with clinical conditions like hypertension, diabetes, and cardiovascular (CV) disease. Increased body fat and adipocyte levels are related to circulating cytokine and adipokine levels. Circulating adiponectin levels are related to glucose regulation, fatty acid synthesis, inflammation, and vascular health. **PURPOSE:** This study was a pilot study for a senior project. We examined changes in CV risk factors with a diet and exercise intervention to hypothesize how adiponectin levels could respond. **METHODS:** We conducted a 6-week short-term diet and exercise intervention. Pre- and post- testing included a fitness test and a fasted visit to measure biomarkers of CV health. **RESULTS:** 13 adults completed the study (38.8 ± 12.2 yrs; 8M, 5F), with intervention adherence of 87.62%. We found improvements in blood pressure (BP, 125.5/79.9 to 121.9/78.4 mmHg), lipid levels (Cholesterol, TC, dropped from 182.6 ± 32 to 168.6 ± 21 mg/dL; Triglycerides, TG, dropped from 122.1 ± 70 to 110.1 ± 74 mg/dL),

body composition(% fat dropped from 30.1 ± 7.6 to $27.7 \pm 6.8\%$), and fitness levels (VO_{2peak} increased from 37.5 ± 10.2 to 40.6 ± 11.6 ml/kgmin; strength increased from 335.9 ± 89 to 374.5 ± 104 lbs for lower body and 45 ± 20 to 49.5 ± 18 lbs in upper body). We also found improvements with vascular health (Augmentation Index, AIx, decreased from 11.5 ± 11 to 9.3 ± 9 and IMT levels decreased from 0.47 to 0.46mm). With regression we also saw significant relationships between AIx with TC (0.603 , $p=0.03$) and with TG (-0.885 , $p=0.00$). **CONCLUSION:** We found improvements in blood pressure, lipids, vascular health and fitness. We also found that stiffer vessels are related to lipid levels and blood pressure. Based on the preliminary data of physical variables, we anticipate an increase of adiponectin levels with a diet and exercise intervention.

Does Quantity of Sleep Affect Cardiovascular Endurance in College Students?

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PURPOSE: To compare quantity of sleep and cardiovascular endurance in college students. **METHODS:** A convenience sample of 100 college students, (51% female and 49% male), participated in a free comprehensive physical fitness assessment. The assessment included tests to determine resting heart rate and blood pressure, body composition, cardiovascular endurance, muscular fitness, and flexibility. The Cooper 12 minute run/walk test was used to predict VO_{2max} and determine cardiovascular endurance. In addition to the assessment, participants completed an electronic health survey. The survey included demographic questions, as well as questions focused on overall health, and lifestyle habits including quantity of sleep and physical activity. Specific data regarding quantity of sleep for both weekdays and weekends was collected, analyzed and compared to predicted VO_{2max} for each participant. **RESULTS:** The mean age of participants in the physical fitness assessment was 21.5 years old ($SD=2.12$). The sample mean estimated VO_{2max} value was 31.47 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ ($SD=10.03$). It was determined that participants in the study obtained an average of 6.76 hours of sleep during the weekdays ($SD=1.21$). Participants sleeping eight or more hours per weeknight had a mean estimated VO_{2max} of 31.2 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ ($SD=10.91$). Participants sleeping seven hours or less per weeknight had a mean estimated VO_{2max} of 31.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ ($SD=9.89$). **CONCLUSION:** The results showed that participants sleeping seven hours or less per weeknight had a slightly higher VO_{2max} than participants sleeping eight hours or more per weeknight. However, the results were not significant ($t=0.12$; $p > .05$).

Video Measures of Running Ground Contact Times and Vertical Ground Reaction Forces

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Ground contact time (GCT) and vertical ground reaction force (VGRF) are key variables with regards to running performance, metabolic rate, and musculoskeletal stresses. However, there are few field-based methods with acceptable accuracy to quantify these variables in comparison to a laboratory force plate standard. The development of commercially available high-speed video cameras (HSC) may provide a cost-effective method for determining these variables during over-ground running. **PURPOSE:** To validate video-based measures of GCT and VGRF compared to a laboratory force plate. **METHODS:** 20 subjects (13 males, height = 1.76 ± 0.07 m, mass = 78.0 ± 9.0 kg; 7 females, height = 1.65 ± 0.07 m, mass = 68.3 ± 9.4 kg) volunteered and provided written informed consent. One HSC (Apple iPad Pro 9.7) filming at 240 Hz was placed at three standardized locations around the laboratory force plate. The HSC captured the point of ground contact on the force plate as subjects performed three running trials at different self-selected speeds (jog, run, sprint), with two minutes recovery between each trial. Velocity was measured with an automatic timing system (Free Lap), and GCT and VGRF were directly measured using an in-ground laboratory plate (Kistler 5691A) collecting at 1000 Hz. Video-based calculations of VGRF were based on GCT and equations of projectile motion. **RESULTS:** In comparison to the force plate, the HSC had a mean absolute error of $3.2\% \pm 2.2\%$ ($R^2=0.97$) for GCT and $10.7\% \pm 5.2\%$ ($R^2=0.85$) for VGRF. **CONCLUSION:** A commercially available HSC filming at 240 Hz can accurately determine GCT during over-ground running, but caution is warranted when using the proposed method to calculate VGRF.

The Influence of Physical Activity, Diet, and Substance Use on Academic Performance

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Physical inactivity, poor diet, and alcohol/substance abuse are common health behaviors among college students. However, little is known about the relationship between these health behaviors and academic performance. **Purpose:** To examine differences in grade point average (GPA) based on physical activity (PA) levels, fruit and vegetable consumption (FVC), and use of alcohol and substances. **METHODS:** Students completed an online survey self-reporting demographics (age, sex, race/ethnicity), PA (min/week of moderate and vigorous PA), FVC (servings/day), use of alcohol and substances (yes/no), as well as GPA. Independent samples ttests were used to examine differences in GPA between those who did/not meet PA and FVC recommendations, and those who did/not use alcohol and substances. **RESULTS:** Data was collected from 3738 participants (women, 57.8%, non-Hispanic white, 77.2%). For all participants, GPA differed significantly between those who did ($3.40 \pm .40$) and did not ($3.36 \pm .48$) accumulate 500 weekly MET minutes ($p=.034$), and those who did ($3.42 \pm .40$) and did not ($3.34 \pm .46$) meet FVC recommendations ($p<.001$). GPA also differed significantly between tobacco users ($3.26 \pm .41$) and non-users ($3.40 \pm .42$, $p<.001$), as well as cigarette users ($3.30 \pm .40$) and non-users ($3.41 \pm .42$, $p<.001$), but not based on alcohol use, for all participants. **CONCLUSION:** Findings indicate that those who utilize substances, are less physically active and display unhealthy eating habits, tend to have poor academic performance. This provides insight to students and campus health professionals regarding how their health behaviors may be affecting their GPA.

Racial Differences in the RAAS and its Relationship to Electrolyte Losses in Collegiate Athletes.

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Racial differences in the Renin-Angiotensin-Aldosterone system (RAAS) have been implicated in the racial disparity in the prevalence of hypertension in Americans. **PURPOSE:** To investigate racial differences in the RAAS and its relationship to sweat and urine electrolyte losses during exercise in a young athletic population. **METHODS:** Twelve Caucasian (CA) (Age: 21.3 ± 1.5 yrs, Height: 184.2 ± 4.7 cm, Mass: 102.8 ± 20.6 kg, BSA: 220.3 ± 33.3 cm²) and 12 African-American (AA) (Age: 21.1 ± 1.4 yrs, Height: 179.7 ± 7.5 cm, Mass: 95.9 ± 27.1 kg, BSA: 209.3 ± 38.7 cm²) male division II collegiate football and soccer players provided a venous blood sample (8 mL) before the first pre-season practice (baseline) and before and after practice on day 10 of practices when players were acclimatized. Serum and plasma were prepared and frozen until assayed. Sweat loss was calculated as Δ body weight (kg) adjusted for fluid intake (L) and total urine volume produced (L). Forearm and low-back sweat samples were collected using standard procedures. Sweat and urine electrolyte concentrations (mmol/L) were analyzed by ion-selective electrodes, and total electrolyte losses (mg) were calculated. **RESULTS:** Significant differences were found in pre-practice renin (CA: 1.49 ± 0.55 ng/dL/hr, AA: 0.98 ± 0.65 ng/dL/hr, $P < 0.05$) and post-practice urine sodium (Na⁺) concentrations (CA: 47.5 ± 30.9 mmol/L, AA: 81.5 ± 43.2 mmol/L, $P < 0.05$). When considering both sweat losses during practice and urine losses immediately following practice, AA athletes experienced significantly higher total Na⁺ loss (CA: 2917.9 ± 1145.7 mg, AA: 4435.5 ± 2085.7 mg, $P < 0.05$). Additionally, no significant correlations between renin or aldosterone and sweat or urine electrolyte concentrations were found to be significant in both races, simultaneously. **CONCLUSION:** Greater total Na⁺ loss in AA players, as well as racial discrepancies in the relationships found between the RAAS and measures of electrolyte losses, suggest a potential racial difference in the mechanism by which electrolytes are lost in AA versus CA athletes and the involvement of the RAAS.

Supported by 2018-2019 West Chester University Provost Grant

Influence of Recovery Positions on Cardiovascular Recovery

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Eliciting quicker cardiovascular recovery between bouts of exercise or after exercise could enhance the individual's subsequent exercise performance or restoration of homeostasis. **PURPOSE:** To investigate the effects of different recovery positions on heart rate (HR) and blood pressure (BP) recovery after a submaximal treadmill run.

METHODS: Thirteen male subjects (age: 21.1 ± 1.4 yrs, mass: 92.3 ± 18.6 kg, height: 183.5 ± 8.0 cm) completed three sessions of testing. The first session consisted of a VO_{2max} test which was used to determine running speed for the following two exercise test sessions. The following two exercise test sessions consisted of a warm-up followed by a 10-minute submaximal run at a pre-determined speed equivalent to 70% of the individual's VO_{2max} . After the submaximal run, subjects were randomly assigned to one of the two recovery positions; 1) active recovery at 3.5 mph walking on the treadmill (ACT) or 2) supine position with legs elevated (SP). All subjects completed both recovery testing sessions. During testing, subjects' HR and BP were measured at rest, after exercise, and 1-min and 5-min post exercise. A two-way ANOVA with repeated measures was used to compare two recovery conditions at

multiple time points. **RESULTS:** Significant differences were found in 1-min post exercise HR between SP and ACT conditions with HR being significantly lower in SP condition (SP: 97.6 ± 16.6 vs. ACT: 126.4 ± 19.2 bpm; $p < 0.05$). At five minutes into recovery, SP condition showed a significant ($p < 0.05$), fastest HR recovery to 89.5 ± 13.9 bpm (52% drop from end exercise HR), while ACT condition reduced the HR to 118.7 ± 19.3 bpm (24% drop from end exercise HR). Although a significant drop in BP was seen during both recovery conditions (SP: 149.4 ± 24.3 to 131.0 ± 23.4 mmHg, $p < 0.05$ vs. ACT: 151.6 ± 23.4 to 131.9 ± 21.4 mmHg, $p < 0.05$), the two recovery positions did not reveal a significant difference in recovery BP (SP: 131.0 ± 23.4 vs. ACT: 131.9 ± 21.4 mmHg; $p > 0.05$).

CONCLUSION: These findings suggest that SP recovery position can accelerate HR recovery and provide evidence to further the advancement of athletics while helping athletes perform their best on their subsequent event.

Effect of Caffeine Supplementation on Acute Rope Exercise Performance and Metabolism

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Use of caffeine as well as utilizing battling rope exercises have increased in popularity as increases in lactate during exercise, muscle power, muscle strength, and delayed fatigue, thus improving overall anaerobic exercise performance and enhancing energy use during recovery were observed. **PURPOSE:** To determine caffeine-induced effect on cardiometabolic and performance during acute maximal rope exercises. **METHODS:** In a double-blind design study, 3 male and 10 female, physically active healthy (23 ± 3 kg/m²) adults (20 ± 1 yrs) consumed 5 mg/kg caffeine or placebo (PL) 15-min prior to rope exercise in a randomized order. The 8-min rope exercise protocol consisted of 6 sets of 30-sec timed maximal rope exercises of vigorous intensity with 1-min rest between sets in which rep number was determined. From a HR monitor and RPE scale, exercise intensity was obtained at rest, after each set, and post-exercise. A finger stick sample determined blood lactate (LA) and glucose (GL) in duplicate at rest (fasted), mid-exercise (set 3), and immediate post-exercise. Repeated measures ANOVA with post-hoc analysis examined the caffeine effect at $p \leq 0.05$ level. **RESULTS:** Although an exercise-induced increase in LA and GL at mid- (vs rest) (LA: 8 ± 2 vs 1 ± 0.3 mg/dL; GL: 95 ± 9 vs 89 ± 8 mg/dL) and post-exercise (LA: 13 ± 2 mg/dL; GL: 117 ± 9 mg/dL) after caffeine intake, there was no caffeine-placebo effect. A trend ($p = 0.07$) for a higher caffeine-induced LA (8 ± 4 vs PL 6 ± 2 mg/dL) at mid- but not post-exercise (13 ± 1 vs PL 11 ± 2 mg/dL) existed. Although no caffeine effect existed, compared to set 1, RPE (28%) and HR (44%) increased by set 6. LA at mid- (18%, $p = 0.02$) and post-exercise (9%, $p = 0.06$) was higher (vs PL) when ingesting caffeine in those whose habitual caffeine intake (0.5 ± 0.4 cups/d) was low. **CONCLUSIONS:** Although, when taken 15 min prior to exercise, the caffeine-induced effects during this acute bout of maximal rope exercises had minimal effects on LA during exercise except for a trend during mid-exercise. The protocol did elicit 75-90% of age-predicted HR_{max} demonstrating the vigorous nature of the exercise. However, an examination of longer protocol durations and varying movements of a multi-set anaerobic rope exercise are necessary as they may provide a better indicator of a potential caffeine response.

Supported by TCNJ MUSE Grant (JB)

The Influence of a High Sodium Meal on Cerebrovascular Reactivity

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Single high sodium (Na⁺) meals transiently reduce peripheral blood vessel function in humans. Rodent models demonstrate that high dietary Na⁺ intake reduces middle cerebral artery (MCA) function. Cerebrovascular reactivity (CVR) to carbon dioxide (CO₂) is a validated method for assessing the cerebrovasculature in humans. However, the effects of a single high dietary Na⁺ meal on CVR in humans is unknown. **PURPOSE:** Therefore, we tested the hypothesis that a single high- vs low-Na⁺ meal impairs CVR in healthy young adults. **METHODS:** Seventeen healthy, normotensive adults (9F/8M; age: 25 ± 4 yrs; BMI: 24.7 ± 0.9 kg/m²; BP: $105 \pm 2/58 \pm 2$ mmHg, mean \pm SEM) participated in this crossover design study. We provided participants with high- (HS: 1,495 mg Na⁺) and low- (LS: 138 mg Na⁺) Na⁺ meals in randomized order. Visits were separated by one week for males. We tested females in the early follicular phase of their menstrual cycle (~four weeks apart). Transcranial doppler of the right MCA was assessed while participants lay supine. Serum Na⁺ and CVR (%MCA velocity/ Δ CO₂) to high CO₂ (hypercapnia) and low CO₂ (hypocapnia) were measured prior to-, 30 minutes post- and 60 minutes post-meal. Data were analyzed using two-way repeated measures ANOVA (meal x time). Tukey post hoc comparisons were used when appropriate. **RESULTS:** Serum Na⁺ was elevated on the high-Na⁺ meal at 30- (HS= 141.2 ± 0.3 vs LS= 140.0 ± 0.5 mmol/L, $p < 0.01$) and 60-minutes post meal (HS= 141.7 ± 0.8 vs LS= 140.2 ± 0.6 mmol/L, $p < 0.001$). Hypercapnia increased MCA velocity from baseline at 30- (HS= 29 ± 1 vs LS= 28 ± 1 %) and 60- (HS= 27 ± 1 vs LS= 29 ± 1 %) minutes post meal without an effect of the meal ($p > 0.05$). Hypocapnia decreased MCA velocity from baseline at 30- (HS= -43 ± 4 vs LS= -45 ± 4 %) and 60-

(HS=47±3 and LS=45±4%) minutes post meal without an effect of the meal ($p>0.05$). Despite elevated serum Na⁺, the HS meal did not alter CVR to hypercapnia (30min: HS=Δ-0.03±0.21 vs LS=Δ-0.19±0.22 %/mmHg; 60min: HS=Δ-0.08±0.20 vs LS=Δ-0.16±0.21 %/mmHg, $p>0.05$). Additionally, CVR to hypocapnia was not different between the two meals (30min: HS=Δ0.15±0.08 vs LS=Δ0.08±0.12 %/mmHg; 60min: HS=Δ0.17±0.07 vs LS=Δ-0.001±0.09 %/mmHg, $p>0.05$). **CONCLUSION:** These preliminary data suggest that a high sodium meal does not acutely alter cerebrovascular reactivity in healthy young adults.

Acknowledgements: ACSM 17-00577 (KUM) and NIH Grant 1R0HL128388 (WBF)

Does Wrist Taping Improve Performance of a Bench Press Exercise?

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In the world of athletics there are many products on the market to aid in resistance training and physical activity. Many of these aids have a common purpose of stabilizing a joint and the surrounding muscle tissue to either prevent injury or optimize training for a particular task. **PURPOSE:** To determine if different types of wrist taping improves the number of repetitions performed during a bench press exercise. **METHODS:** Nine (5 females and 4 males) anaerobically trained college students ($M\pm SD$ age: 20.9±1.1 years and mass: 70.4±17.5 kg) were recruited for the study. Subjects were required to have at least two months experience with upper body resistance training, more specifically the bench press. All subjects completed four different testing sessions. During the first session, subjects were orientated to the bench press and the resistance was determined by the subject reporting a comfortable weight; which was used for the subsequent testing sessions. During the remaining three testing sessions, subjects completed the bench press, until fatigue, under one of three conditions: control (CON), basic wrist taping (BWT), and figure-eight wrist taping (FIG8). The conditions were randomized and both wrists were taped for the BWT and FIG8 conditions. The total number of repetitions were counted for each condition. Data were analyzed using a repeated measures ANOVA. **RESULTS:** The results of the repeated measures ANOVA found there was no significant differences in the number of bench press repetitions among the conditions ($F = 2.00, p = .16$). On average subjects were able to complete 11.4 ± 3.1 reps during the CON, 11.8 ± 2.3 reps during the BWT condition, and 12.4 ± 3.6 reps with the FIG8 wrist taping. **CONCLUSION:** The results suggested wrist taping did not improve or hinder the number of repetitions performed during a bench press exercise. While wrist taping may stabilize the joint, it seems that stabilization does not improve the repetitions performed during a bench press exercise.

Activation of TRPM8 Receptors Mediates a Reflex Increase in Skin Blood Flow Across the Dermatome

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Topical menthol application in over-the-counter analgesics induces an increase in skin blood flow through TRPM8 receptor-dependent activation of sensory nerves and endothelium-derived hyperpolarization factors. It is unclear if localized TRPM8-activation with menthol mediates a reflex driven change in cutaneous blood flow across the same dermatome. **PURPOSE:** To determine the effects of localized menthol application on skin blood flow and neurosensory thresholds across a common dermatome. We hypothesized that skin blood flow would be increased with menthol at the site of application and the contralateral dermatome through a spinal reflex mechanism. **METHODS:** In a double blind placebo control cross over design 5 healthy men and women (3 men; age=24±2) were treated with a 5% menthol gel or placebo on the L4 dermatome on a direct treatment leg. Red blood cell (RBC) flux was measured using laser Doppler flowmetry over the area of direct application and on the contralateral leg. Additionally RBC flux was measured in a separate dermatome (S1) to serve as control. Cutaneous vascular conductance was calculated for each LDF measurement site ($CVC = \text{flux}/\text{MAP}$). Neurosensory thresholds (5, 250, and 2000 Hz) were measured on the treatment site and contralateral dermatome at baseline and after 30 minutes of application. **RESULTS:** At baseline there were no differences in CVC between menthol (M) and placebo (P) gels, or among sites (all $P>0.05$). After 30 minutes CVC increased in the site treated with menthol but not the placebo gel (M: 139±29 vs. P: 2±5 $\text{flux}\cdot\text{mmHg}^{-1}$, $p<0.001$). In the untreated contralateral L4 dermatome CVC increased during menthol application (M: 40±10 vs. P: 7±1 $\text{flux}\cdot\text{mmHg}^{-1}$, $p=0.03$). There were no differences among neurosensory thresholds at any frequencies or treatment sites ($p>0.05$). **CONCLUSION:** Menthol containing topical analgesics increased skin blood flow over the area of direct application and in the untreated contralateral dermatome. These data suggest that menthol-induced activation of the TRPM8 receptor mediates a spinal reflex to increase skin blood flow across the area of common innervation.

Funding provided by Performance Health

BILATERAL DEFICIT IN COMMON RESISTANCE TRAINING EXERCISES

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Bilateral deficit (BD) is a phenomenon that has come to be characterized by a reduced capability of generating maximal force during a bilateral movement when compared to an identical movement utilizing a single limb. With the underlying cause remaining unknown, BD has been investigated in a variety of settings, populations, and movements. While studies predominantly employ the use of isokinetic testing, the practical applicability of BD to the more universal method of free weight training is unclear. **PURPOSE:** To examine the total number of repetitions completed during both bilateral (BL) and unilateral (UL) conditions for the dumbbell chest press, dumbbell bicep curl, leg press, and knee extension exercise. **METHODS:** Non-asthmatic, resistance-trained males ($n=7$) aged 18-25 and free of cardiovascular disease served as participants for this study. 1RM was determined using the BL condition and 70% 1RM was used for BL testing and 35% 1RM was used for UL testing. A minimum of seven days after 1RM loads were determined, participants performed five sets of maximal repetitions for either BL or UL exercises in a randomized crossover design using the dumbbell chest press, dumbbell bicep curl, leg press, and knee extension exercise. **RESULTS:** Participants performed significantly more total repetitions during the UL leg press (22.6 ± 6.3) compared to BL leg press (15.7 ± 5.1 ; $p = 0.008$). However, there was no significant difference between BL and UL total repetitions for chest press (BL= 22.9 ± 3.8 vs. UL= 21.9 ± 5.1 ; $p=0.999$), bicep curl (BL= 21.0 ± 3.3 vs. UL= 18.7 ± 6.3 ; $p=0.999$), or knee extension (BL= 19.3 ± 3.8 vs. UL= 17.3 ± 3.2 ; $p=0.320$). **CONCLUSION:** While the present study found only leg press to be superior in total repetitions completed during the UL condition, if BD is evident in common resistance training exercises, it may be beneficial to complete such exercises in a UL fashion in order to maximize the training volume resulting in greater physiological responses (e.g. strength, hypertrophy). As BD was not evident during the chest press, bicep curl, or knee extension exercise, it is likely that balance and postural stability influenced the expression of BD during these exercises.

Skeletal Muscle-Derived Extracellular Vesicle Uptake by Cardiomyocytes

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Recent studies demonstrate extracellular vesicles (EVs) contribute to the progression and severity of a variety of diseases. EVs are small lipid vesicles released from cells and can deliver functional molecular cargo to both neighboring and distant cells. Previously, our lab demonstrated that skeletal muscle cells deliver RNA and protein to other skeletal muscle cells via EVs. Since many similarities exist between skeletal and cardiac muscle we reasoned that cardiac muscle cells (cardiomyocytes) may also uptake EVs released from skeletal muscle cells and vice versa. **PURPOSE:** The purpose of the present study was to characterize the EVs released from skeletal and cardiac cells, and investigate EV cargo delivery between the two cell types. **METHODS:** Mouse C2C12 skeletal muscle cells and HL-1 atrial cardiomyocytes were cultured and EVs were isolated from culture media. Nanoparticle Tracking Analysis (NTA) was performed to determine EV size and number, and molecular cargo was fluorescently labeled for uptake experiments. Where appropriate statistical analysis was performed by t-test with $p < 0.05$. **RESULTS:** Skeletal muscle cells released more EVs than cardiac cells (2.19×10^9 vs 1.26×10^9 vesicles/mL, $p < 0.0001$), exhibited a higher modal size (124.8 vs 83.1 nm, $p < 0.0001$, and greater average mean size (176.5 vs 125.5 nm, $p < 0.0001$). Additionally, EVs from skeletal cells delivered protein and RNA into cardiac cells. **CONCLUSION:** Collectively, these data indicate cardiac and skeletal muscle cells release distinctly different EV populations and EVs shuttle cargo between skeletal and cardiac cells. This represents a previously unknown mechanism of signaling between skeletal and cardiac muscle cells.

