Case Study: Monitoring Sleeping Patterns of a Boy with Duchenne Muscular Dystrophy and his Caregivers

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Duchenne Muscular Dystrophy (DMD) is a terminal disease involving a progressive degeneration of muscle and motor function in young males, which impacts the entire household. Families exposed to these DMD management demands can be overwhelmed, resulting in sleep disruptions. This current study was implemented to investigate relationships in sleep patterns among boys with DMD and their caregivers. **PURPOSE**: Based on initial data, we present a case study exploring quantitative and qualitative sleep patterns of a young boy with DMD and his parents. **METHODS**: A 10y ambulatory boy with DMD and his parents wore a portable fitness tracking device (PFTD) for one month. The PFTD monitored and recorded sleep efficiency (SE) and amount of nocturnal wake-ups (NWU). A proxy-reported Children's Sleep Habits Questionnaire (CSHQ) was used to evaluate child sleep disturbances. Pearson correlation and paired sample t-tests (SPSS 21.0; SPSS, Chicago, IL) were used to identify relationships and differences, respectively. Statistical significance was set at $p < 0.05$ and results were reported as mean ± SD. **RESULTS**: Relationships between PFTD SE and NWU existed for the father (SE = 93.5 ± 0.6% vs. NWU = 3.8 ± 0.3; r = -.640), mother (SE = 91.9 ± 1.0% vs. NWU = 8.6 ± 0.5; r = -.867), and their son with DMD (SE = 83.7 ± 1.1% vs. NWU = 8.6 ± 0.5; r = -.436). Based on PFTD, parents higher SE and lower NWU were significantly different from their son with DMD (p = .000). SE for the boy with DMD was inversely related to CSHQ morning wake-up times (r = -.986), and tended to be improved by moving to someone else's bed during night (r = .942, p = .058). Also, falling asleep in brothers or parents bed instead of alone (p = .023) tended to reduce NWU experienced by the son with DMD (r = -.870, p = .130). PFTD data and CSHQ scores demonstrated general caregiver awareness of son with DMD NWU more than once during the night (r = .905, p = .095). **CONCLUSIONS**: Although sleep patterns were similar for all three family members, the 10y boy with DMD showed lower SE and more frequent NWU compared to his parents. Further research is warranted to investigate relationships in sleep patterns among a larger dataset of boys with DMD and their caregivers. Identifying sleep habits and patterns can be beneficial to determine strategies that will reduce NWU and improve SE for boys with DMD as well as the whole family.

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The Relationship Between Waist Circumference and Anaerobic Power Output in College Students

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There are a variety of components that make up an individual's physical fitness. Some of these are examined in terms of health risk and others in terms of performance. Abdominal adiposity has been shown to negatively impact one's health, but its impact on performance is unclear. **PURPOSE**: To determine if a relationship exists between abdominal adiposity and muscular power. **METHODS**: One hundred subjects (50 females; 50 males) volunteered to be tested. Height, weight, and waist circumference (WC) were recorded on all subjects. The Wingate Anaerobic Test (WAnT) was used to assess muscular power. **RESULTS**: Mean WC values for females and males were 75.5 ± 10.1 cm and 86.7 ± 10.5 cm, respectively. Mean peak power values for females and males were 539.0 ± 140.6 W and 844.7 ± 143.7 W, respectively. Mean relative peak power values for females and males were 8.0 ± 1.1 W/kg and 9.9 ± 1.3 W/kg, respectively. Pearson-product moment correlations displayed a significant correlation between WC and Peak Power for females ($r = 0.775$, $p < 0.001$) and males ($r = 0.324$, $p = 0.022$), respectively. There was a significant inverse correlation between WC and Relative Peak Power in males ($r = 0.450$, $p = 0.001$). However, no relationship was observed between WC and Relative Peak Power in females. **CONCLUSION**: Our results indicate that a larger WC resulted in a lower relative peak anaerobic power in males, whereas no influence in females. It appears that there are a number of other factors that must be

considered when examining anaerobic power. Future examination of how lean body mass and fat mass influence anaerobic power should also be explored.

Beetroot Juice Supplementation Lowers Oxygen Cost of Vigorous Intensity Aerobic Exercise in Trained Endurance Athletes

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Nitric oxide (NO) plays a critical role in regulating blood flow to skeletal muscle. NO production in humans is 1) oxygen-dependent via NO-synthases that convert L-arginine to NO and 2) oxygen-independent via the nitrate-nitrite-NO pathway. The latter can be augmented via beetroot juice supplementation (BR). **PURPOSE**: The purpose of this study was to investigate the effect of BR during vigorous intensity aerobic exercise. **METHODS**: Using a double-blind, repeated measures crossover design, 12 Division III collegiate distance runners (mean ± SD: age = 20.3 ± 1.1 yr; VO_2peak = 55.5 ± 8.1 ml·kg^{-1}·min^{-1}) consumed either 120 mL·day^{-1} of BR or placebo (PL) for 4 days. On day 5 of each 4-day supplementation period, subjects completed an exercise trial on a motorized treadmill consisting of five minutes of running at 65%, 85%, and 100% of volume of oxygen uptake reserve (VO_2R) separated by 2 minutes each. BR and PL supplementation protocols were separated by a 7-day washout period. Two-way repeated measures ANOVAs were used to determine the effect of treatment (BR or PL) and exercise intensity (65%, 85%, and 100% VO_2R) on VO_2, heart rate (HR), respiratory exchange ratio (RER), and rating of perceived exertion (RPE). **RESULTS**: There were no statistically significant interactions between treatment and exercise intensity for VO_2, HR, RER, or RPE. The main effect of treatment was not statistically significant for HR, p = 0.490; RER, p = 0.462; or RPE, p = 0.471. However, the main effect of treatment was statistically significant for VO_2, where BR (2.43±0.18 L·min^{-1}) was lower compared to PL (2.49±0.17 L·min^{-1}), p = 0.029. **CONCLUSIONS**: These results suggest that a 4-day protocol of 120 mL·day^{-1} of BR reduces VO_2 during vigorous intensity aerobic exercise in trained endurance athletes.

Sex Differences in Aortic Stiffness, 24-hour Aortic Blood Pressure, and Cardiac Deformation in Marathon Runners

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Endurance exercise reduces risk for cardiovascular disease. Excessive endurance exercise may be detrimental to cardiovascular health. Interestingly, these detrimental cardiac adaptations may be more prevalent in male marathoners. Sex differences in the effect of marathons on cardiac function may be related to differences in aortic stiffness. **PURPOSE**: 1) Examine sex differences in cardiovascular function; 2) Explore associations between aortic stiffness and cardiac function in marathoners. **METHODS**: Sixteen experienced marathoners had peak aerobic capacity, aortic stiffness, and cardiac function measured on 3 separate days. Aortic stiffness was measured as carotid-femoral Pulse-Wave Velocity (cfPWV) obtained using applanation tonometry. An ambulatory oscillometric blood pressure cuff was used to measure 24-hr systolic blood pressure (BP). Cardiac function was measured using 3-dimensional deformation echocardiography (3DE). Left ventricular (LV), longitudinal, circumferential, area, and radial strain were used as indices of cardiac function. **RESULTS**: cfPWV and 24-hr systolic BP were higher and 3DE longitudinal and area strain were lower in males compared to females ($p<0.05$). cfPWV was associated with longitudinal ($r=0.58$, $p=0.04$), circumferential ($r=0.71$, $p=0.01$), area ($r=0.66$, $p=0.01$), and radial strain ($r=-0.66$, $p=0.02$). **CONCLUSIONS**: Among marathoners, males have higher aortic stiffness and lower cardiac function when compared to females. Higher aortic stiffness may be associated with lower cardiac function in experienced marathoners.

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Table 1	Males (n=7)	Females (n=9)	*p*-value
Age (years)	45±4	43±3	0.53
VO_2 max (ml/kg/min)	52.8±11.8	47±6.2	0.27
Resting Heart Rate (bpm)	52±7	56±9	0.31
Body Mass Index (kg/m^2)	29±5	22±3	0.00
Body Fat (%)	20.7±10	23±6	0.59
cfPWV (m/s)	8.1±1.0	6.5±1.2	0.02
Brachial 24-hr Systolic BP (mmHg)	124±4	112±7	0.01
Aortic 24-hr Systolic BP (mmHg)	113±4	104±8	0.05
3DE Longitudinal Strain (%)	-10±5	-16±4	0.04
3DE Circumferential Strain (%)	-11.3±4.2	-15.6±4.3	0.10
3DE Area Strain (%)	-18.8±7.1	-26.9±6.3	0.05
3DE Radial Strain (%)	29.2±12.2	46.0±17.1	0.07

Significance level, p<0.05. cfPWV, Carotid-femoral Pulse Wave Velocity; BP, Blood Pressure; 3DE, 3-dimensional Echocardiography

Elevated Temperature Inside a Lower Body Positive Pressure Treadmill During Exercise: A Possible Environmental Constraint

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Lower body positive pressure (LBPP) treadmills have become increasingly popular for rehabilitation and training. Running on a LBPP treadmill entails sealing the body from the hips down in a high air pressure chamber to simulate exercise at lower body weight. The effects of the sealed chamber on treadmill temperature during exercise have yet to be explored. **PURPOSE**: The purpose of the study was to measure treadmill and tympanic temperature while participants were running on a LBPP treadmill. **METHODS**: Fifteen trained endurance athletes, seven males and eight females (AGE 21.7 ± 2.9 yrs., WEIGHT 61.9 ± 8.5 kg) completed four running trials at different body weight (BW) percentage levels (60, 75, 85, and 100%). The 100% BW trial was run on a normal treadmill (non LBPP). During each trial, participants rested for two minutes then ran at three steady state speeds (2.9, 3.4, and 3.8 m/s) for four minutes each. Room air, tympanic, and LBPP chamber temperatures (°C) were recorded before the trial, at the end of each stage, and after the trial. **RESULTS**: The average treadmill temperature (± SD) at each increasing BW was 31.1 ± 2.5, 30.5 ± 1.76, 30.4 ± 2.3, and 22.9 ± 1.8°C, respectively. Sphericity was assumed for a repeated measures ANOVA. Treadmill temperature was statistically significantly different among the four BW conditions $F(3, 42) = 53.49$, $p < .0005$, partial $\eta^2 = .793$. Post hoc analyses with a Bonferroni adjustment indicated that temperature was statistically greater in the 60, 75, and 85% BW conditions than in the 100% condition (M = 8.174, 95% CI [5.572, 10.777], p < .0005) (M = 7.556, 95% CI [5.195, 9.917], p < .0005) (M = 7.495, 95% CI [6.137, 8.853], p < .0005). There was not a significant difference in room temperature among all conditions (overall average 21.6 ± 1.5 °C). Average pre-exercise tympanic temperature for each BW was 35.4 ± 0.7, 35.1 ± 0.8, 35.2 ± 0.7, 35.8 ± 0.5 °C and post exercise tympanic temperature was 35.3 ± 0.6, 35.3 ± 0.6, 35.0 ± 0.8, and 35.8 ± 0.6 °C.
CONCLUSION: Treadmill temperature was significantly higher in all LBPP weight conditions when compared to normal weighted running on a traditional treadmill. Runners may use LBPP treadmills for

rehabilitation or low-impact training, but should be aware of the increase in LBPP chamber temperature. The current study is the first to report elevated temperature inside a LBPP treadmill.

Dietary Sodium and Resting Sympathetic Outflow

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Dietary recommendations for optimal cardiovascular health include limiting dietary sodium intake. However, there is some evidence that severe low sodium diets (<0.9 g/day) may stimulate sympathetic nervous system activity and the renin-angiotensin-aldosterone system, which are both associated with worse health outcomes. These and other findings have led to some controversy surrounding societal recommendations to lower sodium intake. **PURPOSE**: Accordingly, the purpose of this study was to test the hypothesis that muscle sympathetic nerve activity (MSNA) would not be altered by more moderate reductions in dietary sodium intake compared to medium and high sodium diets. **METHODS**: Low (1.0 g Na^+/day), medium (2.3 g Na^+/day) and high (7.0 g Na^+/day) sodium diets (order randomized) were consumed for 10 days each by six subjects (age: 25±1 yrs, BMI: 23.7±1.4 kg/m^2, 3 men). Subjects collected their urine for the final 24 hours preceding in-lab testing. Testing was performed on the last day of each diet. Subjects lay quietly for 10 minutes while undergoing recording of beat-to-beat blood pressure (via photoplethysmography), R-R interval (via 3-lead ECG), and MSNA (via microneurography). **RESULTS**: Twenty-four hour urinary sodium excretion was significantly higher on the high (241±16 mmol/24 hrs), compared to medium (75±13 mmol/24 hrs), and low (36±10 mmol/24 hrs) sodium diets (P<0.001). Resting mean arterial pressure was not different following any diet (low = 89.0±2.7, medium = 87.3±4.2, high = 83.9±4.4 mmHg; P>0.05). Dietary sodium did not alter MSNA burst frequency (low = 8.2±1.1, medium = 10.0±1.1, high = 8.6±1.7 bursts/min P>0.05), or burst incidence (low = 13.6±2.3, medium = 17.3±2.4, high = 15.3±3.6 bursts/100 heart beats; P>0.05). **CONCLUSIONS**: These preliminary data suggest that dietary sodium intake in the range of 1.0 to 7.0 grams per day does not alter resting MSNA in healthy young adults. These findings suggest that diets as low as 1.0 g Na^+/day can be consumed without stimulating the sympathetic nervous system.

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Balance and Muscular Torque Difference Between Recreationally Active Males and Females

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Research has shown that running related injuries (RRI) are common in males and females with females being more susceptible to these injuries which is believed to be due to biological differences. Balance assessments have been used to help identify differences between genders and may help lead to injury prevention techniques. **PURPOSE**: To investigate the difference in static and dynamic balance and the amount of muscular torque in the lower-limb musculature between genders. **METHODS**: Nine healthy recreationally active college aged students between the age of 18-30 (males = 3, 24.3±2.1 years; females = 6, 20.8±0.4 years) participated. Center of pressure (COP) was measured on Bertec Force plates during double leg stance (DLS) and single leg stance (SLS) to determine static balance (S). COP was also measured during Y Balance test and reach distances (cm) to determine dynamic balance (D). A Biodex Dynamometer was used to measure muscular torque (T) in supine and standing hip flexion/extension, knee flexion/extension, and ankle plantar/dorsiflexion to determine the rotational force produced around each joint. Five different speeds were used for hip, knee (60, 120, 180, 240, and 300˚/s) and ankle torques (60, 90, 120, 150, 180˚/s). Two tailed t-tests were used to compare variables. **RESULTS**: Males showed greater reach distances in the Y Balance test for dominant posteromedial (M=88.3±2.7, F=69.6±11.5 cm, p=0.01) and nondominant posterolateral (M=92.1±3.9, F=78.0±6.8 cm, p=0.04) directions. Females showed lower COP excursions in the Y-plane during SLS (M=0.0456±0.0002, F=0.0392±0.0050, p=0.03), the X-plane in anterior direction of Y Balance test (M=0.0330±0.0029, F=0.0267±0.0052, p=0.04). Females also had

greater peak T at 300˚/s during supinated hip flexion (M=284.7±26.3, F=342.0±45.7 Nm, p=0.04) for the dominant leg. **CONCLUSION**: Males showed greater reach distance in the posterior direction than females, thus showing their capability to control COP during D, while females showed lower COP excursion in S. Currently, there is not sufficient evidence demonstrating that males or females produced higher T at the given axis of rotations. Biological differences are a factor in RRI and less dependent on COP and T. Therefore, gender differences in COP and T may not be related to injury related gender disparity.

Pulse Wave Velocity in Youth With Visual Impairments

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Arterial stiffness (AS) is an early indicator of cardiovascular disease (CVD). AS increases naturally with age, but also with disease and lifestyle choices. Individuals with visual impairments (VI) are highly at risk for developing CVD, potentially as a result of significant barriers to physical activity and subsequent limitation to sedentary behavior. **PURPOSE**: To conduct a preliminary investigation on pulse wave velocity (PWV) in youth with VI. **METHODS**: Youth with VI (N=30) including 21 males (14.1± 2.0 yrs, 164.3 ± 13.2 cm, 61.9 ± 20.5 kg) and 9 females (12.0 ± 2.3 yrs, 146.1 ± 15.1 cm, 38.9 ± 11.8 kg) voluntarily participated in the research during a weeklong sports camp for youth with VI. Carotid-femoral PWV was measured non-invasively. While supine, a thigh cuff was secured to the right thigh, after which the participant palpated the femoral pulse. Distances were then measured using a tape measurer from the sternal notch to the carotid pulse, the sternal notch to the top of the thigh cuff, and the femoral pulse to the top of the cuff. Carotid pulse was then palpated and recorded using a tonometer. The thigh cuff inflated as the tonometer was used to record carotid pulse, and once 10 seconds of consistent carotid and femoral waveforms were simultaneously acquired the cuff deflated and data were collected. **RESULTS**: Age group quartiles were created and a 2 x 4 ANOVA to compare sex and age groups was performed. T-tests were also run to compare differences between those identifying as blind (B1) and those identifying as visually impaired (B2-B4). PWV for the 9-10 yr. group was 3.2 ± 0.66 m/s, for 11-12 yr. was 3.59 ± 0.88 m/s, for 13-14 yr. was 3.73 ± 0.84 m/s, and for 15+ yr. was 3.99 ± 0.88 m/s. There were no significant differences between sex, age, or extent of VI. **CONCLUSION**: As expected, PWV increased with age for both males and females yet there is an emergent trend that AS increases at a greater rate among females. However, average PWV values were still within a healthy range. It is possible that because females enter puberty before their male peers hormonal changes may contribute to the PWV differences between sexes. Future research should examine physical activity and sedentary behavior in male and female adolescents with VI. Also, it may be helpful to compare PWV to age-matched sighted peers.

The Effects of a Six-Week Weight Loss Program on Body Composition and Metabolic Rate

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Regular physical activity and a healthy diet are linked to improved metabolic activity and body composition changes. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. **PURPOSE**: The purpose of this study was to determine if a primarily weight loss driven program would also result in a decrease in body fat percentage, a decrease in waist and hip circumference, and improve resting metabolic rate. **METHODS**: Total weight (lbs), body fat (%), lean muscle mass (%), waist circumference (in), hip circumference (in), and resting metabolic rate (RMR) were assessed before and after the six-week program in thirty four sedentary adults (M_{age}=38.24, SD=9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes, follow a given and structured diet plan, and drink a gallon of water daily. **RESULTS**: There was a significant decrease in total body weight following

the six-week challenge (197.1 ± 7.76 lbs pre vs. 187.8 ± 7.16 lbs post; $P < 0.001$). There was also a significant decrease in body fat (38.6 ± 1.52% pre vs. 36.2 ± 1.52% post; $P < 0.001$) as lean muscle mass increased (61.4 ± 1.52% pre vs. 63.8 ± 1.52% post; $P < 0.001$). Participants successfully lost 1 inch off their waist ($P < 0.01$) and hip ($P < 0.001$) circumference. Interestingly, RMR decreased from 1678.6 ± 59.36 kcal/day to 1602.7 ± 49.87 kcal/day although it was not statistically significant ($P = 0.09$). **CONCLUSIONS**: These data suggest that this particular weight loss program is effective in significantly reducing total weight, body fat, waist and hip circumference as lean muscle mass increased. This study supports the effectiveness of a financially driven six-week weight loss program and emphasizes its positive impact on body composition in previously sedentary individuals.

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Relationship Between Land-Based Performance Assessments and Swimming Force During Combat Swim Flutterkick

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Combat swimming (CS) requires military personnel dressed in full combat gear to swim while holding or towing additional weight (i.e. ammunition, rucksack, etc.). Reportedly, additional gear can amount to over 40 kg and increases the demand on muscle force production to overcome water resistance. Limited research has explored relationships between limb length, strength, and power performance assessments and CS flutterkick anaerobic performance during a 30-second maximal effort tethered swim test (TST). **PURPOSE**: To examine relationships between limb length, strength, and power performance assessments and maximum effort CS force production. **METHODS**: Six female (26 $\pm$ 9.2 years, 169.7 $\pm$ 3.9 cm, 67.5 $\pm$ 9.4 kg) and six male (30 $\pm$ 8.0 years, 179.4 $\pm$ 7.6 cm, 80.8 $\pm$ 15.4 kg) skilled swimmers participated in isometric muscular hip strength (HS) testing using a handheld dynamometer, and a 30-second Wingate cycle ergometer anaerobic test (WAnT). Limb length (LL) was measured from the Anterior Superior Iliac Spine to the medial malleolus. For TST, subjects wore full military gear weighing approximately 12 kg, including combat boots and fins, and performed a maximal effort flutterkick in a prone position holding a flotation device for 30 seconds. After testing for normality, correlations between HS, LL, WAnT, and TST were determined using Pearson's correlation ($p<0.05$). **RESULTS**: Absolute Wingate mean power was significantly correlated to TST mean force (TST_{mf}) (0.883, $p<0.001$). Correlations were identified between LL and TST peak force (TST_{pf}) (right: 0.653, $p=0.021$; left: 0.659, $p=0.020$). There was no significant correlation between isometric peak HS and TST_{pf}. **CONCLUSIONS**: LL and absolute WAnT mean power are associated with CS anaerobic kicking performance more so than isometric HS. Findings should not dismiss the relevance of strength, but promote specificity of the assessment. Identifying significant relationships between power and strength assessments and swimming force during CS flutterkick is important to help to improve training for optimal CS anaerobic performance.

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Intermittent Theta Burst Stimulation Does Not Improve Reaction Speeds in Females with Anterior Cruciate Ligament Injuries

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Traumatic peripheral musculoskeletal injuries may reduce the excitability of sensorimotor circuits and alter patterns of activity in the prefrontal cortex. This may explain the long term disability experienced after injuries such as ACL rupture. Recently, non-invasive neuromodulation has been used to ameliorate motor deficits associated with chronic pain and tendinopathy. However, no research has examined the effects of intermittent theta burst stimulation (iTBS) reaction time (RT), during a lower extremity psychomotor choice

reaction test (Stroop). **PURPOSE**: To determine if iTBS can improve congruent (CoM) and incongruent (IcM) stimuli movements after ACL reconstruction (ACL) and in matched healthy controls (CON). **METHODS**: Nine ACL females (20.6±2.3yr, 166.1±8.0cm, 68.1±9.1kg) were matched with 11 CON (20.3±1.4yr, 165.0±5.3cm, 65.7±8.4cm). Over two visits, participants were stimulated with sham or iTBS in a randomized and counterbalanced order, with double blinding. After each stimulation session, a lower extremity Stroop test was completed, consisting of 40 trials in a randomized order. To determine RT, force plates, goniometers, and EMG were used to detect initial movement, and time was subtracted from the point of stimuli presentation. Repeated measures ANOVA was used to compare mean CoM and IcM RT within Sham and iTBS visits, between ACL and CON ($p<0.05$). **RESULTS**: CoM demonstrated faster RTs overall ($F = 10.911$; $p = 0.005$). When broken into CON and ACL, CoM RT was significantly faster in CON ($F = 11.821$; $p = 0.004$). CoM RT was also significantly faster than IcM after iTBS ($F = 6.321$; $p = 0.24$) and sham ($F = 6.617$; $p = 0.021$). When comparing groups, RTs during CoM was significantly faster than IcM ($F = 5.872$; p 0.029) in CON only. **CONCLUSIONS**: Within this study IcM tasks were accompanied by longer RT, specifically within the CON, iTBS, and Sham groups. The lack of change in ACL could reflect neurological deficits in areas outside of M1, including dorsolateral prefrontal cortex or S1, where altered functional activity is evident. More research must be done on neurological pathway stimulation targets to further understand the effects of the injury, specifically for rehabilitation and return to play.

Maturity-Related Differences in the Adaptations to Anaerobic Capacity Following Sprint Interval Training Amongst Boys

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PURPOSE: To assess the maturity-related differences in the adaptations to anaerobic capacity following a 4-week sprint interval training (SIT) program amongst adolescent boys. **METHODS**: Twenty-seven adolescent boys were assessed for their years from peak height velocity (PHV), an estimation of somatic maturity status, and grouped into PRE (<-1.5yr), PERI (-1.5 to +1.5yr) and POST (>+1.5yr) PHV. During the eight SIT sessions, participants completed 4-7 repeated 20-second "all-out" sprints on a cycle ergometer against a load of 7.5% of body mass with 4-minute rest periods. During the first (SIT1) and last (SIT8) sessions, peak (PP) and mean power (MP), relative to body mass, were recorded for each sprint and averaged for each session. Individual sprint data were assessed via 3-way (group×training×sprint) ANOVA, while session averages were assessed via 2-way (training×group) ANOVA. Level of significance was set at $p<0.05$ and trends were determined at $p<0.10$. **RESULTS**: No significant 3-way interactions existed for PP or MP. Average PP and MP are presented in Table 1. For average PP, there was a trend ($p=0.095$) for a 2-way interaction with significant main effects of group ($p=0.030$) and training ($p<0.001$). For average MP, there was a significant 2-way interaction ($p=0.044$), with PRE significantly less than PERI and POST at SIT1 and SIT8. Furthermore, average MP significantly increased from SIT1 to SIT8 in PERI ($p=0.016$) and POST ($p=0.007$), with no change in PRE. In addition, POST had significantly ($p=0.016$) greater changes in average MP than PRE, while a trend ($p=0.053$) for a difference existed between PERI and PRE. **CONCLUSION**: SIT may not be the most appropriate training modality prior to puberty as adaptations to anaerobic capacity may not occur.

Table 1: Average peak (PP) and mean power (MP) during the first (SIT1) and last (SIT8) training sessions (mean±standard deviation)

Variable	Group	SIT1	SIT8	Change
Average PP (W/kg)	PRE	9.09±1.80	9.71±2.20	0.62±0.97
	PERI	11.76±2.01	13.83±3.07	2.07±1.82

	POST	12.08±3.51	13.43±3.12	1.35±0.74
	Overall	11.18±2.83	12.61±3.29*	1.43±1.38
Average MP (W/kg)	PRE	6.66±1.45	6.47±1.80	-0.19±0.80
	PERI	8.25±0.75†	8.61±0.69*†	0.36±0.39
	POST	8.18±1.14†	8.69±0.87*†	0.51±0.46†
	Overall	7.81±1.27	8.09±1.46	0.27±0.59

*significantly greater than SIT1 †significantly greater than PRE

Effects of Treadmill-Training on Solid Meal Gastric Emptying in a Rodent Model

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PURPOSE: Patients suffering from gastrointestinal (GI) dysfunction are frequently prescribed physical activity to improve their symptoms. Yet, physical activity has also been shown to provoke GI disturbances including diarrhea, abdominal pain, and gastroesophageal reflux. These GI disturbances commonly occur after bouts of prolonged or high-intensity exercise, and the GI disturbance frequency is twice as high during running compared to other endurance sports. The effects of GI function following exercise are diverse; studies have reported increases, decreases, or no changes in gastric emptying (GE) rate following treadmill-training. In this study, we evaluated the effects of moderate-intensity treadmill-training (66.6% VO2max) on GE rate in rats. **METHODS**: Male Wistar rats (n = 16) were exercised on a treadmill five days/week for 8 weeks. Baseline, mid-point, and final GE measurements were conducted throughout the study. On the days of the GE experiment, rats were fasted overnight with unlimited access to water, and then placed into individual chambers where GE was indirectly measured. Baseline air measurements were collected before the fasted rats received 1g of pancake containing 5μL of the stable isotope [^{13}C]-octanoic acid. The exhaled breath was collected and analyzed to determine the [^{13}C]- to [^{12}C]- carbon dioxide ratio. **RESULTS**: Body mass increased over the duration of the study by 41%; however, there were no significant differences between exercise and control rats (325.40±3.11 vs. 325.99±3.06g; $p>0.05$). Food intake remained similar between exercise and control rats (23.23±0.20 vs. 23.19±0.20; $p>0.05$). Not surprisingly, mean energy intake (MEI; kcal/100g/day) also revealed no significant differences between exercise and control rats (28.99±0.50 vs. 28.90±0.55; $p>0.05$). There was no significant difference in GE between the exercise and control group gastric emptying coefficient (5.10±1.37 vs 5.04±0.40; $p>0.05$). **CONCLUSIONS**: Moderate-intensity treadmill-training for 8-weeks has no significant effect on anthropometric factors. Interestingly, however, as body mass and food intake increased, MEI decreased. We have validated that moderate-intensity treadmill running has no significant effect on gastric emptying.

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The Effects of a Six-Week Weight Loss Program on Cardiovascular Measures and Blood Profile

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Common physiological adaptations that occur with regular exercise include decreased resting blood pressure and heart rate as well as an improved blood lipid profile. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. **PURPOSE**: The purpose of this study was to determine if a primarily weight loss driven program would also result in improved resting cardiovascular measures and blood lipid profiles.

METHODS: Total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, fasting plasma glucose (FPG), triglycerides (TG), resting blood pressure (BP), and resting heart rate (RHR) were assessed before and after the six-week program in thirty four sedentary adults (M_{age} =38.24, SD=9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes, follow a given and structured diet plan, and drink a gallon of water daily. **RESULTS**: A significant decrease in TC (189.2 ± 6.81 mg/dL vs. 173.4 ± 6.65 mg/dL, $P < 0.001$) and LDL (115.0 ± 7.25 mg/dL vs. 107.0 ± 6.05 mg/dL, $P < 0.05$) were seen following the six-week weight loss program. HDL, FPG, and TG levels were not significantly altered by the six-week program neither were RBP nor RHR. **CONCLUSIONS**: These data suggest that a structured six-week weight loss program is effective in reducing TC and LDL. However, the six-week, 30 session weight loss program did not statistically affect resting cardiovascular measures. While this study emphasizes the health-related advantages of incorporating physical activity and a healthy diet into a sedentary lifestyle, more research is required to establish the most beneficial time frame of a successful weight loss program that would improve the cardiovascular system.

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Evaluating the Effects of Two-Minutes Active Recovery on a "Booster" VO_2max Test Using Ultramarathon Runners

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Maximal oxygen consumption (VO_2max) tests typically end at the point of volitional exhaustion. Yet, prior research with averagely fit individuals and highly fit NCAA female athletes suggest that concluding a maximal treadmill test with 2min active recovery and allowing subjects to exercise a second time (ie. a booster test) at the workload eliciting the initial volitional exhaustion results in significantly greater VO_2 max values (1.4% and 4.2% mean increase, respectively). The potential effects of this testing sequence (ie. 2min active recovery) on VO_2max treadmill graded exercise tests (GXT) has not been evaluated utilizing ultramarathon runners, yet accurate assessment of these unique athletes' VO_2max is crucial. **PURPOSE**: To examine changes in VO_2max values, in fit ultramarathon runners, following 2min of active recovery at the conclusion of a treadmill GXT to volitional exhaustion. **METHODS**: Twenty-nine (m = 19, f = 10) ultramarathon runners completed a max treadmill GXT by reaching volitional exhaustion (MX1). Immediately following 2min active recovery (at 0% grade & 2.5 mph), subjects exercised to volitional exhaustion a second time (MX2). MX1 and MX2 were compared using a Paired-Samples t-Test with significant differences occurring at $p \leq 0.05$. **RESULTS**: MX1 (53.9 $\pm$ 6.0 ml/kg/min) was significantly different ($p = 0.03$) than MX2 (52.7 $\pm$ 7.0 ml/kg/min). The mean change from MX1 to MX2 was -2.2%, yet 37.9% of the subjects benefited (+2.9% mean increase) from the booster test with individual increases of +0.2% up to +8.0%. **CONCLUSION**: Mean results suggest that 2min active recovery may not allow significantly greater VO_2max values to be achieved by fit ultramarathon runners during a max treadmill GXT, yet 37.9% of the subjects increased their VO_2max during the "booster max" treadmill protocol. Future research may examine if fitness level, training experience, age, ultramarathon distance specialty, or other variables might affect this exercise testing protocol.

The Effectiveness of Individualized Exercise Programs on the Physical Fitness of Rural Cancer Survivors

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The race to determine the ultimate exercise program for cancer survivors continues, but is there only one answer? **PURPOSE**: To examine the benefits of individualized exercise prescriptions for cancer survivors in rural Pennsylvania. **METHODS**: Three female cancer survivors with an average age of 64.0 ± 1.5 years from various cancer backgrounds were recruited to participate in a four-week program of 90-minute sessions twice per week. The program consisted of individually tailored resistance, aerobic, and flexibility training. Health and fitness testing occurred on a pre-test, post-test basis and included information on demographics, balance, body composition, cardiorespiratory fitness (CRF), muscular fitness, functional ability, and flexibility. **RESULTS**: Paired sample t-tests compared pre- versus post- testing results. CRF [peak VO_2 ($p=.042$), peak power output ($p=.020$)], and muscular strength [handgrip ($p=.044$)] significantly improved following the individualized training program. Changes in % body fat (-2.1%), fat free weight (+1.3%), ventilatory threshold (VT) (+45.0%), Timed up and go (-17.2%), 30-second chair stand (+62.9%), and flexibility (+21.7%) also improved, but were not statistically significant ($p > .05$). **CONCLUSIONS**: The results suggest that individualized exercise programs benefitted survivors in CRF and muscular strength. Improvements also were observed in body composition, VT, functional ability, and flexibility. Thus, regardless of the stage of diagnosis, type of cancer, or number of recurrences of cancer, individualized exercise programs are highly beneficial to enhancing the physical fitness of rural cancer survivors.

Evaluation of the Accuracy of the ACSM Walking Metabolic Equations During the Bruce Protocol

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The metabolic equations from the American College of Sports Medicine (ACSM) are used to determine energy expenditure during exercise. However, the equations have been shown to overestimate the actual measured value of oxygen uptake (VO_2). **PURPOSE**: To determine the validity of the ACSM metabolic equations for walking in predicting the VO_2 during the first three stages of the Bruce Protocol Treadmill Test. **METHODS**: 48 subjects (24 males, 24 females) aged 31.7 ± 13.3 years and with a BMI 25.1 ± 3.3 kg/m^2 completed a maximal treadmill test using the Bruce Protocol. A Parvo Medics TruOne 2400 system was calibrated before each test and used to collect and measure VO_2. Steady state, defined as a heart rate ± 5 bpm for the last 2 minutes of each stage, was attained in all subjects during each stage. The measured values of VO_2 during the last minute of each stage were compared to the predicted values calculated using the ACSM walking metabolic equation. **RESULTS**: Dependent t-tests were used to compare predicted against measured VO_2 values for each stage. The predicted and mean measured values ± SD of stages 1-3 were 16.3 ml/kg/min and 15.4 ± 1.7 ml/kg/min ($p = 0.0001$), 24.7 ml/kg/min and 22.1 ± 2.1 ml/kg/min ($p = 0.0001$), and 35.6 ml/kg/min and 31.8 ± 4.1 ml/kg/min ($p = 0.0001$), respectively. The equation overestimated VO_2 during stages 1-3 in 37 (77.1%), 46 (95.8%), and 43 (89.6%) subjects, respectively. **CONCLUSIONS**: The ACSM walking metabolic equation consistently overestimated the measured VO_2 for each of the three stages. The ACSM states the metabolic equations can have up to 7% error. However, the predicted VO_2 for stages 2 and 3 were both 12% greater than the measured. Due to the variability between the predicted and measured VO_2 values, caution should be taken when using the ACSM walking metabolic equation to estimate VO_2 during the first three stages of the Bruce protocol.

Excessive Foot Mobility Enhances Static Stability under Visual Perturbation

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PURPOSE: Lack of balance and postural stability has been linked to an increase in injury prevalence. Variations of postural sway have been associated with increased prevalence of ankle injury in basketball players and increased sway index in female soccer players, where balancing on a soft surface has been linked with injury and suggests that impaired proprioception may be a prominent influence on balance deficit. Center of pressure (COP) displacement has been found to be a factor in ankle instability during the early stage of weight acceptance during lateral movement, which may result in a reduction in capacity to

dissipate ground forces upon impact. COP control is particularly challenged when the visual field is distorted. Static instability may be associated with lower extremity injury and foot mobility may be associated with instability, especially under perturbation. Therefore, the purposes of this study were to examine the influence of foot mobility differences on Shear Force Range and Sway Path Linear Mean and to establish a correlation between the two measures in estimating postural instability. **METHODS**: We tested 58 college age subjects using a cross-sectional design and found only low correlations between SFR and SPLM in either eyes open (r = -0.09) or visual distortion (r = 0.21) conditions on Pearson r statistics. **RESULTS**: Independent t-tests revealed that a mobile foot group showed significantly lower SPLM (t = 2.05, p = .048), compared to a less mobile (rigid) foot mobility type. Between group differences on SPLM in GOG condition emerged, where higher foot mobility was associated with greater stability. However, SFR was not statistically different between mobility levels. **CONCLUSIONS**: Since group differences occurred only in the visually perturbed condition, we infer that foot mobility appears to affect static stability when appreciation of visual field is diminished and subjects are left to rely on other substrates for postural control.

Cardiovascular Fitness Testing in Students Diagnosed with Autism Spectrum Disorder

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Exercise and physical activity has been shown to decrease stereotypical or self-stimulating behaviors in children with Autism Spectrum Disorder (ASD), in addition to increasing social skills and decreasing the risk for obesity in children diagnosed with ASD. However, few studies exist that examine what physical activity assessments are most appropriate and can be used with children with ASD. **PURPOSE**: The purpose of this study was to determine the most reliable and appropriate assessment of cardiovascular fitness in individuals with varying degrees of ASD. **METHODS**: Eight participants (11-20 years) who were diagnosed with a mild to moderate form of ASD volunteered to participate in this study. The three fitness assessments that were utilized were: the Pacer Test, the Cooper 12 Minute Run Test, and the Rockport One Mile Walk Test. The participants performed each assessment 3 times over the course of the 4 months. A Cronbach's Alpha was used to test reliability on each assessment. Three independent *t*- tests were also run to compare the participant's estimated VO_2 max levels achieved during the three fitness assessments to the optimal VO_2 max level according to the Fitnessgram Performance standards healthy fitness zone. Finally, a one-Way ANOVA was used to test the differences between VO_2 max levels among the three tests. **RESULTS**: All three assessments were found to be significantly reliable ($p < 0.05$). Estimated VO_2 max levels for all three tests were significantly lower than optimal VO_2 max levels (20^{th} percentile), $F(2,21) = 4.873$, $p = 0.018$, though performance on the Rockport One Mile produced estimated VO_2 max values closest to optimal levels. Performance on the Rockport One Mile Walk test significantly differed from the Cooper 12 minute run test ($p = 0.022$); no other significant differences between tests were found. **CONCLUSION**: It can be concluded by this study that all three fitness assessments can be reliably used when testing individuals with ASD. However, of the three tests, the Rockport One Mile Walk Test is considered the most appropriate cardiovascular fitness assessment to use on individuals diagnosed with ASD, due to the simplicity of the test and mild level of exertion that is required to complete the assessment.

Test-Retest Reliability and Learning Effect of the Modified CTSIB Balance Protocol

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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. A secondary purpose was to study if short term balance training could improve proprioceptive integration for future study of populations that are prone to balance difficulties. **METHODS**: Twenty individuals who were free of concussion, lower leg injury or balance conditions volunteered to participate in the study. The participants

were randomly separated, and counterbalanced for gender, into an experimental group (n=10) and a control group (n=10). All testing was conducted on the Biodex Balance System SD to determine center of pressure sway using the modified CTSIB protocol which consisted of four 30-second trials under different conditions; eyes-open firm surface (EO-F), eyes-closed firm surface (EC-F), eyes-open soft surface (EO-S) and eyes-closed soft surface (EC-S). Both groups were tested on days one, two and six; however, the experimental group received two ten-minute balance training sessions on hard and soft surfaces between days two and six. A 3 (day) x 4 (condition) x 2 (group) ANOVA with repeated measures was conducted to determine significance ($p < 0.05$). **RESULTS**: The main effect of day was not significant ($p = 0.43$). The main effect of group was significant ($p < 0.001$). The training group had less sway than the control group (1.04 ± 0.03 vs (1.18 ± 0.03). The main effect of condition was significant ($p < 0.001$). A Fisher LSD was used to follow up this effect. As balance conditions became more difficult sway increased. EO-F (0.54 ± 0.04) had less sway than EC-F and EO-S (0.85 ± 0.04 and 0.87 ± 0.04, respectively) which were lower than EC-S (2.81 ± 0.04). There were no interaction effects. **CONCLUSIONS**: The modified CTSIB demonstrated strong reliability for multiple day comparisons suggesting no learning effect between trials. In addition, the results suggest that a short-term (1 week) training program could result in reduced sway. Finally, the CTSIB uses multiple conditions across the testing protocol which stresses the sensory feedback system needed to maintain balance. The results indicate that sway increases as sensory input is challenged. This could have application for balance training or rehabilitation.

Consumption of a Caffeinated Soft Drink during Exercise in the Heat Worsens Dehydration

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Chronic dehydration is linked to kidney dysfunction in workers regularly exposed to hot environments. Sugar-rich beverages, such as soft drinks, are regularly consumed on work sites. Such hypertonic drinks decrease plasma and extracellular fluid volumes during rest. Consuming a soft drink-like beverage after resting heat exposure worsens dehydration in rats. It is unknown if drinking a caffeinated soft drink exacerbates dehydration during exercise in the heat. **PURPOSE**: Test the hypothesis that consuming a caffeinated soft drink during exercise in the heat increases the magnitude of dehydration. **METHODS**: Twelve healthy subjects (age: 24±5 y, 3 females) completed randomized soft drink (Mtn Dew, Soda) and water control (Water) trials. Subjects completed four 1 h work-rest cycles (45 min exercise, 15 min seated rest) in a 35°C, 65% RH environment. During rest, subjects drank 500 mL of the assigned rehydration beverage (~11°C). Physiological variables, and venous blood and urine samples were taken pre- (PRE), and post-exercise (POST) after 15 min supine rest in a moderate environment. Percent changes in plasma volume were estimated from changes in hemoglobin and hematocrit. Data are reported as a change from Pre (mean±SD). **RESULTS**: Increases in core temperature (Soda: 0.8±0.3, Water: 0.8±0.3°C, $p=0.46$) and changes in nude body weight (Soda: -0.3±0.8, Water: 0.0±0.7%, $p=0.20$) were not different between trials. Urine specific gravity was higher at POST ($p<0.05$), but there were no differences between trials (Soda: 0.006±0.013, Water: 0.007±0.009, $p=0.89$). At POST, plasma osmolality was elevated in Soda (2±3 mOsm/kg) and reduced in Water (-6±3 mOsm/kg, $p<0.01$). Urine osmolality was higher at POST ($p<0.01$), but there were no differences between trials (Soda: 69±368, Water: 185±311 mOsm/kg, $p=0.12$). Plasma volume was lower in Soda at POST ($p<0.02$), but there were no differences between trials (Soda: -5±6, Water: -2±7%, $p=0.15$). Elevations in heart rate were higher in Soda at POST (Soda: 20±12, Water: 12±12 bpm, $p<0.03$). Mean arterial pressure was elevated in Soda ($p<0.01$) at POST, but was not different between trials (Soda: 5±8, Water: 2±5 mmHg, $p=0.33$). **CONCLUSIONS**: These data indicate that consuming a caffeinated soft drink during exercise in the heat worsens dehydration and elevates cardiovascular strain.

Beverage Sodium Content Delays Time to Net Fluid Balance in Older, but Not Young, Adults

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Healthy older adults typically have a loss of functional nephrons and thus a lower glomerular filtration rate (GFR). Net fluid balance is a time-sensitive measure of fluid retention. Beverages with higher sodium content may promote fluid retention and increase the time in positive net fluid balance, especially in older individuals. **PURPOSE**: To measure net fluid balance in older adults compared to young adults following ingestion of beverages with varying sodium contents. We hypothesized that (1) regardless of sodium content, older subjects would take longer to achieve fluid balance following fluid ingestion, and (2) consumption of commercially-available hydration products with higher sodium concentrations would further delay net fluid balance in older subjects compared to water. **METHODS**: On five separate visits, 9 young (Y, 23±3 yrs 5M/4F) and 8 older (O, 67±6 yrs, 3M/5F) subjects consumed 1 L of distilled water, Enterade ORS (60 mmol/L Na^+, 20 mmol/L K^+), Pedialyte (45 mmol/L Na^+, 20 mmol/L K^+), Enterade Lifestyle (30 mmol/L Na^+, 10 mmol/L K^+), or Gatorade (20 mmol/L Na^+, 3.2 mmol/L K^+) over a 30-minute period. Urine samples were collected before ingestion and at 0, 60, 120, 180, and 240 minutes post-ingestion. Net fluid balance was calculated as (1000 g fluid consumed – g of urine produced) at each time point, and time to 0 net fluid balance (when g urine excreted = g fluid consumed) was determined for each beverage by non-linear regression. **RESULTS**: GFR was lower (69±3 vs. 95±5, $P<0.01$) in O compared to Y. There was no difference among beverages in time to net fluid balance in Y (all $P>0.05$). The time to net fluid balance was longer for O compared to Y following water ingestion (O: 174±16 vs. Y: 112±6 min; $P<0.01$). Time to net fluid balance was increased in O with Enterade Lifestyle ingestion compared to water (304±71 vs. 174±16, $P=0.03$). Time to achieve net fluid balance in O was likewise higher for Pedialyte (239±55) and Enterade ORS (226± 55) compared to water, but were not significantly different from the water trial. **CONCLUSIONS**: After ingestion of water, healthy older adults take longer to reach a state of net fluid balance, which may be due to reductions in GFR. Beverages that contain sodium further prolong time to net fluid balance compared to water in older adults suggesting a further impact of renal sodium handling.

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Exercise Duration Augments Inter-Arm Systolic Blood Pressure Difference

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Blood pressure is a universal measurement used to aid in appropriate clinical decision-making and monitor safe exercise participation. An inter-arm systolic blood pressure difference (ISBPD; difference of ≥10mmHg between arms) at rest is associated with vascular disease, arterial stiffness, and premature morbidity and mortality. The most commonly reported prevalence of ISBPD at rest is 10%. Recently, our laboratory observed a similar frequency of resting ISBPD and a greater occurrence when short-term (e.g. <5 min) moderate-intensity aerobic exercise was used as a perturbation. Despite our observations, the incidence of ISBPD during exercise has yet to be clearly established in apparently healthy individuals. **PURPOSE**: To determine the exercise-induced response of ISBPD during a prolonged steady state bout of aerobic exercise. **METHODS**: Participants completed a VO_{2peak} test on a cycle ergometer. On a subsequent visit, participants cycled (60 rpm) at a workload equivalent to 50% of their VO_{2peak} for 30 min. Heart rate (HR) and systolic blood pressure difference (SBPD) was measured sequentially using standard auscultation in both arms at rest, 5, 10, 20, 30-min of exercise (EX-5, EX-10, EX-20, EX-30), and active recovery (AR). Descriptive and comparative statistics were generated. Further, logistic regression analysis was used to determine the change in the odds ratio (OR) of ISBPD given exposure to exercise. **RESULTS**: The prevalence of ISBPD at rest was 19%. Occurrence increased to 42% at EX-5 and EX-10, 56% at EX-20, 53% at EX-30, and 22% at AR. Males were more likely to present with ISBPD at EX-10 and EX-30 ($p<0.05$). Interestingly, an additional 1mmHg difference in SBPD at rest was associated with an increased OR at EX-10 and AR (1.34 and 1.23, respectively, $p<0.05$). EX-5 resulted in a higher OR (1.14, $p<0.05$) in participants that utilized a greater proportion of their peak HR reserve. **CONCLUSIONS**: The occurrence of ISBPD during moderate-intensity aerobic exercise increased with duration. Sex and submaximal HR response to prolonged exercise are closely related to exercise-induced ISBPD.

A Comparison of Self-Reported Pain Levels in Minimally-Shod vs. Traditionally-Shod Runners with Different Forefoot Types

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Distance running is a popular recreational activity despite high rates of overuse injury. The efficacy of wearing minimalist shoes to prevent injury has been debated. We previously reported that minimalist runners are more likely to experience site-specific lower extremity pain; however, no clear relationship has been established between shoe type, forefoot (FF) shape (Egyptian, Morton's, or square), and pain. **PURPOSE**: Therefore, the purpose of this study is to examine self-reported pain in the lower limbs in minimalist and traditionally shod runners with various forefoot types. **METHODS**: Following consent, 48 experienced runners (age: 27.5 ±9.3 yrs, hgt: 172.2 ±10.2 cm, mass: 70.6 ±15.6 kg, gender: 18M/30F) who reported running at least 10 miles a week for the past three months, completed a visual analog scale (VAS) about pain they experience in five common sites of injury: knee, ankle, calf, shin, and foot. A score of ≥3 on the VAS was considered pain. Shoes were categorized as either minimalist (n=40 feet, midsole drop <4mm) or traditional (n=56 feet, midsole drop>4mm). Superior view photographs were taken of the FF and were categorized as Egyptian (EF) (n=73 feet, typical foot with Hallux the most distal toe), Morton's (MF) (n=10 feet, 2nd toe longer than Hallux), or square (SQ) (n=13 feet, Hallux and 2nd toe equal length). Separate three-factor chi-square analyses determined if shoe type (minimalist, traditional) and forefoot type (EF, MF, SQ) were related to pain (yes, no). (α=0.05). **RESULTS**: More minimalist runners with EF reported pain (61.8%; p=0.004) when compared to MF (50%) or SQ (20%). More minimalist runners with EF reported calf pain (77.8%; p=0.028) than those with MF (0%) or SQ (20%). FF type did not relate to pain at any other site. **CONCLUSION**: Runners with EF are more likely to report pain in at least one location, and specifically in the calf, than runners with other FF shapes when wearing minimalist vs traditional shoes. Minimalist shoes encourage the runner to strike the ground with the forefoot; however, this requires more eccentric loading of the calf musculature and Achilles tendon. Our minimalist runners with EF reported more calf pain than those with other FF types. Other FF types may be better able to absorb the foot contact and muscle forces better than a more typical foot when wearing minimalist shoes.

The Effects of a Six-Week Weight Loss Program on Muscular Strength and Endurance

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Increased muscular strength and endurance are positively correlated with regular exercise training. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. **PURPOSE**: The purpose of this study was to determine if a primarily weight loss driven program would result in substantial increases in muscular strength and muscular endurance. **METHODS**: To test muscular strength, two upper body, shoulder press and bicep curls, and two lower body, squats and Romanian dead lifts (RDL), were assessed in pounds using the 6 repetition maximum (6RM) analysis. To analyze core endurance, forearm plank and six inches were performed for maximum time in seconds. Lastly, whole body muscular endurance was determined by measuring time to fatigue for high knees and wall taps. All of these variables were assessed before and after the six-week training program in thirty four sedentary adults (M_{age}=38.24, SD=9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes, follow a given and structured diet plan, and drink a gallon of water daily. **RESULTS**: There was a significant increase in squat strength (61 ± 8 lbs pre vs. 81 ± 9 lbs post, P < 0.001) and RDL strength (75 ± 8 lbs pre vs. 90 ± 9 lbs post, P < 0.01) following the six-week program. Similarly, upper body strength increased in both the shoulder press (40 ± 3 lbs pre vs. 44 ± 3 lbs post, P < 0.01 and bicep curls (35 ± 2 lbs

pre vs. 40 ± 2 lbs post, P <0.01). Core muscular endurance time only improved in the forearm plank (P = 0.004) and whole body endurance time improved with just wall taps (P = 0.02). **CONCLUSIONS**: These data suggest that this six-week weight loss program is effective in increasing both muscular strength and muscular endurance. Although these strength and endurance gains may clearly be the result of participating in an exercise program after previously living a sedentary lifestyle, further research can contribute to training specificity and the impact both cardiovascular and weight training have in junction with a highly structured weight loss program.

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Using a Urinal Screen Color Assessment Apparatus as a Predictor of Hydration Status

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Hypohydration is a common issue among athletes, manual laborers and the elderly. Adequate daily hydration is essential to maintain and promote optimal health. However, a reliable and accessible method for diagnosing this multivariate health concern is not readily available to the average person at risk. **PURPOSE**: To determine the relative accuracy of a new hypohydration detection device using Urine Color (UC) to a previously validated method of UC assessment. **METHODS**: Urine samples were collected from college aged students (n=54) under free living conditions. Each sample was analyzed three times to determine a UC scores and USG scores by two independent researchers. USG analysis was conducted to establish a criterion baseline for the clinical determination of the subject's hydration status (< 1.020 =euhydrated; >1.020= hyohydrated). UC was determined using an 8 shade color scale that has been previously validated by Armstrong and others as a practical means to estimate hydration status. However, in this investigation UC was also assessed using a new Urinal Screen Color Assessment Apparatus (USCAA) which utilized a 6 shade color scale, a consistent sample quantity (23ml) and sample thickness (4 mm) as well as standardized receptacle background color (cream) for visual analysis. **RESULTS**: The Armstrong Method (AM) and the USCAA methods of estimating hydration status revealed a positive and significant statistical relationship (p <.05) when comparing USG and UC (AM, r =.81; USCAA, r =.77). When urine color was used to predict a simple binary state of either euhydration or hypohydration, the AM was able to accurately predict hydration status 77.36% of the time as compared to 81.13% using the USCAA. A proportional Z-test analysis revealed there was no significant difference in the predictive accuracy of the two methods (z=.46; p=.67) . **CONCLUSIONS**: The USCAA tested in this investigation appears to be comparable in accuracy to the AM of urine color assessment. A non-clinical and user friendly method of self-determining one's hydration status may be useful for those who may be at risk of heat related injury. Further analysis of this USCAA appears to be warranted.

Effects of Sodium Bicarbonate Dosage on Blood Lactate Levels in Trained and Recreational Athletes

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Sodium Bicarbonate ($NaHCO_3$) can be taken as an ergogenic aid for anaerobic athletes, in order to boost performance. It works by increasing the extracellular buffering capacity and promoting the flow of hydrogen ions across the sarcolemma. **PURPOSE**: To test if $NaHCO_3$ will cause blood lactate levels to increase and improve performance time in sprint cycle work in anaerobic and non-anaerobic populations. **METHODS**: 13 healthy, college males (9 anaerobic athletes and 4 recreational athletes) (M±SD: age= 21.54±1.05, mass (kg) = 90.3±19.6, height (cm) = 181.4±10.1) participated in the study. Subjects were required to pedal a distance of 0.6 km on a bike ergometer at a KP load relative to their body mass (body mass x (0.075) x (0.7). Subjects repeated this protocol for 4 different trials [(1) Baseline, (2) 24 hr. dose, (3) 1 hr. dose, (4) control]. Prior to 24-hr. and 1-hr. trials, the subjects ingested $NaHCO_3$ (0.3g per kg of body mass) over 24-hr or 1-hr span, respectively. **RESULTS**: Data was analyzed using a two-way ANOVA between group(s) and condition(s). The anaerobic athletes' post exercise blood lactate levels, when

supplementing with the $NaHCO_3$, were higher (24hr: 16.76 and 1hr: 15.86 mmol/L) than the baseline and control days (13.57 and 14.13 mmol/L, respectively). The recreational athletes, on the other hand, had the opposite effect where blood lactate level was highest during baseline testing (15.95 mmol/L), while the treatment and control conditions showed lower values (24 hr. = 14.2 mmol/L, 1hr= 13.7 mmol/L, control= 13.63 mmol/L). The recreational athletes elicited the best time trials while supplementing with $NaHCO_3$, with the fastest time at 1 hr. treatment (48.38 sec) and the 24hr. treatment being the second fastest (50.68 sec.). The baseline and controls had the slowest times (54.25 and 50.95 sec), respectively. However, these differences in time and lactate levels, across conditions as well as between groups, were not statistically significant. **CONCLUSION**: Though not significantly different, ingesting $NaHCO_3$ could moderately aid in performance time and boost blood lactate levels as shown in this study. Future research should consider exploring higher KP loads, longer or shorter test, and quantity and timing of dosing $NaHCO_3$.

Segmented Motor Output in Parkinson's Disease Improved with Speed-Based Exercise

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In people with healthy neuromotor control, rapid isometric contractions (force pulses) are produced with a linear relationship between rate of force development (RFD) and peak force that results in relative invariance in time to peak force (tPF). Parkinson's disease (PD) disrupts motor output, sometimes resulting in discontinuous bursts in the electromyogram and abnormal rapid force pulses. Transient reductions in RFD result in step-like increases in force to the peak force level. Little is known about this segmentation and if it can be affected by speed-based exercise. **PURPOSE**: Aim 1 was to quantify the duration of the first segment in rapid force pulses and determine its consistency across segment-dominant (SegD) individuals. Aim 2 was to determine if speed-based exercise can improve the smoothness of force output in PD. **METHODS**: 19 adults with PD (69.6±7.9 yrs, Hoehn Yahr stage ≤3, 1 female) completed the study. Subjects performed 75-100 rapid isometric handgrip force pulses to varying percentages of their maximal voluntary contraction force. 7 subjects completed a 6-week program (2 sessions/ week) with low-resistance high-speed bicycling intervals. Dependent variables were time to first peak (t1Pk), tPF, half-relaxation time (HRT), peak RFD, and number of segments from threshold to peak force (SEG). Subjects with ≥14% of pulses with SEG were classified as SegD. Pearson's correlations described relationships between measures. Simulation modeling analysis was used to determine differences in SEG within individual subjects before and after training. **RESULTS**: 7 of 19 subjects tested were SegD with low variance in t1Pk (0.11±0.04 s) compared to tPF in smooth pulses from non-SegD (0.12±0.05 s) and all pulses in SegD (0.25±0.16 s). The average SEG frequency on the rising phase of the force recording was 6.5±2.7 Hz. SEG were positively correlated to HRT ($r=0.82$, $p=0.01$) and negatively correlated with mean RFD ($r= -0.72$, $p=0.048$) in SegD. Of the 7 SegD subjects, 5 had decreased SEG after the exercise program ($p<0.05$). **CONCLUSION**: Segmentation of motor output alters the isometric force profile in some PD and occurs within the frequency range of tremor. Peak forces not reached in approximately 0.11 s may be more likely to exhibit segments. Speed-based exercise may improve the smoothness of isometric force production in PD.

Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns

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Aortic stiffness is linked to atherogenic retrograde and oscillatory shear patterns in peripheral arteries. High-intensity exercise may increase aortic stiffness. Whether such acute changes in aortic stiffness detrimentally affect peripheral shear patterns remains unknown. **PURPOSE**: Determine if acute changes in aortic stiffness negatively influences superficial femoral artery (SFA) shear rates (SR) and stiffness following high-intensity cycling. **METHODS**: 20 adults (27±5 yrs; 10 women) underwent arterial assessment at baseline (BL), after a 5-min time control period (TC), and following a 30-sec bike sprint against 7% body mass (POST). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cfPWV). SFA diameter, blood velocity, and stiffness (β stiffness and Young's elastic modulus, ε) were measured via Doppler ultrasound. Diameters and blood velocities were used to determine SFA antegrade and retrograde

SR as well as the oscillatory shear index (OSI). **RESULTS**: BL and TC were not different for any measures (p>0.05). cfPWV increased POST compared with BL and TC (p≤0.01). SFA retrograde SR and OSI were reduced POST compared with BL and TC (p≤0.001). SFA stiffness was unchanged by exercise (p≥0.06). The change in cfPWV from pre-exercise to POST was not associated with changes in retrograde SR (r = 0.03, p=0.90), OSI (r = 0.13, p=0.58), β (r = 0.07, p=0.78), or ε (r = 0.08, p=0.73). **CONCLUSIONS**: Acute high-intensity exercise increases aortic stiffness while concomitantly reducing oscillatory shear in the SFA. High-intensity exercise-mediated increases in aortic stiffness appear independent from downstream atherogenic shear patterns in the exercised vasculature.

Table 1. Arterial stiffness and shear patterns before and after high-intensity cycling exercise.

	Baseline	Time Control	Post
Stiffness Measures			
Aortic cfPWV ($m \cdot s^{-1}$)	5.8 ± 0.6	5.7 ± 0.6	6.8 ± 1.3†
SFA β Stiffness (aU)	11.2 ± 2.8	13.6 ± 6.0	13.8 ± 4.6
SFA ε (kPa)	135.1 ± 7.8	157.0 ± 19.9	168.5 ± 12.7
Shear Patterns			
Primary Antegrade Shear Rate (s^{-1})	216.1 ± 68.7	200 ± 58.7	255.4 ± 55.5†
Retrograde Shear Rate (s^{-1})	88.4 ± 30.4	89.9 ± 25.5	41.2 ± 25.9*
Secondary Antegrade Shear Rate (s^{-1})	43.9 ± 8.8	42.1 ± 7.8	47.4 ± 36.1
Oscillatory Shear Index	0.25 ± 0.05	0.27 ± 0.04	0.11 ± 0.08*

cfPWV, carotid-femoral pulse wave velocity; SFA, superficial femoral artery; †Significantly different from pre-exercise (p<0.05); *Significantly different from pre-exercise (p≤0.001).

Relationship between Arm Microvascular Reactivity and Brachial Artery Flow Mediated Dilation

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Endothelial dysfunction is associated with an increased risk for cardiovascular disease. Currently, the most common noninvasive measurement used to assess endothelial function is flow mediated dilation (FMD). Unfortunately, FMD assessments require high cost equipment and are technically challenging. Recently, muscle oxygen resaturation rate in the lower leg following vascular occlusion has been shown to correlate to popliteal artery FMD. However, brachial artery FMD is far more commonly used. At present, it is unclear if a similar relationship exists between lower arm muscle oxygen resaturation and brachial artery FMD. **PURPOSE**: To determine if there is a relationship between brachial artery FMD and lower arm muscle oxygen resaturation rate following occlusion. **METHODS**: Brachial artery FMD was measured after five minutes of distal cuff occlusion of the right brachial artery. During the FMD trial three near infrared spectroscopy sensors were placed on the right arm midway between the elbow and wrist on both the anterior (AFA) and posterior (PFA) forearm and the thenar eminence (TH). **RESULTS**: Fifteen healthy participants (9M/6W, 25±2 years, 70.3±3.3kg, SBP 117±3mmHg, DBP 68±2mmHg, FMD 5.2±1%) were studied. Baseline SmO_2 (AFA 62.5±3.0%, PFA 56.2±2.7%, TH 60.0±2.5%; ANOVA p=0.118) and maximum SmO_2 (AFA 87.3±0.6%, PFA 81.0±3.4% TH 85.6±1.6%; ANOVA p=0.094) were not different between sites. Oxygen deficit integral during the occlusion time was greater at the AFA (-9852±637%) than both the PFA (-7403±690%; vs AFA p=0.043) and TH (-7075±537%; vs AFA p=0.020) sites (ANOVA p=0.015). There was no relationship between brachial artery FMD and the maximum negative SmO_2 slope during cuff occlusion (AFA -0.42±0.04%, r=0.32 p=0.29; PFA -0.41±0.04%, r=-0.13 p=0.65; TH -0.43±0.0%, r=0.07 p=0.81) or the maximum positive SmO_2 slope during reperfusion (AFA 5.43±0.71%, r=-0.30 p=0.31, PFA 4.40±0.68%, r=0.34 p=0.24, TH 4.78±0.43% r=0.17 p=0.57). **CONCLUSIONS**: This preliminary data displays no relationship between brachial artery flow mediated dilation and lower arm

muscle oxygen desaturation or resaturation rate. These upper extremity tests may provide complimentary information, i.e. macro- and micro-vessel function, but they likely differ mechanistically.

The Impact of Communication Frequency on a 12-Week Walking Program

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PURPOSE: To determine the impact of communication content and frequency on step counts and attrition rates during a 12-week walking program. **METHODS**: 185 participants enrolled in a 12-week walking program. Participants were randomly assigned to one of three groups: 1) general email (G), 2) general email plus an additional standard email (G+S), or 3) general email plus an additional individualized email (G+I). All participants received a general email on Monday morning that included program details, health information, and a request for step counts to be submitted by a specified day and time. The first group of participants (G) only received the general email. The second group received an additional email on Wednesday morning which included a standard motivational message and an additional "fun fact" (G+S). The third group of participants received an additional personal email on Wednesday morning which included their name, motivation that was specific to their step count goals and weekly progress, and a "fun fact" (G+I). A One-Way ANOVA was used to determine the difference in step counts between the three groups and a chi-square analysis was used to assess attrition rates between the three groups. **RESULTS**: The participants in the 12-week program significantly increased step counts from week 1(66,928±23,822 steps) to week 12 (79,004±24,379 steps) of the program ($p < 0.01$). However, at week 12, there were no significant differences between group G (76,811±29,687 steps), G+S (78,0171±191483), and G+I (82,212±19,183) ($p > 0.05$). There were also no significant differences in attrition rates between the three groups ($p = 0.92$). **CONCLUSIONS**: The level and frequency of communication in this 12-week walking program did not have a significant impact on step counts nor attrition rates.

Relationships Among sEMG Measures of Neuromuscular Excitation

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Mobility researchers interested in neuromuscular excitation rates calculate a variety of dependent measures from surface electromyograms (sEMG). This variation makes the interpretation of findings across studies difficult. **PURPOSE**: To determine the manner in which common sEMG dependent measures are related. **METHODS**: Isometric force and sEMG were recorded from 21 healthy young adults during isometric force-matching tasks with varied rates of force development (RFD). Participants were instructed to match, on a computer monitor, a real-time plot of their dorsiflexion force to a static plot of each RFD ramp-force condition. RFD conditions ranged from 20%MVC/s to the subject's fastest RFD. EMG was recorded at 2kHz, demeaned, rectified and zero-lag 4^{th} order Butterworth filtered. Dependent measures were: peak rate of EMG rise (RER); integrated EMG of the initial 30ms of the EMG burst (Q30); root mean square amplitude of the initial 30ms and 50ms (RMS30, RMS50); peak EMG amplitude prior to peak force; integrated EMG 30ms prior to peak rate of force development (Q30b); RMS amplitude from EMG threshold to peak force generation (RMStp). Spearman's correlation was used to quantify relationships between variables. **RESULTS**: Strong correlations were observed between Q30 and both RMS30 and RMS50 ($\rho = 0.951$, 0.887 respectively, $p < 0.01$) followed by peak amplitude with peak RER and Q30b ($\rho = 0.827$, 0.802 respectively, $p < 0.01$). Additional considerable correlations observed were peak RER with RMS50, Q30, and RMS30 ($\rho = 0.691$, 0.631, 0.608, respectively, $p < 0.01$). RMStp displayed no substantial correlations with any other variables. **CONCLUSION**: Correlations support logical distinctions between measures. Q30, RMS30, and RMS50 are anchored at the onset of the contraction and are collectively suitable for hypotheses about movement initiation. RER, Q30b, and peak EMG amplitude prior to peak force quantify peak neural excitation with timing that is coupled to peak RFD. RMStp measures total

excitation of task accomplishment. These relationships can guide the selection of measures for hypotheses related to either movement initiation or peak rates of force development.