Supported by NIH R01 NS102157 and P20 GM113125

The Validity of Biometric Feedback from Popular Activity Monitors

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PURPOSE: The purpose of this study was to determine the validity of the step count measurement of different activity monitors during walking, jogging, and running. In addition, the heart rate obtained from one activity monitor was compared with the Polar monitor. **METHODS:** Twenty college students (10 male, 10 female) completed five minutes of walking (2.5mph), jogging (4.5mph), and running (6.5mph) on a treadmill with a three-minute rest period in between each exercise bout. To measure step count, each subject wore an electronic wristband on the non-dominant wrist, carried a cell phone with a pedometer app in same hand and wore a piezoelectric pedometer on the ipsilateral hip. A researcher manually counted the steps during each condition to represent the criterion step count. In addition, HR was recorded at each exercise intensity from a Polar HR monitor and the electronic wristband. The step data were analyzed using a one-way ANOVA with repeated measures with post hoc analysis, Fisher LSD, to determine significant differences ($p < 0.05$). A paired t-test was used to analyze the heart rates ($p < 0.05$). **RESULTS:** Results showed that during walking there was no significant difference between the manual step count and the steps recorded on the hip pedometer (519.9 ± 32.8 and 516.8 ± 36.0). During walking, the electronic wristband and the cell phone app significantly underestimated steps compared to the manual step count, 519.9 ± 32.8 , 482.1 ± 63.6 , 496.9 ± 58.4 , respectively, ($p = 0.002$). During jogging, the cell phone significantly underestimated steps compared to the manual step count, (772.4 ± 60.1 and 743.2 ± 56.7 , $p < 0.01$). Under running conditions, all devices accurately measured step count. Finally, the electronic wristband recorded higher heart rates during walking compared to the Polar HR monitor (99.9 ± 21.5 vs 88.2 ± 13.6 , $p = 0.007$) whereas during jogging and running, similar heart rates were recorded. **CONCLUSION:** As exercise intensity increased, the activity monitors more accurately measured step count and heart rate. Across all the exercise intensities, the hip piezoelectric pedometer produced the most accurate measurements. As new technology emerges, future studies should test the accuracy of activity monitors at different exercise intensities.

Exercise Pressor Response is Associated with Impaired Claudication Outcomes in Symptomatic Peripheral Artery Disease

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PURPOSE: The primary aim was to determine whether a greater exercise pressor response during a constant-load treadmill walking test was associated with lower peak walking time (PWT) and claudication onset time (COT) measured during a standardized, maximal treadmill test in patients with symptomatic peripheral artery disease (PAD). **METHODS:** To evaluate the exercise pressor response, 304 symptomatic patients with PAD were measured on heart rate and blood pressure during a constant, submaximal work rate at a treadmill speed of 2 mph and a grade of 0% until maximal claudication pain, or for a maximum of 20 minutes in patients who did not attain maximal claudication pain. Patients were further characterized on demographic variables, comorbid conditions, cardiovascular risk factors, ankle/brachial index, PWT and COT during a maximal treadmill test, and on objective and patient-based measures of physical function. **RESULTS:** During the maximal treadmill test, patients experienced COT at 186 ± 152 seconds (mean \pm SD) and PWT at 402 ± 237 seconds. During the constant-load treadmill test, patients walked for an average of 561 ± 388 seconds. After only two minutes of walking during the constant-load test, mean heart rate increased 26 beats/minute from resting baseline and mean systolic blood pressure increased 16 mmHg, and both were at or above 85% of their peak values. In adjusted analyses, the increases from rest for systolic blood pressure ($p = 0.021$), heart rate ($p = 0.002$), mean arterial pressure ($p = 0.034$), and rate-pressure product ($p < 0.001$) at two minutes of constant-load exercise were negatively associated with COT. Similarly, the increases in heart rate ($p = 0.012$) and rate-pressure product ($p = 0.018$) at two minutes of constant-load exercise were negatively associated with PWT. **CONCLUSION:** A greater exercise pressor response observed after only two minutes of walking at no incline was independently associated with impaired claudication outcome measures in patients with symptomatic PAD. The implication is that measuring blood pressure and heart rate at rest and after two minutes of walking is feasible in the clinical setting to assess an increased exercise pressor response which, in turn, is associated with more severe claudication.

The Effect of Sucrose vs Non-Nutritive Sweeteners on Blood Glucose Levels During Exercise

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PURPOSE: The purpose of this study was to examine the glucose load (GL) between sucrose (SU) sucralose (SP), and stevia (ST) on blood glucose (BG) values, during exercise. **METHODS:** Twenty participants (n = 14 males, n = 6 females; M = 23 ± 4 years) were measured on 4 occasions. Participants were fasted (≥ 8 hours) and blindly provided with one of four beverages containing 30g SU, 30g SP, 15g ST, or no additive (NS) in a 474 ml solution. BG values were collected fasted, post-beverage, at each of the YMCA Bike Test protocol's 4 stages, and 15- and 30-minutes post-exercise. Energy expenditure (RER), rate of perceived exertion (RPE), and heart rate (HR) were measured. Glucose response was determined by area under the curve (AUC). Paired samples t-tests determined differences among AUC and time to peak load, mean RER peak, and total participant RPE, where significance was set at $p < 0.05$. A 4x4 (drink x time) repeated measures ANOVA determined differences among RER. All data was presented as mean ± SD (standard deviation). **RESULTS:** SU AUC was significantly greater than NS, SP, and ST (912 ± 109 mg/dL vs. NS: 712 ± 86 mg/dL, $p < 0.01$; SP: 735 ± 93 mg/dL, $p < 0.01$; ST: 717 ± 79 mg/dL, $p < 0.01$). SP AUC was significantly greater than NS (735 ± 93mg/dL vs. 712 ± 86 mg/dL, $p = 0.016$). SU peaked significantly later during Stage 4 of exercise, compared to NS (Stage 2, $p < 0.01$), SP (Stage 3, $P = 0.009$), and ST (Stage 2, $p < 0.01$). At blood glucose peak, ST RER was lower than SU and SP (ST: 0.99 ± 0.05 v vs. SU: 1.12 ± 0.08, SP: 1.05 ± 0.06, $p < 0.01$). RPE scores were highest in Stage 4 of all conditions. In each condition, HR max was in Stage 4 and decreased after termination of exercise in recovery. **CONCLUSION:** ST may be a better, natural alternative to weight loss as it does not increase glucose levels and the body must utilize fat for energy.

Supported by the Student Research and Creative Expression Program, William Paterson University.

The Effects of an Adjustable Workout System on Performance Gains in Collegiate Lacrosse Athletes.

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While research on the topic of periodization is plentiful, there is limited evidence on the effects of different periodization strategies in varsity collegiate athletes. Furthermore, how the state of preparedness and autonomy effect daily workouts is largely unknown at present. **PURPOSE:** to determine if significant increases in performance variables would be present between a Traditional Periodization (TP) versus Flexible Periodization program (FP). **METHODS:** 34 intercollegiate lacrosse players of both genders volunteered and provided informed written consent. Pre-and post- test measures included bench press, deadlift, vertical jump, sprinting speed and change of direction. After initial testing, subjects were assigned to one of two training groups: a) TP (n=17, age=19.9±1.3 years, height=1.73±0.07m, mass=73.33±14.19 kg) or b) FP (n=17, age=19.4±1.4 years, height=1.72±0.10m, mass=72.32±13.73 kg). Both groups trained three days per week (MWF) for eight weeks. The TP group completed all workout volume and intensity as prescribed by the Head Strength and Conditioning Coach. However, the FP group adjusted the workout volume and intensity based on a daily state of preparedness questionnaire. **RESULTS:** Pre- to post- test improvements were observed for the subject population as whole (deadlift: +9.5%, bench press: +4.5%, vertical jump: +4.9%, sprinting speed: +1.7%, and change of direction: +1.2%). However, a series of ANOVA tests demonstrated no statistically significant between-group differences for pre- to post-test changes in any of the performance tests (range of p -values: 0.21 – 0.86). **CONCLUSION:** Although FP does not appear to be more effective than TP for eliciting performance gains, it may provide greater levels of autonomy while eliciting equivalent levels of improvement. Therefore, flexible periodization based on state of preparedness may be a viable training strategy.

Adiposity and ET-1 Responses in Postmenopausal Women

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Age-related weight gain is greater in women compared to men, such that postmenopausal women are more likely to be overweight or obese (OW/Ob). Previous studies have demonstrated that OW/Ob older adults have impaired endothelial function in part due to endothelin-1 mediated vasoconstriction via the ETA receptor. Our laboratory has

recently demonstrated an important role for the ETB receptor in contributing to vascular endothelial dysfunction in postmenopausal women. **PURPOSE:** The purpose of this study was to test the hypothesis that ETB and ETA receptors contribute to increased impairment of vasodilatory function in OW/Ob postmenopausal women. **METHODS:** Seventeen postmenopausal women completed the study: 9 normal weight (NW; 57±5 years, 22±2 kg/m²) and 8 OW/Ob (57±8 years, 28±3 kg/m²). We measured vasodilatory responses to local heating of the skin (laser Doppler flowmetry) during microdialysis perfusions of lactated Ringer's (Control), ETB receptor blockade (BQ-788, 300nM), and ETA receptor blockade (BQ-123, 500 nM). Cutaneous vascular conductance (CVC) was calculated during the plateau phase of local heating (42°C), and normalized to maximal vasodilation achieved by perfusion of sodium nitroprusside (28mM) and heating to 43°C. A two-way ANOVA with post hoc Bonferroni correction was performed to compare the impact of weight in vasodilatory responses to ETA and ETB mediated vasodilation when compared to control. Threshold for significance was P<0.05. **RESULTS:** ETB receptor blockade tended to increase vasodilation in NW women (Control: 87±6 vs. BQ-788: 94±4 %CVC max; P=0.07), whereas ETA receptor blockade did not alter vasodilation (BQ-123: 88±3 %max CVC; P=0.92). In OW/Ob, both ETB and ETA blockade increased vasodilation (Control: 88±3 vs. BQ-788: 94±4, BQ-123: 94±4 %max CVC; P<0.05). Furthermore, the vasodilatory response to ETA receptor blockade was greater in OW/Ob compared to NW (P=0.02). **CONCLUSION:** These preliminary data suggest that while ETB receptors contribute to lower vasodilatory function in postmenopausal women, there is a larger contribution of ETA receptors impacting endothelial dysfunction in OW/Ob postmenopausal women.

Supported by: NIH GRANT P20 GM 103446, U54 GM 104941, P20 GM 113125 and University of Delaware Research Foundation.

The Relationship of Physical Activity and Fruit and Vegetable Intake on Pulse Wave Velocity

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Arterial stiffness has been found to be an independent predictor of cardiovascular disease (CVD). Those who consume a diet rich in fruits (F) and vegetables (V), and participate in habitual physical activity may experience reduced arterial stiffness, thereby decreasing the risk of CVD. **PURPOSE:** To examine the relationship of F intake, V intake, and MVPA on arterial stiffness in college students. **METHODS:** 13 college students (age 20.1±1.0 yr, height 165.7±7.8 cm, weight 74.9±19.1 kg) completed a modified Dietary Guidelines for American Index (DGAI) questionnaire for 10 days. Moderate-vigorous physical activity (MVPA) was assessed via accelerometry for an average of 8.9±1.96 days. Arterial stiffness was then measured using carotid-femoral pulse wave velocity (PWV). While supine, a cuff was placed around the right thigh and inflated. Concurrently, a tonometer was placed over the carotid artery and data was obtained from both carotid and femoral waveforms after 10 consecutive seconds. **RESULTS:** Participants completed the DGAI for an average of 9.0±1.41 days, and the average servings per day of F and V was 1.8±1.3 and 1.7±1.1, respectively. The average servings per day of F and V combined was 3.5±1.88. Participants engaged in 49.9±20 min/day of MVPA. The average PWV was 4.7±1.4 m/s. Pearson correlation found no significant relationship between total F and V servings/day and PWV ($p=0.52$). A multiple regression was run to predict PWV from F servings/day, V servings/day, and MVPA/day. The three variables combined significantly predicted PWV ($F(3,6)=5.8, p=0.033, R^2=0.745$). F servings/day added significantly to the prediction ($p=0.009$), while V servings/day ($p=0.058$), and MVPA/day ($p=0.055$) were trending toward significance. Therefore, an increase in F servings/day may yield a decrease in PWV by 0.6 m/s. **CONCLUSION:** F and V intake, as well as MVPA may predict arterial stiffness.

Acute Handgrip Exercise Alters the Inter-arm Systolic Blood Pressure Difference in Young Males and Females

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A large inter-arm difference (IAD) in systolic blood pressure (BP) is linked to an increased likelihood of cardiovascular and peripheral vascular disease, hypertension, and premature mortality. Previous research has determined that an acute bout of aerobic exercise can alter IAD both during the activity and in post-exercise recovery. Isometric handgrip exercise (IHE) is known to alter BP both acutely and chronically, with potential sex

differences and mechanisms noted. No prior investigations have examined the effect of IHE on IAD in males or females. **PURPOSE:** To characterize IAD and associated cardiovascular responses (heart rate variability (HRV), systolic/diastolic BP) to IHE. **METHODS:** On visit one, participants completed three maximal voluntary isometric contractions (MVIC) per arm using a Jamar handgrip dynamometer. During visit two, after a five-minute rest, a series of three resting bilateral BP measures were collected and averaged (REST) utilizing a Microlife Watch BP device. Following resting measures, participants maintained the handgrip dynamometer at 20% of their MVIC for two minutes (arm randomly assigned), at which time bilateral BP was again measured (IHE). Upon completion of IHE, subjects released the dynamometer and two additional bilateral blood pressure measures (REC 1 and REC 2) were taken at one-minute intervals. An independent-samples t-test and repeated measures ANOVA were used to compare and track variables of interest. **RESULTS:** Resting IAD was positively correlated with BMI (.354; $P < 0.05$) and waist circumference (.383; $P < 0.05$). IHE resulted in an increase in IAD in both males and females. Males demonstrated higher IAD at rest (7 ± 6 vs. 3 ± 3 mmHg) and during handgrip (12 ± 9 vs. 5 ± 4 mmHg) than their female counterparts ($P < 0.05$), with males also expressing a lower high-frequency HRV at rest ($P < 0.05$). **CONCLUSION:** Isometric handgrip exercise altered the inter-arm difference from rest to exercise, with males displaying an increased difference during both conditions. The attenuated exercise pressor response observed in female participants may be due, in part, to a higher observed baseline of cardiovascular modulation.

Positional Difference in Linear Momentum During Vertical Jump in Division II College Football Players

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Linear momentum, the product of body mass and velocity, is the key determinant of the outcome of collisions. In collision-based sports, such as American football, players with the greatest momentum tend to achieve more favorable outcomes during on-field collision, or tackles. Therefore, today's players are constantly seeking to increase mass without sacrificing velocity. However, no study has quantified linear momentum in American football players. **PURPOSE:** To examine the positional differences in linear momentum during a vertical jump in Division II college football players. **METHODS:** 56 male Division II college football players were assessed for height, body mass, and vertical jump. All players were categorized according to playing position into defensive back (DB), defensive line (DL), running/full back (RB), linebacker (LB), offensive line (OL), tight end (TE), and wide receiver (WR) groups; all other positions were excluded due to insufficient sample. Height and body mass were assessed using a stadiometer and digital scale, respectively. A vertical jump test was performed to determine jump height, which was then used to calculate vertical jump velocity. Vertical jump momentum (VJM) was calculated as the product of body mass and vertical jump velocity. Positional comparisons in VJM were made using one-way ANOVA with LSD post hoc comparisons. Alpha level was set *a priori* to $p \leq 0.05$. **RESULTS:** A significant main effect of position was observed for VJM ($p < 0.001$). Post hoc tests revealed that OL (439.6 ± 44.7 Ns) had significantly higher VJM than DB ($p < 0.001$; 317.3 ± 34.4 Ns), RB ($p = 0.001$; 371.7 ± 24.7 Ns), LB ($p = 0.006$; 376 ± 32 Ns), TE ($p = 0.013$; 377.4 ± 51.9 Ns), and WR ($p < 0.001$; 338.6 ± 25.0 Ns), while trending to be greater than DL ($p = 0.089$; 406.9 ± 59.6 Ns). Also, DL had significantly greater VJM than DB ($p < 0.001$) and WR ($p = 0.001$), and trended to be greater than RB ($p = 0.068$). LB ($p = 0.009$), TE ($p = 0.013$), and RB ($p = 0.004$) had significantly greater VJM than DB, but only RB trended to be greater than WR ($p = 0.086$). **CONCLUSION:** While positional differences in VJM exist in collegiate American football, positions that regularly engage during game play (OL vs DL, WR vs DB, and LB vs RB vs TE) have no statistically significant differences. Therefore, these positions are most likely evenly matched when colliding on the field.

Effects of External Calf Compression on Microvascular Oxygenation in the Lower Limb of Young Men

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Compression garments are used in clinical and sports settings to improve blood flow. Pressure applied by the compression garments varies widely with some garments applying as little as 5 mmHg and much as 60 mmHg of pressure. Although compression can increase blood flow, compression to a pressure of 60 mmHg for short periods

of time (~30 min) has been shown to cause endothelial damage. This is important because endothelial dysfunction is a precursor of atherosclerosis and may impair microvascular oxygenation. **PURPOSE:** Examine the effect of lower versus higher external compression pressures on microvascular oxygenation in healthy, young men. **METHODS:** Near-infrared spectroscopy (NIRS) was used to measure vastus medialis muscle oxygen saturation (SMO₂) and total hemoglobin (THB) in 29 healthy, young men (22 ± 5 years of age, body mass index 23 ± 2 kg·m⁻²). Oxygenation was measured continuously for 10 min at rest and during external compression, which consisted of inflation of a cuff applied to the calf to 5 mmHg and 60 mmHg in a randomized order. There was a 5 min recovery between conditions. Each compression condition was maintained for 30 minutes. Data were binned into 5 min epochs and analysed using a 2 (condition) x 8 (time points) ANOVA with repeated measures. **RESULTS:** A significant time effect was detected for SMO₂. When comparing the final epoch (min 25-30) to baseline, SMO₂ increased 5.75% and 5.86% with compression to 5mmHg and 60 mmHg, respectively (p<0.001). No condition by time interaction was detected (p=0.89). A significant time effect was detected for THB. When comparing the final epoch (min 25-30) to baseline, THB increased 1.08% and 1.15% with compression to 5 mmHg and 60 mmHg, respectively (p<0.001). No condition by time interaction was detected (p=0.76). **CONCLUSION:** Although previous studies suggest that higher compression pressures of 60 mmHg lead to endothelial dysfunction, our findings suggest that there were no subsequent detrimental effects on microvascular oxygenation. Compression increased microvascular oxygenation and increases were similar between the 5 mmHg and 60 mmHg conditions. These findings suggest that both lower and higher compression pressures may have similar modest beneficial effects on microvascular oxygenation.

Caffeine Supplementation Effects On Repeated Wingate Sprints

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PURPOSE: To determine any potential ergogenic effects of caffeine supplementation during repeated Wingate sprints. **METHODS:** Using a single-blind, placebo-controlled design, a total of 26 college aged participants (mean ± SD; age 23 ± 2 years, mass 76.74 ± 17.73 kg, height 169.49 ± 10.34 cm) completed two exercise trials on non-consecutive days. The exercise trial was performed 45 minutes after ingestion of either 5 mg·kg⁻¹ of body mass caffeine or placebo. The Wingate protocol was utilized to measure peak power, anaerobic capacity, average power, and anaerobic power. A paired sample *t*-test was used to examine the difference in peak power, anaerobic capacity, average power, and anaerobic power. **RESULTS:** The results indicate no significant difference in peak power between caffeinated and placebo trials 2 and 3 ($t(25) = -2.072, p < .05$), ($t(25) = -2.50, p < .05$), respectively. The results indicated anaerobic capacity was not significantly different between caffeinated and placebo trials 1, 2, 3, 4. The results indicated average power was not significantly different between caffeinated and placebo trials 1, 2, and 4 while average power was significantly different from caffeine to placebo ($t(25) = -2.20, p < .05$) during trial 3. The results indicated anaerobic power was not significantly different between caffeinated and placebo trials 1, 2, and 4 while anaerobic power was significantly different from caffeine to placebo ($t(25) = -2.35, p < .05$) during trial 3. **CONCLUSION:** The study found a moderate dosage of caffeine did not significantly affect performance. Power variables were not impacted by caffeine supplementation. This suggests caffeine supplementation may not enhance performance during high intensity interval training. In fact, caffeine may have been ergolytic in nature, though it was not statistically significant, placebo trials indicated higher power variables most noticeably during the third sprint.

Supported by the Student Research and Creative Expression Program, William Paterson University

Do Taxane Based Chemotherapies Impair Improvements in VO₂ in Female Cancer Survivors?

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Taxane-Based chemotherapies result in serious physiological side effects in patients, including impaired muscle metabolism, myocyte damage, impaired balance, pain, fatigue, and sensations of numbness in the extremities. As a result, it has been suggested that individuals who have received taxane-based chemotherapies do not obtain the same benefits from exercise as those who receive other forms of cancer treatment. **PURPOSE:** To determine if female cancer patients who underwent taxane-based chemotherapies benefited from exercise as compared to those who received non-taxane based treatments. **METHODS:** Retrospectively, 101 females (57.88 ± 11.59), with female cancers (Breast (79), Ovarian (10), Endometrial (4), Uterine (2), and Cervical (1)) enrolled in a cancer rehabilitation program underwent a variety of fitness assessments, but only measures of VO₂ are reported here. Each subject was

provided an individualized mixed home (2 days) and facility based (1 day) 12 week exercise intervention.

RESULTS: A strong positive correlation between VO₂1-VO₂2 ($r=0.802$, $p=0.000$), a low to moderate negative correlation between VO₂1+age ($r= - 0.365$ $p=0.000$), a low negative correlation between VO₂2+age ($r= - 0.215$ $p=0.036$) were found. A significant change from VO₂1 to VO₂2 ($t=-5.372$ $p=0.000$) was determined. While there were no differences between Taxane and Non-Taxane measures of VO₂, there was a trend in percent change in VO₂ ($F=3.306$ $p=0.073$). There were also no differences in any measure of VO₂ between taxane and non-taxane treatments by cancer type. Regression analysis indicated only age ($t=2.775$ $p=0.007$) predicted percent change in VO₂ values and VO₂ 1 values ($t=-3.606$, $p=0.001$), while age and cancer type predicted VO₂2 values ($t=-2.117$, $p=0.037$; $t=-2.217$, $p=0.029$ respectively). **CONCLUSION:** The data does not support the hypothesis that taxane based chemotherapies result in lower VO₂ values, as both age and cancer type had greater overall effects on VO₂. Additionally, significant improvements in VO₂ after the 12-week exercise intervention, regardless of treatment type, age, or cancer type supports the effectiveness of exercise-based cancer rehabilitation program to improve VO₂ in a female cancer population.