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Repeatability of the Neurocardiovascular Responses to Static Handgrip in Young Adults

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Exercise-induced increases in blood pressure (BP) and heart rate (HR) are partially mediated by reflex-activated increases in muscle sympathetic nerve activity (MSNA). The magnitude of the sympathoexcitatory responses to isometric exercise is commonly used to assess aberrant neurocardiovascular regulation. However, the repeatability of the responses to isometric exercise remains unclear. Determining the repeatability of the neurocardiovascular responses to exercise is critical for accurate interpretation of data between clinical populations and across studies, and is consistent with the National Institutes of Health requirements for rigor and reproducibility in biomedical research. **PURPOSE**: To determine the intra-day repeatability of the neurocardiovascular responses to isometric exercise in young adults. We hypothesized that the increases in BP, HR and MSNA during static handgrip would be repeatable within an individual. **METHODS**: Mean arterial pressure (MAP; finger photoplethysmography), HR (ECG), and MSNA (peroneal microneurography) were measured in 5 (3 M; 25±1 yrs) healthy young adults at baseline and during static handgrip (HG) at 30% of maximum voluntary contraction followed by post-exercise ischemia (PEI) to isolate the metabolic component of the exercise pressor reflex. Each subject completed two trials separated by 15 min. **RESULTS**: The increases in MAP ($\Delta 29 \pm 5$ vs. $\Delta 34 \pm 4$ mmHg; $\rho c = 0.824$, 95%CI: 0.32 - 0.97) during HG were strongly repeatable within an individual; however, the the HR responses ($\Delta 16 \pm 2$ and $\Delta 23 \pm 4$ bmp; $\rho c = 0.108$, 95%CI: 0.37 - 0.54) were not. In addition, the MAP ($\Delta 19 \pm 7$ and $\Delta 18 \pm 5$ mmHg; $\rho c = 0.909$, 95%CI: 0.74 - 0.97) and HR responses ($\Delta -2 \pm 1$ vs. $\Delta -1 \pm 2$ bpm; $\rho c = 0.667$, 95%CI: 0.15 - 0.90) during PEI were substantially repeatable within an individual. The responses in MSNA (n=3) during PEI ($\Delta 7 \pm 4$ vs. $\Delta 12 \pm 4$ bursts$\cdot$min^{-1}; $\rho c = 0.715$, 95%CI: -0.634 - 0.988), but not HG ($\Delta 9 \pm 2$ vs. $\Delta 25 \pm 4$ bursts$\cdot$min^{-1}; $\rho c = -0.013$, 95%CI: -0.773 - 0.763). **CONCLUSIONS**: These preliminary data suggest MAP, but not HR responses to isometric exercise are repeatable within an individual. These are important methodological considerations for accurate interpretation of data examining clinical implications of dysregulated responses to sympathoexcitatory maneuvers.

The Effects of Virtual Reality Training on Balance and Stability in Female Athletes

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Balance and stability in athletes is an important aspect of performance, requiring an individual to maintain and control their center of gravity in response to changes in body position. Virtual reality (VR) is potentially a new technology that may be used to test and train for both balance and stability. **PURPOSE**: The purpose of this study was to examine the effects of VR training on the static balance and stability to improve the control center of the gravity in female collegiate athletes. **METHODS**: Ten female NCAA Division III athletes who had no history of concussions or lower leg injuries were recruited for this study. Familiarization and pre-training on a forceplate (static balance) and on a Biodex Balance System using a test that measures the limits of stability (LOS) to reduce the potential of the learning effect. The forceplace (static balance) protocol consisted of two, 30-second single leg stork stances with an eyes open (EO) and eyes closed (EC) condition while COP variables of total path length, maximum velocity in anterior-posterior (Vy_{max}) and medial-lateral (Vx_{max}) were collected. The LOS protocol used the controlling of multidirectional movements to score (direction and deviation) for overall, forward, backward, right and left movements. On the three training days, subjects participated in VR training that simulated walking and maintaining balance on a tightrope for 7 minutes. Post-testing followed the same protocol as pre-testing and results were analyzed by using paired t-tests ($p<0.05$). **RESULTS**: Of the 10 static and dynamic

variables, the pre- to post-testing comparisons revealed significant changes in only the tests of static balance of x-range eyes open (2.67 ± .46cm vs 2.27 ± .53cm, $p<0.05$) and the dynamic tests of backwards (125.73 ± 50.55cm vs 168.4 ± 26.47cm, $p<0.05$) and left (78.99± 20.09cm vs 119.38 ± 41.27cm, $p<0.05$). **CONCLUSION**: Short term VR training using a simple balance game demonstrated little improvement in balance and stability. Of interest for future research is the significant difference in x-axis range which demonstrated improvement in mediolateral stability during static balance and a significant improvement in backwards dynamic balance. This simple game may show potential for use in populations with limited balance and stability.

Metabolic and Microbial Responses to Exercise in C57 Wild-type and Adenylyl Cyclase 5 KO Mice

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Healthy aging, including protection against diabetes, obesity, cardiovascular disease and enhanced exercise tolerance, have been observed in our longevity model of disruption adenylyl cyclase type 5 (AC5KO). This is a critical observation since the aging population would not enjoy extra years if they accompanied by chronic disease and exercise intolerance. It has been demonstrated that aging is associated with alterations in composition, diversity, and functionality of gut microbiota. The extent to which the microbiota contributes to the healthy aging phenotype is unknown. **PURPOSE**: The goal of this study was to confirm that gut microbiota can mediate the protection against diabetes and enhanced exercise tolerance in AC5KO mice compared to wild type (WT) mice. **METHODS**: 24 (n=6/group) 6-week old C57BL/6NTac male WT and AC5KO were randomly assigned to either exercise or sedentary control groups: (1) wild type-exercise (WT-EX), (2) wild type-sedentary (WT-CON), (3) AC5-exercise (AC5-EX) and (4) AC5-sedentary (AC5-CON). Mice were exercised via forced treadmill running at 60-70% max intensity for 60-minutes 5 days/week, for 5 weeks. Following exercise training, mice were given an oral cocktail of ampicillin and vancomycin for five days to eliminate gut microbiome. All measurements were taken at the following time points: prior to exercise, post training/pre-antibiotic and post antibiotic; and included max exercise test (i.e. distance), glucose tolerance test (GTT) (2 U/kg [body wt.]) and insulin tolerance test (ITT) (1 U/kg [body wt.]). **RESULTS**: AC5KO mice have a unique microbiota with *Helicobacter typhlonius & Bacteroides sartorii spp.* being dominant in AC5KO and not in WT mice. Furthermore, AC5-EX mice showed altered glucose tolerance and reduced exercise tolerance following antibiotic treatment ($p=.05$). Interestingly, post antibiotic AC5-EX mice showed severe insulin sensitivity following (1 U/kg [body wt.]) treatment. **CONCLUSION**: Our results show that AC5KO mice have a unique microbiota compared to WT mice and their insulin/glucose control phenotype appears to be dependent on the microbiota.

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Impact of a 6-Week Exercise Intervention on Prison Inmates

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PURPOSE: Due to public sentiment, limited budgets, and a changing political climate, many correctional institutions are choosing to reduce or eliminate exercise equipment and/or exercise programs in order to make prison life less comfortable and more punitive. As such, many inmates adopt a sedentary lifestyle during their incarceration. The purpose of this investigation was to examine the effects of a 6-week exercise intervention on inmates in the Butler County Prison. **METHODS**: Interested inmates were randomly selected to participate in either the exercise intervention or control group. During the first week of the program, fitness assessments including body composition (bioelectric impedance analysis), muscular

strength (grip strength), muscular endurance (1-minute curl up, pushups), cardiovascular endurance (3-minute step test), and flexibility (sit and reach), were administered to both the intervention and control groups. Following the initial week of testing, only participants in the intervention group participated in a 60-minute exercise session, three days per week, for 6 weeks. Each exercise session included a warm-up, cardiovascular exercise, muscle conditioning exercises, and a cool-down including flexibility exercises. After the 6 weeks, inmates in both the intervention and control groups completed post-fitness testing. **RESULTS**: After 6 weeks of exercise training, inmates in the intervention group had statically better results compared to the control group in cardiovascular endurance (141±16 vs. 162±25 bpm) ($p<0.01$), muscular endurance of the trunk (52± 15 vs. 40± 14 curl-ups) ($p<0.01$), and flexibility (34.27±11vs. 28 ±8cm) ($p=0.32$), respectively. **CONCLUSIONS**: A 6-week guided exercise intervention can be a feasible and effective way to improve the fitness levels of incarcerated individuals with limited access to fitness equipment.

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Bilateral Training Results in Superior Strength Improvements to Unilateral Despite Similar Changes in Fat-Free Mass

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PURPOSE: To determine if strength increases differ between bilateral and unilateral training; to determine whether differences, if any, were mediated by muscle hypertrophy. **METHODS**: College-aged men and women (n=67; age=19.7 ± 0.9 yr; height=168.7 ± 9.8 cm; body fat = 22.14 ± 10.23%) provided written informed consent to participate. Subjects were randomized to a unilateral or a bilateral training group for eight weeks. Strength testing (chest press and leg press) was performed at pre, mid, and post, with body composition (air displacement plethysmography) at pre and post. Statistics included a repeated measures ANOVA with LSD post-hocs and planned contrasts. **RESULTS**: As shown in Figure 1 (leg press), strength increased (significant linear trend for chest press and leg press: $p=0.000$) across all three time points. While there were no significant differences in strength at any time point, within-subjects contrasts displayed a significant linear trend interaction between time and training group for both leg press (0.049) and chest press ($p=0.029$) strength; the slopes of the two lines were therefore significantly different in favor of the bilateral trend. Although both groups increased FFM, the increase was comparable (mean kilogram change from pre to post: 1.6 ± 0.5, $p=0.001$ bilateral, 1.4 ± 0.4, $p=0.001$ unilateral). **CONCLUSION**: Bilateral training results in superior strength improvements over eight weeks as compared to unilateral despite similar changes in fat-free mass.

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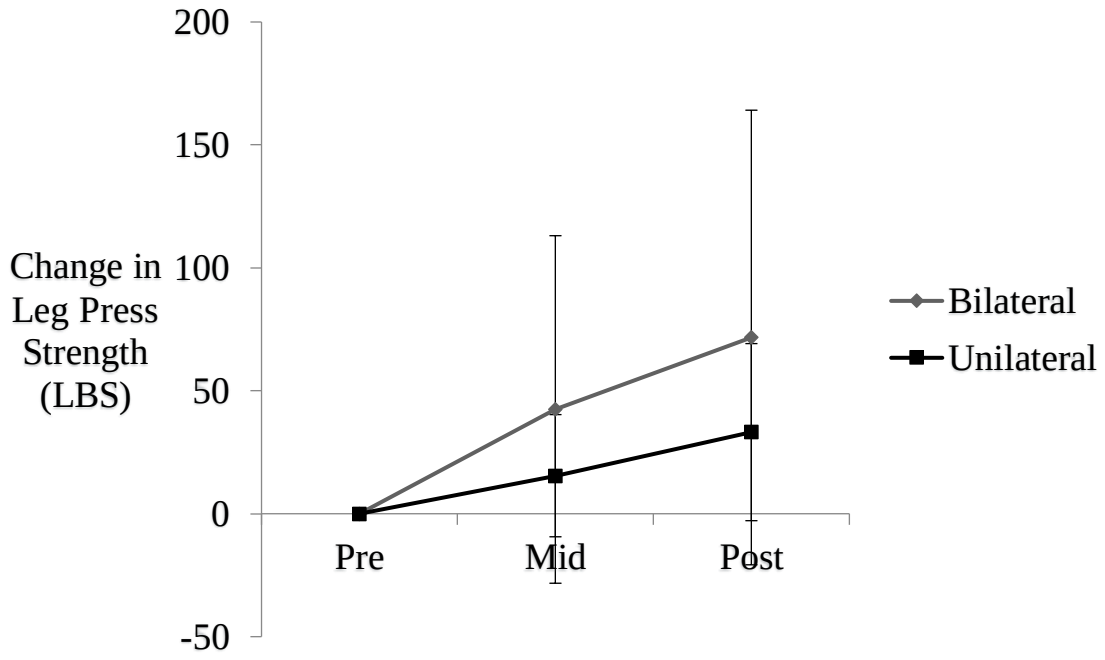

The Human Piriformis Muscle: Sensory, Postural, or Just a Pain

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Piriformis syndrome is a form of low back pain that is debilitating and difficult to treat. Physical therapy is often effective but in some cases the Piriformis muscle is disconnected or removed entirely through surgery. The short term consequences of this procedure are negligible but the long term consequences have not been studied. Furthermore, because of its size and anatomical location, it is not thought to be a primary mover of the body. The purpose and necessity of the muscle is an area of speculation. We hypothesized that it is a sensory and postural muscle, which could explain why short term consequences of its removal are minimal. **PURPOSE**: To determine the density of muscle spindles and fiber type composition of the human Piriformis muscle. **METHODS**: Six human cadavers (male = 3, female = 3) had their right and left Piriformis muscles removed for histological analysis. Whole muscles were paraffin embedded, sectioned, H&E stained or stained with myosin heavy chain antibodies. Microscopy analysis examined spindle density and fiber type composition. **RESULTS**: The average spindle density per muscle was 3.4+1 and was not significantly different between male and female ($p=0.46$). Fiber type composition was 84+8% slow twitch and was not different between men and women ($p=0.23$). **CONCLUSIONS**: The human Piriformis muscle does not appear to be a sensory muscle due to the low concentration of muscle spindles but is very likely a postural muscle. The results of this characterization may better inform treatments including the surgical removal and long term rehabilitation.

Action Boundary Perception, Depression and Visuomotor Symptoms Differentiate Healthy Controls from Athletes with Recent Concussion

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Action boundary perception refers to a person's judgement of their individual action limits. Dysregulation of this process could lead to increased injury risk, and/or be a result of concussion. **PURPOSE**: to compare athletes with concussion history (CH) to those with no concussion history (NCH) in physical/emotional

symptoms, a novel test of action boundary perception accuracy (Perception Action Coupling Task (PACT)), and the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT). **METHODS**: The Patient Health Questionnaire-9, General Anxiety Disorder-7 and Post-Concussion Symptom Score were used to assess for physical/emotional symptoms. The Vestibular Ocular Motor Screen (VOMS) assessed visuomotor symptoms. The PACT presents pairs of 'virtual' balls and holes of differing sizes, to assess the ability to accurately and quickly determine if a ball will fit inside a hole on an iPad. Reaction time (period between presentation of ball/hole to removing finger from the home button) and movement time (period between home button finger removal and placing finger on the joystick) are the outcomes. ImPACT is a 6-item neurocognitive, computerized assessment. To analyze the relationship between these variables and concussion, a chi-square automatic interaction detection (CHAID) decision tree model was used ($p<0.05$). CHAID compares all predictor variables to the outcome (CH or NCH) and assigns a population-specific "cut-point" for the most relevant predictors. **RESULTS**: CH sustained a concussion within 2 years of testing (264±229 days; n=22), while NCH never sustained a concussion (n=24). Depression symptoms were the primary predictor of CH ($p=0.002$; CH: n=22, NCH: n=13). Further, 95% of CH subjects had elongated (>0.216 secs) PACT movement times ($p=0.026$; CH: n=21, NCH: n=7) while 50% also reported symptoms from oculomotor tests ($p=0.042$; CH: n=11, NCH: n=0). **CONCLUSIONS**: Depression/visuomotor symptoms and slower actualization of movement in response to an action boundary stimulus are lingering effects of CH ≤2 years prior. None of the ImPACT neurocognitive domains were predictors of CH. Action boundary perception may be useful to evaluate recovery after concussion, even after neurocognitive performance has normalized. Incorporation of PACT may be useful in concussion evaluation and rehabilitation.

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Psyching Effects on Voluntary Torque Production and Cortico-Cortical Communication Using Electroencephalography

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Psyching refers to a type of mental preparation that involves using self-directed cognitive strategies to enhance arousal, focus, and confidence to improve psychomotor performance. **PURPOSE**: The purpose of this study was to determine if mental preparation i.e. psyching (PSY), will contribute to higher muscular performance (maximal knee extension) and heightened cortico-cortical communication when compared to distracting conditions Mental Arithmetic (MA), Reading Comprehension (RC). **METHODS**: Healthy adults (N=15) between the ages 19-30 were included in this experiment. This study consisted of two visits: the first consisting mainly of reviewing the consent form, along with taking measurements and familiarization with leg extension machine. The second visit involved the participants engaging in the three conditions: PSY, MA, and RC. Each condition consisted of three trials in which participants performed 20 second task periods prior to the voluntary movement of a maximal leg extension, beginning with the instructed "You may now begin" command. Following the end of the 20 second task period, the maximal leg extension was performed at the "Move" command. This all occurred while being hooked up to an electroencephalography (EEG) in order to record brain waves. Torque production was measured by the Biodex Quick Set Isokinetic Dynamometer, and EEG data was gathered via Brain Vision EEG Cap. **RESULTS**: Average torque production for participants within the PSY, MA, and RC condition were 144.80 N*m, 122.05 N*m, and 125.19 N*m respectively. A significant difference was found between PSY and MA (0.008), and PSY and RC (0.005). No significant difference existed between RC and MA distractions. Coherence (High Alpha Bandwidth) averages for participants within PSY, MA, and RC, were 0.474, 0.420, and 0.419 respectively. A significant difference was found between PSY and RC (0.028). **CONCLUSION**:

Amongst participants, the PSY condition produced higher torque averages compared to MA and RC which directly correlated to heightened overall cortico-cortical communication in PSY condition.

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Effects of Germinated Chickpea Flour Incorporated in Pasta on Brachial Artery Flow Mediated Dilation

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Germination can increase the antioxidant activity in legumes such as chickpeas. Foods rich in antioxidants have been shown to positively influence brachial artery flow mediate dilation (FMD), a non-invasive test of a crucial layer of the artery called the endothelium. It is not currently known what, if any, cardiovascular benefits would occur if semolina flour in pasta is partially replaced by germinated chickpea flour. **PURPOSE**: To determine if partial replacement of semolina flour with germinated chickpea flour in pasta will impact brachial artery FMD. **METHODS**: Dried store bought chickpeas were germinated, re-dried, and ground into a flour. Healthy participants underwent a screening visit and two randomized controlled meal data collection visits (experimental and control). At the data collection visits participants consumed 255g of pasta (experimental visit SCF40: 40% sprouted chickpea and 60% semolina flours; control visit SEM100: 100% semolina flour) with butter. Between 2-3hrs after consumption of the pasta brachial artery FMD was assessed. **RESULTS**: Twenty-two healthy participants (5M/17W, 26±2 years, 66.6±2.3kg, BMI 24±1kg/m^2, SBP 114±3mmHg, DBP 75±2mmHg, HR 74±3BPM) were studied. There was no difference between conditions for baseline brachial artery diameter (SCF40 0.303±0.013cm, SEM100 0.305±0.015cm; p=0.788) or shear rate (SCF40 48591±6423AUC, SEM100 53463±5425AUC; p=0.381). FMD in the SCF40 condition (10.3±1.2%) was greater than in the SEM100 condition (7.9±0.8%, p=0.019). **CONCLUSIONS**: This data suggests that partial substitution of germinated chickpea flour for the standard semolina flour in pasta improves post-digestion flow mediated dilation. This is a simple dietary alteration that may contribute to improved cardiovascular health.

Examination of Vascular Function Changes with Exercise in Overweight Men With and Without Sleep Apnea

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Obstructive sleep apnea (OSA) is associated with increased cardiovascular morbidity in middle aged men due, in part, to impaired vascular function. Exercise confers cardioprotection by improving vascular health. Whether this beneficial effect is attenuated in overweight men with untreated OSA is not known. **PURPOSE**: Compare the effects of exercise training on brachial artery flow mediated dilation (BAFMD) between overweight men with and without OSA. **METHODS**: At baseline, all participants underwent overnight polysomnography (PSG) to determine the presence and severity of OSA, as defined by apnea-hypopnea index (AHI). Body fat was measured using dual energy X-ray absorptiometry. Brachial artery diameters and BAFMD were assessed using high resolution ultrasonography before and upon completion of a 6 week (3 sessions/wk; 1 hr/session) exercise training program. **RESULTS**: Five men with moderate to severe OSA (+OSA) and five men with no to mild OSA (-OSA) completed the study. By design, AHI of the +OSA group was higher compared to the -OSA group (34 ± 6 events/hr vs. 8 ± 2 events/hr, p<0.01). While no baseline differences were observed between the groups in age (49 ± 6 yrs vs. 46 ± 9 yrs, p=0.58), BMI (36.1 ± 6.2 kg/m^2 vs. 32.6 ± 3.8 kg/m^2, p=0.32) or resting arterial diameter (3.96 ± 0.67 mm vs. 4.43 ± 0.72 mm, p=0.31), total body fat was higher in the +OSA group (41 ± 3 % vs. 36 ± 3 %, p<0.01). No difference in the change in BAFMD following exercise training was observed between the groups (-1.21 ± 3.04 % vs. 1.12 ± 2.59, p=0.23). Yet, across the sample, improvements in BAFMD were inversely related

to baseline % body fat (r=-0.64, p=0.04), but not AHI (r=-0.54, p=0.12). **CONCLUSION**: The degree of obesity, not OSA severity may predict the level of improvement in vascular function with exercise training.

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Evaluating the Potential Impact of Fatigue on Ultimate Frisbee Players During Tournament Play

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Previous research has evaluated the quantification of recovery from bouts of athletic events. Various individualized measures have been taken to calculate recovery, yet most utilized methods were somewhat problematic for rapid data collection. In performance scenarios where costs are limited, it is important to seek less expensive alternative methods of evaluating recovery. **PURPOSE**: To evaluate potential fatigue of collegiate ultimate frisbee athletes over two days of tournament play utilizing the perceived recovery status scale (PRSS) and ratings of perceived exertion (RPE). **METHODS**: Nineteen college-aged males between the ages of 18-23 participated in the study. Occurring over two days of tournament-style play, PRSS and RPE were recorded during 5 frisbee matches with each match separated by 30min (2 Saturday, 3 Sunday). Two minutes prior to the first and second half of competition, PRSS was recorded for each athlete. Conversely, 2 minutes after each half of competition, the players' RPE was recorded. **RESULTS**: Significant differences were observed in PRSS, specifically a decrease in associating values from the 2nd to the 5th matches (p = 0.006) and within the 2nd half of comparable matches (p = 0.031). No RPE recordings of any kind were significant. **CONCLUSION**: The data suggests that much of the variance in fatigue and fatigue-related measures occur between the 2nd and 5th matches of a weekend tournament. The cumulative effects of fatigue during the tournament could have been a result of several potentially uncontrollable factors. Although, decreased perceived recovery could be related to the increased stress levels that occurred as a result of the amplified significance of the final match. Future research should include other quantifiable recovery data including heart rate variability (HRV) and GPS measures. Also, a periodic test throughout tournament play could include a bioelectrical impedance analysis.

The Acute Effect of Different Self-Myofascial Release Modalities on Anaerobic Sports Performance and Functional Movement

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Self-myofascial release (SMR) has known benefits for accelerating post-exercise recovery and enhancing acute flexibility, but is emerging in popularity as a pre-exercise technique to enhance anaerobic athletic performance. There is little research on the topic and no standardized recommended method of SMR that optimize athletic performance. **PURPOSE**: To determine if an acute bout of SMR using two different myofascial rollers will improve lower body anaerobic sports performance and functional movement in male and female NCAA Division III soccer players. **METHODS**: Male and female collegiate soccer players (n = 20; 10 men and 10 women; weight: 70.55 ± 2.51 kg; height: 174.31 ± 1.76 cm) participated in a crossover, repeated measures study where they were randomized to either a control (CON), conventional Bio-foam roller (BFR), or rigid roller (RR) condition. A dynamic warm-up was performed before each experimental session. For each trial, subjects performed a functional movement screen (FMS), vertical jump (VJ), pro-agility test (PA), and 30 meter sprint (30M). Participants performed an SMR technique bi-laterally on the major muscle groups of the lower body using both myofascial rollers. Subjects rolled each lower extremity muscle for three sets of 30s prior to performing the anaerobic tests. Each trial was separated by seven days. **RESULTS**: There was no significant improvement between the CON and either myofascial roller on any of the anaerobic sports performance tests (VJ: p = 0.993; PA: p = 0.676; 30M: p = 0.246). There was a significant difference between CON, BFR, and RR conditions for composite FMS scores (p = 0.013). The RR condition had a significantly lower FMS composite score compared to the CON condition (p = 0.023) and the BFR condition (p = 0.022). In addition, significant difference were noted between CON, BFR, and

RR conditions in the three categories of the FMS: fundamental mobility (p = .046), fundamental stability (p = 0.004), and functional movement (p = 0.023). **CONCLUSION**: SMR through the use of foam rollers does not enhance athletic performance when used before exercise and a more rigid modality of SMR reduces functional movement. The dynamic warm up alone may have been sufficient for optimal performance.

Effects of Manipulating Rest Periods Within a Lower-Body Resistance Training Program

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PURPOSE: To investigate physiological and cognitive changes following a resistance training protocol. **METHODS**: Eight healthy men volunteered to participate in a 6-week protocol consisting of 3 sets of 5 repetitions at 85% of 1-repetition maximum for the squat and deadlift. The two groups were 90-seconds (n= 5) and 3-minutes (n= 3) rest. **RESULTS**: Analysis of variance (ANOVA) revealed a main effect of time for the squat (p = 0.026), and main effect of group for vertical jump (p = 0.041). The 3-minute group increased squat performance (p = 0.020), while the 90-second group improved vertical jump (p = 0.031). Group by time interactions were observed for Interference (p = 0.048), Word-Color (p = 0.050), and TMD (p = 0.004). Despite the trending increase of executive function in the 3-minute group, a worsened mood post-intervention was observed (p = 0.008). **CONCLUSION**: Minimal rest improved power within the 90-second group while the 3-minute group significantly improved lower body strength. Cognitive function only appeared to improve in the 3-minute rest group. Despite no increase in strength for the 90-second group, it appears minimal rest is advantageous for athletes looking to enhance power performance, although further research is necessary.

Is Seeing Believing? Validity of Modern Sham Coil as a Placebo in Neuromodulation Studies

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Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive brain stimulation technique used to treat conditions involving pathological neurological activity. To establish experimental trial efficacy, a convincing placebo must be used. **PURPOSE**: To determine whether real rTMS could be distinguished from placebo provided by a sophisticated sham coil with identical appearance, sound, and focal scalp electrical stimulation. **METHODS**: Twenty women aged 18-32yr participated (one dropped before receiving sham) after providing informed consent. The leg region of primary motor cortex (M1) was reliably localized on repeated occasions with resting motor thresholds (RMT) determined by Parameter Estimation by Sequential Test (PEST) technique. Participants completed two double-blinded visits (rTMS vs. sham rTMS) in a counterbalanced order with random allocation. Neuromodulation was applied to M1 with intermittent theta burst stimulation (iTBS) at 60% RMT. Afterwards, participants completed a perceived treatment form, asking them to indicate whether they received neuromodulation, and to describe any treatment effects. Responses were analyzed with Monte Carlo Exact tests (CI: 99%, N=10,000) and likelihood ratios (LR). **RESULTS**: iTBS was predicted at chance levels (55%, X^2 (1, N = 20) = 0.20, p = 0.83). Participants were able to identify sham (or were unsure of having received iTBS) 74% of the time (X^2 (1, N = 20) = 4.26, p = 0.06). Participants were 2.09 times more likely to predict neuromodulation after iTBS (LR+), while 0.61 times as likely to receive iTBS after predicting sham (LR-). After iTBS, 42.9% of participants reported treatment effects (X^2 (1, N = 20) = 3.20, p = 0.12); 5.3% reported effects after sham (X^2 (1, N = 20) = 15.21, p < 0.00). While 0.74 times as likely to receive iTBS when reporting no effects (LR-), participants were 5.7 times more likely to have received iTBS when effects were reported. Analysis of written remarks revealed three instances of stimulation percept during iTBS stimulation (e.g. "felt pulses in leg"). **CONCLUSIONS**: Participants are unable to determine whether they received real treatment, but the placebo coil appears less convincing. Future work should consider the use of off-site targets (e.g. visual cortex) as controls in rTMS trials.

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Evaluation of Active Sitting Using Hip Accelerations

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Active sitting claims to increase core muscle activation because sitting on an unstable surface such as an exercise ball requires more effort in order to maintain balanced sitting posture than while sitting on a stable surface such as a stool or chair. Accelerations obtained through ActiGraph provide an objective measurement of subtle body movements. **PURPOSE**: To compare hip accelerations while sitting on a chair with a backrest, a chair without backrest (stool) and an exercise ball. **METHODS**: Eight apparently healthy students, 6 males and 2 females, were recruited from Penn State Berks (Age 22.9±2.5 years, BMI 25.5±4.5 kg/m^2). Each participant sat for 10 minutes on a chair, stool and ball in random order. Participants wore an ActiGraph GT9X accelerometer on their right hip. During each of the three 10-minute sitting segments, participants completed one task (typing, reading comprehension or spatial awareness). **RESULTS**: Standard deviations of the magnitude of the hip accelerations were used to compare differences in hip motion between sitting on a chair with a backrest (2.74±0.682 cm/s^2), stool (3.46±1.65 cm/s^2) and exercise ball (4.69±2.22 cm/s^2). Figure 1 shows the standard deviations for each participant. Statistically significant differences were noted between the chair and the ball (p=0.02). **CONCLUSION**: Our preliminary study showed that deviations in the hip accelerations were lowest when participants sat on a chair with a backrest, and highest when participants sat on an exercise ball. In conclusion, participants moved more while sitting on an exercise ball than while sitting on a chair with a backrest or stool, which suggests that active sitting might increase core muscle activation during a normally passive and sedentary behavior.

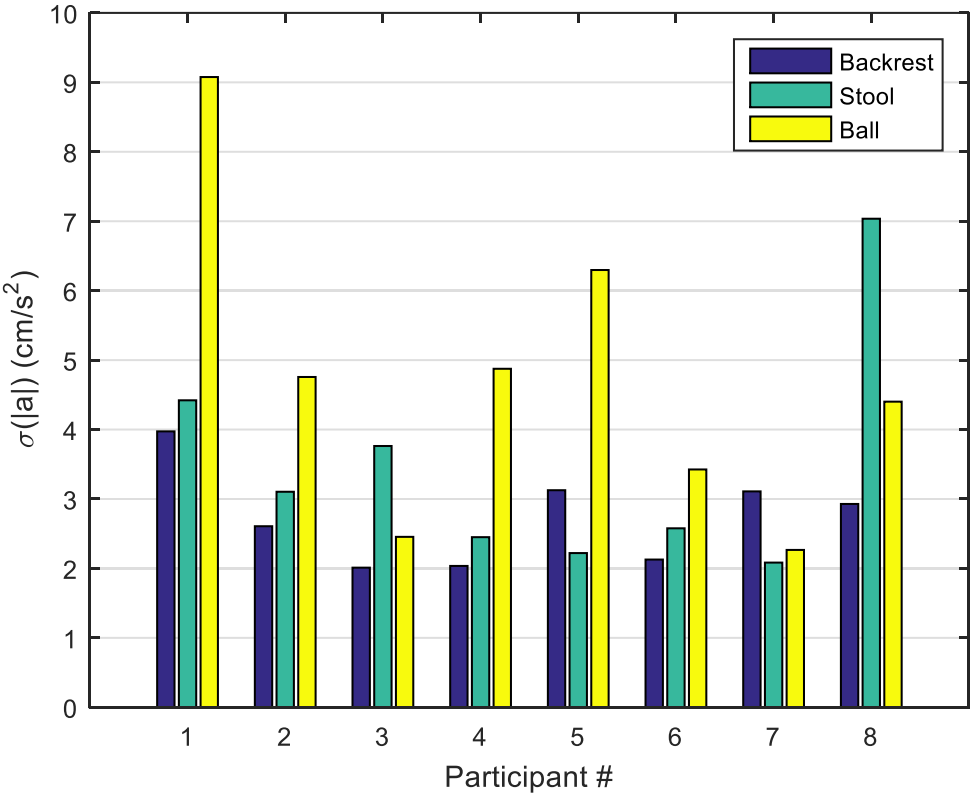

Figure 1. Standard Deviations of Acceleration for Sitting Condtions

Acute Physiological Responses to Steady State and High Intensity Interval Training

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High Intensity Interval Training (HIIT) has become an increasingly popular mode of exercise, especially with those with the perception of a lack of time to perform the ACSM's recommended 150-250 minutes of cardiovascular training per week (ACSM, 2017). These intervals have been shown to decrease the time spent being active while simultaneously providing similar results to steady-state training to elicit the cardiovascular adaptations. **PURPOSE**: To investigate the changes between steady-state training and HIIT training on respiratory exchange ratio (RER), peak oxygen consumption (VO_{2peak}), heart rate (HR) and rate of perceived exertion (RPE) in recreationally trained, college-aged participants. **METHODS**: Eighteen men and women (M= 22.6, SD ± 1.89) were recruited for the study. Subjects participated two sessions and were randomly assigned to two groups: Steady-State or High Intensity Interval Training (HIIT) training on a treadmill. Steady State Training consisted of a 3 minute warm-up at 2.0 mph with a 0% grade followed by the Balke Protocol. HIIT protocol consisting a 10-minute warm-up at 3 mph at 0% grade, followed by maximum effort sprints for 30 seconds followed by a 30 second active recovery with sprint intervals beginning at 4.5mph increasing by .5mph after recovery interval. **RESULTS**: No significant differences in RER, VO_2 and HR ($p > .05$) were identified using a paired samples t-test, between treadmill conditions (SS, HIIT). Additionally, there were no significant differences in RPE after conducting a Wilcoxon matched pairs signed-rank test. Discussion: The results suggest that, in an area of practical exercise protocols, there is little advantage to training at higher intensities with participants that are only recreationally trained. Most literature has used highly trained subjects which elicited results in disagreement to the current study. **CONCLUSIONS**: Although HIIT protocols are time efficient, there is little evidence, based on this study, to suggest that these protocols are superior to convention training in recreationally trained collegiate students.