Tradeoffs Between U.S. Army Trainees' Performance on the Occupational Physical Assessment Test and Body Composition

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The Occupational Physical Assessment Test (OPAT) was developed as a pre-enlistment screen to determine a recruit's ability to begin training, and is based on occupation-specific physical demands. The OPAT assesses cardiorespiratory fitness (interval aerobic run (IAR)); upper- and lower-body muscular power (seated power throw (SPT) and standing long jump (SLJ), respectively); and muscular strength (strength deadlift (SDL)). **PURPOSE:** To examine relationships between Army trainees' OPAT physical performance and body composition. **METHODS:** College-aged (21 ± 3 y) male ($n=947$; $BMI=25.5 \pm 3.7$ $kg\cdot m^{-2}$ (mean ± SD) and female ($n=233$; $BMI=23.9 \pm 2.7$ $kg\cdot m^{-2}$) Army trainees volunteered for the study. Relative body fat (%BF) for men ($18.4 \pm 4.8\%$) and women ($30.1 \pm 4.3\%$) was estimated using the Gallagher equation and BMI, age, and sex. OPAT individual event performance was compared between men and women (t-tests) or stratified by %BF and compared between %BF quartiles (Q) (ANOVA with Tukey post hoc). The SDL test was analyzed using Mantel-Haenszel chi-square for linear trend. **RESULTS:** Trainees combined completed 53 ± 20 shuttles on the IAR, threw 553.6 ± 112.2 cm on the SPT, jumped 190.1 ± 35.3 cm on the SLJ, and 73% lifted the highest weight tested on the SDL (220 lb.). Comparing by sex, women completed fewer shuttles (-41%), had shorter distances for the SPT (-34%) and SLJ (-25%), and only 15% of women vs. 88% of men lifted the highest weight possible on the SDL ($p \leq 0.05$ for all). Men in the highest (Q4) vs. the lowest (Q1) quartile of %BF demonstrated lower performance on the IAR (-24.3%) and SLJ (-8.0%) events, but higher performance on the SPT (+15.8%) event ($p \leq 0.05$ for all). Women in Q4 vs. Q1 of %BF demonstrated significantly higher performance on the SPT (+12.6%, $p \leq 0.05$). In men and women, as %BF increased from Q1 to Q4, significant trends ($p \leq 0.01$) for the SDL indicated that more trainees were able to lift 220 lb. (men) or 180 lb. (women) (the most frequently lifted weight within each group). **CONCLUSION:** Given that occupationally-relevant performance was enhanced in some cases while decreased in others when examined in the context of increased %BF, there may be operational situations in which increased muscular strength and power attributes associated with higher %BF are more important than suboptimal body composition related health concerns.

Effects of a Multi-Ingredient Pre-Workout Supplement on Post-Exercise Brachial Artery Diameter and Blood Flow Velocity

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Multi-ingredient pre-workout supplements (MIPS) containing vasodilatory compounds have demonstrated the potential to augment performance during acute workout bouts by enhancing blood flow to the working muscles via increased nitric oxide production. **PURPOSE:** To evaluate the effects of two different MIPS on blood flow velocity

and vessel diameter in the brachial artery via ultrasound. **METHODS:** Fourteen males (Mean \pm SD, Age: 24.6 ± 5.0 y, Height: 179.2 ± 5.9 cm, Weight: 84.3 ± 14.3 kg, BMI: 26.1 ± 3.3 kg/m²) volunteered to participate in a randomized double-blind, counterbalanced and placebo (PLA) controlled study. Participants performed a familiarization visit followed by three supplement visits. The treatments (separated by ≥ 7 days) included a MIPS with beta-alanine and caffeine (BAC), without beta-alanine and caffeine (NBAC), or PLA. Consistency between trials was achieved through a one-week washout between trials, and exercise and dietary recall controls. On trial days participants consumed half of the dose at baseline, and the other half at the start of the trial (30 min later). The exercise protocol included vertical jumps, ballistic squat and bench, a 5-10-5, a Wingate, and a VO₂ peak on a cycle ergometer. Ultrasound scans of the brachial artery were performed at baseline, 30 min post-supplement, and post-exercise. Doppler mode was used to collect blood velocity (VEL, cm/s), and a cross-sectional image was used to measure vessel diameter (VD, cm). Inter-rater reliability was improved by having all measurements taken by the same researcher. One-way repeated measures analysis of variance was used to analyze differences in VEL and VD baseline to post-workout (Δ VEL and Δ VD, respectively) between visits. **RESULTS:** There were no significant differences in Δ VEL between trials ($p = 0.285$). Values for Δ VEL for BAC were (Mean \pm SD) 8.84 ± 20.25 cm/s, 13.04 ± 15.38 cm/s for NBAC, and 6.64 ± 11.10 cm/s for PLA. There were no significant differences for Δ VD ($p = 0.515$). **CONCLUSIONS:** Preliminary data suggests that neither MIPS tested effected post-exercise VEL or VD. While no differences were observed in VEL, the Δ VEL was the greater in NBAC and lowest in PLA. Inter-subject variability may present obstacles in analyzing the effects of the supplements.

Supported by an industry sponsored grant through Isagenix International LLC.

Enzymatic H₂S Production Does Not Contribute to Local Heating Induced Endothelium-dependent Vasodilation

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Hypertension is associated with vascular dysfunction in the microvasculature, induced by decreases in endothelial signaling mechanisms including nitric oxide (NO) and hydrogen sulfide (H₂S). H₂S-dependent vasodilation is functionally absent in the cutaneous circulation of hypertensive adults. There is extensive cross talk between NO and H₂S enzymatic systems, suggesting that H₂S restoration may improve overall endothelial function. **PURPOSE:** We hypothesized that providing the substrate for H₂S enzymatic production would improve endothelium-dependent vasodilation to the endothelial NO-synthase dependent physiological stimulus of local heating in hypertensive adults. **METHODS:** Intradermal microdialysis fibres were placed in the forearm skin of normotensives (NTN: n=7, 51 ± 2 yrs, $109 \pm 4/71 \pm 3$ mmHg) and unmedicated hypertensive (HTN: n=14, 54 ± 2 yrs, $142 \pm 4/92 \pm 2$ mmHg) adults to serve as control, and H₂S enzymatic inhibited (AOAA) sites, while 20mM of the H₂S amino acid substrate cysteine was continuously perfused through both sites. Laser Doppler flux was measured continuously during a local heating protocol (42°C) to induce NO-dependent vasodilation. After the established plateau, maximal vasodilation was achieved through heating to 43°C and 28mM sodium nitroprusside. Data were normalized to cutaneous vascular conductance (CVC=flux*mmHg⁻¹). **RESULTS:** HTN had attenuated endothelium-dependent vasodilation during local heating (1.23 ± 0.15 vs. 1.70 ± 0.21 flux*mmHg⁻¹, $p < 0.001$), and decreased vasodilatory max capacity compared to NTN (1.37 ± 0.16 vs. 1.90 ± 0.20 flux*mmHg⁻¹, $p < 0.001$). There was no effect of H₂S enzymatic inhibition (AOAA) in HTN adults ($p = 0.19$). NTN had no change in endothelium-dependent responses to local heating (2.38 ± 0.2 flux*mmHg⁻¹, $p > 0.05$), but displayed increased maximal vasodilation (2.75 ± 0.35 flux*mmHg⁻¹, $p = 0.017$) during H₂S enzymatic inhibition. **CONCLUSION:** Enzymatic H₂S production does not appear to contribute to the endothelium-dependent vasodilation induced via local heating. However, maximal vasodilation was increased in the NTN adults. These data suggest that enzymatic H₂S may restrain maximal vasodilator responsiveness in NTN but not HTN adults.

NIH R01HL093238 and American Heart Association Grant #18UFEL33900164

Initial Observations on the Influence of Cognitive Stress on Motor Evoked Potentials in Military Personnel

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Military personnel are exposed to cognitive stress from operational factors such as sleep restriction/disruption, physical fatigue, and caloric deficiency. Assessed via transcranial magnetic stimulation (TMS), corticospinal

excitability may represent a sensitive biomarker for such stress, yet little is known in this population. **PURPOSE:** Determine the influence of cognitive stress factors on corticospinal excitability in military personnel. **METHODS:** In this ongoing study, three male US Army reserves (25.0 ± 3.5 yrs) completed five consecutive days of evaluation, including a familiarization (D0), baseline assessment (D1), two days of stress (D2 & D3), and a recovery day (D4). D2 and D3 included exhaustive physical exercise, caloric deficits, and restriction of sleep to two 2hr sequences (7hr on D1 & D4). To characterize the corticospinal system, stimulus response curves were produced during bilateral isometric contractions of the first dorsal interosseous (FDI; 8 x 25s with 30s rest between) at 15% maximum voluntary force. Forty TMS pulses were delivered to the M1 FDI hotspot in pairs of 5% increments from 5-100% stimulator output (SO) in a random order. Motor evoked potentials (MEP) were quantified as the peak-to-peak EMG amplitude over the 5-50ms post-stimulus interval. Nonlinear regression was used to fit MEP responses to a Boltzmann sigmoidal curve (BSC), with the slope, maximum, and SO at 50% maximum (V50) determined each day. **RESULTS:** Individual measures of corticospinal excitability were generally greatest on D2 or D3 and recovered on D4. On average, BSC slope increased by 22% (5.9 ± 2.6 to 7.2 ± 2.4), max by 90% (2.1 ± 0.1 to 4.0 ± 0.3 mV), and V50 by 21% (52.4 ± 2.9 to 63.6 ± 2.7 SO) from baseline to D2. On D4, corticospinal excitability decreased (BSC slope: 4.1 ± 1.5 , Δ : -42%; max: 3.2 ± 0.2 mV, Δ : -20%; V50: 56.9 ± 1.7 SO, Δ : -11%) relative to baseline. **CONCLUSION:** Our preliminary evidence indicates that corticospinal excitability is sensitive to military operational cognitive stress. If further validated, these physiologic metrics may provide an objective means to characterize, monitor, or discriminate responses to cognitive stress and clarify our understanding of cognitive resilience.

Supported by the Department of Defense W81XWH-16-PHTBIRP-CR3A.

The Effect of Vegetarian and Western Diets on Vascular Function in Healthy Adults

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The health benefits of vegetarian diets are well documented. As compared to their omnivorous counterparts, vegetarians have lower body weight, blood pressure (BP) and cardiovascular disease risk. Although the exact underlying mechanisms remain unclear, it is hypothesized that the vegetarian diet may protect the vascular endothelium, whose optimal function is necessary to prevent pathogenesis of atherosclerosis. **PURPOSE:** To determine if individuals who have been following a vegetarian diet have greater endothelial function compared to individuals consuming a non-vegetarian diet containing red meat. **METHODS:** Healthy, normotensive males and females between the ages of 18-45 years were recruited. Vegetarianism (V) was defined as following a plant based diet that could include eggs and dairy for at least 5 years and omnivores (O) were defined as consuming red meat at least twice a week. Diet history was assessed via a food frequency questionnaire. Assessment of vascular function included passive leg movement (PLM) to evaluate leg blood flow (LBF), an approach to assess nitric oxide-mediated endothelial function, as well as carotid-to-femoral pulse wave velocity (PWV), and aortic augmentation index (AI), an index of wave reflection. **RESULTS:** Forty-one subjects (V: 5M/17F, 27 ± 8 yr; BMI 21.9 ± 2.9 kg/m²; O: 8M/11F, 24 ± 5 yr; BMI 23.2 ± 2.6 kg/m²) completed the study. Significant differences in macronutrient consumption existed with V consuming more carbohydrate and fiber, less cholesterol, saturated fatty acids, and protein than O, even when normalized to energy intake ($P < 0.05$). Systolic BP but not diastolic BP was different between groups (V: $114 \pm 2/71 \pm 1$ mmHg, O: $119 \pm 2/71 \pm 2$ mmHg; $P < 0.05$). Vascular function as assessed by PLM showed differences in baseline LBF (V: 155 ± 15.5 mL/min, O: 200 ± 17 mL/min; $P < 0.05$) and % change in LBF (V: 228 ± 40 mL/min, O: 138 ± 33 mL/min; $P < 0.05$) while area under the curve (V: 108 ± 17 , O: 74 ± 29) remained unchanged between the two groups ($P > 0.05$). Arterial stiffness as assessed by PWV (V: 5.5 ± 0.2 m/s, O: 5.4 ± 0.2 m/s) and AI (V: $8.6 \pm 3\%$, O: $12.5 \pm 2.6\%$) were not different between groups ($P > 0.05$). **CONCLUSION:** These data suggest following a vegetarian diet may improve overall resting hemodynamics and peripheral vascular function compared to consumption of a western diet.

Supported by NIH NIGMS P20GM113125

Exercise is Medicine Day on Campus: A Survey of Opinions and Attitudes

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Exercise is Medicine (EIM) is a global joint initiative between the American Medical Association (AMA) and the American College of Sports Medicine (ACSM). West Chester University (WCU) is recognized by the ACSM as an EIM-On Campus which indicates that WCU is a campus that is actively trying to engage the campus community in physical activity. **PURPOSE:** The purpose of this study was to gauge opinions and attitudes related to EIM Day at

WCU-a first-time event launched at the campus. This event was hosted by the College of Health Sciences (CHS) at WCU and included participation from all six departments in the CHS, faculty and staff across campus, alumni, and community stakeholders. **METHODS:** Forty participants (11 male, 29 female) ($M_{\text{age}}=27.5$, $SD=12.16$) who visited the event responded to an exit program evaluation survey. **RESULTS:** Descriptive results from Likert scale data (1=not at all - 5=very much) indicated that participants reported high levels of enjoyment related to the event ($M_{\text{enjoyment}}=4.6$, $SD=0.78$). They also reported that they found the event largely beneficial for improving their physical activity and nutritional habits ($M_{\text{helpfulPA}}=4.4$, $SD=0.97$; $M_{\text{helpfulNutrition}}=4.3$, $SD=0.99$). Participants also expressed strong intentions to revisit the event in the future ($M_{\text{future visit}}=4.7$, $SD=0.75$). Additional Bayesian analysis also suggested that in comparison to their male counterparts ($M=3.75$, $SD=1.28$), female participants ($M=4.67$, $SD=0.51$) found the event significantly ($p < .05$) more helpful for improving their nutritional habits. Of the motives for participation, 87.5% of the participants reported that they participated because they expected the event to be fun. Finally, with regards to participants' recommendations two themes emerged from the qualitative content analysis: (1) additional activities to include in the event and, (2) greater variety of food and beverage options to offer throughout the event. **CONCLUSIONS:** These results suggest that individuals that participated in this first-time event evaluated it highly favorably and found it beneficial for improving important health behaviors. Future research needs to explore the effectiveness of these initiatives and advance recommendations to further increase their impact. Supported by a PASSHE Wellness Initiative Grant

Perivascular Adipose Tissue Growth and the Impact of Adrenergic Stimulation in Rats With and Without Heart Failure

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Perivascular adipose tissue (PVAT) is a type of fatty tissue that surrounds and interacts with blood vessels and consists of both brown and white adipose tissue depots (BAT, WAT). BAT is responsible for thermoregulation and energy expenditure while WAT stores energy in the form of triglycerides. Excessive accumulation of WAT has been correlated with obesity – a comorbidity for cardiovascular disease (CVD). Also, WAT adipocytes are able to release inflammatory adipokines which cause inter-arterial inflammation in the form of atherosclerotic depots leading to CVD. **PURPOSE:** The goal of the present study was to assess the expansion of WAT and BAT in aortal PVAT isolated from rats with and without heart failure in the presence and absence of β -adrenergic stimulation (isoproterenol). **METHODS:** Heart failure was induced via transverse aortic constriction (TAC). PVAT was harvested from SHAM and TAC rats and placed in Matrigel with growth media with and without isoproterenol. PVAT expansion was analyzed using Zeiss and ImageJ. **RESULTS:** After 7 days, WAT from TAC rats grew more compared to SHAM (783 ± 129 vs 519 ± 202 mm^3 ; $n=4$). Conversely, BAT from SHAM rats expanded more compared to TAC (755 ± 187 vs 523 ± 61 mm^3 ; $n=4$). In the presence of isoproterenol, angiogenesis decreases in BAT and WAT from both SHAM (from 755 ± 187 to 5 ± 5 and from 519 ± 202 to 370 ± 224 mm^3 , $n=4,2$) and TAC (from 523 ± 61 to 29 and from 783 ± 129 to 86 mm^3 , $n=4,1$) rats, demonstrating β -adrenergic stimulation blunted the expansion of WAT from TAC rats (89% decrease) more than SHAM rats (29% decrease). **CONCLUSION:** WAT from TAC rats expands more than in tissue from SHAM rats but is more responsive to β -adrenergic stimulation. Studying different interventions in the future will provide a greater biological understanding of PVAT expansion and lead to potential therapies for obesity as a result of heart disease.

Assessing Mood and Cognitive Performance of EMT Students During Occupational and Heat Stress

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Maintaining mental acuity under occupational duress is crucial for first responders. Presently, there is limited research within the population of EMT students detailing the attenuation of cognitive function during occupational tasks in a hyperthermic environment. **PURPOSE:** To observe the impact of a hyperthermic environment on cognitive responses in EMT students performing a simulated occupational task. **METHODS:** Ten EMT students reported to the lab for a familiarization session consisting of maximal exercise testing and one trial through all computer-based assessments. Experimental condition was assigned in counterbalanced fashion; a thermoneutral environment, or hyperthermic condition (100°F, 60-70% RH). Baseline cognitive and mood values were assessed outside of the environmental chamber and again immediately upon entering for the following dependent variables; total mood disturbance (TMD), word score (W), color score (C), word-color score (WC), and mean response time

(MRT). Following 30 minutes of acclimation participants completed an aerobic bout of exercise followed immediately by an anaerobic bout of exercise. This process was repeated for a total of two aerobic bouts of exercise, and two anaerobic bouts of exercise. After the final anaerobic bout, participants exited the chamber for a ten-minute passive recovery. **RESULTS:** A two condition by nine time point analysis of variance (ANOVA) was conducted on all dependent variables. Post hoc analysis via paired samples t-test were conducted to further explain all main effects and interactions. A main effect of time was observed for TMD ($p < 0.001$), in that mood improved following exercise (-69.08 ± 76.19) compared to a rested state (19.95 ± 42.01). A main effect of time was also found for W ($p < 0.001$), WC ($p = 0.002$), and C ($p = 0.001$). Improvement of all aforementioned cognitive variables led to a reduced MRT following acclimation (454.84 ± 149.28) compared to baseline (487.65 ± 154.58), as well as a reduced MRT post-exercise (423.07 ± 133.95) compared to all other time points ($p < 0.001$). **CONCLUSION:** It appears performing an occupational task may improve mood compared to a rested state in both a normothermic and hyperthermic condition. Mental acuity improved over time in both conditions, while participants compensated via reduced response time.

Acute Resistance Exercise Fails to Alter Post-Exercise Glycemic Control

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Acute exercise has commonly been found to transiently enhance glycemic control during recovery from the exercise. This effect has more commonly been observed following aerobic exercise. **PURPOSE:** This study combined results from two recent smaller investigations to gauge the effects of resistance exercise on post-exercise blood glucose (BG) response to an oral glucose tolerance test (OGTT). **METHODS:** Data from seventeen resistance-trained volunteers were used. All subjects completed a resting control trial consisting of a 75-min OGTT following consumption of a 25% glucose solution dosed at 1 g/kg body mass. On a separate day, subjects completed either 30 repetitions of squat only exercise (at 10-RM); 30 repetitions each of squat, bench press and biceps curl (at 10-RM); or ~30 repetitions each of biceps curl and knee extension (at 10-RM). BG was assessed via fingertip sampling prior to exercise, post-exercise and during the OGTT. Blood lactate was collected at rest and upon completion of exercise. **RESULTS:** Resistance exercise resulted in significantly increased blood lactate vs. resting state (8.58 ± 0.87 vs. 1.39 ± 0.22 mmol/L). OGTT response following acute resistance exercise was not significantly different ($p > 0.05$) from the resting condition. BG area under the curve was 2% smaller ($p > 0.05$) following resistance exercise compared to resting control (11330.6 ± 320 vs. 11551.3 ± 405 arbitrary units). **CONCLUSION:** Based on the results of this investigation, acute resistance exercise was not found to elicit enhanced glycemic control. The overall energy deficit and magnitude of the body's glycogen depletion may be important factors to consider when examining post-exercise blood glucose response to an OGTT challenge.

Effect of Duration and Quality of Sleep on College Student Health Behaviours and Outcomes

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Lack of sleep among college students is a significant epidemic affecting millions of students. Sleep duration and quality is an important determinant of overall health, related to health behaviors (physical activity (PA) and diet) and outcomes (mental health). Little is known about the relationships between each of these variables. **PURPOSE:** To examine how PA depression, stress, body mass index (BMI), fruit and vegetable consumption (FVC) differ based on sleep quality and duration. **METHODS:** Students completed an online survey and self-reported their sex, height, weight, PA levels, FVC, and also responded to questions regarding mental health and sleep. Participants were grouped into those who reported less < 4 or ≥ 4 nights of restful sleep/week. Paired samples t-tests examined differences in PA, FVC, and BMI between groups. Chi-square tests for independence examined differences in mental health (depression and stress) symptoms between groups. **RESULTS:** Among participants ($n=3675$) the majority were women (57.9%) and non-Hispanic white (77.3%). For all participants, those who reported better sleep reported significantly higher MPA (150.4 ± 138.4 vs. 164.4 ± 140.8 , $p = .002$), VPA (146.0 ± 144.8 vs. 161.0 ± 144.9 , $p = .002$), and MET-minutes (1873 ± 1740 vs. 2047 ± 1685 , $p = .002$), whereas BMI (22.6 ± 5.4 vs 22.7 ± 4.9 , $p = .59$) and FVC (5.7 ± 2.2 vs. 5.8 ± 2.2 , $p = .13$) did not differ between groups. The same health behaviours differed based on sleep among women, but not men. Those who reported better sleep also reported significantly less symptoms of depression and stress regardless of sex ($p < .001$). **CONCLUSION:** A positive relationship between sleep and PA was found for women, but not men, and better sleep was associated with positive mental health regardless of sex. Thus, findings highlight the importance

of promoting the importance sleep in the relation to mental health. Further research is required to examine the relationship, in particular directionality, between the amount PA and the duration of sleep in college students.

Assessing Health Trends and Disparities of College-aged Students at a Mid-Atlantic HBCU

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Overweight and obesity numbers are at record high rates and climbing. Obesity affects all age ranges, genders, and populations; however, it is more prevalent in specific groups such as African-American women and men, women of any race, and those aged 18-40. Young adults aged 18-25 are in the prime years to make decisions regarding their own health. Because obesity affects the younger age groups the most, it is important for colleges and universities to look at the health status of their students and to help them take action towards better health with educational and exercise programs. **PURPOSE:** To investigate whether differences existed between body weight, body mass index, body fat percentage, and systolic blood pressure based on gender and ethnicity. **METHODS:** This was a descriptive research study using ex-post facto data from the TriFit Laboratory at Delaware State University. SPSS was used to analyze the quantitative data using descriptive statistics. Two-sample *t*-tests were used to examine differences in the variables based on gender and ethnicity. **RESULTS:** There were 2,051 participants in this study. Demographic data show 77.08% ($n = 1581$) of the participants were Black, 9.61% ($n = 197$) were White, 6.73% ($n = 138$) were Hispanic, 4.73% ($n = 97$) were Biracial, and 1.85% ($n = 38$) were listed as "Other." There were 66.75% ($n = 1369$) participants who were female and 33.25% ($n = 682$) of participants who were male. Significant differences at the $p < .05$ level were found between body weight and gender, body fat percent and gender, body fat percent and ethnicity, and systolic blood pressure and gender. While not found to be statistically significant, other trends were readily apparent in the data. **CONCLUSION:** The results of this study indicated that there were several statistically significant differences in the participants' body weight, body mass index, body fat percentage, and systolic blood pressure based on gender and ethnicity. Based on the findings of this study, a comprehensive, campus-wide strategy to prevent weight gain and to promote weight loss in college-aged students is proposed.

Oxygen Desaturation in Sleep Apnea is Inversely Associated with Vascular Changes Following Exercise Training

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Obstructive sleep apnea (OSA) is characterized by reductions in nocturnal mean O₂ saturation (meanSpO₂) that may increase cardiovascular disease morbidity. The extent to which exercise confers cardioprotection in overweight adults with different meanSpO₂ profiles is not known. **PURPOSE:** Examine the association of meanSpO₂ with vascular function changes following exercise training in adults with and without OSA. **METHODS:** At baseline, participants underwent overnight polysomnography to determine the presence and severity of OSA. Tertile-based cut-off points were used to categorize meanSpO₂ and apnea hypopnea index (AHI). Body fat was analyzed using dual energy X-ray absorptiometry. Vasoreactivity of the brachial artery was measured using flow-mediated dilation (FMD), while microcirculatory function was assessed via the total shear stress area under the curve (SSAUC) response during FMD. Body fat and vascular measures were repeated upon completion of a 6 week (3 sessions/wk; 1 hr/session) exercise training program. **RESULTS:** Thirty (age: 49±9 years; BMI: 32.0±3.8 kg/m²; 18 men: 12 women) adults with and without OSA completed the study. At baseline, adults in the highest tertile of meanSpO₂ were younger than those in the lowest tertile (43±9 yrs vs. 53±7 yrs, $p=0.017$), yet no differences in vascular measures, AHI or total body fat percentage were observed across the tertiles. No changes in brachial artery diameter or FMD were observed across tertiles following exercise. However, the change in SSAUC in the highest tertile of meanSpO₂ was greater, compared to the lowest tertile (13,636±15898 A.U. vs. -186±10879 A.U., $p=0.041$). Forward stepwise linear regression revealed that the highest tertile of meanSpO₂ was a significant ($F=5.15$, $p=0.036$) determinant of the increased SSAUC with exercise, independent of age and baseline SSAUC. **CONCLUSION:** Severe oxygen desaturation during sleep was inversely associated with improvements in microcirculatory function following exercise training.