Measuring Stress Response to Daily Self-weighing

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PURPOSE: Daily self-weighing is a highly-debated topic; evidence has supported daily self-weighing for weight control, but concern exists regarding potential negative psychological consequences. To date, no studies have measured biological proxies for mental states in response to daily self-weighing. The purpose of this study was to assess college women's biological stress/anxiety responses to daily self-weighing as compared to an active control condition using biomarkers cortisol and salivary alpha-amylase. **METHODS**: As part of a larger randomized controlled trial, 6 University of Delaware college-aged (18-26yo) women participated in a sub-study. 4 had been randomized to daily self-weighing and 2 to the active control group. Saliva samples were collected seven times/day on each of 4 days: the day prior to starting the intervention behavior (day 0), and days 1, 3 and 7 of the intervention. Each day, the passive drool method was used to collect saliva immediately after waking (AW), 15 minutes AW, 45 minutes AW, 60 minutes AW, at 12:00pm, 2:00pm, and 6:00 pm. **RESULTS**: 5 participants returned usable samples. Results showed diurnal cortisol and alpha amylase curves that were indicative of poorly collected samples. In all participants, the graphed cortisol data lacked the distinct morning peak seen in normal diurnal cortisol awakening responses. Participant's cortisol levels started highest in the morning, and declined throughout the day, indicating that samples were taken post-waking. Of the 2 participants who reported exact collection times, a slightly higher area under the curve was visible on the graphed alpha amylase results for the self-weighing participant as compared to the temperature taking participant. **CONCLUSION**: Although it appears that there may be a larger AUC in the self-weighing participant as compared to active control for alpha-amylase, which would indicate that the self-weighing participant was under more stress than the control participant, lack of appropriately collected data prohibit conclusions. Process information collected has informed protocols such that future participants will be reminded more frequently of the necessity of following directions, such as taking the samples on time, filling the vials to the desired testing volume, and recording the exact time of sample collection.

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Metabolic Expenditure of Video-Instructed Hula Dancing in Novice Females

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Hula, a cultural form of dance native to Hawaii, can be practiced as an art form or as a group fitness activity. Previous physiologic research in hula dancing has focused on the demands of elite performers. Very little research has explored hula dance in other populations. **PURPOSE**: The purpose of this study was to determine the metabolic expenditure of video-instructed novice hula dancing and evaluate the intensity level according to American College of Sports Medicine (ACSM) guidelines. **METHODS**: Thirteen healthy female college students with no previous hula dancing experience participated in this study. Subjects were introduced to hula over the course of two sessions. On the first day, the volunteers completed a 15-minute familiarization video introducing the five basic hula steps, proper posture, and essential terminology. The five basic hula steps were the Kaholo, ‘Ami, Hela, U’wehe, and Ka’o. The instructional hula video viewed on the second visit consisted of a five-minute warm-up, 15-minutes of the five basic hula steps in sequential order, and a brief cool down period. Volunteers wore a chest strap heart rate monitor. A portable metabolic gas analyzer, for the measurement of VO_2 and VCO_2, was worn in a small fitted backpack for the duration of testing. Measurements were recorded at rest, the end of the warm-up, and the end of each steps’ instruction. **RESULTS**: The average relative VO_2 was 13.38±2.73 ml/kg/min and the average MET was 3.82 ± 0.78. The steps with the lowest and highest energy costs were the Ka’o (3.45±1.13) and Hela (4.01±0.64), respectively. A repeated measures ANOVA ($F_{(4,12)}$ = 59.464, $p<0.001$) and follow-up comparisons identified the U’wehe and Ka’o steps as more metabolically demanding than the other basic hula steps ($p<0.05$). U’wehe and Ka’o were not different from each other ($p>0.05$). **CONCLUSION**: Though some steps represent a greater metabolic demand than others, all introductory hula steps and hula instruction overall should be classified as a moderate intensity activity. Hula dancing, even at the most introductory levels, can be enjoyed as an exercise modality.

The Effect of Mental Preparation on Voluntary Torque Production and Cortico-Cortical Communication

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Mental preparation refers to using self-directed cognitive strategies to enhance arousal and confidence when preparing for psychomotor performance. **PURPOSE**: To determine if mental preparation i.e. psyching (PSY), will contribute to higher muscular performance (maximal knee extension) and heightened cortico-cortical networking when compared to distracting conditions mental arithmetic (MA), reading comprehension (RC). **METHODS**: Fifteen healthy participants (19-30 years of age), were recruited and required to have a minimum of one year weight training experience. Eleven of the participant data for analysis. Electroencephalography (EEG) and torque production (Isokinetic) were measured. The study consisted of two visits. Visit one consisted of informed consent, a background questionnaire and isokinetic practice trials for familiarization. EEG collection was conducted on visit two, included the same warm-up and exposure to three different conditions (PSY, RC, and MA). Conditions consisted of three trials (total of nine) with a rest interval between each trial. During each trial, a 20-second task period was provided (PSY, RC, MA). For each trial, EEG data was collected and participants determined their rate of perceived exertion by using the Borg RPE scale. **RESULTS**: EEG data analysis revealed a heightened level of networking in PSY as indexed by high alpha band coherence [$F(2,20) = 5.885$; $p = 0.010$]. Torque

production averages within participant for PSY (144.80 N*m) were higher compared to MA (122.05 N*m) and RC (125.19 N*m). A significant difference existed between PSY and MA (0.008), PSY and RC (0.005) and no significant difference for the distractions (RC and MA). Participants rated their perceived exertion (RPE) with higher ratings for the PSY (16.80) condition in comparison to MA (15.38) and RC (15.83) with a significant difference between PSY and MA (0.026). **CONCLUSIONS**: PSY appeared to produce higher torque output averages and a higher perceived exertion in comparison to RC and MA. PSY appears to produce higher overall cortico-cortical communication, compared to RC and MA. The study suggests promising results in mental preparation (psyching) as a method to increase muscular performance cortical networking in young healthy adults.

Use of Interdisciplinary Bilingual Home Simulation to Facilitate Multicultural Learning for Kinesiology Students: Students' Perceptions

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Many educational programs include cultural competencies in their student learning objectives. Simulations are a targeted learning environment that allows students to assimilate knowledge and skills learned in their courses. A simulation that features a patient or client from a different culture who does not speak English provides students with a setting to practice cultural sensitivity and optimal healthcare delivery to a diverse patient population. **PURPOSE**: To determine students' perceptions of what they learned after participating in a simulation working with a patient who did not speak English. **METHODS**: Forty-five Nursing (n=20) and Kinesiology (n=25) students entered a Home Health Setting simulation in groups of five. The Nursing students acted as nurses and nursing aids while the Kinesiology students portrayed the roles of physical therapists, occupational therapists, and community health educators. The students worked together to assess the patient, demonstrate home exercise plans, and identify home health concerns specific to the scenario's culture and setting. The patient in the scenario only spoke and understood Spanish and patient's wife only understood limited English. After each simulation round, faculty and students debriefed to discuss the scenario. One week after the simulation, students completed a post-simulation survey. One qualitative question in the survey asked the students what they learned from the simulation. **RESULTS**: Nine (9) students responded to the post-survey for a response rate of 20%. Response themes included awareness, greetings, and researching cultures. Students' perceptions of what they learn included: "I'll now be aware of the perception of time and body language when working with patients from other cultures." "I will need to be aware of different aspects of different cultures in order to provide quality healthcare." "I will definitely greet the patient as well [even if I don't speak their language]." "Always be aware of the patient's beliefs." "Research the culture before meeting the patient in order to provide care." **CONCLUSION**: Providing a simulated learning experience with cultural components or patients who do not speak English provides Kinesiology and Health Science students an applied opportunity to practice cultural sensitivity competencies.

Electromyography and Y-Balance Test for Assessment of Neuromuscular Control of Lower Extremities in Collegiate Athletes

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Ankle sprains are commonly reported musculoskeletal injuries with approximately 23,000 per day in the United States. Non- custom foot orthotics (NCFO) may have the potential to increase neuromuscular efficiency in the lower extremities of collegiate athletes and therefore reduce the risk of injury. **PURPOSE**: To establish a baseline for neuromuscular and postural control in collegiate football players prior to the regular use of foot orthotics. **METHODS**: A sample (n=21) of NCAA football athletes completed the Y-Balance Test (YBT) while Electromyographic (EMG) activity of the tibialis anterior, peroneus longus and the medial and lateral gastrocnemius muscles was recorded. A composite score for each participant for the

YBT was calculated from the reach distance in three separate directions. EMG was used to determine the average amount of force production from each of the four tested muscles during each trial of the YBT. This muscle activity was compared to each participant's Maximum Voluntary Contraction (MVC) and reported as %MVC. The %MVC and the YBT composite score provide a profile of neuromuscular control of the major synergists and stabilizers of the foot and ankle. **RESULTS**: A mean score of 92.5 for the YBT was seen in the athletes. YBT mean scores for offensive players were 96, defensive players 88.7 and stationary positions 93.8. %MVC analysis for six of the twenty-one players, included three players in a normal range and three players in an at risk range. Players in the at-risk group had a %MVC ranging from 26%-52% with a mean of 35.1%. The normal group %MVC ranged from 22%-24% with a mean of 23.3%. **CONCLUSION**: The defensive players' mean composite score (88.7) fell below the at risk cutoff point (89.6) for college football players. A higher range of %MVC was associated with an elevated level of muscle activity in the at risk group.

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Menstrual Cycle Phase Not Exercise Intensity Affects ACL Laxity in Women

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Female athletes experience an anterior cruciate ligament (ACL) tear incidence rate three times greater than male athletes, and due to the disruptive effects on athletic career and the cost to the healthcare system, research on cause and prevention is crucial. One risk factor for ACL tears found to be higher among females is ACL anterior-posterior laxity (AP_{LAX}). Separate studies have found AP_{LAX} to vary throughout the menstrual cycle and to be higher after exercise; however, these variables have never been investigated together. Additionally, few studies have examined the impact of exercise intensity on AP_{LAX}. **PURPOSE**: To determine the effects of exercise intensity on female ACL laxity throughout follicular and luteal menstrual cycle phases. **METHODS**: Eleven eumenorrheic aerobically trained college-aged females (20.82±2.72yrs; 164.16±5.31cm; 60.81±9.89kgs; 32.46±5.32%BF) reported to the lab on four separate days: two in the luteal phase and two in the follicular phase. During each phase, subjects completed both a high (HIE; 85%HRR) and moderate intensity exercise (MOD; 42.5%HRR) session using a randomized crossover design on a treadmill. The two sessions per phase were separated by 4 days. Before and after each session, AP_{LAX} was tested using KT-2000 arthrometer at 90N and 120N. **RESULTS**: ACL laxity measurements were significantly greater in the luteal phase pre-exercise (90N $p=0.018$; 120N $p=0.024$) and post-exercise (90N $p=0.004$; 120N $p=0.002$). However, the level of intensity had no significant impact on AP_{LAX} post-exercise (90N $p=0.698$; 120N $p=0.749$). **CONCLUSION**: The speed engendered during MOD or HIE treadmill running did not differentially affect AP_{LAX} in this study. Our results demonstrated that for a female athlete, ACL tear-risk will vary more throughout her cycle than it will vary based on her level of activity.

The Influence of Caffeine on Resistance Exercise Performance and Post-Exercise Glucose Control

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PURPOSE: To study the effects of oral caffeine on resistance exercise performance and post-exercise glucose control in physically active young adults. **METHODS**: Seven volunteers participated in this study. Subjects completed four experimental trials. Each trial involved placebo (PL) or caffeine (Caf) consumption (4mg/kg of body weight) 30 min prior to testing. For each trial, subjects consumed a 25% glucose solution providing 1g/kg of glucose. Two resting trials (Rest Caf and Rest PL) and two exercise trials (Ex Caf and Ex PL) were performed. For exercise trials, the 75 min oral glucose tolerance test (OGTT) was conducted upon completion of the lifting protocol. The resting trials consisted of the OGTT. For Ex trials, subjects completed four sets (6 reps/set) of knee extension and biceps curl using the 10-RM load. The fifth set for

each lift was completed to fatigue. Additional measures included blood pressure, heart rate, grip strength and blood lactate. **RESULTS**: Area under the curve (AUC) for glucose was 7.5% > than Ex PL; Rest Caf was 7.3% > than Ex Caf; and Rest PL was 3.2% > than Ex PL. No significant difference between treatment or interactions for blood glucose (BG) were present. Blood Lactate (mmol/L) was significantly greater for the Ex Caf condition (7.9 vs. 5.8 in Ex PL condition). Rest Caf mean arterial pressure (MAP) tended to be higher than Rest PL (p=0.053), Ex Caf MAP tended to be higher than Rest PL (p=0.061). No significant difference was present exercise heart rate or in repetitions to fatigue. There was a significant increase in handgrip performance from pre to post-exercise for both treatments. **CONCLUSION**: Caffeine ingestion was not found to influence resistance exercise performance; however, it was associated with a mild, non-significant reduction in glucose control during the post-exercise OGTT. The influence of caffeine on resistance exercise and post-exercise glucose should be investigated further with a larger sample size.

Assessment of Vascular Function throughout the Menstrual Cycle

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Fluctuating sex hormones throughout the menstrual cycle, particularly endogenous estrogen, have been documented to correspond with nitric oxide (NO) bioavailability and likely have a cardioprotective effect in premenopausal women. However, the corresponding temporal changes in vascular function are not entirely understood. Passive leg movement (PLM) is a relatively novel technique assessing NO-mediated vascular function, with a higher degree of NO-dependence than the traditionally used flow-mediated dilation (FMD) technique that could provide additional insight. **PURPOSE**: To assess vascular function throughout the menstrual cycle in premenopausal women using PLM, in addition to FMD. **METHODS**: Assessment of vascular function via PLM and FMD was performed on 10 apparently healthy, young, eumenorrheic women at three phases of the menstrual cycle: early follicular (EF) (1–3 days post onset of menstruation), ovulatory (OV) (within 2-3 days of luteinizing hormone surge determined by ovulation test), and midluteal (ML) (8–10 days post-ovulation). Hemodynamics and artery diameters were measured using ultrasound Doppler. **RESULTS**: Brachial artery FMD tended to be increased during the OV phase (9.4±1%) compared to the EF (8.2±1%) and ML (7.8±1%) phases. There were no significant differences in PLM responses throughout the menstrual phases (Δpeak leg blood flow EF: 390±45 mL/min, OV: 228±36 mL/min, and ML: 287±72 mL/min). **CONCLUSION**: These findings support the importance of menstrual cycle when interpreting vascular function data as measured by FMD. Surprisingly, the PLM responses do not appear to be influenced by menstrual cycle phase but additional data are needed.

The Acute Effects of Loaded Jump on Vertical Jump Performance and Perception

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The ability to increase one's vertical jump (VJ) can translate to sport performance and performance testing. Dynamic loaded warm-ups may increase performance through post-activation potentiation (PAP). **PURPOSE**: To investigate if there was performance/perception effects on VJ when using externally loaded jumps prior to VJ. **METHODS**: 16 college-aged (age 20.6±0.7yrs, mass 77.4±18.3kg) female (n=7) and male (n=9) subjects completed 3 sessions of testing, in a randomized order, with each session consisting 3 sets of 5 VJ, where first set of jumps served as the baseline (B), the 2nd set with the weighted vest (V), and 3rd set with vest removed (PT). During 2nd set of each session, subjects wore weighted vest at either 5, 10 or 15% of their body weight (kg) and performed VJ. VJ (in), peak power (W), peak velocity ($m \cdot s^{-1}$) and the perception of subjects' own performance were measured. Two-way ANOVA with repeated measures was used to compare differences in conditions and time. **RESULTS**: Significant differences were found in VJ between all conditions, for each of the weighted vest conditions ($p<0.05$). The 5% condition showed the greatest increase in mean VJ (+0.75 in.) from the B. Peak power and velocity were also higher during PT when compared to B, although the difference was not significant (Peak Power %change: 2.8-7.7%; Peak

Velocity %change: 3.6-11.2%). Perception results showed that all subjects, under 10 and 15% conditions, perceived to jump higher and feel lighter, while only 75% of subjects in 5% condition perceived to jump higher and feel lighter during PT.

Conditions	Baseline (in)	Weighted Vest (in)	Post-test (in)	Difference (B to PT) (in)	Difference (B to PT) (%)
5%	19.39±5.71	18.53±5.73*	20.14±5.90*	0.75	3.9%
10%	19.41±5.92	17.38±5.39*	19.89±5.95*	0.48	2.5%
15%	19.86±5.69	16.72±5.38*	20.48±5.86*	0.62	3.1%

*Significantly different from baseline ($p<0.05$).

CONCLUSION: It appears that performing VJ with external load can increase VJ performance after the load is removed. According to this study, the 5% condition showed the greatest impact on VJ performance.

Exercise but Not Menstrual Cycle Phase Increases Hamstring Flexibility

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Previous studies have demonstrated aerobic exercise increases hamstring flexibility. However, disagreement exists on the influence of exercise intensity on flexibility changes. Moreover, the menstrual cycle influences soft tissue pliability across menstrual cycle stages. To date, no studies exist which have examined the combined effect of intensity of aerobic exercise and menstrual cycle on hamstring flexibility. **PURPOSE**: Determine the influence of aerobic exercise intensity and menstrual cycle on hamstring flexibility. **METHODS**: 11 college-aged aerobically trained females (20.82±2.72 yrs; 164.16±5.31 cm; 60.81±9.89 kgs; 32.46±5.32 %BF) with regular menstrual cycles not taking birth control were recruited. Participants were randomized into work-matched moderate (MOD; 42.5% heart rate reserve (HRR)) or high-intensity (HIIT; 85%HRR) groups using a cross-over design across different phases of the menstrual cycle. Sit and reach and supine hamstring flexibility were performed before and after each exercise session. **RESULTS**: Significant changes in sit and reach (SAR; $p=0.013$) and supine hamstring flexibility (SHF; $p>0.001$) were observed post-exercise in both MOD and HIIT groups with no difference between groups (SHF $p=0.901$; SAR $p=0.996$) or across follicular and luteal menstrual cycle phases (SHF $p=0.671$; SAR $p=0.706$). **CONCLUSIONS**: Both MOD and HIIT aerobic exercise showed significant increases in hamstring flexibility regardless of menstrual cycle phase. However, there was no significant difference between exercise intensities.

The Epidemiology of DII Baseball, Basketball, and Soccer Injuries and Potential Preventive Strategies

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Baseball (B), basketball (K), and soccer (S) are among the top-five sports causing injury in males. To date, no published studies have prospectively investigated the epidemiology of sporting injuries. **PURPOSE**: To design and implement a prospective injury surveillance system to describe B, K, and S injuries, and devise potential preventive measures to help reduce injury risk. **METHODS**: Participants were recruited from Bloomsburg University's B, K, and S teams. Sport-specific injury reporting forms were developed, and injury details were recorded by athletic trainers. Information was collected on the injury and circumstances surrounding the injury, with injury defined as "damage to the body that occurs as a result of competing, practicing and/or participating in an athletic activity". **RESULTS**: The B, K, and S teams consisted of 32, 11, and 25 players respectively. There were 73 injuries sustained (B = 34, K = 12, S = 27), with significant differences ($p \leq 0.001$) in all injury parameters between sports. Excluding those who were unsure, in all sports, soft tissue injuries were most common (66.6%), with B having more non-contact injuries, and K and S having more contact injuries ($p \leq 0.001$). There were similar numbers of head and torso injuries among

sports, however B had more upper extremity injuries ($p \leq 0.05$), while K and S had more lower extremity injuries ($p \leq 0.001$). B and K had more competition injuries ($p \leq 0.05$), while S had more training injuries ($p \leq 0.001$). **CONCLUSION**: Due to the high injury prevalence, this study reinforces the need for injury prevention strategies, and further highlights that all sports require unique injury prevention strategies, as well as tailoring these strategies to players' positions. For all sports, undertaking a suitable warm-up, evaluating and correcting improper mechanics, and enforcing competition rules may reduce injury risk. Proper conditioning to provide strength and flexibility to the lower extremities in K and S, and upper extremities in B also seems warranted. In S specifically, modifying training intensities and investigating footwear worn and surfaces where games and trainings are conducted might be useful. Whereas in K, plyometric training could be used to improve landing techniques. Lastly, in B, proper preseason conditioning, particularly in pitchers should be investigated.

The Effects of Agonist-Antagonist Paired Set vs. Traditional Set Training on Forearm Strength

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It has been suggested that agonist-antagonist paired set (APS) training may be an efficacious and time efficient way to increase strength. There is no evidence examining the use of APS protocols to train the forearm. **PURPOSE**: To determine the efficacy of APS versus traditional set (TS) training on forearm flexor and extensor strength over a six week training period. **METHODS**: Thirty two recreationally trained individuals performed a 1-RM isometric hand held dynamometer (HHD) for 3 seconds to measure forearm flexor strength. A kneeling break test was used to measure forearm extensor strength before and after a six week training period. Participants were placed in three experimental groups. For the control group (N=9) no training was performed for the duration of the study. The TS group (N=11) performed between 3 and 7 sets of 15 to 25 reps with 90 seconds rest for each muscle group. The APS group (N=12) performed the same amount of volume but would alternate every 30 seconds between the finger flexor exercise and the finger extensor exercise and took half the time to perform each workout compared to the TS group. A 3x2 Repeated Measures ANOVA was used to determine differences. **RESULTS**: There was a significant ($p < 0.05$) increase from pre to post-test standing forearm flexor strength, for both the APS (43.2 ± 12.5 to 49.9 ± 13.2) and TS (43.5 ± 11.0 to 50.3 ± 13.4) training groups. A small magnitude of difference was seen from pre to post-test for both the APS (ES = 0.54) and TS (ES = 0.61). All groups experienced a significant increase ($p < 0.05$) from pre to post- test extensor strength. The control group increased from (36.5 ± 2.6 to 41.8 ± 3.1), the APS group increased from (34.3 ± 2.5 to 46.2 ± 2.6), and the TS (34.3 ± 2.7 to 46.7 ± 3.2). A small magnitude of effect was seen from pre to post-test for the control group (ES = 0.67). A moderate effect was seen in the APS (ES = 1.44) and TS (ES = 1.38) respectively. **CONCLUSIONS**: The results indicate that APS is an effective method for increasing both flexor and extensor forearm strength. If utilized, it is possible that total training time for forearm flexor and extensor strength could decrease significantly.

The Effects of a Six-Week Boot Camp Program on Exercise-related Affects and Perceptions

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Physical inactivity is the greatest public health concern of the 21th century (Blair 2009; Kohl et al., 2012). Lack of motivation for behavior change as well as a low sense of self-efficacy for exercise are amongst the greatest contributors of the problem (Lox, 2017). While evidence suggests the effectiveness of select physical activity (PA) interventions for improving PA levels, whether these interventions can also help long term PA behavior change is unknown (Prince et al., 2014) **PURPOSE**: The purpose of this study was two-fold 1) to investigate the effectiveness of a six-week boot camp program for increasing motivations for long-term PA behavior change, self-efficacy for exercise, and improving participants' perceptions of their general health as well as 2) to gauge participants' motives for adhering to the program. **METHODS**:

Twenty-seven sedentary adults (M_{age}=30.04, SD=10.33) participated in a vigorous boot camp program for a minimum of five days per week for fifty minutes a day throughout a six-week period responded to questionnaires measuring their motivation for behavior change, self-efficacy for exercise and, perceptions of general health at the onset and the completion of the program. At the completion of the program, participants also responded to a single qualitative prompt for identifying motives for continued adherence to the program. **RESULTS**: Paired sample t tests indicated a significant improvement in participants' mean scores for self-efficacy for exercise (M=7.21 ± 2.2 pre vs. 8 ± 1.65 post; t= -2.38, $p < 0.05$) and the perception of their general health (M=3.17 ± 1.01 pre vs. 3.92 ± 0.7 post; t= -4.21, $p < 0.05$). Results from the qualitative prompt revealed three main themes for continued adherence: (1) structured aspect of the program, (2) accountability between the participants and exercise leaders, and (3) the sense of community within the program. **CONCLUSIONS**: These findings suggest that alternative boot camp interventions can prove effective means for improving important precursors of PA behaviors. From a practical standpoint, structured approaches that can provide a supportive community as well as a sense of accountability may present critical initiatives in promoting long term PA and solving the problem of inactivity.

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Age and Waist Circumference Modify Discordance of Body Fat Measurements in Adults with Obesity

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Body composition assessments are a chief component on the evaluation of adipose tissue and its relation to lean tissue within the body in clinical weight management settings. However, due to differences in body type some composition assessments may not be appropriate for certain patient populations. Additional research is needed addressing the validity of body fat estimates within more specific sub-populations such as adults with obesity. **PURPOSE**: The objective of this study was to investigate the concurrent validity of percent body fat (%BF) measures estimated by multifrequency bioelectrical impedance analysis (MFBIA) and air displacement plethysmography (ADP) in adults with obesity. **METHODS**: This retrospective study examined the %BF in 94 adults with obesity (BMI >30kg/m^2) measured through ADP and MFBIA at the same appointment. Differences in %BF measured from ADP and MFBIA were evaluated for associations with age, gender, BMI, and waist circumference (WC). **RESULTS**: The 94 adults (44 male, 50 female) included 53% female with a mean age of 50.1 ± 9.9 years, and mean BMI of 38.8 ±7.5 kg/m^2. In the overall group, %BF from MFBIA (42.1% ± 9.7%) was significantly ($p<0.0001$) lower than %BF from ADP (44.7% ± 9.5%). When stratified by age (<50 n=46; 50+ n=48), the differences in %BF between MFBIA and ADP were lower ($p=0.0017$) within those aged <50 (44.1 ± 9.9 versus 45.5 ± 10.0) as compared to those age 50+ (40.2 ± 9.2 versus 43.9 ± 9.0). A smaller subset (n=27) of our sample population was associated with MFBIA having greater underestimation of %BF relative to ADP ($r = -0.42$, $p=0.029$). Differences in %BF from ADP and MFBIA were not associated with BMI ($p=0.238$) or gender ($p=0.114$). **CONCLUSION**: Agreement between %BF from ADP and %BF from MFBIA was applicable for patients with obesity of younger age and smaller waist circumference. Caution should be used when interpreting %BF measurements in adult patients with obesity of older age or larger waist circumference.

Memory System Engagement as a Potential Neurocognitive Mechanism Underlying the Effectiveness of Self-Regulated Practice

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PURPOSE: Previous research indicates that self-controlled practice can be a more effective mode of practice than externally-controlled practice. This effect may be due, in part, to increased memory system engagement during self-controlled practice relative to externally-controlled practice. The proposed study seeks to investigate this notion using electroencephalographic (EEG) measures of memory system engagement, specifically theta power, alpha 2 power, and theta coherence between frontal and parietal regions. **METHODS**: Thirty-two novice participants were divided into two groups (self-controlled and yoked) to learn the cognitive-motor skill of golf putting over the course of three days. EEG measures representative of working memory engagement (theta power) and long-term memory engagement (alpha 2 power) were collected throughout the experiment. It was broadly hypothesized that the self-controlled practice group would show elevated working memory engagement and a refinement of long-term memory throughout practice as well as increased performance improvement on a 24hr-delayed retention test compared to the yoked group. **RESULTS**: Upon accounting for expected covariates, the self-controlled group achieved a significant improvement from baseline to retention in terms of the number of on-target putts ($p = 0.029$, $d = 0.409$) while the yoked group showed no such difference. Additionally, EEG results revealed that theta power in the left hemisphere remained elevated in the seconds prior to the putt, while the yoked group showed notable decreases (second 1 > second 4, $p < 0.001$, $d = 0.774$). Additionally, alpha 2 power was significantly larger in the first visit than in the second visit for the self-controlled group ($p = 0.005$, $d = 1.233$). These results suggest that the self-controlled group tended to exhibit more memory system engagement during practice than the yoked group which may have contributed to increased levels of performance improvement. **CONCLUSIONS**: These results provide early support for the notion that elevated engagement of the memory system is a potential mechanism by which self-controlled practice has a positive effect on learning over externally-imposed practice.

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The Influence of Emotions on Heart Rate in Horseback Riders

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PURPOSE: The purpose of the study was to find out if positive or negative affects, state-anxiety and trait-anxiety could impact a horseback rider's heart rate (HR) during a 30-minute riding protocol, HR during riding performance (dressage) test, and how the outcome score of the performance test would be affected. **METHODS**: Ten female participants ranging in age from 26 years to 63 years (M_{age}= 43.8 $\pm$ 15.4) took part in this study. At the onset of the study, VO_{2max} was estimated using the Astrand-Rhyming bicycle test protocol while wearing an Alpha Mio heart rate watch. On a separate testing day, participants completed the State-Trait Anxiety Inventory questionnaire (STAI), Positive and Negative Affects Scale (PANAS), and Feeling Scale (FS). The participants then mounted and rode a horse they were familiar with and had ridden before. HR was recorded throughout a 30-minute riding protocol using the Alpha Mio watch. Subsequently, HR was recorded again while participants completed a modified dressage performance test and scored by the same investigator on accuracy. Upon dismounting, participants filled out the PANAS and FS for a second and last time. **RESULTS**: Estimated VO_{2max} of the group ranged from 22.46 ml/kg/min to 58.68 ml/kg/min (M=42.95 $\pm$ 14.30). Positive feelings were inversely correlated with HR during the dressage performance, ($r = -0.623$, $p < 0.05$), and with dressage performance score ($r = -0.834$, $p < .001$). Pre and postpositive affect scores remained similar in all participants. However, a paired t-test indicated a significant decrease in pre to post negative affect scores in all participants ($p < 0.05$). Dressage score was inversely correlated to VO_{2max} ($r = -0.646$, $p < 0.05$). **CONCLUSIONS**: Positive and negative feelings, state-anxiety, and trait-anxiety had limited influence on HR during the riding protocol. However, participants with higher positive feelings had a lower HR during the dressage performance test, but did not

achieve a high score. In addition, riders with a higher dressage score had lower estimated $VO_{2max.}$ Therefore, we can conclude that positive feelings seem to impact performance HR, regardless of aerobic fitness level. Finally, physical activity such as horseback riding could help lower negative affects while promoting positive ones.

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Relationship Between Sedentary Behavior and Arterial Stiffness in Physically Active College Students

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Sedentary behavior (SB) may contribute to arterial stiffness (AS), an independent predictor of cardiovascular disease (CVD). Individuals who engage in more SB are at greater risk for CVD. By implementing regular physical activity (PA), the benefits of exercise may negate the damaging effects of SB. Incorporating routine PA and limiting SB is favorable to achieve cardiovascular benefits, such as decreased AS. **PURPOSE**: To examine the AS in physically active college students and assess the relationships between SB and AS. **METHODS**: College students (N=14) (age 20.64±1.44 yr, BMI 24.16±2.7 kg/m^2) achieving recommended amounts of daily moderate-vigorous PA (MVPA) were included in this study. SB and PA were assessed via accelerometers, worn on the right hip for an average of 9.6±2.85 days. Following accelerometry, AS was measured via pulse wave velocity (PWV) and augmentation index (AIX_{75}). For AIX_{75} subjects were supine while a cuff was placed around the right brachial artery. The cuff inflated and, after assessing brachial blood pressure, analyzed the pulse wave for 5 consecutive seconds. AS was then measured via carotid-femoral PWV using applanation tonometry. **RESULTS**: Pearson correlations found no significant relationships between measures of AS and measures of PA or SB in the entire group and when separated by gender. Participants engaged in 598.6±134.6 min of SB, 18.1±5.45 bouts of SB, 62.1±20.8 min of MVPA, and 294.1±67.7 min of movement per day. Average AIX_{75} and PWV were 3.21 ± 10.6 and 5.36 ±0.94, respectively. Independent t-tests revealed no significant differences in AS, PA, or SB between genders. **CONCLUSIONS**: While physically active college students achieved recommended amounts of MVPA, they also acquired substantial amounts of SB. However, no associations were found between AS and SB. It is possible that achievement of recommended amounts of daily MVPA may attenuate the impact of SB on AS.