Muscular Fitness, Flexibility, Body Composition, and Physical Activity on the Prevalence of Low Back Pain

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PURPOSE: To evaluate the impact of core strength, endurance, flexibility, body composition, and physical activity (PA) on the reported prevalence of low back pain (LBP) in college-aged individuals. **METHODS:** Twenty-six subjects (11 males; 15 females; mean age=22.1±1.5 years) completed an orientation and exercise session. At orientation, subjects completed questionnaires including the Roland-Morris Disability Questionnaire (RMDQ) and the Revised Oswestry Disability Index (RODI) to gauge LBP prevalence. Subjects were then categorized into Little/No LBP and Moderate LBP. A past year Modifiable Activity Questionnaire (MAQ) and the Sedentary Behavior Questionnaire (SBQ) assessed physical and sedentary activity. Physiological measurements were recorded at both sessions and included core strength, endurance, flexibility (F), resting heart rate (RHR) and blood pressure (BP), body composition (BF), and body mass index (BMI). Muscular strength (MS) was evaluated by a partial curl up test and back extension. Muscular endurance (ME) was evaluated by the McGill's Torso Muscular Endurance Test Battery. Exertion level and pain were measured by the OMNI Ratings of Perceived Exertion scale and pain perception scale. F was measured by the sit and reach test. **RESULTS:** T-tests indicated a significant difference in BF between females who reported Little/No LBP and females with Moderate LBP (4.2 vs. 2.5, $t = 2.46$, $p = 0.03$). Pearson correlations showed a significant inverse association between BF and MS ($r = -0.47$, $p = 0.016$) and BF and ME ($r = -0.60$, $p = 0.001$). A significant positive association was noted between MS and ME ($r = 0.70$, $p < 0.001$) and MS and F ($r = 0.55$, $p = 0.004$). Concurrent validity was shown ($r = .62$, $p = 0.001$) between the RMDQ and RODI. **CONCLUSION:** Increased BF was found to be related to decreased MS and decreased ME. Among college-aged females, increased BF was related to higher prevalence of reported LBP. As LBP continues to have a significant impact on younger populations, focusing efforts on improving body composition and strengthen core is warranted.

Responses to Caffeine Supplementation in Trained and Untrained Individuals During the Wingate Protocol

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Caffeine is an ergogenic aid that can enhance performance in both aerobic and anaerobic exercise. **PURPOSE:** The purpose of this study was to determine if trained individuals elicit a greater response to caffeine consumption in the Wingate Anaerobic Power Test (WAPT) when compared to untrained individuals. **METHODS:** Ten participants (5 trained, 5 untrained) completed a WAPT on 3 separate testing days, each day under a different condition (baseline, caffeine, or placebo). The first day was a baseline test. On day two the participants ingested a caffeine or placebo supplement, and the opposite was ingested on the third day. The caffeine and placebo, ingested 30 min prior to lab arrival, were equivalent to 5 mg/kg of participant body mass. Peak and mean power outputs, heart rate (HR), blood pressure (BP), and blood lactate (BL) were measured before and after the Wingate protocol. **RESULTS:** No significant differences were found between baseline (861 ± 213 W), caffeine (898 ± 172 W), or placebo (892 ± 223 W) conditions in peak power outputs ($p < 0.05$). Mean power output values were not significantly different between the baseline (541 ± 94 W), caffeine (545 ± 83 W), or placebo (547 ± 92 W) conditions ($p < 0.05$). Mean power output was larger in trained individuals than untrained individuals in all conditions (baseline, caffeine, and placebo). Peak power output was similar between trained and untrained participants in the baseline and placebo conditions, but in the caffeine condition trained subjects had a significantly greater mean power output. **CONCLUSION:** The WAPT is a short test, and caffeine supplementation might be more suited for repeat Wingate trials or endurance-based testing as caffeine is commonly associated with fatigue blunting properties. Further, due to the often reported glycogen-sparing effect and enhanced FFA mobilization, the drug may be better suited for aerobic work tests in which carbohydrate availability may limit performance.

Health Effects of Three Weeks of Time-Restricted Feeding in Apparently Healthy, Normal Weight College-Age Females

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Intermittent fasting (IF) has recently gained popularity for a number of potential health benefits. While there is an increasing body of evidence demonstrating beneficial effects of IF on weight loss, blood lipids, and body composition in the overweight and obese, limited data are available about the effects of IF in normal weight individuals. **PURPOSE:** To examine the effects of a 3-week time-restricted feeding (TRF) (16/8) protocol on body composition, executive function, and cardiometabolic health in apparently healthy, normal weight, college aged females. **METHODS:** Twenty-two females were randomly assigned to the TRF or control group (CON). TRF subjects consumed 100% of their energy needs in an 8-h period of time each day. The remaining 16 h per 24-h period made up the fasting period. Subjects were tested before and after 3 weeks of the assigned diet for body composition, resting blood pressure, blood glucose, alanine aminotransferase (ALT) total cholesterol (TC), aspartate aminotransferase (AST), low-density lipoprotein cholesterol (LDL), very low-density lipoprotein cholesterol (VLDL), high density lipoprotein cholesterol (HDL), triglycerides (TG), kilocalories consumed, macronutrient distribution, and executive function. **RESULTS:** No adverse effects were attributed to TRF, and 100% completed the 3-week TRF protocol. At 3 weeks there were no significant between group differences in change in weight (mean \pm SD; TRF 0.2 ± 0.9 kg, CON -1.2 ± 4.1 kg), percent body fat (TRF $0.06 \pm 0.9\%$, CON $0.2 \pm 0.9\%$), systolic blood pressure (TRF -0.6 ± 9.6 mmHg, CON -3.5 ± 11.6 mmHg), diastolic blood pressure (TRF -5.1 ± 7.3 mmHg, CON -3.4 ± 7.3 mmHg), HDL (TRF -0.5 ± 5.1 mg/dl, CON 1.2 ± 6.9 mg/dl), LDL (TRF 0.1 ± 18.3 mg/dl, CON -13.7 ± 17.1), glucose (TRF -0.5 ± 6.7 mg/dl, CON 6.2 ± 12.3 mg/dl), and executive function ($p > 0.05$). **CONCLUSION:** Overall, TRF had no adverse effect on body composition, executive function, or indices of cardiometabolic health in normal weight college-aged females. Further research implementing larger sample sizes and longer duration TRF protocols is required.

Supported by Grove City College Exercise Science Department

Mild Acute Dehydration Does Not Affect Anaerobic Power Output

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Many sports and physical activities take place in hot environments which can lead to dehydration. Dehydration during aerobic activities has negative physiological effects on substrate usage optimization, skeletal muscle metabolism, cardiovascular responses, thermal regulation, and perceived exertion; which can negatively affect performance. However, it is currently unclear how dehydration affects anaerobic performance. **PURPOSE:** To examine the effect of moderate dehydration on power output and blood lactate accumulation during anaerobic exercise. **METHODS:** Nine recreationally active participants (2 female, 7 male) completed two exercise sessions, well hydrated (HYD) with a urine specific gravity (USG) between 1.000-1.019 and moderately dehydrated (DEH) with a USG > 1.020 . Each session consisted of a baseline anthropometric and blood lactate (BLa) measurement followed by a 30-second Wingate test and 3 vertical jumps used to measure peak power. The Wingate test was performed on an electronically braked cycle ergometer. The vertical jump tests were measured using the My Jump 2 App. Additional BLa measurements were taken immediately post-Wingate test and at 5, 10, and 15 minutes post-Wingate test. A paired t-test was used to measure the power differences between each condition. A repeated-measures ANOVA was used to analyze BLa differences. **RESULTS:** There was no statistical difference in peak power during the Wingate test between hydrated and dehydrated trials (1051 ± 315 watts vs. 1036 ± 339 watts, respectively; $p=0.605$). Additionally, no statistical difference was found for peak power during the vertical jump trials between hydrated and dehydrated conditions (1913 ± 619 watts vs. 1950 ± 729 watts, respectively; $p=0.660$). BLa values at baseline, 5, 10, and 15 minutes post-Wingate test for the HYD trial were 1.4 ± 0.2 mmol/l, 8.2 ± 3.9 mmol/l, 8.6 ± 2.5 mmol/l, 8.3 ± 2.6 mmol/l, 6.6 ± 2.2 mmol/l; for the DEH trial they were 1.3 ± 0.6 mmol/l, 7.7 ± 2.2 mmol/l, 7.7 ± 2.6 mmol/l, 7.7 ± 2.3 mmol/l, 6.8 ± 1.9 mmol/l. BLa levels were increased in response to anaerobic exercise ($p > 0.05$) but there was no difference between hydration state ($p=0.451$). **CONCLUSION:** These results indicate that during acute bouts of anaerobic exercise, moderate dehydration does not have a negative effect on power output.

Effects of Mitochondrial Antioxidant Supplementation and Endurance Exercise Training on Microparticles and Endothelial Cell Integrity

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PURPOSE: Antioxidants and chronic exercise are viable options to mitigate deleterious reactive oxygen species (ROS) and improve endothelial function, but the efficacy of non-specific antioxidants to elicit beneficial vascular effects, alone or during exercise training, remains inconsistent. A mitochondria-specific antioxidant (MQ) has been shown to elicit favorable changes in the vasculature. The impact of chronic exercise with and without MQ on training-induced vascular adaptations, and related functional consequences in the endothelium, are not fully understood. Endothelial microparticles (EMPs) are shed from the endothelium in response to activation and apoptosis, facilitating intercellular communication. Thus, using *in vivo* and *in vitro* complementary studies, we investigated the effects of MQ on endothelial cell (EC) integrity. **METHODS:** 20 healthy men (22.1±0.7 yr) performed 3 wk of aerobic cycle training at 50-70% maximal oxygen uptake for 45-60 min, with and without MQ supplementation (n=10/group). Blood samples were analyzed for plasma levels of EMPs derived from apoptotic ECs (CD31⁺/CD42b⁻) and two types of activated ECs (CD54⁺/CD45⁻, CD62E⁺). *In vitro*, ROS were assessed in ECs pretreated with and without MQ for 6h before exposure to mitochondria complex inhibitors for 12h. Data are presented as mean ± SEM and were analyzed using a two-factor repeated measures or one-way ANOVA. **RESULTS:** A group x time interaction was observed for EMPs derived from apoptotic ECs after training (P=0.06). MQ treatment reduced CD31⁺/CD42b⁻ EMPs by 27% after training (18.1±2.7 to 13.3±1.8 EMPs/μl; P=0.06), whereas no change was observed in the placebo group (14.0±2.0 to 16.1±2.4 EMPs/μl; P>0.05). CD54⁺/CD45⁻ EMPs, derived from activated ECs, were unaltered by exercise training or MQ (P>0.05). Independent of MQ administration, CD62E⁺ EMPs from activated ECs were reduced by 30% (70.6±9.3 to 49.8±6.3 EMPs/μl; n=20; P<0.05 main effect of training). *In vitro*, pretreating ECs with MQ reduced ROS production by 5% (n=6; P<0.05). **CONCLUSION:** Short-term endurance exercise training reduces EC activation with or without MQ supplementation. The addition of MQ supplementation during training may increase endothelial integrity by reducing EC apoptosis. MQ reduces impaired mitochondria induced ROS production in ECs.

Statement of disclosure: Mr. Shill was supported by NIH F31-HL140777. This study was supported by funds from the a) University of Maryland Kinesiology Graduate Research Initiative Fund (to D.D.S) and b) the Office of the Vice President for Research and the College of Education at the University of Georgia (to N.T.J.).

Initial Investigation of Satellite Cell-Derived Extracellular Vesicles as a Potential Therapeutic for Myopathies

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Satellite cells (SC) are muscle-specific stem cells that play a central role in muscle repair and regeneration. Like other stem cell populations, SCs represent a promising source for novel therapies. The therapeutic potential of stem cells is thought to be largely due to paracrine-like factors. However, to date, stem cell therapy (including SC-based therapeutics), remain largely unsuccessful. A major limitation to stem and SC therapeutic approaches is the number needed for injection is typically much greater than the limited number obtained through isolation protocols. Recently, numerous studies have shown cells release large numbers of extracellular vesicles (EVs) and EVs act in a paracrine-like fashion by delivering functional molecular cargo from specific cells types to distant cells. Therefore, SC-derived EVs are a promising source for potential novel muscle therapies. **PURPOSE:** The purpose of the present study was to characterize SC EVs and establish the feasibility of SC-derived EVs as a potential therapeutic treatment for myopathies. **METHODS:** SCs were isolated and cultured from healthy C57 mice (n=6). EVs were isolated from media and characterized via nanoparticle tracking analysis and separately, internal protein and RNA cargo was fluorescently labeled for uptake experiments. Where appropriate, statistical analysis was performed by t-test with p<0.05. **RESULTS:** SCs release EVs with an average size of 106.3 ± 0.8 nm and modal size of 78.1 ± 2.5nm, indicating SCs release EVs in the size range of exosomes. Further, 278,026 ± 14,196 EVs were released per SC the first 24 hours of culture. Finally, when muscle cells were exposed to SC-derived EVs, the EVs delivered protein and RNA into the fully differentiated muscle cells. **CONCLUSION:** Collectively, these data demonstrate SCs release EVs that are capable of delivering cargo into muscle, thus providing initial evidence of the feasibility of SC-derived EVs as a therapeutic treatment for myopathy.

Supported by NIH R01 NS102157 and P20 GM113125

Prolonged Exposure to an Isolated, Confined, and Extreme Environment: Impact on Vigilance and Cognitive Function

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Astronauts are required to perform a variety of cognitively demanding tasks in the face of psychosocial stressors occurring throughout extended periods in isolated, confined and extreme (ICE) environments. Short-term ICE environmental exposure is shown to affect vigilance and cognitive performance; however, these domains have not collectively been studied during extended exposures. Coastal and inland Antarctic analog stations are excellent sites to study ICE environmental exposure and their effects on vigilance and cognition. **PURPOSE:** Investigate vigilance and cognitive performance between Antarctic analog sites during a 5-month ICE environment simulation. **METHODS:** 110 participants were assigned to either I or C sites and completed Psychomotor Vigilance Task (PVT) and Spaceflight Cognitive Assessment Tool for Windows (WinSCAT) each month. A series of 2 (site) X 5 (time) ANCOVAs were conducted to evaluate mean reaction time (RT; ms), lapses (500-1000ms), and commission errors (CEs) between sites across monthly PVT and WinSCAT assessments whilst controlling for circadian cycle. **RESULTS:** 70 participants completed PVT and WinSCAT at months 1-5 between inland (M=18, F=1) and coastal (M=37, F=14) sites and were equally distributed across age, sex, occupation, work shifts, and prior mission experience ($p > .05$). A within-subjects' effect was identified for WinSCAT performance ($p < .01$); post-hoc analysis revealed an improved performance at months 2-4 compared to month 1 ($p < .01$). Between-subjects' effects were identified for PVT, indicating the coastal site had a longer (worse) RT at month 4 (326.86 ± 54.91 vs 304.72 ± 32.05 ; $p = .029$), and more lapses at months 1 (3.4 vs 0.8 ; $p = .03$), 3 (3.6 vs 2.8 ; $p = .02$) and 4 (3.9 vs 1.9 ; $p < .01$). There were no differences between sites in WinSCAT performance; and no interactions were observed for any outcome. **CONCLUSION:** Vigilance and cognitive performance were marginally affected during an ICE environmental exposure. Extended isolation showed a negative effect with the coastal site (less isolated), but not the inland site (more isolated). Exposure to ICE environments was not the primary factor for our findings and other factors require consideration to comprehensively understand the deleterious effects of ICE environment exposure on vigilance and cognitive performance.

This research was supported by a grant from the National Aeronautical Science Administration (NASA) to Candice Alfano (13-14BMEDPROP-0007)

Acute High Sodium Meal Consumption Does Not Impair Vascular Function in Young, Healthy Adults

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Endothelial dysfunction is a primary event in the development of atherosclerosis, a leading cause of cardiovascular disease (CVD). Furthermore, increased arterial stiffness and wave reflection are independent risk factors for CVD. High dietary sodium intake has been shown to impair endothelial function independent of blood pressure (BP) in young, healthy populations through an increase in oxidative stress. **PURPOSE:** To investigate the acute effects of an antioxidant cocktail on a high sodium meal on measures of vascular function and arterial stiffness. **METHODS:** We recruited non-obese, apparently healthy males and females 18-45 years of age. Participants ingested either two doses of an antioxidant cocktail (AO; each capsule contained 500 mg vitamin C, 300 IU vitamin E, and 300 mg alpha-lipoic acid) or a placebo (PLA; cellulose) prior to consuming a high sodium meal (1500 mg). Brachial artery flow-mediated dilation (FMD) was measured at baseline (BSL), 60 and 120 minutes after meal consumption. Carotid-femoral pulse wave velocity (PWV) and augmentation index (AIx) were measured at BSL, 30, 60, 90, and 120 minutes after meal consumption. **RESULTS:** Thirty-two young healthy adults (12M, 19F; 23 ± 1 years; BMI 23.1 ± 0.4 kg/m²; systolic BP 111 ± 1 mmHg, diastolic BP 66 ± 1 mmHg) completed two study trials separated by at least 48 hours. There were no baseline differences between the trials. FMD was not different between the two trials (AO: BSL: $6.9 \pm 0.6\%$, 60 min: $7.0 \pm 0.7\%$, 120 min: $7.1 \pm 0.6\%$; PLA: BSL: $7.1 \pm 0.6\%$, 60 min: $6.8 \pm 0.7\%$, 120 min: $6.8 \pm 0.5\%$; $P > 0.05$). PWV also remained unchanged ($P > 0.05$). AIx decreased over time in both trials (AO: BSL: $4.1 \pm 1.9\%$, 60 min: $-2.2 \pm 2.6\%$, 120 min: $0.3 \pm 2.0\%$; PLA: BSL: $2.2 \pm 2.4\%$, 60 min: $-3.7 \pm 1.7\%$, 120 min: $-2.4 \pm 1.9\%$; $P < 0.001$ for time effect). **CONCLUSION:** Acute consumption of a high sodium meal did not impair vascular function nor arterial stiffness in young, healthy adults. Further investigation is needed to discern potential sex differences.

The Influence of Caffeine and -163A>C CYP1A2 Polymorphisms on Power during the Wingate Anaerobic Test

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The influence of the cytochrome P450 enzymes, specifically a polymorphism of the CYP1A2 genotype, following caffeine ingestion has been shown to influence aerobic endurance; however, the effect on short-term anaerobic performance is inconclusive. Individuals with the AA variant are responders to caffeine and those with the AC/CC variant are non-responders. **PURPOSE:** To examine the effects of caffeine and specific CYP1A2 genotype on anaerobic performance. **METHODS:** 10 subjects completed two 30 second Wingate Anaerobic Tests (WAnT30) (resistance = $0.075 \text{ kg} \cdot \text{BW}^{-1}$) on the Velotron that were separated by 2 to 7 days. Relative peak power (PP) and relative mean power (MP) were computed by the Velotron software. An oral bolus of caffeine (CAF), $5 \text{ mg} \cdot \text{kg}^{-1}$, or placebo (PLA), maltodextrin, was given in a randomized and counterbalanced design 60 min prior to testing. Buccal epithelial cells were collected via a mouth rinse of 0.9% NaCl. Genomic extraction was obtained using QiAmp Mini spin columns and cell lysing with proteinase k, followed by PCR amplification with Fast Taq. The restriction enzyme (*ApaI*) was used to cut fragments. Cut and uncut samples underwent electrophoresis in 1% agarose gel and ultraviolet light photography identified genotype. The data was analyzed using a 2 (condition) x 2 (CYP) ANOVA with repeated measures ($p < 0.05$). **RESULTS:** 5 people were AA and 5 people were AC/CC. The results revealed that CAF elicited no ergogenic effects. The main effect of condition, PLA versus CAF, showed no significant difference for PP or MP ($p = 0.49$). The main effect of CYP1A2, AA or AC/CC, did not reveal power differences for PP or MP ($p = 0.96$). Follow-up pairwise comparisons between PLA to CAF for PP ($\text{W} \cdot \text{kg}^{-1}$) showed non-significant Δ 's of 1.17% in AA (10.3 and 10.42) and -0.38% for AC/CC (10.36 and 10.46, respectively). Likewise, MP resulted in non-significant Δ 's of 3.66% for AA (8.2 and 8.5 $\text{W} \cdot \text{kg}^{-1}$) and 2.24% for AC/CC (8.3 and 8.5, $\text{W} \cdot \text{kg}^{-1}$ respectively). **CONCLUSION:** Caffeine did not produce an ergogenic effect for anaerobic exercise, regardless of an individual's CYP1A2 variant. However, the larger percent increases, specifically in MP, suggest that further research should be conducted, such as increasing sample size and identifying confounding variables such as other receptor sites that may interact with caffeine.

Validity and Reliability of Electronic Devices to Measure Muscular Power during Linear Weight Lifting Movements

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PURPOSE: The purpose of this study was to determine the validity and reliability of three electronic measuring devices used to assess mean power during inter-set compound linear barbell movements. **METHODS:** 9 athletes experienced in resistance training (8 males, 1 female) participated in this study. Subjects attended a familiarization session, gave written informed consent, received lifting form analysis and established their 1 repetition max (RM) from a 5RM protocol. Each subject attended a single testing session in which they performed a 5-minute aerobic warmup followed by the parallel back squat and bench press. The subjects executed 3 sets of 2 reps to produce power at 70% of their 1RM with 3 minutes rest between sets for each lift. A mobile app (APP), tri-axial accelerometer (ACC) and Tendo power analyzer (TEN) were used to record mean power during each lift. An iPad loaded with the APP was set on a tri-pod 15 feet from the platform, the ACC was placed inside a foam sleeve and slid onto the barbell, and the TEN was placed on to the left side of the barbells sleeve. The velocity and bar displacement were downloaded from the APP and the ACC and mean power was calculated from the raw data. The mean power from the TEN was recorded from the microcomputer. An interclass correlation coefficient (ICC) was used to assess reliability of intra rep lifts and a one-way ANOVA with repeated measures was used to determine validity of inter set differences ($p < 0.05$) with the TEN as the criterion value. **RESULTS:** The APP, ACC and TEN demonstrated a high reliability with ICC r-values for the parallel back squat of 0.93, 0.83 and 0.98, respectively and values for the bench press were 0.95, 0.40 and 0.96, respectively. The APP and ACC exhibited high validity by showing no differences for mean power (W) between sets for parallel back squat (APP, 703.72 ± 155.4 ; ACC, 743.74 ± 274.3 ; TEN, 728.78 ± 754.1) or bench press (APP, 367 ± 75.4 ; ACC, 324.07 ± 148.5 ; TEN, 283.76 ± 69.3). **CONCLUSION:** Each electronic method demonstrated high reliability between lifts and produced valid measures when compared to a criterion method for measuring mean power. The results indicate that inexpensive, mobile and readily available devices can provide reputable feedback for assessing mean power during linear lifting movements.