The Use of an Experimental, Topical Foam to Enhance Skin Cooling and Sodium Retention

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Integrity of the stratum corneum has important applications for maintaining skin pH levels and transepidermal water loss. Therefore, products that enhance stratum corneum integrity may have important applications for mitigating sodium (Na) loss and increasing body temperature during exercise. **PURPOSE**: To examine the effects of an experimental, topical foam on Na retention and skin temperature during exercise. **METHODS**: 6 men and 6 women (Age = 28.3 ± 5.0, Height (cm) = 172.7 ± 10.3, Mass (kg) = 73.3 ± 19.0) completed a thirty-five minute exercise protocol on a treadmill. The protocol included a 5-minute warm-up and 30 minutes of exercising at a moderate intensity. Subjects were weighed before and after exercise to determine total sweat loss. Before exercising, subjects were treated with the experimental foam on one side of the body on the forearm (FA), thigh (TH), chest and scapula. Sweat patches were applied to the same sites on both the treated (T) and untreated (UT) sides of the body. Skin temperature on UT and T sides was assessed every 10 minutes during and 5 minutes post exercise with an infrared thermometer at the FA and TH. After exercise, sweat patches were removed and analyzed for Na content using direct measurement by an ion selective electrode. Paired t-tests were used to compare sweat Na

concentrations and repeated measures ANOVA (2 x 5) was used to compared skin temperature across time between T and UT sides ($\alpha < .05$) **RESULTS**: No significant differences in Na concentration were found between T (Mean Na (mmol) = 31.68 - 54.06) and UT (Mean Na (mmol) = 29.22 - 50.24) sites. A main effect of time on skin temperature was found for both the FA (Mean Temperature (ºC) = 32.13 ± .43) and TH (Mean Temperature (ºC) = 31.68 ± .29). This effect was quadratic in nature, whereby skin temperature dropped through the warm-up, and then rose steadily through recovery. However, no effect of treatment was found across any of the time points for the FA or TH. **CONCLUSIONS**: Although based on a small sample size, these results point towards the conclusion that the experimental foam did not have a statistically significant effect on skin temperature or sodium retention during exercise.

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An Observation of Resistance Training History in Ultramarathon Runners and Implications on Performance

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There is minimal current literature relating resistance training history and periodization to ultramarathon performance. Thus, it is necessary to gain a fundamental understanding of current training techniques and methods to improve training standards in this population of athletes. **PURPOSE**: The purpose of this investigation was to identify current resistance training practices in-season and off-season in ultramarathon runners participating in the Eastern States 100. Additionally, the aim of this study was to determine the relationship between resistance training practices and pace throughout the 102.9-mile event. **METHODS**: A training history survey was completed by registered runners prior to the commencement of the Eastern States 100 ultramarathon (n = 44). Runners were asked if they resistance train during the in-season or off-season and were asked to provide details regarding their resistance training methods. During the event, time of arrival was recorded at each aid station for all study participants. Thereafter, pace was calculated. Frequencies were used to analyze survey data and correlations were used to analyze relationships between pace and resistance training tendencies. **RESULTS**: 20 study participants completed the ultramarathon. Of the 20 finishers, 10 participants resistance trained in-season and 10 participants did not resistance train. 24 study participants did not complete the ultramarathon. Of the 24 non-finishers, 14 participants resistance trained and 10 participants did not resistance train in-season. Within the group of 20 finishers, there was no significant difference ($p = 0.224$) in overall pace between participants who resistance trained and who did not resistance train. **CONCLUSIONS**: This investigation offers insight on current resistance training practices of ultramarathon runners. In addition, this study demonstrates that there is no significant difference in overall ultramarathon performance between runners who resistance train and who do not resistance train. Future research is necessary to determine the relationship between resistance training methods and ultramarathon performance.

Differences in Neuromuscular Excitation Rates in Young Adult, Older Adult, and People with Parkinson's Disease

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Older adults and people with Parkinson's disease (PD) experience a decrease in power and movement velocity, which are strongly related to function and mobility. High rates of neuromuscular excitation (NE) are required for rapid movement to occur. During rapid movement, the amplitude of NE in healthy young adults is greater than that observed during maximal voluntary contractions (MVC). While speed is known to be a predictor of hospitalization and survival, walking is often assessed at a preferred rather than a fast velocity and therefore peak rates of NE and function cannot be assessed. **PURPOSE**: To determine if older adults and people with PD show similar rates of NE as young adults across varying velocities in commonly tested movements. **METHODS**: Two young adults, one person with PD, and one older adult participated

in this study. Participants performed weighted arm curl, transverse plane elbow extension, bicycling, and a 4-meter walk at increasing movement velocities. Surface electromyography (EMG) from relevant muscles was rectified and smoothed with a zero-lag 4th order Butterworth filter (20Hz low pass filter). Dependent measures were peak acceleration, peak rate of EMG rise (RER), and Q30b (integrated EMG of the 30ms prior to peak acceleration). **RESULTS**: A two way MANOVA was run for each movement with the independent factors of group and movement speed. The dependent factors were peak RER and Q30b for each muscle recorded. Preliminary results show that NE rates varied across groups and speeds for all four movements (arm curl: $F(12)=9.589$, $p<.001$; elbow extension: $F(16)=3.182$, $p<.001$; cycling: $F(70)=19.934$, $p<.001$; walk: $F(40)=11.501$, $p<.001$). For example, during arm curl, while the young adults NE was 676%mvc during the fastest condition (1.2Hz), older adults required 3125%mvc and people with PD 1576%mvc. During cycling, older adults showed a 238% increase in NE in the soleus between 40 rpms and 100rpms and people with PD's NE increased 403% whereas young adult NE increased by 172%. **CONCLUSIONS**: Differences in NE rates may account for some of the differences in function and mobility between aging and people with PD whereas inherent muscle quality differences may play a role when compared to healthy young adult.

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Effects of Dietary Sodium Intake on Ambulatory Central Blood Pressure

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Recent data suggest that high dietary sodium increases laboratory-based assessment of central systolic blood pressure. However, it is unclear if ambulatory central systolic blood pressure is similarly increased during a high sodium diet. Ambulatory pressure assessment is important because it reflects blood pressure during activities of daily living, and it is predictive of cardiovascular risk. **PURPOSE**: Therefore, the purpose of this study was to test the hypothesis that 24-hour ambulatory central blood pressure would be increased following a high sodium diet. **METHODS**: Low (1.0 g Na^+/day), medium (2.3 g Na^+/day) and high (7.0 g Na^+/day) sodium diets (order randomized) were consumed for 10 days each by 11 subjects (age: 25±1 yrs, BMI: 23.9±0.8 kg/m2, 6 men). Twenty-four hour ambulatory blood pressure cuffs were worn on the tenth day of each diet. Ambulatory blood pressure monitors were equipped to derive central blood pressure from the brachial pressure waveform. **RESULTS**: Twenty-four hour urinary sodium excretion was significantly higher on the high (236±18 mmol/24 hrs), compared to medium (87±9 mmol/24 hrs), and low (37±9 mmol/24 hrs) sodium diets ($P<0.001$). Dietary condition did not affect central systolic (low = 104±2, medium = 106±2, high = 106±3 mmHg; $P=0.44$), diastolic (low = 66±2, medium = 68±2, high = 68±2 mmHg; $P=0.50$), or mean (low = 82±2, medium = 84±2, high = 84±2 mmHg; $P=0.49$) arterial pressures. Central pulse pressure was not different following any dietary condition (low = 37±2, medium = 37±2, high = 38±2 mmHg; $P=0.55$). **CONCLUSIONS**: These preliminary data suggest that 10 days of high dietary sodium intake does not alter ambulatory central blood pressure in healthy young adults.

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Altered Vascular Function in Chronic Kidney Disease: Evidence from Passive Leg Movement

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Chronic kidney disease (CKD) is an independent risk factor for the development of cardiovascular disease, with both diseases characterized by reduced nitric oxide (NO) bioavailability and vascular dysfunction. Passive leg movement (PLM) has previously been shown to produce NO-mediated hyperemia in the lower extremity, however this technique has not yet been utilized to assess vascular function in patients with CKD. **PURPOSE**: To assess vascular function in patients with CKD using PLM, in addition to the traditional flow-mediated dilation (FMD) technique. **METHODS**: Assessment of vascular function via PLM and FMD was performed on 10 patients (CKD, 66±4 yrs) and 12 healthy controls (CON, 59±2 yrs).

Hemodynamics and artery diameters during PLM and FMD were measured utilizing ultrasound Doppler of the femoral and brachial arteries, respectively. **RESULTS**: Patients with CKD had reduced peak leg blood flow (LBF) (CKD, 400±44 vs. CON, 626±93 mL/min, $p \leq 0.05$) and a reduced change in LBF from baseline to peak (ΔpeakLBF) (CKD, 168±30 vs. CON, 274±41 mL/min, $p \leq 0.05$) during PLM compared to CON. Additionally, ΔpeakLBF was significantly correlated with kidney function as assessed by estimated glomerular filtration rate for all participants ($r=0.48$). As anticipated, FMD was also significantly attenuated in CKD patients compared to CON. **CONCLUSIONS**: Vascular function as assessed by PLM and FMD is attenuated in patients with CKD compared to controls, supporting a reduction in NO bioavailability in this chronic disease state. Additionally, PLM appears to be a novel and feasible approach to assess NO-mediated vascular function in CKD and is associated with kidney function.

Muscular Strength is Inversely Associated with Central Hemodynamic Load in Young Women

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Muscular strength is important for overall fitness. Strength is also associated with cardiovascular health; individuals with higher strength have a lower risk of developing hypertension. Muscular strength has been shown to be inversely associated with aortic stiffness, a precursor of hypertension. **PURPOSE**: Determine the relationship between muscular strength, aortic stiffness, and central hemodynamic load in young women. **METHODS**: Forty-two healthy young women (age 24 ± 6 years, body fat 23.1 ± 8.3 %) underwent muscular strength and vascular testing. Muscular strength was evaluated using a five-repetition maximum bench press and expressed relative to body weight. An aortic blood pressure waveform was derived from the brachial artery via an oscillometric cuff and used to estimate aortic pulse wave velocity (PWV). From this waveform, we also derived measures of central hemodynamic load: augmentation index (AIx@75, at heart rate of 75 bpm), forward wave pressure (Pf) and reflected wave pressure (Pb). Body composition was evaluated using air displacement plethysmography. **RESULTS**: As seen in Table 1, there was a negative correlation between relative strength and Pf ($p<0.05$) and Pb ($p<0.05$). Correlations remained after adjusting for age and mean arterial pressure (Pf, $r = -0.28$, $p<0.05$; Pb, $r = -0.31$, $p<0.05$) but were lost after further adjusting for body fat (Pf, $r = -0.22$, $p>0.05$; Pb, $r = -0.19$, $p<0.05$). There were no associations between relative strength and aortic PWV or AIx@75 ($p>0.05$). CONCLUSIONS: Women who have higher relative strength have lower forward and reflected wave pressure suggesting lower central hemodynamic load. Favorable associations may be partially mediated by stronger women having lower body fat.

Table 1. Correlation matrix between strength and central hemodynamics.

	Age	Body Fat	MAP	AIx @75	Relative Strength	PWV	Pf
Body Fat	-0.08						
MAP	0.05	-0.02					
AIx@75	0.12	0.11	0.23				
Relative Strength	0.14	-0.50**	-0.10	0.03			
PWV	0.68**	0.05	0.52**	0.23	-0.14		
Pf	-0.07	0.19	0.01	-0.01	-0.29*	0.41**	
Pb	0.22	0.27*	0.14	0.42**	-0.28*	0.62**	0.57**

MAP, mean arterial pressure; AIx@75, augmentation index at 75 beats per minute; PWV, pulse wave velocity; Pf, forward wave pressure; Pb, reflected wave pressure.

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

The Characterization and Prediction of a Safe Workload for the Unilateral Loaded Carry

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The unilateral loaded carry (ULC) is a multi-planar, locomotive exercise that challenges the core and hip musculature, and may provide unique opportunities to develop lateral stabilization, muscle co-contraction, and balance. Due to compressive and shear forces on the spine with the ULC, caution must be exercised to account for potential injury risk. **PURPOSE**: To quantify and compare male and female ULC performance, and determine if additional variables allow the prediction of a safe starting load. **METHODS**: Anthropometric (height, body weight (BW), body mass index, and bioelectrical impedance analysis), muscular endurance (maximal duration side plank) and balance (balance error scoring system (BESS)) tests were completed. On a subsequent visit, participants performed a series of 20-second ULC trials (non-dominant side) at a consistent cadence. Initial load was 10% of BW and increased by 10% per trial. Five minutes of rest transpired between trials. When video analysis revealed deviations in spinal alignment or compromised gait patterns, the series ended. The highest load carried before technical failure was recorded. Descriptive and comparative statistics and a stepwise linear regression analysis were utilized to determine relationships between ULC performance and anthropometric, muscular endurance, and balance tests. **RESULTS**: Males (n=25) were significantly taller (177.3±6.7 v. 164.7±7.2cm, $p<0.05$), heavier (81.7±7.0 v. 62.0±9.4kg, $p<0.05$), and leaner (14.4±4.4 v. 22.4±4.8%, $p<0.05$) than their female (n=26) counterparts. Further, males had a higher amount of fat-free mass (FFM_{kg}; $p<0.05$) than females. Males and females carried an average ULC load of 52.2±9.0 (64% BW) and 32.5±7.1kg (53% BW), respectively, with males able to carry a significantly heavier load ($p<0.05$). Fat-free mass was strongly predictive of ULC load (ULC load = $-9.88876 + 0.88679 * (FFM_{kg})$; $r^2=0.774$, $p<0.0001$). **CONCLUSION**: There are differences in ULC performance ability between males and females. As our method does not account for all potential confounding variables, the use of this equation should always be combined with technique analysis and participant feedback to ensure the safe prediction of a starting workload.

Reaching At-Risk Female Adolescents for Inactivity: Case Study for Increasing Educational Interventions

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Health education continually reinvents itself as the need for various health issues and problems evolve. Physical educators need to create a meaningful connection in the classroom for healthy habits that can carry through to adult life. **PURPOSE**: To develop a program that would improve young females understand lifelong activity, build self-confidence to participate in new activities, and foster a healthy outlook on staying active. **METHODS**: The "Fit to Run" program was conceptualized as a secondary in-school option as a Physical Education alternative for female students. Thirty female high school students (BMI = 22 ± $11kg/m^2$; Waist to Hip = 0.69 ± 0.28) from freshman to senior year were recruited to participate three times a week over five weeks during the last period of the school day. During the five week program the participants were exposed to various activities (yoga/kickboxing/circuit training), nutrition information and tastings, and run/walk sessions. In addition, students were asked to fill out an exercise needs assessment and an open-ended questionnaire about student's perceptions/ideas about health and physical activity. Attitudes toward health fitness were examined prior to program using frequencies and correlation analyses. **RESULTS**: From the survey it was found that 59% of the students felt that they were the right weight and 51% still want to lose weight. In addition 67% reported that they did not participate in high school sports, but 70% are were interested in learning more alternative activities for health and fitness. While not significant, the correlation analysis revealed that the students with the highest BMI reported less

participation in activity (r = -.366), less desire to change their weight (r = -.260), and poorer overall health status (r = -.296). However, students that participate in organized sports show a greater interest in alternative activities for health and fitness (r = .142). **CONCLUSIONS**: Based on these results, those that are at most risk are students with a high BMI and are not participating in organized sports. Therefore, utilizing surrounding community-based organizations such as institutions, community centers, and fitness professionals are essential to assist school systems that may lack the resources to provide opportunities for at-risk students.

Inter-Segmental Coordination Strategies and Kinematics Utilized During a Single Leg 180° Jump

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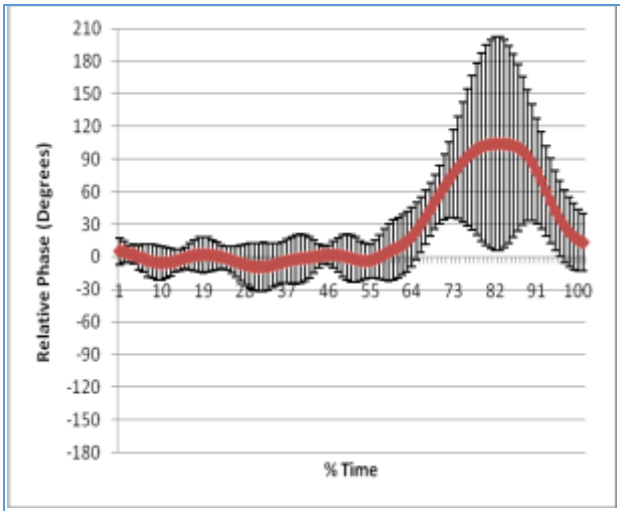
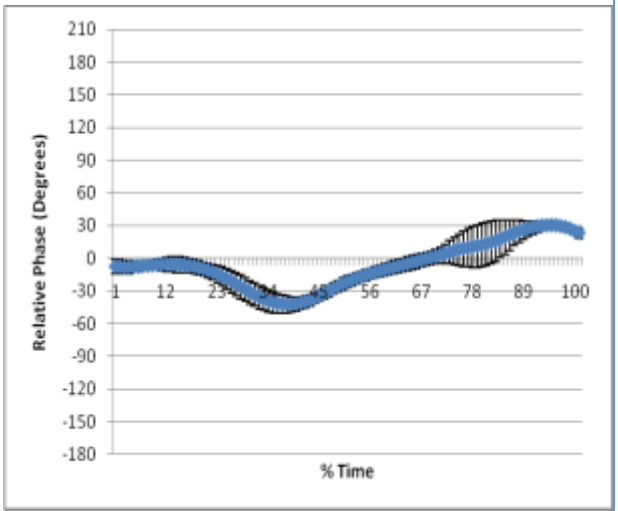
Recent literature indicates multi-planar analysis provides a more robust assessment for functional instabilities that could indicate injury. The single-leg 180° jump requires multi-planar movement, dynamic effort and allows for bilateral assessment. **PURPOSE:** To determine inter-segmental thorax and pelvis coordination and knee kinematic strategies utilized when performing a single-leg 180° jump. **METHODS:** 14 male elite rugby players performed five single leg 180° jumps on each leg, with 3D kinematic data collected using a 12 camera motion capture system. Independent t-tests were used to determine any significant differences in abduction (ABD)/adduction (ADD) between the dominant limb (DL) and non-dominant limb (NDL) during the loading (LOP) and landing (LAP) phases following a 180° single leg jump. Continuous relative phase (CRP) was calculated as a representative of inter-segmental coordination between the segmental rotations of the thorax and the pelvis about the vertical (z) axis. **RESULTS:** At LOP, NDL greater peak ABD (p = .01). At LAP, DL greater peak ADD (p= .05). At LAP, NDL, greater peak ABD (p= .01). CRP plots denoted differences in pelvis/thorax segmental coordination for both the DL and NDL (see figure 1). **CONCLUSIONS**: Differential inter-segmental movement CRP plots indicate participants can utilize a thorax led; pelvis led or synchronized rotational method. Variability is more pronounced during the LAP, indicated by significant differences in bilateral LAP peak ADD/ABD, which is of greater interest for injury risk prediction because of the dynamic loading of the tissues. Future research should assess CRP to identify compensatory strategies and injury risk.

Figure 1: Thorax/Pelvis Coordination: DL (Left) vs NDL (Right)


Relative Phase (Degrees)
% Time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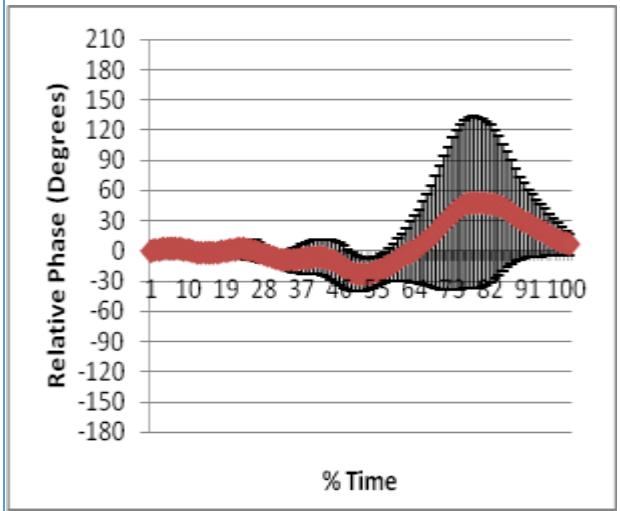
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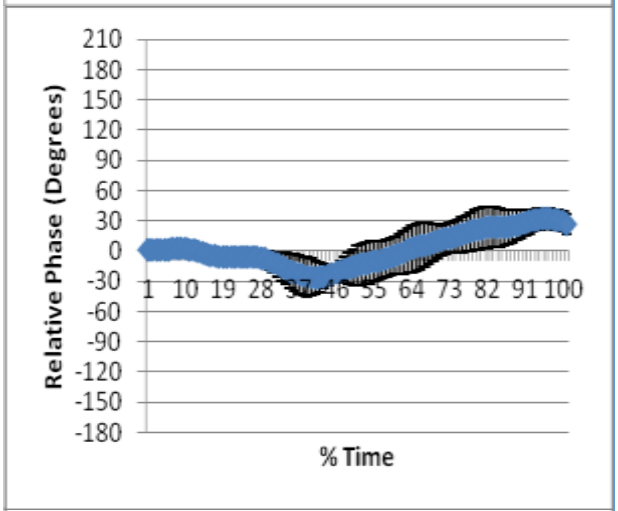
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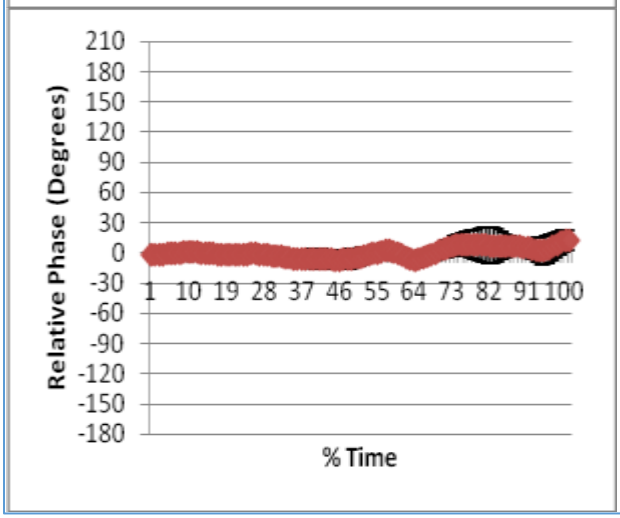
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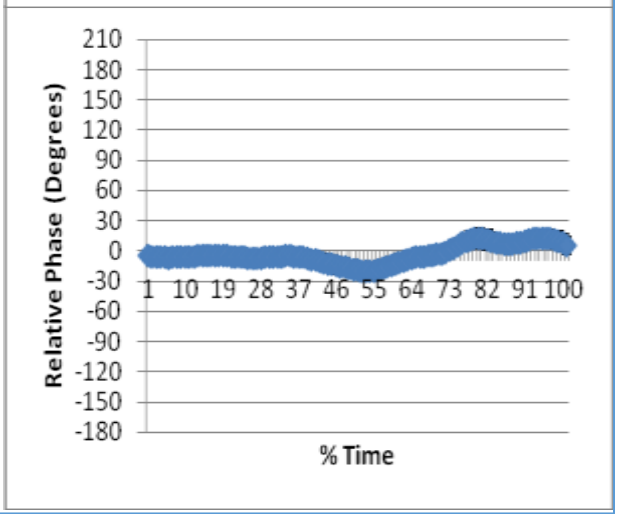
Relative Phase (Degrees)
% Time

Low-Flow-Mediated Constriction Is Preserved Across the Menstrual Cycle in Healthy Young Women

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Fluctuations in ovarian hormones during the menstrual cycle can alter vascular endothelial function. Low-flow-mediated constriction (L-FMC) has recently been demonstrated to be a complementary measure of vascular health. Reduced L-FMC is present in numerous cardiovascular disease states. However, the impact of fluctuating ovarian hormones on L-FMC in women is unknown. **PURPOSE**: The purpose of this study was to test the hypothesis that L-FMC would be greater during the mid-luteal phase (ML) of the menstrual cycle, when estrogen (E2) and progesterone (P4) are elevated, compared to the early follicular phase (EF), when both E2 and P4 are low. **METHODS**: We measured changes in brachial artery diameter via ultrasound in nine young women (22±1 years, 23±1 kg/m^2) during both their EF (days 2-4 of cycle) and ML (days 20-25 of cycle) phases. A blood pressure cuff was placed just distal to the olecranon process and inflated to suprasystolic pressure 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. Flow mediated dilation (FMD) was calculated as a percent change from baseline to peak diameter after cuff deflation. Total vessel reactivity was calculated as the sum of the absolute value of L-FMC and FMD. Results are reported as mean ± standard error. **RESULTS**: L-FMC was similar between the EF (-2.33±0.65%) and ML (-2.74±0.73%) phases ($p = 0.68$). FMD values during the EF phase (7.97±0.86%) and ML phase (7.09±1.26%) were also similar ($p = 0.57$). Total vessel reactivity was also similar between the EF (10.48±1.02%) and ML (10.82±1.43%) phases ($p = 0.71$). As expected, ovarian hormones were significantly higher during the ML (E2, 128.1±19.2; P4, 8.17±1.10 pg/mL) compared to EF phase (E2, 44.59±12.48; P4, 0.8±0.23 pg/mL), $p<0.05$. **CONCLUSIONS**: These findings suggests L-FMC is preserved across the menstrual cycle. Estrogen and progesterone have unique mechanisms that interplay to alter vascular function. Due to the strong vasodilatory effects of estrogen, future studies examining the impact of estradiol alone on L-FMC are needed to better understand the mechanisms of vascular reactivity.

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Effect of Increasing Military-Related Load Carriage Magnitude on Dynamic Postural Stability in Men and Women

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The impact of load carriage on dynamic postural stability affects the survivability of the Warfighter by influencing performance capabilities and injury incidence. Further, sex may interact with the relationship between load carriage and dynamic postural stability to further compromise survivability. **PURPOSE**: To investigate the effect of load carriage magnitude on dynamic postural stability of men and women and its relationship to jumping ability. **METHODS**: 32 subjects (16 men, 16 women) were investigated for maximum jump height and dynamic postural stability. Dynamic postural stability was assessed by subjects jumping a horizontal distance of 40% their height over a 30cm hurdle, landing on one leg on a force plate (sample rate = 1200 Hz). 3 trials were completed for 3 load conditions: +0, +20 and +30% body weight (BW). Dynamic postural stability was determined from ground reaction force data during landings, by calculation of the dynamic postural stability index (DPSI). Maximum jump height was assessed by subjects performing 3 countermovement jumps (sample rate = 1000 Hz). Two-way repeated measures ANOVA were used to compare mean DPSI scores between sexes and conditions ($\alpha = 0.05$). Pearson's Correlation Coefficients were used to determine the relationship between jump height and change in DPSI scores between conditions ($\alpha = 0.05$). **RESULTS**: Load condition significantly affected DPSI ($F = 100.304$, $p = 0.001$). DPSI scores increased between the 0% (0.359 ± 0.041), 20% (0.396 ± 0.034) and 30% (0.420 ± 0.028) BW load conditions. No significant effect of sex on DPSI was found ($F = 0.131$). No significant

sex by load interaction on DPSI was found (F = 0.393). No significant correlations were found between jump height and change in DPSI scores between conditions. **CONCLUSIONS**: Increased load was found to negatively affect dynamic postural stability, most likely as a result of modifying the demands of the task. Therefore, the dynamic postural stability of men and women changes comparably in response to increased load carriage magnitude. Future research should focus on the effects of load on dynamic postural stability under higher loads and during more military-specific tasks.

Statement of Disclosure: Freddie H. Fu Graduate Researcher Award

The Effects of Loaded Fatigue on Loaded Postural Stability

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Military personnel are often required to carry heavy loads for long distances over unpredictable terrain. Additional load carriage, in conjunction with fatigue, has the potential to influence postural control mechanisms which may in turn increase injury risk. **PURPOSE**: To determine if a loaded incremental march to fatigue negatively influences loaded postural stability (LPS). **METHODS**: LPS was measured before and after a loaded incremental march to fatigue in 23 physically active men and women (age: 24.09 ± 3.98 years, height: 172.34 ± 11.07cm, weight: 162.17 ± 38.22lbs). LPS was assessed using Sensory Organization Test (SOT) clinical outcome scores and kinetic force plate variables (vertical ground reaction forces: SDvGRF) while subjects were adorned with a weighted vest equating to 30% of their body weight. The SOT consisted of six conditions (C1-C6) aimed to perturb the sensorimotor system, which were performed before and after a loaded fatigue protocol. C1, C2 and C3 challenged the somatosensory system, C4 challenged the visual system, while C5 and C6 challenged the vestibular system. Fatigue was induced with a treadmill march at 4mph with increasing grades of 2% every three minutes until volitional fatigue. After testing for normality, paired sample t-tests or Wilcoxon signed rank tests were conducted to assess pre- to post-fatigue differences. **RESULTS**: Worse LPS was observed post-fatigue with significant reductions in SOT scores found in overall composite scores (pre: 82.76 ± 4.65, post: 81.61 ± 5.18, $p=0.010$), and SDvGRF of C1 (pre: 1.26 ± 0.45, post: 2.04 ± 0.96, $p<0.001$), C2 (pre: 1.37 ± 0.60, post: 1.92 ± 1.19, $p<0.001$), C3 (pre: 1.35 ± 0.50, post: 2.05 ± 1.81, $p=0.026$), and C6 (pre: 2.52 ± 2.16, post: 3.49 ± 3.15, $p<0.001$). No differences were seen for C4 or C5. **CONCLUSIONS**: Significant decrements in LPS, and more specifically the somatosensory and vestibular systems, were caused by loaded fatigue. Findings could aid in future postural stability screenings, load carriage training and strategies for injury prevention in the military.

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Effect of Aerobic Exercise on Artery Stiffness and Cerebrovascular Pulsatility in Hypertensive and Non-Hypertensive Adults

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Large elastic arteries (i.e. aorta, carotid) buffer pulsatile hemodynamics by dampening changes in pressure and flow. Stiffer central arteries, as seen in hypertension, transmit greater pulsatile hemodynamics into fragile cerebral vessels. Aerobic exercise is recommended for hypertensives (HTN), but its effects on artery stiffness and pulsatility in this group are unclear. **PURPOSE**: Investigate the effect of acute aerobic exercise on artery stiffness and cerebrovascular pulsatility in HTN and non-HTN adults. **METHODS**: 30 medicated HTN and 30 age, sex, and body mass index (BMI)-matched non-HTN adults (56±6 yrs, BMI 28.2±2.9 kg/m^2; 32 men) underwent hemodynamic measures pre and 10 min post a 30-min cycling bout (55% peak oxygen consumption). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cf PWV) and carotid artery (CA) stiffness was assessed with PWV-β via Ultrasound. Aortic mean (MP) and pulse pressure (PP; via radial generalized transfer function), and CA PP were measured by tonometry. CA and middle cerebral artery (MCA) blood velocity pulsatility index (PI) were measured using Doppler.

RESULTS: cf PWV, MCA PI and CA PI increased post exercise compared to pre in both groups ($p<0.05$), while aortic MP, PP, and CA PP, PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other significant group or interaction effects were detected. **CONCLUSIONS**: Acute aerobic exercise increases aortic stiffness and cerebrovascular hemodynamic pulsatility in both non-HTN and HTN individuals. These data suggest medicated-HTN have similar vascular responses to early recovery from acute aerobic exercise as non-HTN.

Statement of Disclosure: Supported by a Foundation Research Grant from ACSM and AHA Pre doctoral Fellowship

Table 1: Arterial stiffness and hemodynamic pulsatility pre/post acute exercise in non-HTN and HTN subjects.

	non-HTN		HTN		Effects		
Measure	Pre	Post	Pre	Post	G	T	GxT
Aorta							
Mean pressure, mmHg	91±8	92±7	96±10	95±9	0.047	0.531	0.136
Pulse pressure, mmHg	33±9	32±7	33±7	30±7	0.175	0.005	0.595
cf PWV, m/s	7.9±1.1	8.1±0.9	8.2±1.3	8.7±1.5	0.081	0.001	0.221
Carotid artery							
Pulse pressure, mmHg	37±10	36±8	37±8	35±8	0.816	0.070	0.888
Blood velocity PI	1.43±0.34	1.49±0.34	1.34±0.26	1.42±0.26	0.356	0.001	0.530
PWV-β, m/s	6.3±1	6.3±0.9	6.6±1.3	6.8±1.5	0.209	0.204	0.602
Middle cerebral artery							
Blood velocity PI	0.78±0.12	0.82±0.12	0.76±0.11	0.78±0.11	0.314	0.003	0.513

HTN, hypertensive; cf, carotid-femoral; PWV, pulse wave velocity; PI, pulsatility index; G, group; T, time; GxT, group-by-time interaction.