Analysis of Body Composition Changes in Professional Male Ice Hockey Players

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Body composition evaluations are used to establish objective goals for athletes. To appropriately make recommendations to athletes, practitioners must know the specific demands of the athlete's sport, age and sex. **PURPOSE:** To establish an average body composition profile for professional male ice hockey players, assess whether yearly fluctuations exist, and examine if there are differences among positions played. **METHODS:** In this cross-sectional study, 36 professional male ice hockey players (25.4±3.8 years of age; body mass index [BMI]: 26.7±1.5 kg/m²) were measured for: total body mass, percent body fat (PBF), lean body mass (LBM), fat free mass (FFM), total body bone mineral density (TBBMD), and lumbar spine BMD (LBMD) using dual-energy X-ray absorptiometry (DXA). Descriptive statistics were used to determine average age, total body mass, PBF, LBM, FFM, TBBMD, and LBMD. A repeated measures t-test was used to determine if differences existed in these same parameters over a one-year period. A one-way ANOVA was used to determine if differences existed among the positions played (Forwards, Defensemen, and Goalies). Alpha levels were set *a priori* at $p < 0.05$. **RESULTS:** Average values at the beginning of one season compared to the beginning of the next season, respectively, were: total body mass: 91.6±6.1 vs. 92.5±6.1 kg; PBF: 14.74±2.69 vs. 15.4±2.93%; LBM: 74.3±5.5 vs. 74.2±5.1 kg; FFM: 78.3±5.5 vs. 78.2±5.3 kg; TBBMD: 1.466±0.838 vs. 1.479±0.07g/cm²; and LBMD: 1.468±0.099 vs. 1.476±0.115 g/cm². Significant increases were observed in PBF ($t(35) = -2.451$, $p = 0.019$) from the beginning of one season (14.7±2.69%) to the beginning of the next season (15.4±2.93%). No significant changes existed in any other measure between the two seasons or among position type ($p > 0.05$). **CONCLUSION:** Our results support a possible standard of body composition for professional male ice hockey players. These data will help drive more objective interventions when addressing body composition goals.

Assessing Self-Reported Physical Activity, Body Composition, and Bone Mineral Density in Wellness Fair Participants

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Past studies have shown that self-reported levels of physical activity (PA) and measured percentage of body fat (% fat) in adults is not consistent. In addition, few studies to date have examined how self-reported PA relates to bone mineral density (BMD). **PURPOSE:** To examine whether self-reported PA was reflective of an individual's measured body composition and BMD. **METHODS:** A population of 104 individuals (students, faculty, staff, and community members) was sampled at two university wellness fairs. Participants filled out the Godin Leisure-Time Questionnaire (GLTEQ), which examined self-reported PA for the past 7 days. From the GLTEQ, total leisure score (TLS) was computed in addition to how often they participated in vigorous physical activity (VPA). Body composition measures, including body mass index (BMI), % fat, and BMD (g/cm²) were also measured for each individual. Regression analyses were performed to determine which predictor (BMI, % fat, BMD, and VPA) significantly related to TLS. In addition, GLTEQ responses, body composition measures, and BMD were examined in a small subset of the population ($N = 25$) to determine differences between athletes and non-athletes using independent *t*-tests. For all statistical measures, $\alpha = 0.05$. **RESULTS:** Of the variables examined, % fat ($\beta = -0.302$) and VPA ($\beta -0.492$) significantly predicted TLS, $p < 0.05$. Thus, as both the % fat of the participants and total days for VPA increased, TLS decreased in magnitude. No other variables, including BMD, significantly predicted TLS. TLS was 42% greater in athletes versus non-athletes ($p < 0.05$). Non-athletes reported an additional 0.8 days of VPA than athletes ($P < 0.05$), but were measured with 35% greater % fat compared to athletes, $p < 0.05$. **CONCLUSION:** Individuals with a higher % fat tend to partake in fewer leisure time activities than leaner individuals. In addition, those that reported greater amounts of leisure time performed more mild forms of PA. Based on body composition measures, non-athletes overestimated their amount of VPA compared to athletes, who may have underestimated their VPA due to being accustomed to high levels of PA. Finally, based upon our sample, the GLTEQ may not be an appropriate inventory to assess the relationship between BMD and self-reported PA.

Comparison of the Effects of Sprint Interval Exercise, Steady State Exercise and Control on RMR

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Exercise is a modality that may result in an elevation of resting metabolic rate (RMR) due to homeostatic disruption. Sprint Interval Training (SIT) exercise is widely recognized as a time efficient, low-volume, high-intensity alternative to endurance training and, in acute phases, may elevate RMR for longer durations. **PURPOSE:** To

compare the effects of an acute bout of SIT vs. steady state (SS) vs. control (CON) on 24-h RMR in recreational active college-aged males. **METHODS:** In this randomized crossover design, 13 recreationally active males ages 18-30 yrs. (24.1 ± 2.3) participated in three exercise sessions using an electronically braked cycle ergometer: SIT (5, 30-sec. sprints, interspersed with 4-min. active recovery), SS (70% $\text{VO}_{2\text{ peak}}$ for 30 min.) and CON. Exercise sessions were separated by one week. All sessions included 7 RMR measurements taken at the same times over a 24-h period (8am resting, 8:50am pre-ex, 10:10am post-ex, 12:10pm 2-h post-ex, 1:00pm 3-h post-ex, 4:00pm 6-h post-ex and 10:10am the following morning 24-h post-ex). RMR comparisons were made using two-way ANOVA with repeated measures. **RESULTS:** There was a significant main effect for group with regard to RMR ($F=5.706$; $p=.043$) with no effect of time ($F= 5.351$; $p=.113$) or group x time interaction ($F=1.486$; $p=.066$). There was a significant difference between SS (2116 kcal) and CON (1891 kcal) ($p=.009$) and SIT (2105 kcal) and CON (1891 kcal) ($p=.012$). SS (2116 kcal) and SIT (2105 kcal) were not different ($p=.994$). There was a significant effect for time between combined exercise (CE) condition vs. CON when comparing rest to pre ($\Delta\text{CE} = 582$ kcal vs. $\Delta\text{CON} = 498$ kcal) ($p=.002$), rest to post-ex ($\Delta\text{CE} = 628$ kcal vs. $\Delta\text{CON} = 211$ kcal) ($p=.034$), and rest to 6-h post ($\Delta\text{CE} = 716$ kcal vs. $\Delta\text{CON} = 193$) ($p=.016$). There was a significant group x time interaction for CE vs. CON ($p = .043$). Post-hoc analysis revealed statistical differences in measurements 2-h post ($p= 0.018$; 455 kcal), 3-h post ($p= 0.002$; 599 kcal) and a trend towards statistical significance at 6-h post ($p= .076$; 340 kcal) and 24-h post ($p=0.103$; 313 kcal). **CONCLUSION:** A single bout of SIT may significantly elevate post-exercise RMR, and if repeated regularly, may confer longer-term benefits similar to that produced by 30 minutes of SS exercise.

Static and Dynamic Handgrip Exercise Increases Wave Reflection in Healthy Young Adults

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Increased wave reflection augments pulsatile load, wastes left ventricular effort, and is associated with cardiovascular events. Acute handgrip (HG) exercise increases central blood pressure and surrogate measure of wave reflection, augmentation index. However, surrogate measures of wave reflection do not provide a comprehensive assessment of pulsatile load and ventricular-arterial interactions. Wave separation analysis can determine the relative contributions of forward (Pf) and backward (Pb) pressure wave amplitudes and reflection magnitude ($\text{RM}=\text{Pb}/\text{Pf}$). Wave intensity analysis can assess compression waves traveling forward (FCW) and backward (BCW) and forward expansion (suction) waves (FEW). **PURPOSE:** To determine the effect of acute static and dynamic HG exercise on wave reflection with wave separation and wave intensity analyses in young healthy adults. **METHODS:** Applanation tonometry was used to record radial artery pressure waveforms in 31 adults (25 ± 4 years) at baseline and during static and dynamic HG exercise. Radial waves were calibrated to respective brachial mean and diastolic pressures and synthesized to central pressure waves using a generalized transfer function. Wave separation analysis was used to derive Pf, Pb, and RM while wave intensity analysis was used to derive FCW, BCW, and FEW intensities. Both of these methods were performed offline using a synthesized flow waveform. **RESULTS:** Central blood pressure and augmentation index increased with HG exercise as expected ($p<0.05$). Compared to baseline, both HG exercises increased wave reflection measures Pb (baseline 11.4 ± 0.4 mmHg; static 12.7 ± 0.6 mmHg; dynamic 12.6 ± 0.5 mmHg, $p<0.05$) and RM (baseline $40 \pm 1\%$; static $44 \pm 1\%$; dynamic $43 \pm 1\%$, $p<0.05$), but not Pf ($p>0.05$). Both HG exercises increased wave reflection measure BCW vs. baseline (baseline $2.1 \pm 0.3 \times 10^{-2}$ AU; static $3.7 \pm 0.3 \times 10^{-2}$ AU; dynamic $2.9 \pm 0.3 \times 10^{-2}$ AU, $p<0.05$). However, FCW increased only during dynamic HG exercise vs. baseline (baseline $4.5 \pm 0.2 \times 10^{-1}$ AU; static $4.7 \pm 0.3 \times 10^{-1}$ AU; dynamic $5.0 \pm 0.3 \times 10^{-1}$ AU, $p<0.05$). FEW did not change with either HG exercise ($p>0.05$). **CONCLUSION:** HG exercise increased measures of wave reflection (Pb, RM, and BCW) indicating that wave reflection is elevated during both static vs. dynamic HG exercise.

Influence of Testing Sequence on an Adult's Ability to Achieve Maximal Aerobic and Anaerobic Power

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Due to the nature of maximal physical exertion tests, researchers and clinicians schedule maximal oxygen consumption ($\text{VO}_{2\text{max}}$) tests and Wingate Anaerobic Tests (WANt) on separate days to ensure optimal results. **PURPOSE:** To examine how testing sequence affects an adult's ability to achieve maximal aerobic and anaerobic power during a single assessment visit. **METHODS:** Fifty-three adults (31 women, 22 men; 21.9 ± 1.6 years) participated in this investigation. All subjects were tested on three separate occasions. Participants completed two

baseline visits (Visits 1 and 2) consisting of either a VO_{2max} or WAnT in a randomized counterbalanced order. Participants then completed an experimental visit (Visit 3) which consisted of both a VO_{2max} and WAnT in randomized order (Group A: VO_{2max} /WAnT; Group B: WAnT/ VO_{2max}) with 20 minutes of rest between tests. Mixed model ANOVAs with Bonferroni post hoc analyses compared baseline (Visits 1 or 2) and experimental (Visit 3) exercise test performance between and within groups for both relative VO_{2max} and absolute peak power. **RESULTS:** No significant main or interaction effects were observed for relative VO_{2max} at baseline and experimental visits when comparing Group A (40.9 ± 8.6 ml/kg/min and 41.2 ± 8.2 ml/kg/min, respectively) and Group B (42.9 ± 7.2 ml/kg/min and 42.0 ± 8.0 ml/kg/min, respectively). Similarly, no significant main or interaction effects were observed for absolute peak power at baseline and experimental visits when comparing Group A (681.7 ± 209.0 W and 690.2 ± 197.6 W, respectively) and Group B (747.7 ± 229.4 W and 742.7 ± 221.3 W, respectively). **CONCLUSION:** Our findings indicate that testing sequence had no effect on achievement of maximal aerobic and anaerobic power. Researchers and clinicians can include VO_{2max} testing and a WAnT during the same visit with 20 minutes of rest without compromising maximal performance.

An Examination of Vascular Function Following Acute Exercise in Adults With and Without Sleep Apnea

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Obstructive sleep apnea (OSA) is associated with increased cardiovascular morbidity due, in part, to impaired vascular function. Conversely, vascular function is enhanced following acute exercise. Whether OSA moderates this effect is not known. **PURPOSE:** Examine the conduit and resistance artery function in response to acute exercise in overweight adults with and without OSA. **METHODS:** Participants underwent overnight polysomnography to determine the presence and severity of OSA, as defined by apnea-hypopnea index (AHI). Body fat was analyzed using dual energy X-ray absorptiometry. Vasoreactivity of the brachial artery was measured using flow-mediated dilation (FMD), while microcirculatory function was assessed via the total shear stress area under the curve (SSAUC) response during FMD before completing a 30 minute bout of treadmill exercise (PreEx). Vascular measures were repeated 1H and 2H post exercise. **RESULTS:** Twelve adults (7 men: 5 women) with moderate to severe OSA (+OSA) and twelve adults (8 men: 4 women) with no to mild OSA (-OSA) completed the study. By design, AHI of the +OSA group was higher compared to the -OSA group (29 ± 11 events/hr vs. 8 ± 4 events/hr, $p < 0.01$). At baseline, no differences in age, sex, or total body fat percentage were observed between groups. For FMD, resting arterial diameter and SSAUC, there was no significant time-group interaction, although a trend was present for FMD (+OSA: PreEx: $9.07 \pm 7\%$; 1HR: $4.83 \pm 5\%$; 2HR $6.73 \pm 4\%$; vs. -OSA: PreEx: $6.76 \pm 3\%$; 1HR: $7.45 \pm 3\%$; 2HR $7.97 \pm 3\%$; $p = 0.089$). **CONCLUSION:** We found no substantial difference between the OSA groups in FMD or SSAUC at 1H or 2H, suggesting no adverse or beneficial effects of OSA on vascular function following acute exercise.

Research funded by R15HL133884

Appropriateness of The Godin Leisure-Time Exercise Questionnaire to Identify Physically Active College Individuals

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Sports medicine researchers often generalize findings to athletes, but access to athletes may be limited, forcing researchers to recruit cohorts who are not athletes but share similar characteristics. One potential cohort may consist of physically active individuals that meet the American College of Sports Medicine (ACSM) fitness guidelines. Even still, this may not include quantification of fitness levels. The Godin Leisure-Time Exercise Questionnaire (GODIN) has been used within sports medicine research, and can be used to match the ACSM cardiorespiratory fitness guidelines and quantify fitness levels. **PURPOSE:** To determine the ability of the GODIN questionnaire to identify physically active individuals compared to the ACSM cardiorespiratory fitness guidelines. **METHODS:** An

online survey consisting of ACSM guidelines, specific exercises, and the GODIN questionnaire both with and without specific examples for physical activity participation was provided to a college campus. Duration of physical activity reported from the strenuous and moderate sections of the GODIN questionnaire were used to calculate the accuracy, sensitivity, and specificity of the GODIN questionnaire compared to the ACSM cardiorespiratory fitness guidelines. Receiver operating characteristic curves were also conducted to determine the area under the curve.

RESULTS: A total of 169 college age individuals (21 ± 4 years) completed the entire survey. The accuracy of the GODIN questionnaire ranged between 30-66% across all conditions. Area under the curve estimates ranged between 0.591 and 0.686, with sensitivity values between 0.02 and 0.62, and specificity scores between 0.68 and 0.97.

CONCLUSIONS: The GODIN questionnaire has limited accuracy of correctly detecting both those that meet and do not meet the ACSM cardiorespiratory guidelines. However, specificity of the GODIN questionnaire is acceptable given rates of false positive and false negative outcomes. Thus, it could potentially be used to identify those who meet the ACSM cardiorespiratory guidelines.

Effect of Treadmill-Based Resistance on Landing Strategy and Force Attenuation in Female Collegiate Lacrosse Players

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Female athletes have been recognized as at risk for non-contact anterior cruciate ligament (ACL) injuries. The role of hip musculature in attenuating ground force and maintaining neutral alignment through the knee during landing has recently emerged as a focus of ACL injury prevention research. Novel methods to target and condition hip extensors have been proposed, with closed kinetic chain resistance exercises widely considered most functional in achieving adaptations relevant to knee stability and coordinated landing strategies. However, the use of treadmill-based resistance training for developing hip-specific strength in this context has not been investigated. **PURPOSE:** To examine the effect of six weeks of modified incline treadmill-based resistance training on functional landing strategies, vertical ground force attenuation and knee and trunk flexion angles in female athletes, compared to active controls. **METHODS:** 15 healthy female intercollegiate lacrosse players (age = 19.5 ± 1.7 years, height = $1.65 \pm .23$ m, weight = 59.33 ± 5.4 kg) participated in a repeated measures, cross-sectional design and provided written informed consent. Independent variable was time (pre- and post-training). Dependent variables were reactive strength index (RSI), vertical ground force rate of loading (ROL), and knee and trunk flexion angles during drop jumps from a 30cm box. Training occurred on two non-consecutive days per week, over six weeks with treadmill set at 15 percent grade and progressive cable resistance load set initially at 40% of hip extensor strength average for a duration of 7 minutes per session. **RESULTS:** Paired samples t-tests showed a significant ($p = .007$) increase in RSI post training, specifically reflecting a 12.5% increase in RSI scores. No other group differences in ROL or knee or trunk flexion angles were statistically significant pre to post training. **CONCLUSION:** Calculated as vertical jump height divided by pre jump ground contact time, RSI differences reflect training adaptations to enhance transfer of eccentric landing force load to a propulsive outcome, demonstrating improved power and plyometric performance. Future research should investigate strength and neuromuscular stiffness changes associated with dynamic knee restraint mechanisms protective against ACL injury.

This study was supported by a research grant from US Lacrosse Center for Sport Science, Sports Science and Safety Committee.

Endothelial Permeability Compared at Various Times and Ages Post Skeletal Muscle Injury in Mice

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Capillary permeability following skeletal muscle injury is necessary for the entry of blood cells and plasma factors necessary for healing. However, it is unclear how aging and sex differences affect capillary permeability after muscle injury. **PURPOSE:** To compare endothelial permeability 48 hours post skeletal muscle injury between male and female mice at 1 month and 3 month of age. **METHODS:** Barium chloride (BaCl_2) was injected into the left tibialis anterior (TA) to create a chemical injury and sodium chloride (NaCl) was injected into the right leg as a control. Evans Blue (EB) dye was injected through the lateral tail vein at 48 hours post-injury. The mouse was sacrificed 30 min following EB injection and both TA's were removed, weighed and soaked in formamide to remove extravasated EB from the muscles. Absorbance of extravasated EB was measured. **RESULTS:** Permeability 48 hours post-injection was significantly elevated in the BaCl_2 injected muscles of mice aged 4 weeks compared to NaCl Male: 3.613 ± 0.79 vs. 7.012 ± 0.56 ngEB/mgTA, $p < 0.001$; Female: 3.250 ± 1.39 vs. 15.84 ± 2.46 , $p < 0.001$).

Permeability was also significantly higher in female TAs injected with BaCl₂ compared to males (7.012±0.56 vs. 15.84±2.46, p<0.01). Permeability 48 hours post-injection was significantly elevated in the BaCl₂ injected muscles of mice aged 12 weeks compared to NaCl (Male: 0.4845±0.14 vs. 3.62±1.39 ngEB/mgTA, p<0.05; Female: 2.24±0.239 vs. 6.926±2.9, p<0.01). Permeability was also significantly higher in female TAs injected with BaCl₂ compared to males (3.62±1.39 vs. 6.926±2.9, p<0.05). Permeability values in BaCl₂ injured TAs were lower at mice aged 1 month compared to mice aged 3 months (Male: 7.012±0.56 vs. 3.62±1.39 ngEB/mgTA; Female: 15.84±2.46 vs. 6.926±2.9 ngEB/mgTA). **CONCLUSION:** Both age and gender contribute to permeability 48 hrs post-skeletal muscle injury.

Effects of Acute Creatine Supplementation on Arterial Stiffness: a Pilot Study

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Arterial stiffness (AS) has long been regarded as an indicator of disease and is an independent predictor of cardiovascular events. Thus, identification and characterization of behaviors promoting the development of arterial stiffness are necessary. There is a void in our knowledge on the impact of exercise, in particular creatine monohydrate supplementation, on the stiffening process in the major elastic arteries. As of this writing, there is one experiment that examined the relationship between acute (< 7 day) creatine supplementation and arterial stiffness. However, the previous study used arterial stiffness indices that were dependent on several factors including blood pressure, thus subjected to interpretation. **PURPOSE:** To determine the effects of acute creatine monohydrate supplementation on AS. **METHODS:** 12 male, physically active participants were randomized in a double-blind fashion to placebo (PL) (n=6, 23±2 yrs) or creatine (CM) (n=6, 21±2 yrs) groups. Subjects received 0.3 g/kg/day creatine monohydrate or placebo in gelatin capsules for 6 to 7 days. Subjects were instructed to avoid nutritional supplements for at least 14 days prior to start of the study period. A series of anthropometric measurements, ultrasonography of the carotid artery, applanation tonometry, and blood pressure acquisition were conducted at baseline and on day 7 of the study period. **RESULTS:** There were no significant differences between PL and CM in carotid-femoral pulse wave velocity (CFPWV) (4.60±10.42 vs. -2.71±21.20 % change), β-stiffness index (5.81±26.3 vs. 1.65±41.35 % change), central pulse pressure (CPP) (-17.38±16.31 vs. 6.05±24.61 % change), and arterial compliance (AC) (19.79±37.50 vs. 12.48±53.89 % change) (all P>0.05). There were also no significant differences in body weight (0.53±0.79 vs. 0.20±0.87 % change), fat mass (-3.40±3.49 vs. -0.23±8.17 % change), and fat free mass (1.12±0.98 vs. 0.23±0.80 % change) between PL and CM, respectively (all P>0.05). **CONCLUSIONS:** Using a randomly controlled, double-blind trial with validated measurements of AS, acute creatine supplementation does not appear to impact vascular compliance in young, otherwise healthy males.

Impact of Active and Passive Recovery on Metabolic Measures in Female Soccer Players

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Most sporting events have a period of time where athletes take a break from competition. During this break many athletes do not cool down or warm up again before returning to competition, which may increase a risk of injury or cause a decrease in performance when play is resumed. **PURPOSE:** To investigate the effects of passive and active recovery on subsequent performance. **METHODS:** Ten Shippensburg Women's Soccer Team players (19.2±1.1 yrs) completed two sessions of testing, in randomized order. Each session consisted of a warm up, two-eight minute 5v5 short sided games, and four of the same test battery. Each test battery was measured: 1) after warm up, 2) after first half of game, 3) after recovery, and 4) after the second half of the game. Each test battery consisted of measuring heart rate (HR), blood lactate, and rate of perceived exertion (RPE). Two way ANOVA with repeated measures was used to compare active versus passive recovery conditions during multiple time points. **RESULTS:** HR during passive recovery decreased significantly from the first half of game (154.0±21.9 to 91.1±15.9 bpm, p<.05). HR then spiked backed up immediately after second half of the game (145.9±17.8 bpm). During active

recovery, HR remained elevated during recovery (143.2 ± 15.4 to 145.2 ± 14.3 bpm, $p > 0.05$) and slightly decreased (137.6 ± 17.3 bpm) immediately after the second half. Baseline lactate levels were significantly higher on the day of active recovery than passive recovery (7.4 ± 2.3 vs. 4.6 ± 2.9 mM, $p < 0.05$). Furthermore, active recovery produced significantly higher lactate than passive recovery (14.9 ± 7.4 vs. 3.7 ± 2.9 mM, $p < 0.05$). However, active recovery showed 13.6% decrease (from 14.9 ± 7.4 to 13.1 ± 6.5 mM) in their lactate levels after the second half of game whereas during passive recovery, an increase in lactate level of 18.9% was shown (3.7 ± 2.9 to 4.4 ± 1.8 mM). RPE also confirmed that the subjects were feeling less fatigued after active recovery than passive recovery although the difference was not significant (10.8 ± 1.4 vs. 11.3 ± 1.5 , $p > 0.05$). **CONCLUSION:** Active recovery left subjects feeling less fatigued in the second half which was noted by a decrease in HR, RPE, and lactate in the second half of the game. These results suggest that active recovery could decrease the risk for injury and increase an athlete's performance in the second half.

Test-Retest Reliability and Learning Effect of the Modified CTSIB Balance Protocol in a Geriatric Population

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PURPOSE: The purpose of this study was to determine the test-retest reliability of the modified Clinical Test of Sensory Integration and Balance (CTSIB) test on a clinical balance system in a geriatric population. **METHODS:** Twenty individuals (15 males and 5 females, age = 82.5 ± 7.0) were recruited through the retirement facilities' wellness program to participate in the study. The individuals reported to the wellness center on two different days with a minimum of 48 hours between testing sessions. The Biodex Balance System SD was used to determine the sway index during a modified CTSIB protocol that utilized four 30-second trials under different sensory conditions; eyes-open firm surface (EO-S), eyes-closed firm surface (EC-S), eyes-open soft surface (EO-U) and eyes-closed soft surface (EC-U). A 2 (day) x 4 (condition) ANOVA with repeated measures was conducted to determine significance ($p < 0.05$). **RESULTS:** The main effect of day demonstrated high reliability. The day-to-day testing revealed no significant difference between days of testing with mean sway index scores of 1.28 ± 0.86 and 1.31 ± 0.85 , for Day 1 and Day 2 respectively. In addition, day-by-condition analysis and post hoc testing also showed high reliability with no significant differences from Day 1 to Day 2 for any of the 4 conditions. The main effect of condition revealed that as the CTSIB was able produce more challenging balance conditions as the test progressed ($p = 0.44$). Post hoc analysis revealed that the sway index scores significantly increased from the most to least stable condition, EO-S = 0.62 ± 0.16 , EC-S = 1.09 ± 0.30 , EO-U = 1.19 ± 0.49 , and EC-U = 2.94 ± 0.86 . The only condition during the test that did not show a significant difference was the transition from EC-S and EO-U. **CONCLUSION:** The modified CTSIB demonstrated strong reliability for day-to-day comparisons suggesting no learning effect between trials. In addition, the CTSIB uses progressively challenging sensory conditions that stress the proprioceptive feedback system needed to maintain balance in older adults. The strong reliability of in this study suggest that the modified CTSIB is a reliable test for older adults and the sensory challenges used to test may help prescribe training or rehabilitation for older adults whose sensory system may be compromised.

Perceptions, Knowledge, and Attitudes of Inter-professional Education and Collaboration

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PURPOSE: To assess perceptions, knowledge, and attitudes of inter-professional education (IPE) and inter-professional collaboration (IPC) of students in health care programs at one institution. **METHODS:** Senior and select graduate students from community health, exercise science, medical laboratory science, nursing, respiratory therapy, and social work were invited to participate in a one day interdisciplinary conference that included a guest speaker and interdisciplinary break-out discussions on two hypothetical case studies. One case involved a student athlete in a car crash with traumatic brain injury, while the other case was a mother that sustained a back injury with a history of lung disease and opioid addiction. Perceptions, knowledge, and attitudes related to IPE and IPC were assessed utilizing the Inter-professional Perception, Knowledge, and Attitudes Scale (IPKAS) pre and post conference. Participants also completed an open-ended three-question feedback survey. Pre and posttest scores on the IPKAS were compared using a paired t-test. Differences among programs and survey questions were analyzed with the chi-square statistic. Common themes were identified in the answers to open-ended questions. **RESULTS:** Significant differences were found in IPKAS subscales scores. Scores increased on overall perception ($t = 5.61$,

df=91, $p<.001$), inter-professional education ($t=5.53$, $df=91$, $p<.001$), roles and responsibilities ($t=5.36$, $df=91$, $p<.001$), and communication ($t=4.61$, $df=91$, $p<.001$). Pre-conference differences were found between programs and their agreement with the statement that my discipline encourages teamwork between professionals ($\chi_4=11.62$, $P=.02$). Both pre ($\chi_{12}=26.42$, $p=.01$) and post ($\chi_8=18.10$, $p=.02$) conference differences were found between programs and how much they agreed with the statement that other disciplines think highly of my discipline. Open-ended responses show participants felt learning about others was a valuable experience of the conference. They wanted more case studies and inclusion of additional programs from across campus. Teamwork was identified as important in improving practice. **CONCLUSION:** A one-day conference on IPE and IPC was effective in changing perceptions, knowledge, and attitudes of students from a variety of health care programs.

Blood Pressure Reactivity During Short-term Water Restriction in Older Adults

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Water restriction (WR) reduces plasma volume and concentrates blood electrolytes (e.g. sodium [Na⁺]), resulting in hyperosmolality. Animals models demonstrate an association between hyperosmolality and blood pressure (BP) dysregulation. In humans, BP dysregulation is associated with future cardiovascular disease risk. However, it is unknown if WR causes BP dysregulation in older adults, a population that frequently experiences dehydration in daily life. **PURPOSE:** Therefore, we tested the hypothesis that WR induces hyperosmolality and consequently augments BP reactivity in older adults. **METHODS:** Five older adults (4F/1M; age: 70±2 yrs; BMI: 24±1 kg/m²; BP: 122±6/79±3 mmHg) completed two hydration conditions in random order. A normal hydration (NH) and WR visit were separated by at least one week. Daily water intake for the NH condition was 23mL water/kg bodyweight/day for 3 days prior to testing. The WR condition included a stepwise reduction in water intake over 3 days followed by a 16hr WR prior to testing. Beat-to-beat BP was measured via finger photoplethysmography throughout a 10-min baseline, handgrip exercise (HG, 30% MVC, 2min), post-exercise ischemia (PEI, upper arm occlusion at 250mmHg, 3 min), and a cold pressor test (CPT, hand in ice-cold water, 2 min). Peak responses were calculated as the change in BP during the final minute of each perturbation compared to the respective baseline. **RESULTS:** Plasma volume, estimated by changes in hemoglobin and hematocrit, declined 4.6±2.4% following WR. Serum Na⁺ (140.7±1.0 vs. 142.3 ±1.0 mmol/L, $p=0.01$), plasma osmolality (296.6±1.9 vs. 300.6 ±2.0 mOsm/kg H₂O, $p=0.04$), and spot urine specific gravity (1.013±0.003 vs. 1.020±0.002, $p=0.02$) were higher for the WR condition, suggesting mild hypohydration. Mean BP responses were not different between conditions (HG: Δ11±6 vs. 12±2 mmHg, $p=0.89$; PEI: Δ18±5 vs. 11±3 mmHg, $p=0.46$; CPT: Δ22±2 vs. 17±2 mmHg, $p=0.14$; NH vs. WR for all). **CONCLUSION:** These preliminary findings suggest that short-term water restriction does not augment blood pressure responses during isometric handgrip exercise in older adults.

Supported by NIH Grant 1R01HL128388 (WBF & SDS), NIGMS P20GM113125 (COBRE), and University of Delaware Doctoral Fellowship (JCW).

Examining the Effect of a Dance Technique Class on Postural Stability in Novice Collegiate Dancers

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Postural stability is an essential skill across many genres of dance to create and maintain specific positions and motions with proper technique, but limited research has examined changes in postural stability following a dance intervention in novice collegiate dancers. This may, in part, be due to the use of costly equipment to assess postural stability; the use of balance boards has been shown to be a cost-effective alternative. **PURPOSE:** to examine the effect of an introductory dance technique class on postural stability in novice collegiate dancers. **METHODS:** Balance boards were used to assess postural stability at the beginning and end of a college semester via four 30-second trials: bilateral stance - eyes open (BEO), bilateral stance - eyes closed (BEC), unilateral stance - right leg (UR), and unilateral stance - left leg (UL). The experimental group (EG; $n = 8$) participated in an introductory dance class involving ballet and modern dance technique. Participants in the control group (CG; $n = 8$) never received dance training. Average center of pressure velocity (vCoP) was compared between groups and pre/post within groups. **RESULTS:** Post-intervention, the EG had a mean vCoP of 0.24 m/s in the BEC trial, 0.05 m/s less than that of the CG, indicating better postural stability in the EG ($p=0.09$). Similar results were seen in BEO post-intervention, in which the EG had a mean vCoP of 0.20 m/s, 0.06 m/s less than the CG, again indicating the EG had

better postural stability ($p=0.07$). When comparing pre/post for UL trials, the CG displayed better postural stability at post-testing with a mean vCoP 0.36 m/s less than during pre-testing ($p<0.01$). No other comparisons of vCoP were found significant when comparing within groups pre/post or between groups. **CONCLUSION:** Overall, the EG showed better postural stability than the CG during post-testing trials BEO and BEC. While no significant improvements were seen in the EG post-intervention, postural stability in the EG remained intact despite confounding variables present at the end of semester (exams, fatigue, etc.). As participants here were healthy young adults, this intervention may be better suited for populations in which diminished postural stability is associated to a high risk of falls.

This study was conducted with support from the Skidmore College Student Opportunity Funds.

Investigating Bilateral Asymmetries in Joint Angular Motion of the Lower Limb During Running

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Measures of bilateral symmetry are frequently employed to assess athletic performance and injury risk. When analyzing running gait, prior research has often utilized spatial-temporal variables such as stride length and stride rate. However, joint angular asymmetries during running across a range of speeds in athletic populations remains relatively unexplored. **PURPOSE:** To investigate bilateral asymmetries at the hip and knee during running in trained athletes. **METHODS:** Eleven healthy male and female intercollegiate athletes (height= 1.66 ± 0.23 m, mass= 67.80 ± 18.77 kg, age= 21.18 ± 1.08 years) from a range of sports volunteered and provided written informed consent. After completing a dynamic warm-up, subjects performed a series of 40m runs in an indoor athletic facility. One or two trials were completed at each of the following self-selected speeds: jog, run, submaximal sprint, and maximal sprint. A 3D motion capture system (OptiTrack, 200 Hz) collected kinematic data as subjects ran through the field of view from 30-38m. For each trial, angular kinematics for the hip and knee joints were analyzed for both a right and left gait cycle. Angular position vs. time data was synchronized for right vs. left hip and right vs. left knee joints. A total of 36 trials (72 steps) were analyzed, with asymmetry quantified by Root Mean Squared Error (RMSE). **RESULTS:** Paired-samples *t*-tests revealed significantly less asymmetry in bilateral hip angular motion compared to knee angular motion ($p < 0.001$, hip RMSE = 4.95 ± 1.86 degrees, knee RMSE = 7.97 ± 2.40 degrees). The relationship between hip and knee asymmetry was moderate ($R^2 = 0.38$), implying that asymmetry at the knee is not completely determined by hip angular motion. **CONCLUSION:** In addition to spatial-temporal variables, analysis of joint angular motion may provide further insight into locomotor gait asymmetries in athletic populations. In this athletic population, hip angular motion was relatively symmetrical, perhaps functioning to reduce torques about the center of mass.

Reliability and Validity Analysis of the COSMED K5 Portable Metabolic System

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Increased energy expenditure via physical activity has been shown to improve health outcomes. It is difficult to accurately measure energy expenditure and physical activity outside the laboratory. **PURPOSE:** To determine the reliability and validity of the K5 portable metabolic system. **METHODS:** 27 ($n = 15$ females) healthy adults (27 ± 5 yrs; $21.0 \pm 8.2\%$ body fat) completed a treadmill walking protocol. Participants completed 3 identical trials of 5-min stages that included standing and 6 walking speeds from 1.5 to 4.0 mph in 0.5 mph increments, with a 2-min rest between stages. Visit 1 consisted of wearing the K5 system. During visit 2 (1-7 days later), participants wore the K4 and K5 systems in a randomized, counter-balanced order. Oxygen and carbon dioxide consumption (VO_2 and VCO_2 , respectively), ventilation (V_e), and metabolic equivalents (METs), were recorded breath-by-breath and averaged from minutes 2.5 to 4.5 from each stage for analysis. Reliability of the K5 was determined using an intraclass correlation coefficient (ICC). Validity was assessed using Pearson correlations (r) and paired *t*-tests. **RESULTS:** In standing, the ICC for all metabolic variables ranged between .50 and .63. For all walking speeds, the ICC for VO_2 , VCO_2 , V_e , and METs ranged between .69-.84, .59-.80, .75-.87, and .53-.77, respectively. The range of mean differences between systems for VO_2 , VCO_2 , V_e , and METs was -52.3-1.23 mL/min; -46.8-79.1 mL/min; -0.06 - -0.67 L/min; -0.07 - 0.07 METs, respectively. There was a moderate to strong relationship between K4 and K5 in VO_2 , VCO_2 , and V_e ($r = .49-.80$; $.51-.82$; $.69-.87$, respectively) and a low to moderate relationship for METs ($r = .38-.57$). Statistically significant mean differences between K4 and K5 were only noted in VCO_2 ($p \leq 0.043$) at 1.5mph, and 2.5-4.0 mph. **CONCLUSIONS:** The K5 provided reliable and valid measures of VO_2 , VCO_2 , V_e , and METs across a variety of walking speeds, with higher reliability and validity noted at 3.0-4.0 mph. Although

significant differences in $\dot{V}O_2$ were observed, they were fairly small (-48.2-79.1 mL/min). Results were less consistent for standing. Future studies should examine the reliability and validity of the K5 during running.

Comparison of Gait Patterns and Everyday Dual-Tasks in College Students

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Performing a dual-task (DT), such as texting and walking, has been shown to negatively impact gait patterns. Additionally, cognitive thinking and carrying tasks have also been linked to increases in step width and decreases in stride length and gait speed. **PURPOSE:** To compare the impact of everyday tasks on selected gait parameters in a college-aged sample. **METHODS:** Thirteen (7 females and 6 males) subjects ($M \pm SD$ age: 20.28 \pm 1.50 years, body mass index: 26.88 \pm 5.16 kg/m², height: 171.16 \pm 8.00 cm, mass: 78.90 \pm 18.94 kg) completed three trials for each DT condition. The conditions were control (CON), carrying groceries (CG), texting (TEX), and cognitive thinking (CT). Subjects were instructed to walk at their habitual walking pace for 15 m and a gait mat was placed in the middle of the walkway. Gait speeds (GS) were calculated for 5 m, 10 m, and 15 m. Statistical analysis for stride length (SL) was completed using 9 subjects due to missing data. Data were analyzed using a repeated measures ANOVA. **RESULTS:** The repeated measures ANOVA yielded a statistically significant difference for the calculated GS at 5 m ($F = 6.21, p = .028$), 10 m ($F = 28.18, p < .01$), and 15 m ($F = 36.061, p < .01$). Texting GS at 15 m decreased ($M \pm SD = 1.15 \pm 0.08$ m/s) by 14.2% as compared to the CON 15 m GS ($M \pm SD: 1.34 \pm 0.11$ m/s). A similar trend was noted during the CT ($M \pm SD: 1.11 \pm 0.12$ m/s); whereas GS decreased by 17.2%. SL ($F = 12.63, p < .01$) decreased when the subjects completed the TEX ($M \pm SD: 127.47 \pm 6.63$ cm) and CT ($M \pm SD: 124.67 \pm 11.93$ cm) DT conditions by 9.22% and 11.22% as compared to CON ($M \pm SD: 140.43 \pm 10.86$ cm). A statistically significant difference was also noted for cadence ($F = 11.27, p < .01$). Cadence decreased during the TEX ($M \pm SD: 109.88 \pm 4.69$ steps/min vs. CON: 114.96 steps/min) and CT ($M \pm SD: 107.22 \pm 8.66$ steps/min vs. CON: 114.96 steps/min) DT conditions. No differences were found between the CON conditions and CG or TEX and CT ($p > .05$) on the selected gait variables. **CONCLUSION:** Subjects walked slower, decreased their stride length and cadence when texting and computing basic math problems while walking. However, the selected gait variables were not negatively impacted by carrying groceries. These findings suggest college-aged students tend to focus more on certain tasks more than the motor skill.

Metabolic and Cardiovascular Effects of Standing While Performing Computer Work

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Current information regarding the efficacy of standing desks and their long-term health benefits are conflicting. Short term studies have focused on the metabolic effects and generally report increased energy expenditure. However, long term research suggests occupational standing may increase the risk of cardiovascular disease. **PURPOSE:** To evaluate the metabolic and cardiovascular differences between sitting and standing while doing computer work. **METHODS:** Twelve healthy subjects (23 \pm 2.1 yrs; 5 females, 7 males) were examined. Subjects participated in two trials (sitting and standing) during which they completed simple mouse driven computer tasks. Trials were completed back-to-back beginning with seated. Each trial lasted 15 minutes. Throughout the test indirect calorimetry was used to monitor oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$) and ventilation (\dot{V}_E), a continuous blood pressure system monitored systolic BP (SBP), diastolic BP (DBP), mean arterial pressure (MAP) and heart rate (HR), and three near-infrared spectroscopy units were used to monitor muscle oxygen saturation (SmO_2) of the quad (Q), calf (C) and forearm (FA). Data from the last five minutes of each condition was averaged together and used in the analysis. All BP measures were calculated as change scores from the first 5 minutes of seated baseline. Analysis consisted of comparing the mean from the last 5 minutes in the sitting vs. standing trial using a student's t-test. **RESULTS:** Standing vs. sitting HR (78 \pm 9 bpm vs. 68 \pm 10 bpm; $p < 0.001$), $\dot{V}O_2$ (4.1 \pm 0.9 mL/kg/min vs. 3.5 \pm 0.9 mL/kg/min; $p = 0.019$) and \dot{V}_E (9.9 \pm 2.7 L/min vs. 8.8 \pm 2.0 L/min; $p = 0.041$) were elevated while standing compared to sitting. $\dot{V}CO_2$ was no different between trials (0.25 \pm 0.08 L/min vs. 0.22 \pm 0.07 L/min; $p = 0.106$). SBP (7 \pm 12 mmHg vs. 5 \pm 12 mmHg; $p = 0.698$) and MAP (5 \pm 8 mmHg vs. 1 \pm 8 mmHg; $p = 0.174$) were not different between conditions, but DBP (6 \pm 6 mmHg vs. 0 \pm 6 mmHg; $p = 0.023$) was greater in the standing condition. The standing vs. sitting Q SmO_2 (70 \pm 13 % vs. 85 \pm 11 %; $p < 0.001$), C SmO_2 (60 \pm 11 % vs. 75 \pm 12 %; $p = 0.005$), and FA SmO_2 (55 \pm 8 % vs. 62 \pm 9 %; $p = 0.003$) were all

lower while standing. **CONCLUSION:** These results support the idea that standing desks increase energy expenditure, but the elevated DBP may indicate increased cardiovascular stress.

The Effects of Static and Dynamic Stretching on Postural Stability, Hip Flexibility, and Power

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PURPOSE: The purpose of this study was to investigate the effects of a dynamic (DS), static (SS) or no stretching (NS) warm-up on postural sway, hip power, hip range of motion (ROM), and vertical jump height. **METHODS:** In this crossover study, participants attended one familiarization and three testing sessions, each separated by at least 48 hours. At each testing session, the subject completed a 5-minute light aerobic activity (1Kp) on a cycle ergometer immediately followed a 7-minute DS video, 7-minute SS video or sitting (NS) to complete the warm-up. DS and SS protocols were designed to equally target (time/intensity) muscle groups of the lower limb. Following the warm-up, hip ROM (flexion, extension, abduction, adduction) was measured with a goniometer, 1-foot stance for sway on a force plate, countermovement vertical jump height and hip power was recorded using an isokinetic dynamometer at 60°- and 180°•sec⁻¹. A one-way ANOVA with repeated measures with a Fisher LSD post-hoc test was used to determine significance ($p < 0.05$) for each variable. **RESULTS:** For ROM, measured in degrees, hip flexion and adduction showed no significant difference; however, compared to NS, DS and SS improved hip extension (19.7 ± 6.2 ; 20.7 ± 2.6 ; 25.2 ± 6.3 , respectively) and abduction (31.8 ± 5.3 ; 37.1 ± 7.8 ; 40.3 ± 8.9 , respectively). For isokinetic power (W) at 60°•sec⁻¹, DS significantly generated more power than NS and SS (DS=during flexion but no difference in extension ($p = 0.11$). Isokinetic power (W) at 180°•sec⁻¹ showed difference between all warm-ups (DS $427.65 \pm 80.4 > SS 256.7 \pm 76.6 > NS 216.5 \pm 73.31$) for flexion and both DS and SS produced more force than NS during extension (DS 102.3 ± 55.4 and SS $105.2 \pm 54.0 > NS 88.5 \pm 45.1$). There were no differences detected between conditions for postural sway or vertical jump. **CONCLUSION:** The literature on the effects of stretching prior on performance varies and the results of this study substantiate the different results from previous studies. The variables of sway and vertical jump showed no differences between conditions. The acute benefits for improved ROM was only found in 2 of the 4 exercises. Finally, isokinetic power was generally increased following stretching; however, DS gave the greatest benefits.

Measured vs. self-report height, weight and BMI: Relationships with health outcomes and behaviors

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Researchers, policy makers, and clinicians commonly use height and weight to determine BMI and classify weight status. Self-report measures are utilized in a considerable portion of the scientific literature and national surveys, but often result in misreporting of height and weight, and consequentially underestimation of BMI and therefore potentially BMI category (weight status) misclassification. **PURPOSE:** To examine differences in self-reported and measured height, weight and BMI values, and whether discordance is associated with other anthropometric measures, fitness levels, and physical activity (PA) and sedentary behaviors (SB). **METHODS:** Data were collected from college students via: (1) a pre-consultation online questionnaire where participants self-reported sex, height, and weight; (2) an objective fitness assessment that assessed height, weight, body fat percentage, abdominal girth, predicted aerobic fitness, and muscular endurance; and, (3) a post-assessment electronic survey that assessed PA and SB. Parametric and non-parametric analyses was used to examine differences between groups. **RESULTS:** Self-report and measured height and weight data were collected from 1,061 participants, 224 of whom also provided PA and SB data. Women significantly under-reported weight ($p = .003$, $\eta^2 = .02$), and both sexes over-reported height ($p < .001$, $\eta^2 \geq .07$), resulting in a significant difference between BMIs calculated using self-reported and measured values ($p < .001$, $\eta^2 \geq .07$) and misclassification of BMI category of ~15% of both sexes. Minimal differences were found in anthropometric, fitness, or PA between those who over and underreported their height, but significant differences were found based on reporting differences for weight ($p \leq .015$) and BMI ($p \leq .015$). **CONCLUSION:** Students were found to have a tendency to underreport weight and overreport height, resulting in BMI category misclassification. Findings suggest that those who underreport weight tend to be in poorer health, as indicated by lower aerobic fitness in and higher abdominal girth and body fat percentage in particular. With respect to PA, overreporters tended to report lower PA

levels than under and accurate reporters. Further research is required to establish the link between underreporting weight and overreporting PA.

Exercise Intensity: Do Individuals Perceive It as We Physiologically Define It?

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The American College of Sports Medicine (ACSM) defines exercise intensities using physiological measures (%VO₂max, %VO₂R, %HRmax, %HRR). Currently, there are no studies examining if individuals perceive the exercise intensity as it is defined by the physiological ranges. **PURPOSE:** To determine if individuals perceive aerobic exercise intensities as defined by %VO₂max. **METHODS:** Thirty-three subjects (16 males, 17 females) aged 27.6 ± 10.6 years, BMI 24.8 ± 2.9 kg·m⁻², and VO₂max 43.5 ± 7.3 mL·kg⁻¹·min⁻¹ participated in this study. Subjects completed a Bruce treadmill protocol to maximal exertion while rating the intensity at the end of each stage using a Perceived Intensity (PI) scale. The scale reads: Very Light, Light, Moderate, Vigorous, Near Maximal, and Maximal. Subjects were given standard instructions on how to use the scale during the test. Actual Intensity (AI) was determined using %VO₂max attained at the end of each stage. PI rated at the end of each stage was compared against the AI. Near Maximal and Maximal were combined into one category (Near Max/Max) for statistical analyses. **RESULTS:** Correlation analyses showed a strong relationship ($r = 0.918$, $p < 0.001$) between PI responses and %VO₂max. Contingency tables showed PI ratings that matched AI were 73.3%, 50.0%, 34.5%, 37.1%, and 78.6% at Very Light, Light, Moderate, Vigorous, and Near Max/Max intensities, respectively. At Moderate intensities, 10.3% and 55.2% of PI ratings were Very Light and Light, respectively. At Vigorous intensities, 11.4% and 48.6% of PI ratings were Light and Moderate, respectively. Cohen's Kappa (K) revealed a moderate agreement between PI and AI ($K = 0.447$, $p < 0.001$). **CONCLUSION:** Current physical activity recommendations state that adults should participate in moderate and vigorous intensity activities for several health-related benefits. Despite having a strong relationship with %VO₂max, the majority of subjects under-rated moderate and vigorous intensities as they are defined by %VO₂max. The agreement observed suggests that further subjective definitions of intensity and practice may be needed to match perceptions with physiological measures. Therefore, individuals may need additional familiarization with intensity definitions if they are going to use perceptual measures to regulate intensity as defined by the ACSM.

Exercise and High-Fat Diets Upregulate Endoplasmic Reticulum Membrane Protein Sensors and Muc2 in Female Mice.