Heart Rate, Perceived Exertion, and Speech Characteristics across Cycling Exercise Intensity Levels

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The *Talk Test* is a non-invasive measure of exercise intensity and is useful in identifying safe levels of exercise intensity. Previous investigations of the *Talk Test* have used exhaustive exercise bouts to examine the impact on physiological and speech production variables such as the perception of speech difficulty. Other critical speech measures, such as the ability to sustain a sound (e.g., maximum phonation test; MPT) or breathing frequency (BF) during exercise, are less clear. Moreover, the responses of these variables during submaximal, self-selected exercise intensities are yet unknown. **PURPOSE**: The purpose of this investigation was to examine the responses to heart rate, speech production, and ratings of perceived exertion measures across a range of exercise intensities. **METHODS**: Sixteen college-aged participants completed three 15-minute bouts of cycling exercise at three intensities: (a) self-selected (SS, as measured by Watts), (b) 20% below (-20%), and (c) 20% above (+20%) the self-selected intensity wattage in a randomized counterbalanced manner. Pre- and post-exercise, participants performed an MPT test and read a paragraph from *The Rainbow Passage*. Passage analysis was conducted to determine the number of breaths per passage reading. Heart rate (HR) and perceived exertion (RPE) were recorded at end of exercise. One-way repeated measures ANOVAs were performed on BF, MPT, HR, and RPE. **RESULTS**: Main effects were observed for all dependent variables (all $p < .05$). Post hoc tests for HR revealed the -20% condition (M = 122.75±16.30) was less than the SS (M = 134.69±16.82; p = .005) and +20% (M = 141.38±20.31; $p < .0001$) condition. The -20% condition RPE (M = 12.00±2.37) was less than the +20% (M = 14.81±2.97; p = .003). MPT evidenced significant differences between +20% (M = 9.56±3.50 s) and

both -20% (M = 12.19±3.58 s; p = .012) and SS (M = 11.06±3.42 s; p = .030). BF was significantly different between -20% (M = 6.00±1.86) and both SS (M = 7.63±3.32; p = .024) and +20% (M = 7.68±3.28; p = .019). **CONCLUSIONS**: Results suggest that difficulty producing speech may occur at lower intensities than those previously investigated. Findings may have implications for those working in the fitness and rehabilitative environments.

Indexing Attentional Focus: A Critical Neural Element of Athletic Performance

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Attentional focus refers to the mental inhibitory capacity an individual draws on when performing a skilled motor task. How an individual manages his mental resources will have a strong effect on motor performance. Often in sports, poor performance is due to errors of attention or the inability of athletes to focus on the task at hand. How an athlete responds to challenge can dictate their ability to be successful on the field. Electroencephalography (EEG), a measure of brain activity, and heart rate variability (HRV), an index of autonomic (i.e., parasympathetic) activity, have been used as measures of attentional focus and, as such, can provide important insights into critical neural processes associated with attention and sport performance. **PURPOSE**: To index an individual's psychophysiological biomarkers (EEG and HRV) and validate how they would change as task difficulty increases. **METHODS**: Thirty-five healthy participants (ages ranged from 18-40 years) were recruited from the University of Maryland, College Park. Thirty-one (n = 31) of the participants provided usable data for the analysis. They performed a visuo-motor task in a Snake® game with two levels of challenge (Easy vs Hard) that lasted five-minutes. **RESULTS**: EEG data analysis was performed using a 2 x 2 x 5 (Condition x Cerebral Hemisphere x Brain Region) ANOVA. The results of the experiment revealed an elevation in neural effort, as indexed by regional theta band power (4-7 Hz), which suggests an increase in cerebral cortical activation with increased task difficulty ($F(1, 30) = 27.15$; $p < 0.005$). HRV data analysis was calculated using a repeated measure ANOVA and the results revealed a withdrawal of parasympathetic influence, and an increase in sympathetic dominance with increased challenge ((i.e., increased high frequency(0.15 - 0.4 Hz) HRV ($F(1,30) = 9.074$; $p = 0.005$)), low-frequency HRV (0.04 - 0.15 Hz) ($F(1,30) = 9.074$; $p = 0.005$), and low-frequency to high-frequency ratio ($F(1,30) = 5.185$; $p = 0.3$). **CONCLUSIONS**: The results of this experiment support the validity of EEG and HRV as objective measures of attention demand and, furthermore, that withdrawal of parasympathetic activity is associated with increased mental workload as measured by EEG theta power.

Comparison of Energy Expenditure Between Hacky Sack and Elliptical Cross Trainer

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PURPOSE: More than 60% of adult Americans do not engage in the minimum recommended amount of daily exercise. Even younger adults struggle, with 43% of 18-24 year olds not engaging in the minimum amount of exercise (McCracken et al., 2007). Fischer et al. (2004) showed that adults can successfully achieve recommended physical activity levels and substantial energy expenditure by playing children's games with their kids. However, it remains unclear how metabolic responses from game activities compare with traditional aerobic exercise. Therefore, we compared energy expenditure between Hacky Sack and Elliptical Cross Training. **METHODS**: 11 apparently healthy, college-aged men (21.3±1.3 yrs) performed a maximal graded exercise test on an elliptical trainer to determine VO_2max. Subjects then performed three exercise protocols, once per week, randomly assigned in a counterbalanced order including 30 min of aerobic exercise performed at 35% of VO_2max on an elliptical cross trainer (AEROBIC), hacky sack play (HACKY), and a no-exercise control trial (CTRL). Expired air was collected continuously before (15 min), during (30 min), and for 30min after each exercise protocol using a Parvo TrueOne 2400 Metabolic cart. Data were analyzed using a two-way repeated measures ANOVA with Fisher's Least Significant Difference (LSD) post hoc analyses wherever appropriate. **RESULTS**: Significant differences ($p<0.05$) among the

average rates of energy expenditure (kcal.min-1) included AEROBIC and HACKY > CTRL from 0-10, 11-20, and 21-30min of activity, as well as +5min after exercise. No significant differences in the rates of energy expenditure among groups were observed at rest, nor after +10, +15 and +30min of recovery. Total energy expenditure (kcal) was significantly greater ($p<0.05$) during AEROBIC (195.8±42.7) and HACKY (199.9±34.8) compared to CTRL (40.0±3.7). Total energy expenditure was not significantly different between AEROBIC and HACKY. **CONCLUSIONS**: Energy expenditure was similar between AEROBIC and HACKY, suggesting that game activities can elicit similar metabolic challenges compared to popular aerobic exercise modes in young adults. Therefore, game activities could be considered in addition to regularly planned aerobic exercise to help meet minimum activity recommendations.

The Effects of Hyperhydration and Salt Loading on Bioelectrical Impedance Analysis Body Fat Estimates

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Bioelectrical impedance analysis (BIA) is a common and non-invasive method to evaluate body composition by measuring the electrical impedance of the body. Altering blood electrolyte concentration or blood volume may impact BIA measurements by directly influencing the electrical conductivity of the body. While dehydration and sweat induced electrolyte loss certainly impacts BIA, it is unclear how simultaneous hyperhydration and electrolyte loading effects BIA measurements. **PURPOSE**: To examine the effects of acute hyperhydration and salt loading on the impact of BIA derived body fat estimates. **METHODS**: Each participant ate a standardized meal followed by ≥4hr fast, prior to the experimental visit. Adequate hydration (urine SG ≤1.020) of each participant was confirmed prior to the start of the visit. Tanita TBF-300A BIA and a blood sample were performed at baseline and every 30min for 3hr following the consumption of 3.8 grams of table salt dissolved into 466mL of deionized water (sodium: 1500mg, 140mmol). All urine produced during the 3hr follow-up was collected to assess volume and electrolyte excretion. **RESULTS**: Seven healthy participants (3M/4W, 29±2 years, 67.0±4kg, urine SG 1.007±0.001, hemoglobin 13.7±0.2g/dL, hematocrit 45±1%, serum sodium 140.0±0.5mmol/L) were studied. Participants excreted 646±55mL of urine containing 17.1±6.8mmol of sodium during the 3hr follow-up period. Consumption of the salt water solution increased plasma volume 7.0±0.7% and serum sodium 1.3±0.4% with each statistically elevated above baseline during the time points ≥60min and ≥120min, respectfully (all $p<0.05$). Both body mass (+0.4±0.1kg) and BIA estimated body fat percentage (+0.6±0.2%) (both $p<0.05$) increased immediately and returned to baseline levels by 90min. Leg to leg electrical impedance was not affected by the consumption of the salt water beverage ($p=0.660$). **CONCLUSION**: This preliminary data suggests that when starting in a hydrated state, concurrent consumption of salt and water temporarily increases body mass causing an increase in body fat estimates. However, differences in temporal patterns suggest increased plasma volume with small elevations in electrolyte concentration does not directly affect bioelectrical impedance analysis body fat estimates.

The Effect of High-Intensity and Moderate-Intensity Exercise on Enjoyment and General Mood

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Interval training is defined as exercise involving bouts of high-intensity exercise, usually prescribed at intensities between 80-95% of an individual's heart rate maximum (HR_{max}), that are interspersed with rest periods (ACSM 2014). A major reason why high intensity interval training (HIIT) has become so popular is due to the fact that physiological and psychological benefits can be achieved in a much shorter period of time than that of continuous exercise. Although HIIT can achieve similar benefits as continuous exercise, just in a shorter amount of time, a question that must be considered is whether HIIT is enjoyable. One of the most common barriers to compliance with exercise is a lack of pleasure (Bruno, 2013). **PURPOSE**: To evaluate the effects of body weight HIIT on enjoyment and general mood in a group of college age males.

METHODS: 15 male participants between the ages of 18-25 completed two 20 minute exercise sessions. Exercise sessions were either a moderate intensity continuous (MIC) exercise session prescribed at 50-65% of their HR_{max} or a HIIT session. General mood was recorded prior to each exercise session and again five minutes post exercise. During each session ratings of perceived exertion (RPE), affect, and heart rate were recorded. Immediately after exercise and 5 minutes post exercise the Physical Activity Enjoyment Scale (PACES) was administered. **RESULTS**: A 2 X 2 repeated measures ANOVA revealed no significant main effect for group (MIC and HIIT) ($F= 1.234$, $p= .285$) or PACES ($F= .648$, $p= .434$), and there was no significant interaction between group and PACES ($F= .665$, $p= .429$). A 2 X 2 repeated measures ANOVA revealed a significant main effect for mood ($F= 7.146$, $p= .018$). **CONCLUSION**: This study found general mood significantly improved from pre exercise to post exercise in the MIC session, but not the HIIT session. Therefore, when improving mood is a focus of an exercise program, MIC exercise should be prescribed.

The Effects of Aerobic vs Anaerobic Exercise on Cognitive Function in College Aged Individuals

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Many college aged students enjoy exercising as a lifestyle choice in between studying for exams. While exercise is beneficial to improving physical fitness, certain types of exercise may provide additional benefits to improving cognitive function, therefore aiding in memory recall. **PURPOSE**: To evaluate the effects of aerobic and anaerobic exercise on memory recall (MR) and reaction time (RT). **METHODS**: 17 healthy college aged individuals (9 male, 8 female, age 18-25 years) were evaluated on three separate days. On the first day, subjects performed a baseline MR and RT test. On the second day, subjects completed a MR and a RT before and after aerobic exercise. The aerobic exercise consisted 20 minutes of cycling at 75% of their age predicted maximum heart rate. The final day of testing was conducted in a similar manner, but this time anaerobic exercise was performed. The anaerobic exercise consisted of 3 short bouts of cycling exercise with each exercise bout covering 700 m with intensity equal to .03 kp/kg. As for the MR and RT, a computerized MR test was administered, which consisted of 15 words that flashed on the screen for one second each. Subjects were then asked to recall as many words as possible in 30 seconds. The RT were completed on the computer, consisting of two parts. The simple RT required pressing a button as soon as the letter appeared while the choice RT consisted of matching the proper letter on the keyboard with the correct choice on the screen when flashed. A two way ANOVA with repeated measures was used to compare differences in exercise conditions and time on MR and RT. **RESULTS**: The average number of words recalled decreased after completing the aerobic (5.4 ± 1.2 vs. 4.8 ± 1.6 words; $p>0.05$) and anaerobic (5.3 ± 1.7 vs. 4.2 ± 1.8 words; $p<0.05$) exercise tests. However, choice RT improved after both aerobic and anaerobic conditions when compared to the baseline (417.8 ± 50.3 vs. 406.4 ± 57.5 ms, $p>0.05$ and 421.30 ± 45.0 vs. 407.9 ± 50.8 ms, $p>0.05$, respectively). Furthermore, simple RT also slightly improved after aerobic exercise (295.4 ± 31.7 vs. 289.5 ± 32.9 ms, $p>0.05$), but not after completing the anaerobic test (288.4 ± 16.5 vs. 294.7 ± 21.9 ms; $p>0.05$). **CONCLUSION**: Findings of the study suggest that there may not be significant benefits of short bouts of exercise on MR but modest improvements in RT may be achieved.

The Effects of Small Group Exercise on Rate of Perceived Exertion and Mood State in College Students

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Motivating people to become physically active can be challenging. It is possible that exercising with others can provide a more enjoyable exercise experience. **PURPOSE**: To compare differences in rate of perceived exertion (RPE), mood state and enjoyment in individual and small group exercise. **METHODS**: Eighteen (5 female, 13 male) subjects (age: 22.1 ± 1.4 yrs; mass: 81.4 ± 16.2 kg) came in on two occasions and completed two exercise sessions; one individual and one small group exercise. For the small group exercise,

subjects were randomly placed into groups of 3 and interacted with each other throughout the exercise. Each exercise session consisted of a 3 min warm up followed by 4 consecutive, 3 minute intervals at a workload (kp) equal to 2% of their body weight. Subjects pedaled the 1st and 3rd intervals at 50 rpm while the 2nd and 4th intervals at 60 rpm. Subjects' RPE, blood pressure (BP) and heart rate (HR) were measured at rest, during and after exercise. On each test day, subjects completed pre- and post-exercise mood state (positive and negative affect scale (PANAS) and physical activity enjoyment scale (PACES). Two-way analysis of variance with repeated measures was used to compare differences in condition and time. **RESULTS**: Small group exercise showed higher HR (106.1±17.1 vs. 103.1±16.8 bpm) but lower SBP (140.2±17.0 vs. 144.5±18.3 mmHg) when compared to individual exercise. Small group exercise also showed differences in positive and negative affect. Moreover, group exercise revealed higher motivation than individual exercise. However, there were no significant differences in any of the measures.

Group	Positive affect	Negative affect	Motivation	RPE	PACES enjoyment
Individual	36.9 ± 7.2	12.6 ± 3.3	7.6 ± 1.7	11.1 ± 3.1	2.44 ± 1.42
Group	40.0 ± 6.6	11.6 ± 2.1	8.0 ± 1.2	11.4 ± 2.2	2.04 ± 1.41

CONCLUSIONS: Group exercise does not seem to have an effect on increased mood state following exercise or decrease in RPE during exercise.

The Effects of Ballistic Exercise on Cognitive Function

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A strong connection between physical activity and cognition has been well documented in health science. Prior research suggests a strong relationship between both aerobic exercise training and slow-controlled resistance training with improvements in cognitive function (CF). Little research exists on the influence of high-force production (ballistic) strength training on CF. **PURPOSE**: To determine the effects of ballistic strength training on CF in an apparently healthy, college-aged population. **METHODS**: 21 low-risk participants (age 18-25 years) who had refrained from any ballistic strength training for at least six months were recruited to the treatment group. 19 individuals (age 18-25 years) served as controls. Treatment and control groups continued previous aerobic and traditional (slow-controlled) resistance training during the study. Both groups completed congruent (CONG) and incongruent (INCONG) sections of The Stroop Test, and the Trail Making Test, Part B (TMT-B), at baseline, and eight weeks later. The Stroop Test assessed the number of correct answers on CONG and INCONG questions and the completion time of the test. The TMT-B measured the correct completion time of the test. The treatment group met twice weekly for eight weeks and completed a ballistic training protocol. Pre- and post-test comparisons within and between subjects on CF were assessed. **RESULTS**: Completion time for both CONG and INCONG sections of The Stroop Test significantly improved from baseline to post-test for all participants (1.65 ± 3.59, $p = .006$; 2.17 ± 4.60, $p = .005$, respectively); however, there was no significant difference in between groups ($F = .921$, $p = .847$; $F = 2.696$, $p = .450$, respectively). All participants significantly improved from baseline to post-test on the TMT-B (9.74 ± 10.48, $p < .001$); however, there was no significant difference between the treatment and control group from baseline to post-test (1.82 ± 3.08, $p = .564$). **CONCLUSION**: CF improved in the treatment and control group but was not statistically different. Future research could investigate if ballistic strength training influences CF in sedentary individuals.

Face Cooling Reveals Transient Cardiac Parasympathetic Dysfunction in Recently Concussed College Athletes

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Autonomic control of the cardiovascular system during sympathetic stress appears to be impaired in concussed patients. However, evidence is lacking regarding the autonomic responses to parasympathetic stimulation in concussion. Cooling the forehead, eyes, and cheeks (i.e., face cooling) transiently increases cardiac parasympathetic activity within 1-2 min. **PURPOSE**: Test the hypothesis that recently concussed college athletes (CA) have impaired cardiac parasympathetic activation during face cooling. **METHODS**: Seven healthy controls (HC) (age: 23±2 years, height: 175±10 cm, weight: 76±16 kg, 4 women) and four symptomatic CA (age: 20±1 years, height: 184±15 cm, weight: 94±33 kg, 1 woman, 6±2 days from injury) participated. Participants rested supine for 10 min before a plastic bag of ice water (~0°C) was placed over the forehead, eyes, and cheeks for 3 min. Recovery data were collected for 1 min. Heart rate (3-lead ECG) and blood pressure (photoplethysmography) were continuously recorded. The root mean squared of successive differences (RMSSD) was calculated from the R-R interval as an indicator of cardiac parasympathetic activity. Change from baseline data were analyzed across 1 min intervals. **RESULTS**: There were no differences between HC and CA at baseline for heart rate (58±10 vs. 53±8 bpm, respectively; P=0.38), RMSSD (78±56 vs. 175±179 ms, respectively; P=0.21), or mean arterial pressure (97±9 vs. 93±5 mmHg, respectively; P=0.55). Changes in heart rate were not different between groups (P=0.55) or across time (P=0.46). At 1 min of face cooling there was a significant increase in RMSSD in HC (122±120 ms; P<0.01) but no change was observed in CA (-96±158 ms; P=0.26). The change in RMSSD was greater in HC vs. CA at 1 min (P=0.01) but was not different thereafter (P>0.12). Mean arterial pressure increased 1 min into face cooling and remained elevated thereafter in HC (peak increase at 2 min, 24±6 mmHg; P<0.01). Mean arterial pressure increased 2 min into face cooling in CA and remained elevated at 3 min (peak increase at 2 min, 16±4 mmHg; P<0.01). The increase in mean arterial pressure was greater in HC (23±6 mmHg) vs. CA (15 ± 7 mmHg) at 3 min (P=0.04). **CONCLUSION**: Cardiac parasympathetic activation during face cooling appears to be attenuated in CA and might contribute to impaired autonomic cardiovascular control in CA.

The Effects of Intermittent Fasting on Endurance Performance

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Introduction: Proper diet and exercise can lead to a healthy life style and weight loss. In recent years Intermittent fasting (IF) has become one of the growing fad diets in our culture. **PURPOSE**: The aim of this study was to evaluate the effects of IF on aerobic cycling performance. **METHODS**: Five physically active (participating in 30 minutes of exercise at least three days a week) subjects volunteered for this study. Subjects were randomly assigned to an IF diet (n=3) or a normal (CON) diet (n=2) that would be carried out over the span of one week. Subjects' body composition was recorded using a Bodpod (Cosmed, Chicago IL), along with a baseline VO_{2peak} graded exercise test preformed on a Monark cycle ergometer (Vansbro, Sweden). All subjects performed two graded cycle protocols in the fasted state, one before the start of the diet and immediately after the one-week diet. Following a five minute warm-up, subjects cycled at 50rpm wtih resistance increasing 3kp every 2 minutes until failure. Paired sample t-tests were used to determine significant differences between groups using Microsoft Excel (Microsoft, Redmond, WA). Significance was set at p<0.05. **RESULTS**: Body fat was not different before (15.03±7.31% IF, 14.35±1.91% CON; p=0.89) or after (14.73±4.83% IF, 15.4±0.42% CON; p=0.83) the diet. VO_{2peak} was 54.20±7.71 ml/kg/min in IF group and 45.75± 8.27 ml/kg/min in CON diet group (p=0.36). Time to exhaustion was not different before (944.00±156.64 sec IF, 712.50±355.67 sec CON; p=0.52) or after (951.33±158.20 sec IF; 701.50±386.79 sec CON; p=0.52) the diet. The total caloric intake for the IF group was 1968.3±643.7 kcal, carbohydrate intake was 268.41±128.9g, protein intake was 101.05±33.6g, and fat intake was 52.7±10.3g. The CON diet group had a total kcal intake of 2172.6±486.9, carbohydrate intake of 237.6±23.4g, protein intake of 109.9±59.4g, and fat intake of 69.2±33.6g. There were no differences between groups in total calories consumed (p=0.71), carbohydrate (p=0.72), protein (p=0.87), or fat (p=0.61). **CONCLUSION**: IF

induced no changes that aided in aerobic exercise performance compared to those who were not IF. IF had no ill effects on exercise performance.

Comparison of Maximal Treadmill Test Using Open-Circuit Spirometry and Maximal Effort Two-Mile Run Test Performance

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Maximal oxygen uptake (VO_2 max) testing is the leading measure for determining one's aerobic capacity. It directly relates to fitness level and optimal human performance. Cardiorespiratory fitness based field assessments have in the past focused on time of completion and distance covered rather than utilizing physiological measures. **PURPOSE**: To compare open-circuit spirometry measured VO_2 max during a maximal treadmill test and their normative scores to a maximal effort two-mile run test. **METHODS**: Gannon University Men's Soccer players (N = 19, 19.89 ± 1.91 years of age) volunteered to participate in this study. Testing appointments were separated by 48 hours of rest. Participants completed a maximal effort two-mile run test while wearing Polar Pro Team 2 heart rate monitors. Participants also underwent body composition testing via the Bod Pod, and then completed an open-circuit spirometry VO_2 max treadmill test utilizing the Bruce protocol. **RESULTS**: Participants in this study had an average fat-mass percentage of 12.39 ± 4.32. A significant difference was found between normative standard performance scores of the maximal effort two-mile run test and open-circuit spirometry VO_2 max treadmill test ($t(36) = 2.117$, $p = 0.041$). Correlations between fat-mass percentages and normative test performances were significant. **CONCLUSIONS**: The maximal effort two-mile run test is not an accurate representation of an athlete's maximal cardiorespiratory fitness when compared to an open-circuit spirometry measured VO_2 max treadmill test. This research may be utilized in other physically demanding activities or professions such as military, law enforcement, and firefighters.

Assessment of Demographic, Anthropometric, and Physical Performance Variables as Predictors of Spring Cycling Power

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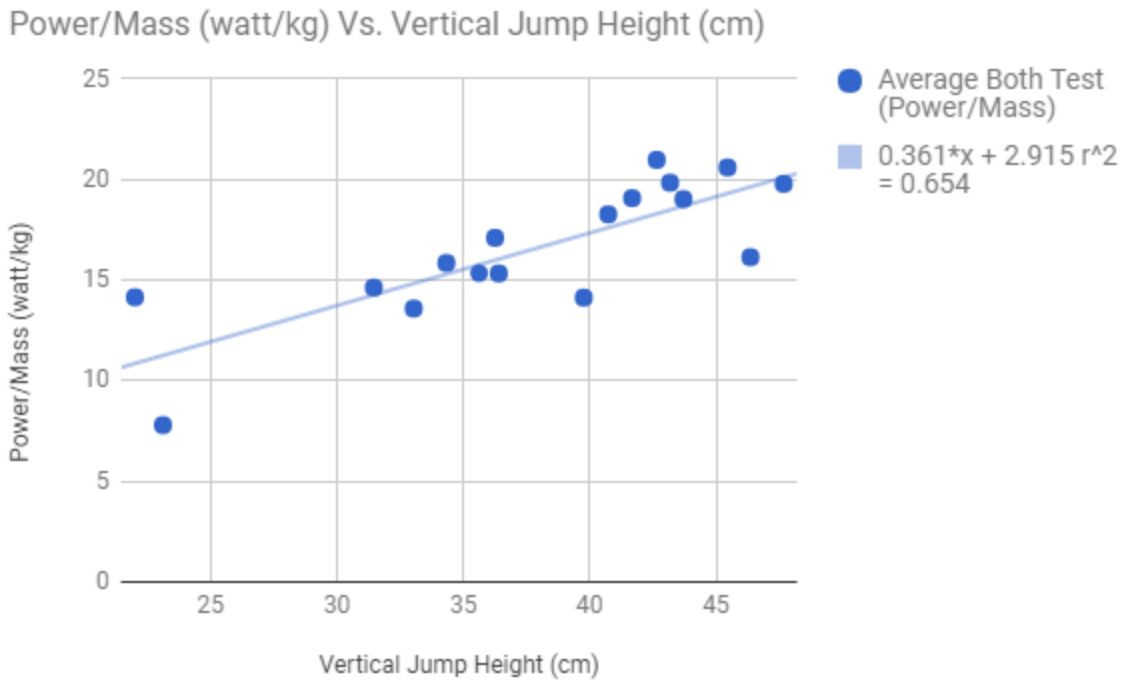
Prior research suggests peak sprint power (PSP) is correlated with cycling sprint times, indicating that individuals able to produce higher PSP demonstrate faster ride times. These faster ride times are indicative of better performance in sprint cycling competitions. **PURPOSE**: The primary aim of the study was to determine if a simple vertical jump height (VJH) test would correlate with PSP on a bike. It was hypothesized that a higher VJH would correlate with a higher PSP. **METHODS**: Trained cyclists were enrolled in the study and completed a VJH test, PSP test, and provided demographic and anthropometric data. Seventeen cyclists were enrolled in the study. Their age, mass, height, thigh circumference, and cyclist experience level (CEL) were collected (29.1 ± 17.2 years, 77.0 ± 13.3 kg, 172.8 ± 8.2 cm, 59.4 ± 4.8 cm, and 1.8 ± 0.9 CEL). Simple linear regression examined VJH as a predictor of normalized PSP. PSP was normalized by taking the PSP and dividing by the subjects mass. **RESULTS**: The average normalized PSP the subjects produced (16.7 ± 3.2 watt/kg) and average VJH (37.9 ± 7.5 cm) were plotted against each other in Figure 1.

Figure 1:



There was a significant positive correlation between VJH and PSP (r^2 = 65.4%). **CONCLUSIONS:** The results indicate that a higher VJH will indicate that a cyclist will have a higher normalized PSP.

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Adapting Sedentary Video Games to Require Physical Activity

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Approximately $117 billion in annual healthcare costs are associated with physical inactivity. The Pew Research Center reports that about 49% of American adults play video games (VG). Adapting tradionally sedentaty VG controls to require physical activity using low coat devices may help to increase habitual physical activity. **PURPOSE**: To determine the effects of adapting sedentary VG to require physical activity on exercise intensity, perceived exertion, enjoyment, and VG performance. **METHODS**: Three women and five men 22 to 53 years of age played PAC-MAN Championship Edition DX+ (NAMCO) in three conditions: sedentary play (SED), standing active play using gestures recognized by a motion sensor (AVG-G), and standing active play using buttons (AVG-B). Exercise intensity was assessed by recording continuous heart rate through a chest strap monitor. Ratings of perceived exertion (RPE) were reported using the Borg 6 to 20 scale. Enjoyment was reported by completing an abbreviated Physical Activity Enjoyment Scale. VG performance was represented by the in-game score. A repeated measures ANOVA was used to compare heart rate, RPE and enjoyment across conditions. A Friedman's ANOVA was used to compare VG performance scores across conditions. **RESULTS**: There was a significant effect of game condition on heart rate, percent of age predicted heart rate maximum (APHRM), and RPE ($p < 0.001$). Enjoyment was not significantly different across conditions ($p = 0.585$). Post hoc analysis indicated AVG-G and AVG-B elicited a higher mean (±SD) heart rate (112±15 and 102±15 BPM), percent of APHRM (61±8 and 55±9%), and RPE (12.58±2.04 and 11.45±2.31) versus SED (74±13 BPM, 40±8% APHRM, 7.07±1.06). VG performance was significantly different between game conditions, ($\chi^2 = 12.25$, $p = 0.002$) with lower scores in both AVG-G and AVG-B versus SED ($Z = -2.51$, $p = 0.012$). **CONCLUSIONS**: These results suggest that adapting sedentary video games to be active may positively impact health. Participants

achieved moderate to vigorous physical activity during adapted AVG play. Enjoyment did not suffer as a result of active play despite lower VG performance.

Predictors of Two Kilometer Rowing Ergometer Time Trial Performance

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Predictors of performance can aid coaches and trainers in prescribing exercise programs for rowing athletes. To date, most of the prediction models have been developed for runners and cyclists. **PURPOSE**: The aim of this study was to develop a regression model to predict performance of a simulated 2 kilometer rowing ergometer time trial. **METHODS**: A group of mixed gender rowing athletes (n=12) completed in a counterbalanced order a 2 Kilometer rowing time trial and a continuous progressively incremented graded exercise test on a rowing ergometer. Subjects were 23.91±4.99 years old, weighed 79.14±12.85 kg, were 187.38±12.60 cm, had a VO_2max of 55.48±10.32 ml/kg/min and had 3.17±2.79 years of rowing experience. Physiological measures were recorded during both testing protocols. **RESULTS**: Maximum Power/Stroke Ratio ($r = -0.96$, $p<0.001$), Power/Stroke Ratio at the ventilatory breakpoint ($r = -0.90$, $p<0.001$), Maximal Oxygen Uptake ($r = -0.84$, $p<0.001$) and Oxygen Uptake at the ventilatory breakpoint ($r = -0.82$, $p<0.001$) were found to be strong and significant predictors of 2 kilometer rowing performance. **CONCLUSIONS**: The four significant predictors of rowing performance suggest training should focus on improving both aerobic capacity and strength.

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Effects of Feedback Content on Bivariate Error Measures in a Throwing Task

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Numerous studies have confirmed that performance variability is an important variable in the study of skill learning. However, a large number of investigations have used inappropriate measures of variability. **PURPOSE**: The purpose of this study was to assess the effects of feedback content on accuracy and variability in a throwing task, using appropriate performance measures. **METHODS**: Twenty-four participants performed Koosh ball tosses to a floor-mounted target located at a 6 meter distance, using a blindfolded, non-dominant underhand throwing technique. On the first day of testing, 10 blocks of 6 tosses were performed, with participants receiving feedback about the 3 best or 3 worst tosses in each block. Half of the participants were made aware of the type of feedback (aware best (AB) or aware worst (AW)), while the other half were unaware (unaware best (UB) or unaware worst (UW)). On the second day of testing, retention and transfer (3 meter distance) tests were performed (with no feedback). Radial error (RE) and bivariate variable error (BVE) were used to assess accuracy and variability, respectively. **RESULTS**: Accuracy and variability values were similar across practice blocks in all feedback conditions (see Figures 1 & 2). In the transfer tests, participants receiving feedback about their worst trials had smaller error values. **CONCLUSION**: The two-dimensional error measures used in this study should continue to be used in future research projects.

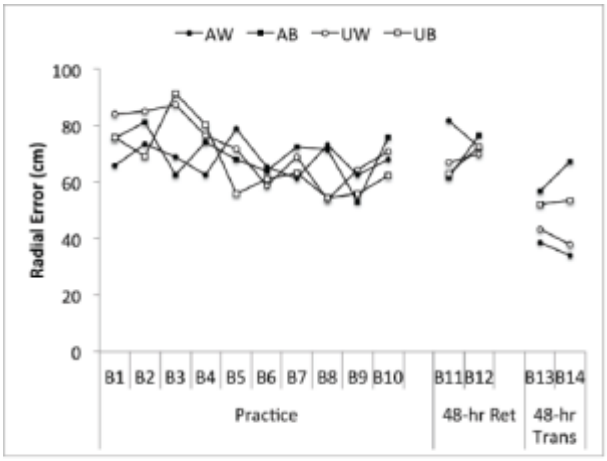

Figure 1. Radial error for practice, retention, and transfer tests.