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A dense dual-layered mucus barrier, comprised of the muc2 mucin glycoprotein, protects the colon epithelium from luminal microbes and the external environment. The complexity and high secretory output of muc2 makes it prone to misfolding which activates the unfolded protein response (UPR) contributing to endoplasmic reticulum (ER) stress if unresolved. Interestingly, high fat diets have shown to induce colonic epithelial stress and inflammation which may be attenuated by exercise. **PURPOSE:** We aimed to examine impact of a high-fat diet (HFD) and exercise on the gene expression of factors involved in the UPR and ER stress in male and female mice colon. **METHODS:** 56 (n=7/group) 6-week old C57BL/6NTac male and female mice were weighed and randomly assigned to one of 4 groups: (1) control-diet sedentary (CDS, 10% fat diet, Research Diets); (2) very high-fat diet sedentary (VHFS, 60% fat, Research Diets); (3) control-diet exercise (CDX); and (4) very high-fat diet exercise (VHFX) for 12 weeks. Mice had *ad libitum* access to food and water. Exercised mice had free access to a running wheel in their cages. Food intake was monitored every other day and body weights once per week. After 12 weeks animals were sacrificed. Total RNA was extracted from colon tissue fixed in RNAlater and converted into cDNA using the RNeasy Mini and First Strand kits. qRT-PCR was performed using a custom RT2-profiler PCR array (Qiagen). Ct values were normalized to GAPDH and unpaired student t tests were used to analyze group means of Δ Ct values for each sex. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. Relative expression to CDS groups was assessed using the $\Delta\Delta$ Ct method. **RESULTS:** For females, Atf6 and Ire1 β expression was increased in VHFX mice (0.9 and 1.1-fold times) compared to VHFS (0.6-fold times; $p = 0.001$ and $p = .008$). Muc2 expression was significantly increased in CDX mice (2.3-fold times) compared to VHFS (0.7-fold times; $p = 0.02$). In males, no significant differences in the expression of any factor was observed. **CONCLUSION:** High-fat diets coupled with exercise increase the expression of endoplasmic reticulum membrane protein sensors involved in the unfolded protein response in females. Exercise increases muc2 expression in females.

The Modulating Effects of Sunscreen and Simulated Sweat on Ultraviolet Radiation-Induced Microvascular Dysfunction in the Human Cutaneous Vasculature

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Nitric oxide (NO)-mediated vasodilation is attenuated in the cutaneous microvasculature after acute ultraviolet radiation (UVR) exposure. Application of sunscreen to the skin protects from, while sweat on the skin may exacerbate, the deleterious effects of UVR. It is unknown whether the presence of sunscreen or sweat on the skin influences the effect of UVR exposure on NO-dependent vasodilation, a marker of skin vascular health. **PURPOSE:** To compare the impact of acute UVR, UVR with sunscreen (+SS), and UVR with simulated sweat (+SW) on NO-mediated vasodilation in the cutaneous microcirculation. We hypothesized that +SS would blunt and +SW would augment the reduction in NO-dependent vasodilation following acute UVR exposure. **METHODS:** Three intradermal microdialysis fibers were placed in the ventral skin of the left forearm, while a single fiber was placed in the right forearm, in 6 healthy adults (23±4 y; 1M/5F). Sites on the left forearm were randomly assigned to UVR exposure (450 mJ/cm²), UV+SS, or UV+SW, while the sight on the right forearm served as a non-UVR exposed control (CON). Following UVR exposure, a standardized local heating (42°C) protocol induced cutaneous vasodilation. After attaining a plateau blood flow, 15mM N^G-nitro-L-arginine methyl ester (L-NAME; NO synthase inhibitor) was infused at all sites to quantify the NO contribution to cutaneous vasodilation. Red cell flux was measured at each site (laser-Doppler flowmetry) and cutaneous vascular conductance (CVC=flux/MAP) was expressed as a percentage of maximum (%CVC_{max}; 28mM sodium nitroprusside+43°C) for each phase of the local heating response. NO contribution (%NO) was calculated as the difference between the local heating and L-NAME plateaus. **RESULTS:** There were no differences in %CVC_{max} between treatments at baseline ($p \geq 0.75$), initial peak ($p \geq 0.19$), or heating plateau ($p \geq 0.25$). However, UVR blunted %NO compared to CON (31.0±4.5 vs 13.6±3.4%; $p < 0.01$). The attenuation in %NO was prevented by sunscreen (UVR: 13.6±3.4 vs +SS: 43.6±7.8%; $p < 0.01$) or simulated sweat (UVR: 13.6±3.4 vs +SS: 42.1±7.0%; $p < 0.01$) on the skin. **CONCLUSION:** Acute UVR exposure attenuates NO-mediated vasodilation in the cutaneous microvasculature. The presence of sunscreen or sweat on the skin may play a protective role against this effect.

Supported by ACSM Foundation Doctoral Student Research Grant #17-00552

Facial Expressions and Performance: Testing the Effects during a Muscular Endurance Task

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INTRODUCTION: A number of emotional factors influence the outcome of everyday tasks. Mood states such as happy, sad, and angry, for instance, are thought to impact performance-based activities. Recent research (Brick, McElhinney, & Metcalfe 2017) also suggests that mood states mediated by facial expressions affect running economy and physiological variables such as: VO₂max, ratings of perceived exertion (RPE), and heart rate (HR). However, to date, there is a lack of literature concerning facial expressions' potential effects on muscular endurance tasks. **PURPOSE:** The purpose of this study was to test the role of facial expressions and consequent mood states on RPE and time on task during a handgrip squeezing task. **METHODS:** Forty participants (20 female, 20 male), ranging from age 18-25, took part in this study. Participants were randomly assigned into one of the following facial or control conditions: (1) sad, (2) happy, (3) angry, and (4) control (no facial expression). A baseline measure of maximal squeezing value was taken. Participants were instructed to squeeze the dynamometer at 30% of their maximal squeezing value up to volitional fatigue. Participants were also instructed to keep their assigned facial expression and reflect on a memory that provoked that expression in the course of their squeezing performance. Participants in the control group were not asked to hold any facial expressions or reflect on related memories. RPE and time on task were recorded at task completion. **RESULTS:** Preliminary results from one-way ANOVA analyses showed no significant differences in RPE, $F(3,36) = 1.08$, $p = .37$ and time on task, $F(3,36) = 1.4$, $p = .26$ between the conditions. **CONCLUSION:** Although the results were not significant, role of facial expressions and mood states should be further investigated within strength and endurance settings. From a practical standpoint, exploring the link between moods and performance can provide practitioners with tools to promote performance while accounting for individuals' general well-being and relevant mood states.

Supported by a West Chester College of Health Sciences Student -Faculty Research Award and West Chester University Foundation Faculty and Student Research (FaStR) Grant

Effects of Varied Rest Intervals on Vertical Countermovement Jump Performance and Fatigue Index

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Finding an optimal rest period that results in a high level of performance can be difficult. It is important to match the rest interval (RI) with the intended activity in order to minimize fatigue and maximize functionality. **PURPOSE:** To investigate the effects of varied rest intervals on vertical countermovement jump performance, power/velocity, fatigue, and rate of perceived exertion (RPE). **METHODS:** Sixteen (8 male, 8 female) subjects (21.2 ± 0.9 yrs) came in on three separate occasions and completed three sets of 10 vertical jumps (VJ). On each occasion, a different RI (30, 60 or 90 seconds) was administered between tests. Jump height, average and peak power and velocity, fatigue index (%), and RPE were measured and/or calculated for each set and condition. A 3 x 3 factorial analysis of variance was used to compare differences in RIs with jump height, average and peak velocity/power, fatigue index and RPE. **RESULTS:** Sixty second RI showed the most improvement in average jump height from the previous set (Set 1: 19.1 ± 3.6 to 19.4 ± 3.3 in (+1.5%), Set 2 to 3: 19.4 ± 3.3 to 19.8 ± 3.4 in (+2.1%), when compared to 30-sec (Set 1 to 2: -0.5%, Set 2 to 3: +2.0%) or 90-sec RI (Set 1 to 2: +2.1%, Set 2 to 3: 0%). However, these improvements were not statistically significant ($p > 0.05$). While no significant difference was observed in average ($p = 0.518$) or peak ($p = 0.261$) power between sets, significant difference was observed in peak velocity between 1st and 3rd set with 3rd set showing the highest velocity (1.28 ± 0.01 vs. 1.39 ± 0.03 m·sec⁻¹, $p < 0.05$). However, no significant difference in peak velocity was observed between RI conditions. 60-s RI showed the least amount of fatigue, but there was no statistical difference between 30, 60 and 90 RI conditions (4.43 ± 0.58 vs. 3.26 ± 0.07 vs. $4.50 \pm 0.75\%$ respectively, $p > 0.05$). RPE from set 3 was significantly higher than set 1 but not set 2 (12.3 ± 1.6 vs. 10.2 ± 1.6 vs. 11.4 ± 1.6 , $p < 0.05$), however no statistically significant differences were found between RI conditions. **CONCLUSION:** Based on the results, varied RIs did not significantly alter vertical jump performance or fatigue. Although not significant, modest improvement on performance was shown during 60 RI condition, which may impact an athlete's performance.

Static Cerebral Autoregulation is Not Altered in Symptomatic Concussed Athletes During Acute Central Hypervolemia

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Dynamic cerebral autoregulation is impaired in concussed individuals. However, less is known regarding static cerebral autoregulation in symptomatic concussed athletes during a central hypervolemic challenge that increases blood pressure. **PURPOSE:** We tested the hypothesis that static cerebral autoregulation during a central hypervolemic challenge is impaired in symptomatic concussed college athletes (CA) vs healthy controls (HC). **METHODS:** Seven CA (age: 19 ± 2 y, 5 females) and ten HC (age: 21 ± 2 y, 6 females) completed one study visit. After 5 min of resting baseline, 20 mmHg of lower body positive pressure (LBPP) was applied for 5 min using an airtight chamber. Beat to beat blood pressure (photoplethysmography) and middle cerebral artery blood velocity (MCAv; transcranial Doppler) were recorded continuously. Static cerebral autoregulation was calculated using Fourier transfer function analysis with 3 min segments at baseline and after mean arterial pressure (MAP) stabilized during LBPP. Cerebral vascular resistance (CVR) was calculated as $MAP/MCAv$. Pulsatility index (PI) was calculated as the difference of peak systolic MCAv and end diastolic MCAv, divided by mean MCAv. Values are reported as a change from baseline. **RESULTS:** MAP (CA: 90 ± 6 vs HC: 92 ± 11 mmHg; $P = 0.32$), MCAv (CA: 58.7 ± 19.4 vs HC: 62.6 ± 11.1 cm/s; $P = 0.30$), gain (CA: 0.7 ± 0.2 vs HC: 0.8 ± 0.2 cm/s/mmHg; $P = 0.17$), coherence (CA: 0.5 ± 0.1 vs HC: 0.5 ± 0.1 ; $P = 0.21$), CVR (CA: 1.7 ± 0.6 vs HC: 1.5 ± 0.3 mmHg/cm/s; $P = 0.21$), and PI (CA: 0.9 ± 0.1 vs HC: 0.9 ± 0.2 ; $P = 0.31$) were not different at baseline. The change in MAP was not different between CA (12 ± 6 mmHg) and HC (8 ± 6 mmHg; $P = 0.12$). The change in MCAv was greater in CA (CA: 4.8 ± 4.6 vs HC: -4.3 ± 8.7 cm/s; $P = 0.01$). There were no differences in the change from baseline for gain (CA: 0.1 ± 0.2 vs HC: 0.1 ± 0.5 cm/s/mmHg; $P = 0.49$) or coherence (CA: -0.0 ± 0.1 vs HC: -0.0 ± 0.1 ; $P = 0.40$). The increase in CVR was attenuated in CA (CA: 0.0 ± 0.2 vs HC: 0.3 ± 0.3 mmHg/cm/s; $P = 0.04$). The decrease in PI was greater in CA (CA: -0.1 ± 0.0 vs HC: 0.0 ± 0.1 ; $P = 0.02$). **CONCLUSION:** These data indicate that indices of static cerebral autoregulation are not different between CA and HC during an acute increase in MAP. The blunted increase in CVR and greater decrease in PI appears to allow for a rise in MCAv during an acute increase in MAP in CA.

Patient Perceptions of a Cancer Rehabilitation Program Which Provides 12 Weeks Of Individualized Exercise Prescription.

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PURPOSE: The purpose of this study was to determine why cancer patients choose to participate and remain in an exercise rehabilitation program. **METHODS:** 79 participants in a cancer rehabilitation program were asked to complete a questionnaire consisting of 6 open ended questions asking 1. Who referred them, 2. What did they follow through with the referral, 3. Why they have chosen to remain in the program, 4. What their initial thoughts of the program were, 5. What their current thoughts about the program are, and 6. Are they satisfied with the program. This study was approved by the Saint Francis University IRB. **RESULTS:** 38% of clients were referred by either an oncologist or family doctor, 25% by hospital staff, 24% by friend or support group and 13% by media outlets. 59% of clients followed through for their health, and 15% for supervision of their exercise sessions. 51% of clients continued in the program because of the results they obtained and 25% because they had not yet met their goals, while 24% continued because of their cancer exercise trainer. 73% of clients had positive thoughts about the program, and 99% had the same or improved thoughts. Finally 94% of clients were satisfied with the program. **CONCLUSION:** The majority of clients were referred by their oncologist, or hospital staff indicating the power that physicians and hospital staff have in providing guidance for their clients. Further, once clients join a cancer rehabilitation program the benefits motivate them to continue in the program. Clearly they are satisfied with the program which is a program which provides individualized personalized exercise prescription and a cancer trainer for support and motivation.

Analgesia, Hyperalgesia and Behavior Modifications are Mediated by Endogenous Opioids Following Forced Swimming Exercise

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Exercise is specifically linked to at least three phenomena that are likely to involve opioid release; the 'athlete's high', increased pain tolerance, and addiction to exercise. Exercise studies that have examined the effects of the opiate receptor blocker naltrexone, found that its administration prior to exercise alter these before mentioned phenomena. **PURPOSE:** The purpose of this study was twofold: 1) to establish an exercise modality that is sufficient to stimulate the release of endogenous opioids and 2) to examine the role endogenous opioids play in post-exercise behavioral modifications. **METHODS:** Following a week of familiarization, mice underwent a 50-minute (min) bout of forced swimming (FS). Mice were injected with either saline (S; 0.9%) or the opioid blocker naltrexone (NTX; 0.4 mg/kg) 15 mins prior to exercise. Following exercise mice were challenged with a tail suspension test (TST), pain test or monitored for post exercise food consumption for 2 hours. **RESULTS:** NXT injection decreased total FS time (46 ± 1.2 mins. vs. 38 ± 1.0 mins; $p < 0.05$). Forced swimming increased food consumption by $88\% \pm 11$ ($p < 0.05$) two hours following exercise but was abolished by NXT ($p < 0.05$), verifying an increase in opioid mediated hyperalgesia. An increase in hot water tail immersion time following exercise ($S = 2.72 \text{ s} \pm 0.13$ vs. $FS = 4.28 \pm 0.19$; $p < 0.05$) demonstrated an improvement in pain tolerance. Pain tolerance decreased by $20\% \pm 0.05$ with the addition of NXT ($P < 0.05$). Finally, a TST demonstrated that following a bout of exercise, mice spent $47 \pm 2.6\%$ less time immobile ($p < 0.05$), signifying lower depression levels. This effect was reversed with the opioid blockade ($p < 0.05$). **CONCLUSION:** Fifty minutes of forced swimming is an effective stimulus for the release of endogenous opioids and modulates behavioral changes mediated through endogenous opioids in mice.

Validity of Barbell Velocities Recorded from the GymAware Device during Squat and Bench Press Exercises

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PURPOSE: To assess the validity of the GymAware linear position transducer (LTP) during the squat and bench press exercises. **METHODS:** Thirteen resistance-trained men (age: 21.7 ± 0.4 years; height 1.74 ± 0.07 m; mass: 82.9 ± 9.5 kg; squat 1RM: 149.85 ± 20.68 kg; bench 1RM: 114.77 ± 18.47 kg.) performed three trials of squat and bench press using the following percentages of a one repetition maximum (1RM): 20, 30, 40, 50, 60, 70, 80%. The order of the loads was counterbalanced across the participants. The mean vertical velocity of the barbell during the concentric phase of each repetition was recorded using a 3-D motion analysis system (Vicon; 200 Hz) and the GymAware LTP. Analysis of variance was used to assess the differences in the vertical velocities across the seven load conditions for

each of the two exercises. **RESULTS:** Mean velocities were significantly different between devices for both the squat and bench press exercises ($p < 0.05$). Specifically the GymAware LTP provided significantly greater velocities under the 20% 1RM and 40% 1RM load conditions in the squat exercise (mean differences: 0.05 ± 0.03 m/s; 0.02 ± 0.02 m/s; $p < 0.05$) in addition to the 30% 1RM load for the bench press exercise (mean difference: 0.04 ± 0.02 m/s; $p < 0.05$). **CONCLUSION:** The GymAware LTP had a tendency to overestimate barbell velocities during the squat and bench press exercises when compared to the Vicon 3-D motion analysis system, particularly at the lighter loads. Such differences may bring into question the validity of the force-velocity characteristics derived from the LTP device during these resistance exercises.

Effect of Acute Exercise on Endothelial Function in African American and Caucasian Men

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Compared to Caucasian individuals (CA), African American individuals (AA) have reduced endothelial function at rest, as well as increased arterial stiffness and attenuated reductions in blood pressure in response to exercise. However, the effects of acute submaximal exercise on endothelial function in AA as compared to CA is unknown. **PURPOSE:** To compare the effect of two different exercises on endothelial function in young, healthy CA and AA men. **METHODS:** Healthy, young (22 ± 2 years), moderately active AA ($n = 6$) and CA ($n = 5$) men were recruited. Participants completed a maximal exercise test on a cycle ergometer to determine peak power output (PPO). In randomized cross-over order, subjects completed a 30 min moderate, continuous (CONT) (60% PPO) and high intensity interval (HII) (intervals of 85% PPO, 3 min and 40% PPO, 4 min) bout of leg cycling exercise. Endothelial function was measured by flow mediated dilation (FMD) using ultrasonography on the brachial artery. FMD measurements were taken at baseline, 10 min post exercise, and 60 min post exercise. **RESULTS:** Baseline FMD did not differ between AA and CA ($5.7 \pm 1.9\%$ vs. $4.5 \pm 2.4\%$) or intra-participant (between visits). There were no significant race, time, or interaction effects in FMD for HII. Changes in FMD were similar for AA and CA at 10 min ($0.35 \pm 5.13\%$ vs $0.82 \pm 2.40\%$) and 60 min ($-1.10 \pm 3.22\%$ vs $-0.04 \pm 0.93\%$) post exercise compared to baseline. For CONT, there was a significant interaction between race and time ($p < .05$). However, post-hoc comparisons showed no significant differences in FMD responses 10 min post exercise between AA and CA (change = $-0.63 \pm 3.55\%$ vs. $-0.89 \pm 4.43\%$). Interestingly, 60 min post exercise, AA had significantly lower ($p < 0.05$) FMD as compared to baseline and in comparison to CA (change = $-3.23 \pm 3.30\%$ vs. $1.95 \pm 2.78\%$). **CONCLUSION:** FMD did not differ significantly between AA and CA men following HII cycling exercise. Following CONT, CA exhibited a biphasic response in FMD (decrease 10 min post, followed by an increase back to/above baseline by 60 min post exercise). However, the FMD response in AA was reduced 60 min after exercise, suggesting physiological differences in the endothelial function in AA following a moderate bout of exercise.

Comparisons of BMI, body fat percentage, and abdominal girth as obesity indexes for college students

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Obesity can be categorized using a number of methods, such as body mass index (BMI), abdominal girth (AG), and body fat percentage (BF%). Each of these methods have their strengths and weaknesses. **PURPOSE:** To compare rates of overweight and obesity as determined by BMI, AG, and BF% and to describe the associations among each method. **METHODS:** 5943 college students completed an objective fitness assessment, where height, weight, AG, and BF%, using BIA, were assessed. Correlation and chi-square tests for independence analyses examined the relationships between the variables and differences in obesity classification. **RESULTS:** The majority of participants identified as men (60.5%). Significant differences were found in the categorization of those meeting obesity criteria by technique. In men and women, respectively, 47.6% and 44.1%, of individuals categorized as normal based on %BF were categorized as overweight or obese by BMI (Men: $\chi^2=1547$, $p < 0.001$; Women: $\chi^2=1127$, $p < 0.001$). In men and women, respectively, 48.3% and 24.0% of individuals classified as normal based on AG were categorized as overweight or obese using BMI (Men: $\chi^2=1274$, $p < 0.001$; Women: $\chi^2=996$, $p < 0.001$). Comparing AG and BF%, 25.1% of men and 18.6% of women categorized as normal based on AG were categorized as overweight or obese using BF% (Men: $\chi^2=1412$, $p < 0.001$; Women: $\chi^2=421$, $p < 0.001$). Significant correlations were found between BMI and BF% for men ($r=0.775$, $p < 0.001$) and women ($r=0.849$, $p < 0.001$); BMI and AG for men ($r=0.868$, $p < 0.001$) and women ($r=0.858$, $p < 0.001$); and, BF% and AG for men ($r=0.749$, $p < 0.001$) and women ($r=0.767$, $p < 0.001$). **CONCLUSION:** Significant associations between BMI, AG, and BF% were found for both

sexes. BMI demonstrated an increased rate of misclassification compared to AG and %BF. Further research is needed in this, and other, populations due to the potential consequences of misclassification of obesity.

CLINICAL CASE STUDIES

Abnormal Uterine Bleeding – Rugby

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Sponsor: Peter H Seidenberg, MD

History:

A 19 year-old female college rugby athlete presented for evaluation of several months of heavy bright red vaginal bleeding for 1-2 hours after any physical activity including running, conditioning, lifting, rugby practice, and hiking. Bleeding was accompanied by pelvic pain, lightheadedness, dizziness, and hot flashes. At the worst, she would bleed through multiple super tampons per hour. She had a history of regular periods, every 30 days, lasting 5-7 days, with painful cramping and heavy flow. LMP was 2 weeks prior to presentation and was normal. She denied any vaginal discharge. She was sexually active with a female partner and had never had an STI. Past medical history was significant for recurrent Lyme infection, multiple concussions, and generalized anxiety disorder. Family history was significant for breast cancer in paternal great-grandmother, paternal grandmother, and maternal grandmother. Her mother had a history of dermoid ovarian cysts.

Physical:

Vitals: within normal limits

General: well-appearing, anxious, no acute distress

Heart/Lungs: regular rate and rhythm, no murmurs, clear to auscultation bilaterally

Abdominal Exam: soft, non-distended, normal bowel sounds, mild suprapubic tenderness, no rebound/guarding

GU: Normal external genitalia and vaginal mucosa. Cervix discolored at 6 o'clock position, otherwise normal appearance. No polyps or growths noted in/around cervix. No blood in vaginal vault. Bimanual exam within normal limits

Differential Diagnosis

Endometrial Polyp, Uterine Fibroid, Endometrial Hyperplasia/Cancer, AV malformation

Tests/Results:

CBC: Hb 12.7 Hct 37.8

CMP: normal

UA: positive blood

hCG: negative

TSH: 0.66 μ U/mL

Pap: ASC-US, negative HPV

Transvaginal Ultrasound: normal uterine size but thick, hypervascular endometrium measuring 18.7mm (normal 8-11), normal ovaries

Hysteroscopy: Uterine cavity thick and irregular. Very small polyp emanating from each tubal ostia, no other specific masses noted

Final/Working Diagnosis:

Endometrial Polyps

Treatment/Outcomes:

Patient underwent polypectomy and curettage of the endometrium. She was then placed on combined OCP for 8 weeks. She had a much lighter period with significantly reduced cramping after starting the OCP. Bleeding during activity resolved and she was able to continue sport participation.

Hand Injury in a Motorcycle Rider

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HISTORY: 39 y/o, right handed, male sustained a motorcycle accident 5 days before being seen in clinic. He states he lost control of his motorcycle and had to jump off of it before it crashed. He landed with outstretched hands striking the ground to prevent hitting his head against the road surface. When he got up he noted his left thumb was “out of place” but denies pain. He reports he reduced the abnormal appearance of the thumb himself and headed to the closest Emergency Department for initial evaluation and then referred to the Sports Medicine.

PHYSICAL EXAMINATION: Examination in the office demonstrated edema of the left thumb and tenar area, additionally there were skin abrasions over tenar area. No gross deformity. Thumb was abducted and radially rotated. There was minimal tenderness to palpation along the first metacarpal and proximal phalanx. Active and passive thumb range of motion of the metacarpophalangeal and interphalangeal joints were limited by edema and pain. Limited examination of the UCL was performed due to patient being unable to tolerate stress test. Passive clenched fist revealed no rotation of the rest of the fingers. Sensation and circulation were intact.

DIFFERENTIAL DIAGNOSIS: 1. UCL sprain 2. Radial collateral ligament sprain 2. Fracture of the first metacarpal 3. Phalangeal fracture

TEST AND RESULTS: Left hand frontal, oblique, and lateral radiographs: acute intra-articular fracture involving the ulnar base of the first metacarpal with minimal depression/displacement. No substantial soft tissue swelling or arthritic changes are observed. There is developmental fusion of the lunate and triquetrum.

FINAL/WORKING DIAGNOSIS: Bennett’s fracture (Left thumb intra-articular metacarpal base fracture)

TREATMENT AND OUTCOMES: 1. Thumb spica splint and immediate referral to orthopedic surgeon. 2. Attempted closed reduction with move to open reduction and internal fixation of left thumb Bennett's fracture with 3 pins. 3. Thumb splint for 10 days post op followed by immobilization with thumb spica cast for 6 weeks post operatively. 4. Pin removal 6 weeks post-op. 5. After pin removal the patient began course of physical therapy focusing on range of motion and strengthening of the patient's thumb.

Recurrent Knee Effusions in Gymnast

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History: A 20-year-old current college freshman sustained a right knee effusion following a hyperextension injury approximately 8 years ago while participating in gymnastics. Per report, workup at the time was negative, and she returned to gymnastics. She participated in gymnastics for 2 additional years and retired due to other interests. While continuing regular exercise, and participation in marching band, she reports recurrent, intermittent right knee effusions since that time. She reports that these would occur more often with repetitive activity. Over the past few months, her knee has been more significantly and persistently swollen. She exercises often, but reports no specific inciting incident. She reports pain with end range flexion. She denies any instability or locking. Previous physical therapy has improved her pain.

Physical Examination: Examination revealed significant effusion of right knee. No obvious effusions in other joints. Range of motion was normal and pain free. Negative Lachman, anterior drawer, posterior drawer, varus and valgus stress testing, patellar grind, McMurray, Thessaly. Neurovascularly intact.

Differential Diagnosis: 1. Meniscal tear, 2 Infection including possible Lyme Disease or Gonococcal Infection; 3. Rheumatoid Arthritis; 4. Gout; 5. Pigmented Villonodular Synovitis; 6. Hemophilia

Test and Results: Aspiration: Bloody - >10000 RBCs, no crystals, normal WBC. Lyme and gonorrhea negative. Ultrasound: Significant for villous synovial thickening within the suprapatellar recess with large effusion. MRI: Large joint effusion with synovitis, synovial proliferation and significant hemosiderin staining of the synovium suggests pigmented villonodular synovitis. Concern for recurrent hemarthrosis with etiology not otherwise apparent. No osseous erosion.

Final/Working Diagnosis: Pigmented Villonodular Synovitis

Treatment and Outcomes: 1. Referral to orthopedic oncology who recommends biopsy. 2. Plan for open Synovectomy; 3. 3 months of Intensive Physical Therapy; 4. Postoperative Radiation due to high recurrence rate.

Left Calf Pain—Runner

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History: 56 y/o F runner w/PMHx of DM1, HTN presented with L calf pain. It has been 6 months of dull moderate pain located to posterior calf with running and walking without radiation to foot. She would stop these activities to relieve the pain. It was not present with spin classes. There was no back pain, leg weakness, numbness, swelling, or discoloration. She was referred to us for possibility of chronic exertional compartment syndrome and testing.

Physical Examination:

Lower extremities were normal color and warm to palpation. There was no tenderness to palpation of the left calf. Straight leg raise and slump test were negative. The left lower extremity demonstrated normal strength and sensation in the L2-S1 nerve roots with 2+ Patella and ankle reflexes. Dorsalis pedis (DP) pulses were 1+ to palpation bilaterally and posterior tibial (PT) was faint.

Differential Diagnosis:

- 1) L popliteal entrapment syndrome
- 2) Chronic exertional compartment syndrome
- 3) Peripheral artery disease
- 4) stress fracture of posterior tibia

Test and Results:

X-ray of the LEFT tibia/fibula revealed calcifications along the popliteal artery but was otherwise normal.

Office-performed ultrasound-guided ankle-brachial index (ABI) was performed of the left lower extremity: DP ABI was 1.27 and PT ABI was 0.35. Exercise ABI were attempted following week, unable to get PT waveform. She was then referred for formal ABI testing by podiatrist.

Formal ABI of bilateral lower extremities: ABI of left leg was 0.97 for DP but unable to compress PT vessel so believed to be erroneous value and TBI 0.75. There was noted focal stenosis in the left distal SFA and abnormal monophasic PT waveforms. Right leg TBI was 0.74, but the ABI was unable to be obtained due inability to locate the PT artery.

Final/Working Diagnosis: Peripheral artery disease of the left lower extremity

Treatment/Outcome: Patient was started on Aspirin 81mg. She was also offered a supervised exercise program and Cilostazol, however she declined. She was already maintained on a moderate intensity statin.

Leg Injury – World Champion Super-Heavyweight Weightlifter

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HISTORY: A 41-year-old male Bulgarian was lifting in a Masters Championship in Barcelona in the 105+kg weight class. The first series was the snatch with his first attempt at 115 kg (~254 lbs.) going well and without pain. On his second attempt at 121 kg (~267 lbs) he experienced some anterior left thigh pain. He attempted the third at 126 kg (~278lbs) unsuccessfully. After a short break he attempted the clean and jerk series first at 145 kg (~320lbs) and had a good lift. He attempted his second clean and jerk at 150 kg (~331lbs) at which point his pain increased and he forfeited the last attempt. Overnight at his hotel his pain intensified, and he sought care at a local ER. He was subsequently discharged with no imaging, intervention, or treatment plan. The following morning, he presented to the event medical tent with worsening pain, swelling and difficulty with bearing weight on his left lower extremity.

PHYSICAL EXAMINATION: Appreciable difference in thigh size, no erythema with mild lacey bruising over left knee and distal to the knee joint. Right thigh measuring 65cm and left thigh measuring 72cm. Marked tenderness to palpation over the superior quad tendon and over the bodies of the rectus femoris and vastus lateralis. Limited hip and knee flexion, with endorsed pain in anterior thigh and superior aspect of patella. Sensation intact, Palpable femoral, DP, PT pulses.

DIFFERENTIAL DIAGNOSIS: 1. Quadriceps hematoma 2. Superior patella avulsion fracture 3. Quadriceps tendon tear 4. Morel-Lavallee Lesion 5. Evolving thigh compartment syndrome

TEST AND RESULTS: Plain film showed superior pole avulsion fracture of the left patella and soft tissue swelling suggestive of hematoma. MRI obtained 4 days following evaluation indicated significant diffuse edematous changes of muscle and fascia with interstitial hematoma and evidence of muscle body rupture of the Vastus Lateralis

FINAL/WORKING DIAGNOSIS: Left Vastus lateralis rupture with avulsion fracture of the superior pole of the patella

TREATMENT/OUTCOMES: Sent back to ER, radiograph obtained, placement in a long leg splint and LMWH given. Inability to obtain better imaging in Spain due to cost. Orthopedic evaluation upon return to Bulgaria within 4 days of injury with subsequent MRI. Patient treated conservatively with rehab and no surgical intervention.

Catching a déjà vu? A repeat finger injury in a high school football player

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HISTORY: A 15-year-old sophomore high school football wide receiver sustained a left 4th finger injury during practice. He is a right-hand dominant male with a past medical history significant for a left 4th finger Salter Harris Type II proximal phalanx fracture treated non-operatively with successful healing eight months prior to the current injury. While catching a

pass, he received a direct impact to his left ring finger by the football. Upon immediate contact with the football, he experienced severe pain, swelling and bleeding.

PHYSICAL EXAMINATION: Left 4th finger dorsal dislocation with exposed bone, sensation intact on ulnar aspect, 2+ cap refill, diminished sensation to light touch on radial aspect.

DIFFERENTIAL DIAGNOSIS: 1. Jammed finger 2. Mallet finger 3. Open fracture 4. Volar plate injury without dislocation 5. Finger laceration

TEST AND RESULTS: Radiographs of left 4th digit demonstrate mildly comminuted transverse fracture of the distal aspect 4th proximal phalanx. There is ulnar displacement of the distal fracture fragment by 100%; dorsal displacement by greater than 100%. On the lateral view, the distal end of the fracture phalanx protrudes through the skin. Mild foreshortening of the digit. No other fracture identified. Open displaced mildly comminuted fracture involving the distal aspect of the fourth proximal phalanx.

FINAL/WORKING DIAGNOSIS: Recurrent left 4th proximal phalanx fracture, resulting in open fracture and near amputation.

TREATMENT AND OUTCOMES: Emergent operative irrigation and debridement of the open fracture, followed by reduction and internal fixation with percutaneous pinning for stabilization. Anticipating pin removal in two weeks in which he will be five weeks post-op. Plan to begin occupational hand therapy following surgical healing.

SHOULDER INJURY IN A FEMALE SOCCER GOALIE

**Utsav Hanspal (Fellow); James Tom, Thomas Trojian (Program Director/Sponsor)
Drexel University/Hahnemann University Hospital PCSM Fellowship**

HISTORY: 18-year-old female soccer goalkeeper dove for a ball in warm-ups prior to first game of season. She reached out for a ball and fell on an outstretched arm, hitting the posterolateral region of her left shoulder to the ground. She felt her shoulder 'pop out of place'. Seen at the field by the athletic trainer. She identified the joint was in place. Placed in sling and referred to us. She noted an episode of subluxation occurred in the sling overnight. No previous shoulder injury or problems.

PHYSICAL EXAM: Examination on next day, her left arm was in a sling with significant mild diffuse swelling, and superficial bruising over the latissimus region. She had notable pain with all active shoulder movements. Actively, her abduction was limited to 90 degrees and external rotation was painful. There was tenderness to palpation over the glenohumeral joint and deltoid muscle. The clavicle was normal and there was no AC joint step-off or pain.

DIFFERENTIAL DIAGNOSIS:

- Rotator Cuff Contusion
- Greater tuberosity Compression fracture
- Anterior shoulder subluxation
- Humeral Neck Fracture
- Labral tear / dislocation
- Acromial Fracture
- Acromial Clavicular Sprain

TESTS & RESULTS: X-rays demonstrated no fractures and normal alignment of humerus within glenoid. An MRI without contrast demonstrated hemarthrosis, anterior labral tear with associated soft tissue Bankart lesion as well as a small Hill-Sachs deformity of the humeral head.

FINAL DIAGNOSIS: Traumatic anterior shoulder dislocation with self-reduction causing an anterior labrum tear with associated soft tissue Bankart lesion as well as a Hill-Sachs deformity of the humeral head.

TREATMENT: The initial treatment consisted of placing the affected shoulder and arm in a sling, ice, NSAIDs, and pendulum exercises. We had a discussion of risks vs. benefits with the family and student-athlete regarding rehab and non-operative care. The patient was referred to the team orthopedic surgeon. She underwent surgery with arthroscopic repair of the anterior labrum and inferior capsular plication. Post-surgical rehab was initiated.

Interesting Case of Abdominal Pain and Knee Pain in a Soccer Player
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HISTORY:

A 6yoM presented to the emergency department for one day of abdominal pain and fevers up to 104.2 at home. The patient was admitted to pediatric surgery service for a rule out appendicitis. CT abdomen/pelvis was negative and he was discharged. He presented back to the ED the following night after discharge for right knee pain. His pain began that evening while playing in the McDonald's playplace. His pain was noted in the posterior right knee, was worse with weight bearing activities, with swelling and mild warmth, no falls or injuries. His mother also noted that he had fever 103.7F while at home.

PHYSICAL EXAMINATION:

Abdominal exam benign.

R knee with decreased range of motion in flexion secondary to pain, can bring R hip to the chest. Swelling and warmth over the right knee without erythema, however moderate joint effusion present.

DIFFERENTIAL DIAGNOSIS:

Septic arthritis, Bacteremia, Subperiosteal abscess

TESTS AND RESULTS:

Knee arthrocentesis done under MSUS guidance for 20cc of cloudy fluid cell count noting 71600 wbc and gram stain noting many PMNs but no organisms. WBC 9.64K/uL, ESR 25mm/hr, Low sensitivity CRP 129mg/L, lactic acid 1.5mmol/L. Blood cultures positive for group a beta hemolytic streptococcus. Synovial fluid culture grows group a beta hemolytic streptococcus. Right knee xrays had no evidence of bony abnormalities and no noted joint effusions. Right knee and hip MRI: Moderate knee joint effusion, evidence of synovitis, concerning for septic arthritis. Signal abnormality in right distal femoral metaphysis, concerning for early osteomyelitis. Subperiosteal abscess along right posteromedial distal femoral metaphysis. Right hip without evidence of abscess or osteomyelitis.

FINAL/WORKING DIAGNOSIS:

Group a beta hemolytic streptococcus septic arthritis with osteomyelitis and subperiosteal abscess perhaps presenting with abdominal pain

TREATMENT AND OUTCOMES:

1. Started empirically on vancomycin/ceftriaxone switched to clindamycin after blood/synovial fluid cultures came back sensitive
2. OR with orthopedics for debridement and irrigation of the knee with bone biopsy.
3. Back to normal activities

Foot and Ankle Injury — Soccer

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HISTORY: 16-year-old male soccer athlete presented to team training room for evaluation of left dorsal foot and lateral ankle pain. He reports that he had his foot stepped on in a soccer game yesterday and in another game 2 days ago. He has noticed some bruising and progressive swelling extending from his ankle to his toes. He can bear weight on his injured foot. He was treated supportively, however his foot continued to swell despite supportive care and has gotten significantly worse. He has noticed that the bruising is now extending to his proximal toes and his foot continues to swell.

PHYSICAL EXAMINATION: Significant edema on dorsal surface of left foot. Ecchymosis on dorsal left foot to the proximal toes. No point tenderness over 5th metatarsal or lateral malleolus. Limited dorsiflexion due to pain. Plantar flexion, inversion, eversion normal range of motion. Negative anterior drawer test. Positive talar tilt. Bruising bilateral shins.

DIFFERENTIAL DIAGNOSIS: 1. Lateral ankle sprain 2. Fracture, possible metatarsal, navicular 3. Contusion with underlying bleeding disorder 4. Avulsion fracture, pseudo-jones

TEST AND RESULTS:

1. Radiograph of ankle and foot reveal no fracture
2. There was a discussion to send him for CBC and coagulation studies due to concern for underlying bleeding disorder. During the discussion he reports that he has Hemophilia A and has been receiving infusions since he was 10 years old.

FINAL/WORKING DIAGNOSIS: Lateral ankle sprain with associated contusion on dorsal foot complicated by previous unknown Hemophilia A diagnosis with no evidence of hemarthrosis.

TREATMENT AND OUTCOMES:

1. Consultation with hematology. He has been receiving Antihemophilic recombinant factor 3000 international units SubQ every other day for prevention of bleeding due to Hemophilia A diagnosis. Hematology recommended continuing his regular schedule without additional doses.
2. He was held from practice and monitored closely until signs of bruising and swelling resolved. Ice and range of motion exercises were used to help with bruising. Tylenol was used for pain control with strict instructions to avoid aspirin. On repeat exam 12 days after initial presentation his swelling had completely resolved. He was permitted to practice with padding. He was instructed to report any signs of bruising or trauma immediately.

Title: More Than Just a Hand Injury in a World Champion

Authors: Joseph Medellin, MD, MPH, MBA ¹; Ryan Rompola, LAT, ATC ² (Sponsor: Mark E. Lavallee, MD, CSCS, FACSM ¹)

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History: LB, a 51-year-old female competing for team USA at the International Weightlifting Federation (IWF) World Masters Championships in Barcelona, Spain on August 20, 2018 was on her third attempt (70kg) in the clean and jerk when she sustained intense pain in her right hand on the bottom of the jerk which caused her to not complete the lift. She came directly to medical area for evaluation.

Physical Examination: Right Hand: Sensation intact, 2+ radial pulse, <2 second capillary refill of first finger. The first finger extended posteriorly angulated off the metocarpophalangeal (MCP) joint.

Differential Diagnosis: 1. Dislocation of MCP joint of 1st finger 2. Ulnar collateral ligament of thumb injury 3. First finger fracture

Test and Results: No imaging obtained

Final/Working Diagnosis: Dislocation of MCP joint of first finger

Treatment and Outcomes: Reduction of first finger MCP joint dislocation was achieved in the medical area at the competition with normal exam post reduction. The patient then found out her prior lift of the clean and jerk (66kg) was enough to secure her the World Championship title for her weight class. It was then we found out her complete medical background, which included an ongoing battle with breast cancer for the past two years, diagnosed in the fall of 2016. Due to the aggressive nature of the cancer, she has undergone a bilateral radical mastectomy (including resection of both pectoralis major muscles), partial right lung resection, partial diaphragm resection and partial gastrectomy in November 2017. The operation kept her from training for 8 months. She has also undergone chemotherapy and radiation as her cancer has metastasized to her brain and bone. In February 2018, just 6 months prior to the competition, she sustained a pelvic fracture after a fall in her home. Despite this, her coach described her attitude and willingness to compete never faltered and she continued to train out of her garage in Arizona leading up to the Master's competition.

Her finger was completely healed two weeks after competition and she is back to lifting. LB, the IWF Master's World Champion for the Female 90kg Class, started another round of chemotherapy and radiation two weeks after the competition. Despite the 8 months her Oncologist has given her, LB is hopeful, kind spirited and a World Champion.

Ankle Pain - Dancer

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HISTORY: The patient is a 25 year-old female who presented with complaint of chronic posterior right ankle pain. Patient reported pain started 10 years ago while dancing (ballet) and has been progressively worsening. She stopped dancing however pain continued and has become a constant pain in her posterior right ankle described as a tightness. She reported occasional swelling as well as pain to palpation. No history of trauma to the area or audible popping sound. She has not been taking any medications or going to physical therapy for this issue.

PHYSICAL EXAMINATION: Inspection revealed soft tissue swelling posterior to the calcaneus anterior to the Achilles tendon of the right ankle. Tenderness to palpation over the calcaneus and anterior to the Achilles tendon. Active range of motion limited to 0 degrees dorsiflexion and 40 degrees plantar flexion. No peroneal tendon subluxation or tenderness to palpation. No heel cord tenderness. Negative Thompson's test. Negative squeeze test. Negative anterior drawer and talar tilt testing. Muscle strength 5/5 dorsiflexion and plantarflexion. Knee and pelvis exam revealed normal active range of motion and no deformities bilaterally.

DIFFERENTIAL DIAGNOSIS: 1. Haglund's syndrome, 2. Achilles tendinopathy, 3. Posterior impingement, 4. Flexor hallucis longus tendinitis, 5. Subtalar effusion, 6. Retrocalcaneal bursitis, 7. Ganglion cyst

TEST AND RESULTS: X-ray right ankle: - "Masslike soft tissue density in the region of Kager's fat pad. No osseous abnormality identified."

Point of care ultrasound right ankle - "The achilles tendon is intact. There is a 2.74cm x 1.63cm x 2.30cm mixed echogenic mass in the soft tissues between the lateral aspect of the achilles tendon and the peroneal tendons. The mass is non-compressible, has ill-defined borders, has increased through-transmission, and demonstrates increased neovascularization on Color Power Doppler. Anterior joint recess: Unremarkable. No effusion."

MRI right ankle with and without IV contrast - "There is an enhancing, juxta-articular mass posterior to the ankle. The imaging appearance is nonspecific however the location and demographics raises the possibility of synovial sarcoma. Recommend consultation with orthopedic oncology."

FINAL/WORKING DIAGNOSIS: Ankle synovial sarcoma

TREATMENT AND OUTCOMES: Patient was referred to orthopedic oncology to discuss management of right ankle soft tissue mass. Patient elected to have fine needle core biopsy of the mass to further evaluate. Patient will undergo fine needle core biopsy of right ankle soft tissue mass. Biopsy is being coordinated with orthopedic oncology and musculoskeletal radiology.

Unusual Headaches After a Concussion in a Basketball Player

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HISTORY: A 20-year-old men's D1 basketball player presented four months after a concussion sustained in basketball. The athlete reported that three weeks after injury, he was asymptomatic and six weeks after injury he was cleared for full return to sport activities by a team physician. He reported that he began having mild headaches 2-3 weeks thereafter. These headaches became more frequent and severe. The headaches were described as a pressure sensation that encompassed the entire head. He was allowed to participate in sports since the team physicians felt that chronology suggested the headaches were not related to the concussion. After 3 weeks of headaches he experienced an episode of nausea and dizziness while playing pickup basketball at home that was so severe, he was taken to an outside emergency department. His workup there was unrevealing and, after receiving fluids, his symptoms abated and he was discharged. Upon return to college he continued to have headaches, malaise, and photophobia, for which he returned to see a team physician.

PHYSICAL EXAMINATION: A complete neurological exam including cranial nerves, strength of all extremities, sensation, reflexes and balance testing were normal. He had no visual field cuts by confrontation.

DIFFERENTIAL DIAGNOSIS: 1. Post-concussion syndrome 2. Headache syndrome 3. Dehydration 4. Intracranial lesion

TEST AND RESULTS: Initial non-contrast brain MRI revealed a pituitary mass. Prolactin (69.6 ng/dl -normal <20 ng/dl). Growth hormone, cortisol, IGF and ACTH were normal.

Follow-up brain MRI, pituitary protocol, with contrast: - intrasellar mass of about 7.65 mm in primary dimension involving the right pituitary gland.
3rd MRI 6 weeks later – no growth.

FINAL/WORKING DIAGNOSIS: Prolactinoma without mass effect

TREATMENT AND OUTCOMES: 1. Neurosurgery referral. He was started on bromocriptine which normalized prolactin levels and relieved the athlete's headaches. 2. Ophthalmology for visual field testing due to the location of the mass. He had no visual symptoms and testing was normal. 3. Endocrinology consult for hormonal testing which was normal except for prolactin. 4. The athlete was able to begin sport activities and meet the demands of his sport. Repeat MRI's demonstrated stable mass size and no surgery was indicated. He continues to follow with neurosurgery.

Shortness of Breath in a Swimming Athlete

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HISTORY: 13yr old female with shortness of breath during exercise. Symptoms presented in the winter of 2017/18. She is regular qualifier for the NYSPHAA State Championships. Her symptoms are described as “tightness in my throat and chest” while swimming longer distances and repeated bouts of sprinting. She describes more trouble with inspiration than expiration.

DIFFERENTIAL DIAGNOSIS: 1) Baseline asthma 2) Exercise-Induced Asthma 3) Exercise – Induced Laryngeal Obstruction 4) Unreasonable fitness expectations 5) Anemia 6) Cardiac pathology 7) Lung pathology

PHYSICAL EXAMINATION: Healthy and well developed 13yr old
Ht: 62.5" Wt: 105lb BMI: 19.3

TESTS AND RESULTS:

03/01/17: Spirometry; WNL, no significant response to beta agonist

03/01/17: ECG: Sinus arrhythmia otherwise WNL, Resting HR: 62bpm
Hemoglobin/ Hematocrit: 14mg/dL and 42%

03/01/17: CXR, PA and lateral: WNL

04/06/17: Exercise Induced Asthma provocation test

Peak VO₂: 57.6ml/kg/min

Post exercise decrease in FEV₁ of 26%

Obstructive expiratory loop that improved with Albuterol

8/17/17: Continuous Laryngoscopy with Exercise

Grade 2 supraglottic closure with posterior movement of the epiglottis causing closure of the upper airway at sub max workload

FINAL/WORKING DIAGNOSIS: Comorbidity of grade 2 supraglottic (EILO) and mild (EIA)

TREATMENT AND OUTCOMES: Successful evidence was gathered to diagnose patient with EILO and EIA

Conservative treatment of 6 weeks speech therapy was initiated which includes poolside therapy

Medication was prescribed for EIA

- Qvar 40 mcg/Act 2 puffs twice a day
- Proair HFA 108 (90 Base) mcg/Act 2 puffs as needed at the onset of shortness of

breath and prior to exercise

The patient is still competing at a high level and continuing to improve times in swimming events. It has been a multifaceted approach including medication, speech therapy, and further education about the comorbidity of EIA and EILO. Timing of her rescue inhaler is crucial to not exacerbate EILO symptoms. Performing speech therapy poolside has been a unique challenge. The patient will continue to follow up regularly for repeat spirometry, monitoring of medication usage, and update on symptoms.