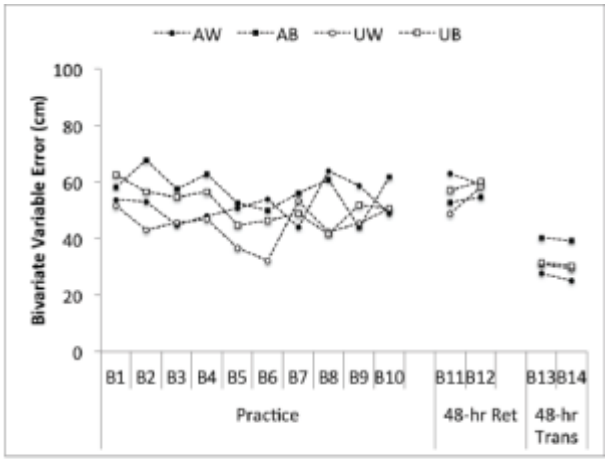

Figure 2. Bivariate variable error for practice, retention, and transfer tests.

Effect of Dietary Salt Intake on Blood Pressure Variability

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Studies in rodents have demonstrated that increased dietary sodium intake elevates blood pressure variability (BPV), independent of changes in resting blood pressure. Clinical studies have shown that increased BPV independently contributes to target organ damage and cardiovascular events. However, the effects of high dietary sodium intake on BPV in young, normotensive adults remains unknown. **PURPOSE**: Therefore, the purpose of this study was to test the hypothesis that increased dietary sodium intake alters BPV in young, healthy adults. **METHODS**: Fourteen healthy, normotensive adults (7M/7W; age: 25±4 yrs; BMI: 24.7±0.9 kg/m^2) participated in a controlled feeding study that consisted of 10 days of either low (LS:1 g sodium/day), medium (MS: 2.3 g sodium/day), or high-sodium (HS: 7 g sodium/day) diets, in randomized order. The diets were separated by at least a month. Urinary sodium excretion was determined to ensure compliance on diets. Resting beat-to-beat BPV was assessed in the laboratory in the supine position for ten minutes, and BPV derived from 24-hour ambulatory blood pressure monitoring (ABPM) was also assessed to reflect BPV under free-living conditions. BPV was calculated as standard deviation (SD) and as the average real variability index (ARV; the average of the absolute differences between consecutive blood pressure measurements). **RESULTS**: Twenty-four-hour urinary sodium excretion increased from low, to the medium, to the high sodium diets (LS: 34±6 mmol/24 hours, MS: 93±9 mmol/24, HS:275±29 mmol/24 hours, $p<0.05$). Diet did not alter laboratory beat-to-beat systolic ARV (LS=2.2±0.2 mmHg, MS= 2.0±0.2 mmHg, HS= 2.1±0.2 mmHg, $p>0.05$) or 24h ABPM systolic ARV (LS=9.4±0.5 mmHg, MS= 9.9±0.4 mmHg, HS=10.3±0.7 mmHg, $p>0.05$). Diet also did not alter laboratory beat-to-beat systolic SD (LS= 5.4±0.5 mmHg, MS=5.1±0.3 mmHg, HS=5.8±0.6 mmHg, $p>0.05$) or 24h ABPM systolic SD (LS= 12.1±0.9 mmHg, MS= 13.9±0.7 mmHg, HS= 13.1±0.9 mmHg, $p>0.05$). **CONCLUSIONS**: These preliminary data suggest that 10 days of high dietary sodium intake does not alter BPV in young, healthy adults.

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Influence of Acute Resistance Exercise on Glycemic Control

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PURPOSE: To study the effects of resistance exercise on the body's ability to regulate blood sugar in active, resistance trained, college students **METHODS**: The study included eight participants (2 female, 6 male; age: 20.63 years; mass: 80.98 kg; height: 173.31 cm; % fat: 16.73%). Initially, informed consent, 10-repetition maximum (10-RM) for the three resistance exercises (squat, bicep curl, and bench press) and demographic measurements were obtained. Subjects completed three trials on separate days. One resting trial and two exercise trials (squat only, full body: all three exercises) were completed. The subjects performed five sets (6 reps/set) using the 10-RM load. In each trial, the subject consumed a 25% carbohydrate beverage (4ml/kg of body mass) after completion of exercise. All trials (resting included) involved a 75-minute oral glucose tolerance test (OGTT). Blood glucose (BG), heart rate (HR), blood pressure (BP) and blood lactate (BL) measures were collected before and following exercise. Blood pressure, and HR were also measured following the OGTT. **RESULTS**: OGTT response was not significantly different based on trial. Area under the curve (AUC) did not differ significantly by trial. Resting AUC was 5.8% greater than the squat only trial and 2.5% greater than the full body trial. There were no significant differences between exercise trials for BL, HR, or mean arterial pressure (MAP). Rate of perceived exertion was significantly greater for full body (15.88 ± 1.81) vs. squat (13.63 ± 1.06). **CONCLUSIONS**: Resistance exercise was not shown to significantly affect glucose regulatory response during recovery. The volume of active muscle did not seem to influence the OGTT response. Resistance exercise may not be as potent as aerobic exercise in promoting acutely enhanced glycemic control. Future investigations into post-exercise glycemic control should be expanded to include a larger sample size and varied resistance exercises.

Functional Movement Assessment in the Performing Arts

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Ballet is physically and mentally demanding, contributing to the development of musculoskeletal injuries. Combined assessment of dynamic balance and functional movement has been recommended to improve predictive injury ability, but has their use within dance is limited. **PURPOSE**: The purposes of this investigation were to identify the effect of 10 weeks of ballet training on functional movement and dynamic balance and to examine the relationship between functional movement and balance in ballet dancers. **METHODS**: Sixteen (16) female collegiate ballet dancers (19.06 ± 1.18 years old), were assessed using the Functional Movement Screen™ (FMS) and the Y-Balance test, prior to and after 10 weeks of ballet training. **RESULTS**: FMS, YBT-LQ composite (YBT CompR/L) scores, and YBT-LQ asymmetry improved but did not reach significance (see table 1). A moderate effect on FMS and YBT-LQ posteromedial (YBTA PM) asymmetry, and a small effect on YBT CompL, and YBTA Ant and YBTA PL were seen. FMS composite score was correlated with the deep squat ($r(13) = 0.79$, $p<0.01$), rotary stability ($r(13) = 0.46$, $p < 0.05$), and shoulder mobility ($r(13) = 0.49$, $p < 0.05$). Pre-test FMS scores were not correlated with YBT-LQ composite score (Left $r(13) = 0.40$, $p = 0.14$; Right $r(13) = 0.45$, $p = 0.90$). Post-test FMS score was associated with YBT CompR ($r(13) = 0.57$, $p < 0.05$). **CONCLUSION**: The moderate effect of ballet on movement competency and the small effect on balance, combined with the association of certain components of the total FMS score, highlights the role of movement quality and balance in ballet. Identifying dysfunctional movement patterns and enhancing dynamic balance remain pertinent concepts in dance injury prevention.

Table 1. Mean FMS and YBT-LQ performance with effect size (Cohen's d).

	Pre-Test	Post-Test	p-value	Effect Size
FMS 21	15.73 ± 1.62	16.4 ± 1.24	0.07	0.52
YBT CompR (%)	86.12 ± 9.5	87.57 ± 7.74	0.40	0.22
YBT CompL (%)	87.11 ± 7.04	88.47 ± 9.05	0.25	0.32
YBTA Ant (cm)	3.25 ± 3.53	3.0 ± 2.18	0.66	0.11

YBTA PM (cm)	4.06 ± 3.60	3.07 ± 3.71	0.11	0.45
YBTA PL (cm)	3.28 ± 2.61	2.00 ± 5.88	0.39	0.23

YBTA = Y Balance Test Asymmetry; PM = posteromedial, PL = posterolateral

Comparison of Oxygenation Trends in the Latissimus Dorsi Across Handle Types During Seated Row Exercise

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Deoxygenation rates in the Latissimus Dorsi muscle have not been previously reported during seated rowing exercise. **PURPOSE**: This study compared near infrared spectroscopy (NIRS) responses during seated row exercise in the Latissimus Dorsi (LD) using a cylindrical handle versus a newer ergonomically designed handle. **METHODS**: Sixteen college-aged subjects (6 males, 10 females) with prior resistance training experience (4.9 ± 3.0 years) performed the exercise protocol on a cable machine. Participants completed a one-repetition maximal lift (1-RM) followed by one set @ 85% 1-RM until failure. NIRS recordings were normalized to the 1-RM values. **RESULTS**: Paired t tests showed significant differences ($p \leq 0.05$) between 1RM lifts as well as rate of muscle deoxygenation (HHb) in the LD. Strength and NIRs values (Mn ± SD) are presented in the table below:

	Handle Type	
	Cylindrical	Newer Ergonomic
LD 85% 1RM (kg)	83.52 ± 30.2	85.65 ± 30.7*
HHb (µMol/sec)	0.61 ± 0.39	0.663 ± 0.47*

***** Sign. Diffs. ($p \leq 0.05$)

CONCLUSION: These findings showed significantly higher maximal lifts and greater muscle deoxygenation rates in the LD using the newer handle type. Further investigations are needed to identify oxygenation trends in additional muscle groups using varied handle designs.

Simple Assessment of Lower Extremity Soft Tissue Pain in Obesity

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Loss of physical functioning due to lower extremity soft tissue pain (LESTP) is not well studied. LESTP have been linked to difficulty completing activities of daily living. Obese patients have high incidences of LESTP in the back, knee, ankle, and feet as barriers to a physically inactive lifestyle. The American College of Sports Medicine (ACSM) recently published simple methods to assess physical functioning for adults with a chronic disease or disability. **PURPOSE**: To see if the ACSM methods can be implemented in a medical practice, and to examine the relationships between lower-extremity exertional symptoms, BMI and biomechanical abnormalities with poor physical functioning. **METHODS**: 15 subjects (12 female, 3 male) completed informed consent and underwent a brief medical history and physical exam for symptoms and signs of LESTP. Weight and height were recorded; knee and ankle alignments were measured (Ingham's knee mal-alignment and foot rotation instruments). Dynamic stability was assessed by Trendelenberg test, 2–legged half-squats and 1–legged squats. Functional performance was assessed by gait speed, sit-to-stand, and stair climb tests. Associations between LESTP, biomechanical burdens, and poor physical functioning were examined with Fischer's Exact tests and Spearman's rank correlation. **RESULTS**: Fisher's Exact test revealed significant relationships between BMI vs abnormal gait ($p<0.01$), as well as BMI vs two-legged squat mechanics ($p<0.05$). There were strong associations between physical functioning measures: sit to stand vs stair time $r=-0.64$, $p<0.05$; gait speed vs sit to stand $r= 0.60$, $p<0.05$; gait speed vs stair climb time $r=-0.65$, $p<0.05$. Strong associations were also seen between BMI and dynamic instability score $r=0.712$, $p<0.005$, as well as dynamic instability and poor physical functioning $r=0.50$, $p<0.05$. Significant correlation was found between BMI and biomechanical burdens ($r^2=0.273$, $p<0.05$). **CONCLUSION**: In

this pilot study, BMI was associated with dynamic instability, and dynamic instability was associated with poor physical functioning. These findings support the concept of sarcopenic obesity, wherein body mass outstrips musculoskeletal ability to provide normal biomechanical functioning and impairs independence and activities of daily living.

Breaking Sedentary Behavior among Faculty and Staff: Are Acoustic and/or Vibrational Stimuli Effective?

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With the emergence of wearable technology, many commercially available activity monitors have some sort of sensory stimulus to gently remind people to move. Acoustic, vibrational, and a simultaneous combination of both are the considered preset stimuli for this study. The effectiveness of each type of stimulus to elicit a movement response is less known. **PURPOSE**: To objectively determine the differences in step count during individuals' 8hr workday for three work days using each type of stimulus. **METHODS**: Six (2M/4F, 48.3±9.6years, BMI 28.8±5.2kg/m^2) apparently healthy faculty and staff were recruited from The Pennsylvania State University, Berks. A wrist-worn Actigraph activity-tracker and a Vibralite watch with preset stimuli were deployed for 5 sessions (3day interval/session) to assess the stimulus elicited movement response. The Vibralite stimulus was preset to go off once/hr for 8hrs/day for 3 days. Participants wore Actigraph for the duration of the study (8hrs/day) for 5 sessions (3day interval/session): a) Vibralite without any stimuli (control); b) acoustic or vibrational, c) acoustic or vibrational (alternate to what was used in previous session) d) acoustic+vibrational, e) no Vibralite. **RESULTS**: Mean±SD; steps/8hr workday: Control 6031±2364 steps/day, Vibration 6210±2481 steps/day, Acoustic 5039±1466 steps/day, Combination 4826±1725 steps/day. An ANOVA test for the four groups (control, vibration, acoustic, and both) found no significant differences between the groups with p=0.5705. **CONCLUSION**: Although the vibrational stimulus was personally preferred by 67% of the cohort, our preliminary findings indicate that there were no significant differences between any of the stimuli to elicit movement responses. Further, our findings might help users customize their reminders to enhance user experience for effective health outcomes.

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The Effect of a Short-Term Plyometric Training Intervention on Power and Strength in Collegiate Club Hockey Players

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Plyometric training is a power-enhancing training technique that is utilized by coaches and trainers for their athletes. This type of training has been proven to be effective in longer duration training inventions lasting at least 6-8 weeks. However, there are gaps in research regarding the effectiveness of short-duration plyometric training interventions. **PURPOSE**: To determine whether a four-week upper and lower body plyometric training intervention would result in increased power output and strength measures via a Wingate Anaerobic Cycle Test, seated medicine ball throw test, and a one-repetition maximum bench press in Division III college club hockey players. **METHODS**: The participants in this study were Division III college club hockey players (N= 15 for seated medicine ball throw test and N=12 for bench press test and Wingate Anaerobic Cycle Test). Prior to the intervention, the participants completed a one-repetition maximum bench press test, a seated medicine ball throw test, and a Wingate Anaerobic Cycle Test. These tests were repeated following the intervention. The participants completed a four-week plyometric training intervention targeting upper and lower body muscle groups. Six separate dependent t-tests were used to analyze the data, and a significance value of $p < 0.05$ was set for each measurement. **RESULTS**: The seated medicine ball throw test indicated a significant improvement in scores after the intervention period (p=

0.022). Anaerobic capacity, measured using the Wingate Anaerobic Cycle Test, improved significantly among the participants (p= 0.041). **CONCLUSIONS**: The results of the study indicate that a four-week plyometric training program can significantly improve upper and lower body power generation in college-aged club hockey players.

The Effects of Caffeine on Cycling Performance in College-Aged Males

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Caffeine is a naturally occurring substance found in foods and drinks and is the most commonly consumed drug in the world (Graham, 2001). Caffeine is also an ergogenic aide, which may enhance an athlete's aerobic endurance, strength, and reaction time (Graham, 2001). **PURPOSE**: The objective of this study was to determine the effects caffeine has on performance. **METHODS**: Four recreationally active male college-aged (20 ± 1.41 yrs) students participated in this single blinded, cross-over study. Each subject was required to attend three exercise sessions. During the first session, the subjects were explained the procedures of the testing and performed a cycle to exhaustion test. During the second and third sessions, the subjects were required to drink two cups of black caffeinated or decaffeinated coffee during the hour prior to the cycle exhaustion test. The subjects' overall RPE, local RPE, and heart rate were taken in five minute increments during each testing session. Two-way repeated measures ANOVA was used to determine differences across conditions and between groups using Microsoft Excel (Microsoft, Redmond, WA). Significance was set at $p<0.05$. **RESULTS**: There was a statistically significant difference in time to exhaustion between trials for all subjects (CON: 31.20 ± 7.50min, DECAF: 30.00 ± 0.00min, CAF: 40.00 ± 10.88min; p=0.006). There was no significant difference in overall RPE (CON: 14.78 ± 1.21, DECAF: 15.67 ± 1.72, CAF: 15.45 ± 2.62; p=0.89), local RPE (CON: 16.85 ± 0.36, DECAF: 17.06 ± 1.47, CAF: 16.90 ± 1.81; p=0.99), or heart rate (CON: 155.55 ± 6.42 bpm, DECAF: 150.84 ± 12.41, CAF: 149.68 ± 15.32; p=0.86) between the three conditions. **CONCLUSIONS**: The results of this study suggest that caffeine in the form of coffee does not have a significant impact on sub-maximal cycling performance.

Aerobic Exercise Training in Chronic Kidney Disease Improves Cardiopulmonary Exercise Test Measures

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Individuals with chronic kidney disease (CKD) demonstrate decreased cardiorespiratory fitness (CRF) levels that contribute to an increased risk for cardiovascular disease (CVD). Abnormal cardiopulmonary exercise testing (CPX) measures reported in CKD indicate exercise intolerance and reveal subclinical cardiopulmonary abnormalities that precede overt CVD. Aerobic exercise may be a potential intervention to improve exercise capacity and cardiopulmonary function. **PURPOSE**: To evaluate the effect of aerobic exercise on CPX measures in mild-moderate CKD. **METHODS**: In this randomized controlled trial, 36 Stage 3-5 CKD patients (eGFR = 44 ± 2 ml/min/1.73m^2) were allocated to an Exercise Training (EXT; 54 ± 3 years) or Control (CON; 63 ± 2 years) group. EXT consisted of 3x45 minutes of supervised exercise per week at 60-85% HRR for 12 weeks whereas CON received routine care. Pre- and post-training CPX were carried out on an upright cycle ergometer starting at 15W and workload increasing an additional 15W every minute thereafter until volitional fatigue. Breath-by-breath expired respiratory gas analysis was performed using an automated gas analyzer with data averaged in 10 second intervals. **RESULTS**: EXT significantly improved exercise capacity as shown by an increase in VO_2peak (17.89 ± 1.21 vs. 19.98 ± 1.59 ml/kg/min; p = 0.047) compared to CON (18.29 ± 1.73 vs. 17.36 ± 1.60 ml/kg/min; p = 0.144) and an increase in exercise time (506 ± 46 vs. 582 ± 56 seconds; p = 0.010) compared to CON (521 ± 55 vs. 470 ± 51 seconds; p = 0.060). Cardiopulmonary reserve improved following EXT as indicated by an increased oxygen uptake efficiency slope (1.76 ± 0.13 vs. 1.93 ± 0.12; p = 0.044) but not in CON (1.76 ± 0.14 vs. 1.68 ± 0.15; p = 0.247). Relative O_2 pulse, suggestive of improved left ventricular function, tended to

improve following EXT (0.12 ± 0.01 vs. 0.14 ± 0.01 ml/beat/kg; $p = 0.069$) compared to CON (0.14 ± 0.01 vs. 0.14 ± 0.01 ml/beat/kg; $p = 0.275$). **CONCLUSIONS**: Aerobic exercise resulted in improvements in exercise capacity and cardiopulmonary reserve. However, CPX measures remained decreased compared to sedentary healthy counterparts. Additional interventions coupled with exercise may be required to enhance adaptations to training in CKD.

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The Effects of Vision Impairment on Balance in Athletes and Non-Athletes

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PURPOSE: To compare athletes' and non-athletes' balance when visual impairments (VI) were induced with alcohol impairment simulation goggles. **METHODS**: Twenty subjects (10 males, 10 females, half athletes and half non-athletes; age: 21.55±1.05 yrs; mass: 78.64±21.14 kg, height: 172.40±1.19 cm) performed three balance tests in a randomized order under various VI conditions. A nine-step tandem walk and modified Y-Balance test were completed under the following conditions with: (1) no VI (CON), (2) 0.07-0.10 blood alcohol content (BAC) goggles (GOG A), and (3) 0.17-0.20 BAC goggles (GOG B). Postural sway (PS) was also assessed, using a force plate, with two different stances for 15 s under a blindfolded (BLD) condition as well as the other conditions. Data were analyzed using group by condition repeated measures ANOVAs. **RESULTS**: There were no significant differences found between athletes and non-athletes on the balance measures. However, differences were noted among the conditions ($p < .05$). For the tandem walk, there was a significant decrease while wearing the goggles as compared to the CON condition (CON 19.83±0.49 points vs. GOG A 15.10±1.89 points and GOG B 15.50±2.19 points). Also, a significant decrease in the relative distance covered was found during the Y-balance (expressed as a percentage of leg length) on the right leg from CON (98.56±8.91%) to GOG A (94.21±9.86%). However, there were no differences found for the left leg or between CON and GOG B for the right leg. There was a significant increase in anterior-posterior PS from CON (0.013±0.010 cm) to BLD (0.440±1.243 cm) when standing on both feet. Further, there were significant increases in PS while standing on the non-dominant limb for both anterior-posterior (CON: 0.106± 0.114 cm, GOG A: 0.020±0.016 cm, GOG B: 0.389±1.625 cm, BLD: 0.435±1.389 cm) and medial-lateral (CON: 0.114±0.488 cm, GOG A: 0.019±0.066 cm, GOG B: 0.124±0.515 cm, BLD: 0.410±1.081 cm) directions. **CONCLUSION**: While there were no differences found between the groups, changes were noted among the conditions when vision was impaired. These results suggested both dynamic and static balance were negatively impacted. More specifically, subjects made more errors during the tandem walk, did not reach as far while standing on the right leg, and swayed more while wearing vision impairment goggles.

Effects of Caffeine on the Muscular Endurance, Perceived Pain, and Effort of Resistance Trained Women

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Caffeine is a substance that is heavily used by Americans daily. It is commonly consumed by individuals prior to exercise, as research has shown that caffeine can enhance exercise performance. Research firmly supports the positive effects of caffeine on aerobic endurance performance. Research supporting the effects of caffeine upon resistance exercise is less consistent. It is believed that part of the positive effects of caffeine upon resistance exercise is due to a reduction of perceived effort and pain during the activity. The majority of research done on this topic has involved only male subjects. **PURPOSE**: The purpose of the present study was to examine the effects of acute caffeine ingestion on muscular endurance and perception of pain and effort in resistance trained (RT) women. **METHODS**: Eleven RT women volunteered in this double-blind, repeated measures study. One-repetition maximum (1 RM) was determined on the leg

extension (LE) and chest press (CP) during the pre-assessment. During the two exercise sessions, participants ingested either 300 mg of caffeine or placebo and completed the same protocol twice. Participants completed three sets of repetitions (reps) to failure on the LE and the CP at 60% of their 1 RM. Rating of Perceived Exertion (RPE) and pain perception (PP) were taken after each set. **RESULTS**: A Two-way analysis of variance of repeated measures revealed caffeine had no effect on reps on the LE ($p=0.530$) and CP ($p=0.922$). No significant effect of caffeine on RPE was found on the LE ($p=0.499$). There was a significant result found in RPE on CP ($p=0.035$). No significance was found between caffeine and PP on LE (0.094) and CP ($p=0.518$). **CONCLUSION**: Caffeine has an effect on RPE during the chest press, but does not have an effect on muscular endurance, pain perception, or RPE during the leg extension on resistance trained women.

An Assessment of a 15 vs. 30 Second Recovery Period on Vertical Jump Performance

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The vertical jump (VJ) test is often used to assess an individual's lower body peak power. The standard recovery time between subsequent jumps is usually 30 seconds (secs) with a completion of 3-6 jumps. Prior studies have reported no significant difference between 30 vs. 60 secs recovery on VJ performance. However, it may be possible that a shorter passive recovery (PR) period may allow for maintenance or improvements in jumping performance versus the standard recovery time and therefore, potentially contribute to a more time efficient testing session. To the best of the researchers' knowledge, the impact of a shorter PR period, such as 15 vs. 30 secs PR, on VJ performance has not been assessed. **PURPOSE**: To investigate potential differences between a 15 vs. 30 secs PR period on VJ performance in no less than averagely fit college-age males. **METHODS**: After measuring descriptive data (Ht., Wt., BF%, age), 25 averagely fit college-age males completed an 8 minute (min) dynamic warm-up. Subjects were given a 4 min PR during which their reach height was measured. Following the PR, four familiarization jumps were completed using a VJ measurement device. After another 4 min PR, the subjects completed 2 series of jumps, with 6 trials each, in a counterbalanced order with either 15 (FIF) or 30 (THI) secs of recovery between each jump. The FIF and THI jump series were separated by 6 min of PR. Excluding the first jump, the highest jump for FIF and THI were compared using Paired-Samples t-Tests with significant differences occurring at $p \leq 0.05$. **RESULTS**: Significant differences ($p=0.01$) occurred between FIF (68.88 ± 8.42 cm) and THI (69.70 ± 8.92 cm). **CONCLUSION**: The current results suggest that 30 secs of PR between jumps is optimal recovery for performance during the VJ test, while 15 secs of PR may limit peak VJ performance in averagely fit college-age males. Future research may assess the impact of 15 vs. 30 secs PR on VJ performance using highly fit collegiate athletes.

Learning Effect of Anchoring Bias in Combination with Action-Perception Coupling in Novice Golf Putting

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Quality of instruction significantly influences skill acquisition and performance in sport related tasks, such as golf putting. Instruction for novice individuals should promote external focus, and constantly emphasize the relationship between motor action and task outcome. **PURPOSE**: To analyze the influence of an anchoring bias, while also examining the learning benefits of integrating action-perception external foci. **METHODS**: The putting protocol consisted of three trials: pre-test, acquisition, and post-test. Each trial was performed from a distance of eight feet on artificial turf. Subjects (6 males, 6 females) did not receive instructions or cues for any of the ten putts during the pre- or post-tests. Two counter balanced groups were made upon the completion of the pre-test. Immediately before the start of the acquisition trial subjects were provided an anchor number and asked to estimate whether their average putt would stop closer or further than the number. Group one (High) was given an anchor of 12 inches and group two (Low) was given an

anchor of 3 inches. External cues were positioned in front of and behind the starting point of the ball to facilitate club and ball path for the acquisition trials. The subjects were not made aware of the cues or instructed to use them in any way. The acquisition trial contained five blocks of twenty putts with a three-minute break between each block. Twenty-four hours after the completion of the acquisition trial subjects returned to complete the post-test. Distance from the target was measured as the average sum of horizontal and vertical distance. **RESULTS**: The high anchor group responded with an average of 5.55 inches (9.3±1.96 vs 3.75±1.78, $p<0.05$) more than the low anchor group. This difference was found to be significant, demonstrating that anchor values may have an influence on estimation. Error was reduced in both the High (50.1±18.07 to 40.84±9.71, $p<0.05$) and Low (58.72± 18.59 to 35.71±7.99, $p<0.05$) groups from pre-test to post-test. Differences between groups were not found to be statistically significant ($p = 0.262$). **CONCLUSION**: Individuals used the provided anchor values to adjust their estimate of predicted performance. Significant differences in putt performance from pre to post test showed improvement in both groups. Improvement between groups were not significant.

Promoting Exercise Performance in Adults with Intellectual Disabilities Through Visual Schedules and Systematic Prompting

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Individuals with intellectual disabilities (ID) have lower levels of physical activity (PA) and muscle strength compared to general population (Frey et al., 2008). Research provides evidence that carefully structured progressive resistance training has the potential to improve muscle strength in this population (Shields et al., 2008). However, many available community PA opportunities are not accessible and appropriate for individuals with ID. Even though ACSM (2009) requires that a proper form of exercises be learned before resistance is progressively increased, detailed information on the strategies that can be used to achieve task mastery and guarantee high levels of performance in individuals with ID is lacking in current studies. Two effective instructional strategies to promote task acquisition in therapeutic fields have been visual activity schedules (VAS) (Koyama & Takanori, 2011) and the system of least to most prompts (SLMP) (Van Laarhoven, 2007). **PURPOSE**: To examine the degree to which VAS and SLMP promotes mastery of muscle-strengthening exercises in adults with ID, and how it generalizes to a community setting. **METHODS**: This study utilized a multiple-baseline-across-participants single-subject design with a convenience sample of three adults with moderate ID. The dependent measure was the percentage of exercise steps (2 upper-body and 2 lower-body) completed without prompting. Secondary analyses examined the level of prompting (i.e., verbal, video, gestural, physical) needed to promote mastery. Mastery was defined as achieving at least 90% of all exercise steps. **RESULTS**: The staggered data demonstrated all participants achieved mastery of the four exercises in a community-based setting within eight training sessions (Upper-Body Exercises: *M* gain = 24.34, *SD* = 3.11; Lower-Body Exercises: *M* gain = 26.70, *SD* = 5.67). The mastery was maintained two weeks after the SLMP withdrawal and generalized into a YMCA fitness room. Stability of performance was achieved in all participants within eight training sessions. Using the percentage of non-overlapping data (Scruggs et al., 1987), the treatment was considered very effective for all participants and exercises (all were 1.00). **CONCLUSIONS**: The VAS and SLMP were effective in promoting exercise mastery in three adults with moderate ID.

Improvement in High School 1600-Meter Run Times Within and Between Seasons

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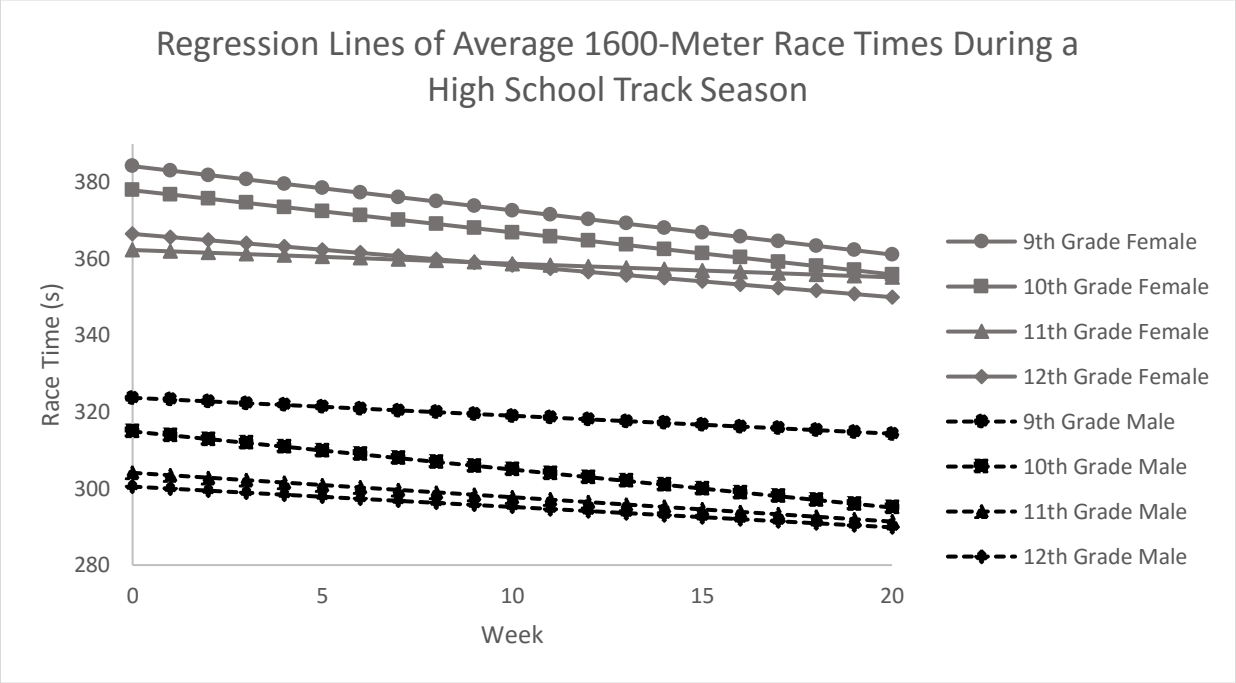
A model for expected improvement of high school 1600-meter runners' race times throughout a track season could improve coaches' ability to determine the effectiveness of a given training program. **PURPOSE**: To develop a model for improvement within and between seasons for high school track athletes in the 1600-m run through analysis of New Jersey meet results across one track season. **METHODS**: The results of the 1600-m races from 36 high school indoor and outdoor track meets from December 2014 to May 2015 were downloaded from a publicly available website (http://nj.milesplit.com), and regression lines

were used to model the average race time as a function of the week of the season by gender and grade. **RESULTS**: The regression parameters for 9th grade females were an intercept of 384.2±6.2 s (mean±SE) and a slope of -1.2±0.5 s·week-1 (r2=0.28). For 10th grade females the intercept was 377.9±5.7 s and the slope was -1.1±0.4 s·week-1 (r2=0.29). For 11th grade females the intercept was 362.3±4.1 s and the slope was -0.4±0.3 s·week-1 (r2=0.08). For 12th grade females the intercept was 366.5±5.7 s and the slope was -0.8±0.4 s·week-1 (r2=0.19). For 9th grade males the intercept was 323.9±5.1 s and the slope was -0.5±0.4 s·week-1 (r2=0.08). For 10th grade males the intercept was 314.9±4.1 s and the slope was -1.0±0.3 s·week-1 (r2=0.39). For 11th grade males the intercept was 304.1±4.0 s and the slope was -0.6±0.3 s·week-1 (r2=0.22). For 12th grade males the intercept was 300.5±4.1 s and the slope was -0.5±0.3 s·week-1 (r2=0.15). **CONCLUSIONS**: Further research is needed verify the accuracy of this model. We speculate that this model would be a poor predictor of week-to-week 1600-m times, but a better predictor of long term improvement.



Manipulation of Retrograde Shear in the Superficial Femoral Artery in Recreationally Active and Exercise-Trained Men

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Retrograde shear stress increases with age and contributes to atherosclerosis. Habitual exercise has been shown to ameliorate the effects of age on cardiovascular disease possibly due to favorable vascular remodeling and reductions in retrograde shear. **PURPOSE**: Examine whether the vascular remodelling from habitual exercise training affects retrograde shear at rest and during a manipulation designed to alter shear (lower limb compression) in young adults. **METHODS**: Doppler ultrasound was used to measure superficial femoral artery (SFA) diameter and retrograde shear rate in 11 exercise-trained men (Division I track athletes; 20 ± 3 years of age, body mass index 21 ± 2 $kg \cdot m^{-2}$) and 18 recreationally active controls (23 ± 5 years of age, body mass index 23 ± 2 $kg \cdot m^{-2}$). Measures were made at rest and during a shear manipulation: inflation of a pneumatic cuff applied to the calf to 5 mmHg (sham) and 60 mmHg (experimental) in a randomized order. **RESULTS**: All results are displayed in Table 1. SFA diameter was

larger in exercise-trained men versus controls ($P < 0.05$). Retrograde shear was similar between the exercise-trained men and controls at baseline and during the sham condition ($P > 0.05$). Exercise-trained men had lower retrograde shear during the experimental condition ($P < 0.05$). Group differences during the experimental condition remained after co-varying for resting retrograde shear and body mass index ($P < 0.05$). **CONCLUSION**: Manipulation of retrograde shear using lower limb compression reveals differences in shear patterns not detected at rest. Exercise-trained men have a more optimal, anti-atherosclerotic shear pattern (i.e. less retrograde shear) in comparison to recreationally active men.

Table 1. SFA diameter and shear at rest and during lower limb compression.

	Exercise-Trained	*Control*
Rest		
Diastolic diameter (cm)	0.64 ± 0.06	0.57 ± 0.06#
Antegrade shear rate (s^{-1})	170.8 ± 41.2	181.8 ± 41.7
Retrograde shear rate (s^{-1})	75.6 ± 26.6	84.4 ± 23.3
5 mmHg Condition (Sham)		
Diastolic diameter (cm)	0.64 ± 0.04	0.58 ± 0.06#
Antegrade shear rate (s^{-1})	172.1 ± 41.5	174.8 ± 44.7
Retrograde shear rate (s^{-1})	81.8 ± 14.6	89.7 ± 18.2
60 mmHg Condition (Experimental)		
Diastolic diameter (cm)	0.64 ± 0.06	0.58 ± 0.06#
Antegrade shear rate (s^{-1})	208.1 ± 36.9	227.1 ± 46.9
Retrograde shear rate (s^{-1})	88.6 ± 17.1*	106.4 ± 19.6#*

 # different from exercise-trained (p<0.05)
** different from rest (p<0.05)*

Muscle-Released Exosome Contain Diverse Protein Cargo and Deliver Protein and RNA to Other Muscle Cells

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Exosomes are ~50-200 nm vesicles that were originally identified as a way by which cells could rapidly remove damaged or misfolded proteins. Recent evidence indicates exosomes contain a variety of molecular cargo from the originating cells including proteins and RNAs. Previous published work from our lab demonstrated that C2C12 myotubes release exosomes containing RNAs including microRNAs. However, less information exists on the specific proteins in muscle released exosomes. Further, it is feasible that muscle released exosomes play a role cell-to-cell signaling via delivery of protein and RNA cargo to recipient cells. **PURPOSE**: Therefore the purpose of the present study was to characterize the proteome of exosomes released from healthy muscle cells and determine if exosome RNA and protein cargo is delivered to other muscle cells. **METHODS**: Media from C2C12 was collected and ultracentrifugation performed to isolate exosomes. Liquid chromatography mass spectroscopy (LC-MS) proteomic analysis was performed on proteins isolated from exosomes. Nanoparticle Tracking Analysis (Nanosight) was performed to verify exosome size and quantify exosome number. To examine exosome protein and RNA uptake by myotubes, C2C12 released exosomes were labeled with Exo-Green to label protein (EXOG200A-1) or Exo-Red to label RNA and labeled exosomes were added to media of plated C2C12 myotubes. Cells were treated for 12 hours (Exo-Green) or 30 minutes (Exo-Red) then washed with PBS, fixed, and imaged using a Zeiss 880 Confocal microscope. Where appropriate, t-tests were performed and a p-value of 0.05 was used to establish significance. **RESULTS**: LC-MS based proteomic analysis with subsequent statistical analysis of peptide information identified 1105 different proteins in isolated exosomes. Additionally,

nanoparticle tracking analysis identified a significant majority of exosomes to be 96 nm in size. Further, fluorescence of C2C12 myotubes treated with labeled exosomes demonstrated delivery of both RNA and protein cargo into the myotubes. **CONCLUSIONS**: These results demonstrate muscle-released exosomes contain a variety of proteins, and identify a previously unknown mechanism of protein and RNA delivery between muscle cells.

Effects of Energy Drinks on Resting Cardiovascular Measures

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The use of energy drinks among athletes has risen greatly. Reviews of energy drink related health complications have highlighted adverse cardiovascular events. **PURPOSE**: To examine the effects of three commercially available energy drinks on resting cardiovascular measures prior to exercise. **METHODS**: Twenty-five healthy subjects participated in this study. Subjects reported to the laboratory on four separate occasions where they ingested a placebo or one of three commercially available energy drinks (energy drink 1, energy drink 2 and energy drink 3). Trials were conducted subject blinded and counterbalanced. During each trial blood pressure and heart rate were measured at three key points: prior to beverage ingestion, at 30 minutes post ingestion and at 60 minutes post ingestion. Subjects remained seated and in a relaxed state for the duration of the 60 minute trials. Means for dependent measures were analyzed using repeated measures ANOVA with an alpha of 0.05 to determine significance. **RESULTS**: Heart rate was found to be significantly increased from pre-ingestion measures to 60 minute measures for both energy drink 2 (Pre = 65.12 ± 9.81 bpm and 60 min = 73.08 ± 10.82 bpm at p=0.010) and energy drink 3 (Pre = 65.76 ± 8.44 bpm and 60 min = 73.52 ± 11.25 bpm at p=0.005). Systolic blood pressure was found to be significantly increased from pre-ingestion to 60 minutes for energy drink 1 (Pre = 114.84 ± 9.33 mmHg and 60 min = 120.80 ± 9.43 mmHg at p=0.003), energy drink 2 (Pre = 113.56 ± 8.55 mmHg and 60 min = 121.44 ± 8.86 mmHg at p=0.004), and energy drink 3 (Pre = 113.24 ± 7.09 mmHg and 60 min = 119.40 ± 10.58 mmHg at p=0.037). **CONCLUSION**: These findings demonstrate that energy drinks impact cardiovascular measures by increasing both heart rate and blood pressure during a resting state. While the demonstrated increases may not be dangerously high, users should be aware of the impact of these drinks on cardiovascular measures.

Assessing the Impact of a Governed Focal Point on Broad Jump Performance in Collegiate Females

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The broad jump (BJ) test is frequently utilized to evaluate how far a person can jump and what their resulting lower body power will be. Hence, it is important that the BJ test be administered correctly for a person to jump as far as possible. The standard BJ test has no set focal point for a subject which causes the subject to look wherever they choose. However, prior research with vertical jump performance suggests a set focal point contributes to higher jumps. Therefore, it is logical to assume that a set focal point may assist in greater BJ performance, but to the best of the researchers' knowledge, the impact of a focal point (FP) vs. no focal point (NFP) on BJ performance has not been assessed. **PURPOSE**: To investigate the potential differences between a FP vs. NFP on BJ performance in no less than averagely fit college-age females. **METHODS**: After having descriptive data (Ht., Wt., BF%, age) recorded, 27 averagely fit college-age females participated in an 8 min dynamic warm-up. Subjects were then given a four minute passive recovery (PR) period after the warmup and then completed four familiarization jumps (ie. trials). After another 4 min PR period, subjects completed two series of jumps (ie. four trials apiece) in a counterbalanced order with either a FP or NFP for each jump. The FP and NFP jump series were separated by 4 min of PR. The farthest jump for FP vs. NFP was compared using Paired-Samples t-Tests with significant differences occurring at $p \leq 0.05$. **RESULTS**: No significant differences ($p = 0.280$) occurred between FP (180.00 $\pm$ 3.81 cm) and NFP (179.32 $\pm$ 3.85 cm). **CONCLUSION**: The results suggest that FP has no significant impact on BJ

performance using no less then averagely fit college-age females, yet 37% of the subjects did benefit from an FP. Future research may be required to assess the impact of FP vs. NFP on BJ performance using no less than averagely fit college-age males as well as athletes who perform horizontal jumping actions.

The Effects of Pedometers on Body Weight and Metabolic Factors in Patients with Prediabetes

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Sedentary behavior, increased total body weight, elevated blood glucose levels and hyperlipidemia increase the risk of prediabetes. Individuals diagnosed with prediabetes (fasting blood glucose (FBG) between 100-125mg/dL) are recommended to perform a minimum of 150 minutes of physical activity (PA) per week and decrease total body weight by 7% to reduce the likelihood of developing type 2 diabetes. However, there is little known about the role of pedometers with regards to a Diabetes Prevention Program (DPP) **PURPOSE**: To determine if pedometer use could aid in the reduction of total body weight, cholesterol, and blood glucose levels as a part of the Centers for Disease Control National DPP. **METHODS**: Body weight, FBG and lipids (total cholesterol, high-density lipoproteins (HDL) and low-density lipoproteins (LDL)) were measured prior to the start of the DPP and 16 weeks following the intervention. All participants were either diagnosed as prediabetic or at risk for prediabetes based on the CDC screening tool. The pedometer group (PG) (n=9) received pedometers and the control group (CG) (n=8) did not. All participants received the same educational sessions that explained dietary changes and strategies to increase PA. The PG was asked to wear a pedometer on their belt for all waking hours of the day, seven days a week, for sixteen weeks. At each weekly DPP meeting, step counts from pedometers were recorded and pedometers were reset and returned to the participants. A 2x2 ANOVA was performed to examine differences. **RESULTS**: The PG experienced significant ($p<0.05$) weight loss from pre to post-test (186.2lbs $\pm$ 9.7 to 180.7 $\pm$ 8.9) while the control group did not (191.3lbs $\pm$ 16.8l to 190.1 $\pm$ 17.0). Interestingly, HDL significantly decreased from pre to post-test ($p>0.05$) in the PD group (58.1mg/dL $\pm$ 4.0 to 54.1mg/dL $\pm$ 3.6) while the CG remained unchanged (50.9mg/dL $\pm$ 5.1 to 50.5mg/dL $\pm$ 4.8). There were no differences between any other variables. **CONCLUSIONS**: It appears that the addition of pedometers into the DPP can contribute positively to weight loss. It is possible participants experienced a sense of greater accountability due to the added tracking tool. Further research and a larger participation population is needed to elucidate the mechanisms that contribute to the changes in body weight and lipid profile.

The Effect of Dietary Nitrates on Exercise Capacity in Chronic Kidney Disease

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PURPOSE: The purpose of this study was to test the hypothesis that an acute dose of 12.6mmol dietary nitrate in the form of concentrated beetroot juice (BRJ) would improve exercise capacity and skeletal muscle mitochondria function in adults with moderate to severe chronic kidney disease (CKD). **METHODS**: 12 individuals with moderate to severe CKD participated in this study (61±4 yrs; 9 males; eGFR 47.8ml•min^{-1}•1.73m^2). Participants reported to the laboratory and a baseline blood sample was obtained for determination of NO metabolites (NOm; Nitrate, nitrite, s-nitrosothiols and metal bound NO). Participants were then randomized to ingest 12.6mmol of BRJ or a nitrate depleted placebo (PLA). Exercise testing began 2.5 hours post beverage ingestion to coincide with peak plasma nitrite levels. Skeletal muscle mitochondrial oxidative function testing was performed using near infrared spectroscopy (NIRS) followed by a symptom limited graded exercise test (GXT) on a cycle ergometer for determination of peak oxygen consumption (VO_2 peak). Participants repeated the entire protocol in the other condition a minimum of 7 days later. **RESULTS**: Plasma NOm values were significantly increased in the BRJ condition 2.5 hours post ingestion compared to BRJ baseline as well as PLA at 2.5 hr (2.5 hr: PLA 30.2±6.6uM vs BRJ 973±261uM, $p>0.05$). We did not observe an improvement in mitochondrial oxidative capacity or VO_2 peak in the BRJ condition compared to PLA ($p>0.05$). The amount of work performed and total exercise time was significantly increased after BRJ compared to PLA (Work: PLA 39.5±9.9 vs BRJ 44.7±10.7kJ;

Exercise Time: PLA 627±86 vs BRJ 674±85 seconds; $p<0.05$ for both). VO_2 at the ventilatory threshold (VT) was significantly greater in the BRJ condition compared to PLA (PLA 0.79±0.08L/min vs BRJ 0.95±0.09 L/min; $p<0.05$). **CONCLUSIONS**: An acute dose of 12.6mmol dietary nitrate significantly improved VO_2 at VT, work performed, and total exercise time in adults with moderate to severe CKD.

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Effects of Meditation on Heart Rate and Blood Pressure: A Mindfulness-based Study

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Today average college student experiences more than average stress (American College Health Association, 2015). Stress is known to contribute to high blood pressure (BP), anxiety, weight gain, and depression (Cassel, 2017). While the effectiveness of a number of stress management techniques have been investigated across different samples, scant research has tested the usefulness of these approaches within a college-aged population (Coiro et al., 2017). PURPOSE: The purpose of this study was to determine the effects of a mindfulness-based stress management intervention on resting heart rate (HR) and BP in college aged participants. **METHODS**: A total of twenty-eight (17 female and 11 male) participants (M_{age}= 22.25, SD= 1.76) were included in this study. The mindfulness intervention took place over the course of six weeks. At the first and last day of the intervention, resting HR and BP were measured before and after the mindful meditation practice. **RESULTS**: Paired sample t tests indicated a significant ($p = .000$) decrease in HR from pre-meditation (M_{HR}= 64.93, SD=10.32) to post meditation (M_{HR}= 52.96, SD=7.72) on the first day of the intervention. On the last day of the intervention, analyses indicated a significant decrease in HR from pre-meditation (M_{HR}= 68.57, SD=8.56) to post-meditation (M_{HR}= 63.68, SD = 8.41). Resting systolic and diastolic blood pressure also showed a significant decrease from pre-meditation (M_{SBP}= 118.14, SD=11.18; M_{DBP}= 71.64, SD= 10.44) to post-meditation (M_{SBP}= 112.00, SD= 11.39; M_{DBP}= 65.50, SD= 8.36) on the first day and from pre-meditation (M_{SBP}= 118.14, SD= 11.18; M_{DBP}= 69.29, SD= 8.68) to post meditation (M_{SBP}= 110.32, SD= 9.46; M_{DBP}= 67.43, SD= 7.81) on the last day of the intervention. **CONCLUSIONS**: Present finding seem to suggest that the mindfulness based intervention had an overall positive effect on resting physiological measurements in this population. To the extent that college students are facing great levels of stress, mindfulness-based stress reduction techniques can facilitate physiological responses to stress thereby potentially reducing risks of stress-related conditions in this sample.

Effects of an Acute Bout of Moderate and Vigorous Exercise in College Students with Anxiety

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Aerobic exercise and anxiety has been researched extensively and studies suggest that aerobic exercise can be beneficial in decreasing anxiety. However, what is still not known is the intensity, duration and type of exercise that produces the greatest decrease in anxiety. **PURPOSE**: The purpose of this study was to examine the effects of moderate and vigorous acute exercise on the perception of anxiety in college aged females. **METHODS**: Nine female college students between the ages of 18 and 25 volunteered to participate in four sessions to examine their perception of anxiety before and after exercise over a 24-hour period. This project has been approved by the Indiana University of Pennsylvania institutional review board for the protection of human subjects. The first session was a pre-screening session where demographic information and eligibility for the study was obtained. The remaining three sessions were exercise sessions which included a maximal exercise test, 50% of age-predicted max heart rate (APMHR) and 80% of APMHR exercise session. It was hypothesized that a participant's perception of anxiety would decrease significantly following any intensity of exercise. Additionally, there would be a greater decrease in the perception of anxiety following the vigorous bout of aerobic exercise in comparison to the moderate bout of aerobic exercise. **RESULTS**: The results indicated that the decrease in anxiety between intensities did

not differ (F = .313, p>0.05). There was a significant decrease between pretest and posttest anxiety scores (J=9.222, p = .019) that returned to baseline within 24 hours showing that the effects did not last longer than 24 hours. **CONCLUSIONS**: These results suggest that any intensity of exercise for 20 minutes decreases anxiety in this population. There does not appear to be an effect based upon the percent intensity or an effect that is maintained over time. Clinicians can use this information to prescribe exercise as an intervention for female college-aged students diagnosed with an anxiety disorder.

Central Chemosensitivity is Augmented During Thermoneutral Head Out Water Immersion in Healthy Adults

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Carbon dioxide (CO_2) retention occurs during water immersion and increases the risk of CO_2 toxicity. The central chemoreceptors primarily mediate the rise in ventilation during hypercapnia. However, it is unknown if two hours of head out water immersion (HOWI) alters central chemosensitivity. **PURPOSE**: We tested the hypothesis that central chemosensitivity is blunted during two hours of HOWI. **METHODS**: We assessed central chemosensitivity in 18 subjects (age: 22±1 y, BMI: 25±2 kg/m^2, 8 women) during a thermoneutral (35±0°C) HOWI trial and a time-control dry trial at baseline, 10 min, 60 min, 90 min, 120 min, and post. The partial pressure of end tidal CO_2 ($PETCO_2$; capnograph) and ventilation (pneumotachometer) were recorded continuously. Central chemosensitivity was evaluated via the Read rebreathing test. Briefly, subjects rebreathed 7% CO_2 and 93% O_2 from a 10 L bag for 3.5 min. Central chemosensitivity was calculated as the slope of the linear regression line of ventilation vs. $PETCO_2$ every 30 s throughout the test. Central chemosensitivity is reported as a change from baseline. **RESULTS**: $PETCO_2$ was not statistically different during HOWI vs. control at baseline (p=0.90) or post (p=0.27) but was greater during HOWI vs. control at 10 min (45±2 vs. 44±2 mmHg, p=0.02), 60 min (46±1 vs. 44±2 mmHg, p≤0.01), 90 min (46±1 vs. 44±2 mmHg, p≤0.01), and 120 min (46±1 vs. 44±2 mmHg, p≤0.01). Ventilation was not statistically different during HOWI vs. control at baseline (p=0.66), 60 min (p=0.12), 90 min (p=0.12), 120 min (p=0.27), or post (p=0.12) but was greater during HOWI vs. control at 10 min (9.3±2.5 vs. 8.4±1.7 L/min, p=0.05). Change in central chemosensitivity was greater during HOWI vs. control at 10 min (0.7±0.5 vs. 0.0±0.4 L/min/$PETCO_2$, p<0.01), 60 min (0.7±0.7 vs. 0.1±0.3 L/min/$PETCO_2$, p<0.01), 90 min (0.7±0.9 vs. 0.0±0.3 L/min/$PETCO_2$, p<0.01), and 120 min (0.8±1.1 vs. 0.4±0.5 L/min/$PETCO_2$, p<0.01) but was not statistically different during HOWI vs. control at post (p=0.90). **CONCLUSIONS**: These findings indicate that central chemosensitivity is augmented during two hours of thermoneutral HOWI. Thus, it is unlikely that changes in central chemosensitivity contribute to CO_2 retention during water immersion.

Fitness and MetS Components Affect Serum-Induced Endothelial Migration and MicroRNAs in

Effects of Beetroot Juice Supplementation on Physiological Response During Submaximal Exercise in Normoxia and Hypoxia

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Exercise in hypoxia is associated with reduced oxidative function and impaired exercise tolerance due to the reduced partial pressure of oxygen. Recent studies have shown beetroot juice ingestion assists in NO production and may consequently increase exercise efficiency, decrease muscular fatigue, increase mitochondria respiration, increase calcium handling, elevate glucose uptake, and aid vasodilation. Dietary nitrate ingestion may serve to enhance exercise performance in hypoxia via increased NO production. **PURPOSE**: The current study examined physiological responses during submaximal exercise in simulated altitude following beetroot consumption. **METHODS**: Eight active healthy males participated in the study. Subjects were assigned in a double-blind, randomized, crossover design consuming 140mL of beetroot

juice (2 shots) containing ~8.4mmols of nitrate or nitrate depleted placebo for 2 days prior to testing and again 2.5 hours prior to testing. A 72 hour washout was utilized during the crossover. During testing, subjects completed a 5-min warm up (25% of the subjects' VO_2max), followed by four 5-min cycling bouts (40, 50, 60 and 70% of VO_2max) each separated by 4 min rest periods in either normoxia (F_1O_2 = 20.93%) or simulated hypoxia (F_1O_2 = 14.5% O_2). A two-way ANOVA with repeated measures on conditions (4 levels) and intensity groups (5 levels) was used to determine any treatment differences for dependent variables. Post hoc analysis was performed when significant F-values were observed by application of a Tukey correction. The alpha level for all analyses was set at $p \leq 0.05$ **RESULTS**: There was a significant main effect for condition in VO_2, SpO_2, HR. Specifically, VO_2 in H-PL (21.23± 8.36) was significantly less from N-BR (23.42±8.42, p<0.000) and N-PL (23.90±8.79, p<0.000). For SpO_2, H-BR (90.33±1.97) was significantly less than N-BR (96.48± 1.45, p<0.000) and N-PL (96.78± 1.56, p<0.000). Finally, HR for N-BR (134.03±29.29) was significantly higher than N-PL (132.28±27.18, p=0.034). **CONCLUSIONS**: These findings indicate that supplementation with dietary nitrate in the form of beetroot juice may confer some benefit to aerobic exercise performance in hypoxic conditions.

Assessing The Impact of Body Fat Percentage And Lean Mass, on Wingate Performance

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The Wingate test is commonly utilized to assess the anaerobic power capabilities of athletes across various sporting disciplines. Although prior studies have assessed the impact that body composition values have on anaerobic performance in above averagely fit populations, it appears that no study has evaluated the relationship between body fat percentage (BF%), lean leg mass (LLM), and trunk lean mass (TLM) on Wingate performance in no less than averagely fit males. **PURPOSE**: To investigate the relationship between BF%, LLM, and TLM on Wingate performance in no less than averagely fit college-age males. **METHODS**: After having descriptive data recorded, 38 averagely fit college-age males had their BF%, LLM, and TLM assessed via a bioelectrical impedance analyzer. BMI was also calculated. Subjects participated in an 8 min dynamic warm-up on a leg cycle ergometer, followed by the completion of a maximal effort 30s sprint. Pearson Correlations were then performed between %BF, LLM, TLM, peak power (PP), and mean power (MP) with significance difference determined at $p \leq 0.05$. **RESULTS**: High to moderately high positive correlations existed between PP and TLM (r = .834, p = .000), LLM (r = .773, p = .000), BMI (r = .657, p = .000) as well as between MP and TLM (r = .904, p = .000), LLM (r = .880, p = .000), and BMI (r = .619, p = .000). However, no relationship occurred between BF% and PP (r= -.064, p= .123) while a low negative relationship occurred between MP (r = -.234, p = .049) and BF%. **CONCLUSIONS**: TLM, LLM, and BMI appear to have a strong positive relationship with Wingate performance in no less than averagely fit males, while BF% appears to have little to no relationship with Wingate performance. Further research may be necessary in order to determine if fitness level, sport specificity, or a different type of body fat percentage measurement technique may play a factor when considering if BMI, BF%, LLM, and TLM has a relationship with Wingate performance.

Postmenopausal African-American Women

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PURPOSE: To determine the effects of cardiorespiratory fitness level and risk factors for metabolic syndrome (MetS) in postmenopausal African-American women on serum-induced endothelial migration rate and circulating microRNAs. **METHODS**: Overweight, sedentary, African-American, postmenopausal women and habitual physical activity-matched, healthy, young women were recruited. Blood was drawn

and serum frozen at -80°C. Participants completed a VO_{2max} test on a treadmill. Postmenopausal women were grouped based on their number of MetS risk factors (0-5) and VO_{2peak} (very low<18 $mL \cdot kg^{-1} \cdot min^{-1}$ [n=25], low=18–22 $mL \cdot kg^{-1} \cdot min^{-1}$ [n=21], or moderate>22 $mL \cdot kg^{-1} \cdot min^{-1}$ [n=16]). Human umbilical vein endothelial cells (HUVECs) were exposed to 5% serum of each subject in a 96-well plate radius migration assay and migration to cover a simulated "wound" area was tracked over 24 hours. Total RNA was isolated from fresh sera and a priori chosen microRNAs were quantified by real-time PCR. **RESULTS**: Serum of postmenopausal women with moderate cardiorespiratory fitness induced greater migration than serum of women with low or very low fitness levels at 16 hr (79% vs. 59% and 59%, $p<0.01$) and 24 hr (87% vs. 68% and 69%, $p<0.05$). Migration in response to serum from the young, healthy group was higher than the low and very low fitness groups after 8, 16, and 24 hr ($p<0.05$), but was not different from the moderately fit group at any time point. Migration in response to serum from postmenopausal women with 0−1 risk factor for MetS (n=18) compared to those with 2−3 (n=37) and 4−5 (n=6) was greater after 16 hr (75% vs. 62% vs. 42%, $p<0.05$) and 24 hr (85% vs. 70% vs. 54%, $p<0.05$). Significant negative correlations with migration were found for total cholesterol (r=-0.24), LDL (r=-0.25), and triglycerides (r=-0.25) ($p<0.05$). Circulating microRNAs 126, 21, and 221 all correlated negatively with VO2peak (r=-0.21−-0.26, $p<0.05$) and approached significant correlations with LDL (r=-0.22−-0.24, p=0.06−0.09)). **CONCLUSIONS**: Factors which impair endothelial cell migration rate are present in serum of overweight, postmenopausal, African American women. Having a moderate cardiorespiratory fitness may be protective, while having as few as two risk factors for MetS may relate to detriments in endothelial repair functions.

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Association of Body Composition to Aerobic Capacity and Swimming Performance in Adult Fitness Swimmers

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The ability to examine and track lean mass and anthropometric characteristics in swimmers is necessary to determine training modalities and volumes for optimal performance, injury prevention, and ensure optimal levels of body fatness for overall health. Few studies have examined the relationship of body composition (BC) to swimming performance or aerobic capacity ($VO2max_{sw,}$) in water. **PURPOSE**: To examine the relationship of BC to sidestroke and freestyle performance swimming (PS) and a freestyle flume $VO2max_{sw}$ ($ml \cdot kg \cdot min^{-1}$) test (VO2). **METHODS**: Six males and 9 females (27.1±7.9yrs.; 174.1± 7.6cm; 72.1 ± 13.3kg) performed both PS tests [500 yard freestyle (475.5 ± 95.4s) and 500 yard sidestroke (Mean 662.5 ± 88.2s) in a swimming pool and a $VO2_{max}$ in the swimming flume. Percent Body Fat (BF) was measured using the Body Plesthmography (Bod Pod). The relationship of PS times (s) and VO_2 was correlated to BF, fat-free mass, BMI ($kg \cdot m^2$), height (cm), and body weight (kg). Data was assessed using Pearson correlation coefficients ($p<0.05$) after assessing normality. **RESULTS**: Relationships between BC and PS variables are presented in Table 1. BF was significantly associated with the flume $VO2max_{sw}$ test (r=-0.854, $p<0.001$), but neither PS tests ($p>0.05$). **CONCLUSIONS**: BC of swimmers is an important determinant of health and performance. Future studies should use a larger cohort and compare land based measures in order to examine the relationships of BC and anthropometrics to PS, measures of propulsive force, and swimming economy. Furthermore, multiple observations of swimmers over a training season would provide further evidence in order to identify key factors related to swimming performance.

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Table 1.

Variable	N	PS (Sidestroke)	PS (Freestyle)	$VO2max_{sw}$
		r-value (p-value)	r-value (p-value)	r-value (p-value)

Height (cm)	15	-0.301 (.275)	-.250 (.369)	0.215 (.441)
Weight (kg)	15	0.495 (.061)	-0.403 (.136)	0.174 (.536)
BMI ($kg \cdot m^2$)	15	-0.614* (.015)	-0.508 (.053)	0.132 (.639)
Percent Body Fat (%)	15	0.299 (.278)	0.422 (.117)	-0.854* 0.000)
Fat Free Mass (kg)	15	-0.501 (.057)	-0.469 (.078)	0.420 (.119)

*p<0.05

Hydrogen Sulfide Does Not Functionally Contribute to Acetylcholine-Mediated Vasodilation in Young Healthy Adults

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Hydrogen sulfide (H_2S) is one of several endothelium-dependent vasoactive molecules that contribute to the regulation of vessel function. In the cutaneous vasculature, young adults express enzymes that synthesize H_2S, and exogenous delivery of H_2S elicits substantial dilation, suggesting that H_2S may be important for the regulation of vessel function *in vivo*. However, because there are several redundant endothelium-dependent contributors, the functional contribution of endogenous H_2S to dilation in the cutaneous circulation is unclear. **PURPOSE**: To quantify the contribution of H_2S to endothelium-dependent dilation in young adults and pharmacologically determine the primary enzymatic source of H_2S in the microvasculature. We hypothesized that CSE-derived H_2S would mediate a portion of acetylcholine (ACh)-induced dilation. **METHODS**: Four microdialysis fibers were placed in the ventral forearm skin of 10 young adults (22±2 y). Red cell flux was measured (laser-Doppler flowmetry) during graded perfusion of the endothelium-dependent agonist ACh (10^{-10}-10^{-1} M) alone and during co-perfusion with D-Penicillamine [10mM DPen; selective inhibitor of the H_2S-producing enzyme cystathionine γ-lyase (CSE)], aminooxyacetic acid [8mM AOAA; inhibitor of H_2S-producing enzymes CSE and cystathionine β-synthase (CBS)], and a combination of DPen+AOAA. Cutaneous vascular conductance (CVC=flux·$mmHg^{-1}$) was expressed as a percent of maximal CVC (CVC_{max}, 28 mM sodium nitroprusside + local heat 43º C). Sigmoidal dose-response curves were generated and the $logEC_{50}$ was used as an index of vessel sensitivity. **RESULTS**: ACh elicited endothelium-dependent dilation in all subjects (82.9±4.3% CVC_{max}; $P<0.05$). CSE inhibition alone or combined CSE/CBS inhibition had no effect on ACh-induced dilation (ACh: -4.1±0.5; DPen -3.2±0.5; AOAA -3.3±0.7; Combo -2.6±0.4; $P>0.05$). **CONCLUSION**: H_2S does not appear to have a functional role in mediating cutaneous dilation in response to ACh in young adults. Despite the ability to synthesize H_2S it is likely that other redundant mechanisms, including nitric oxide, mask any functional contribution of H_2S to endothelium-dependent agonists in the cutaneous circulation of young adults.

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Performing Resistance Type Exercise in Various Body Positions Elicits Different Cardiovascular Responses

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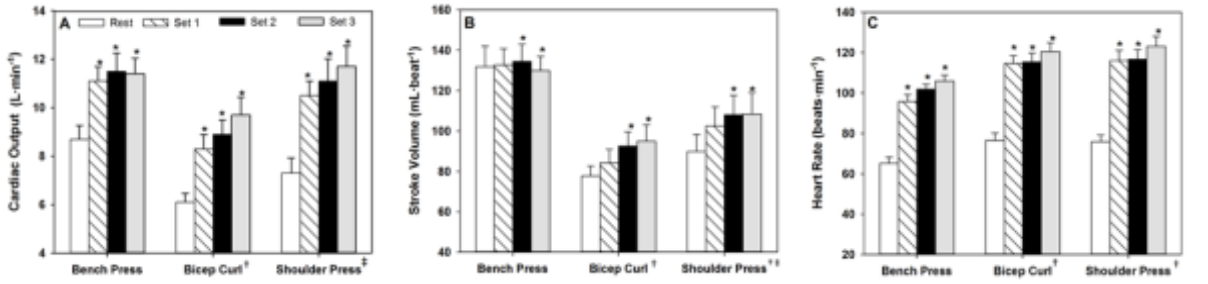
PURPOSE: There is limited research regarding the different cardiovascular responses to acute resistance training in various body positions. Therefore, the purpose of this investigation was to determine the different responses of cardiac output (CO), stroke volume (SV), heart rate (HR), systolic (SBP) and diastolic blood pressures (DBP) while performing resistance type exercise in three different body positions. **METHODS**: Fourteen apparently healthy individuals (8 female; 6 male) volunteered to participate in this study. The resistance type exercises to be performed included the bench press, seated bicep curl, and shoulder press. A non-invasive cardiac output monitoring (NICOM) system was used to measure cardiac output, stroke volume, and heart rate. A two-way analysis of variance (ANOVA) with repeated measures revealed significant differences ($p<0.05$) in cardiac output, stroke volume, heart rate and diastolic blood pressure between different body positions. **RESULTS**: Average participant characteristics were as follows: age 20.4 ± 1.5 years, height 169.6 ± 8.4 cm, body mass index (BMI) 26.9 ± 6.1 kg/m2, and fat free mass (FFM) 21.8 ± 12.1 kg. The figure below shows cardiovascular responses during various types of resistance exercise.



Panel A: Cardiac Output; **Panel B**: Stroke Volume; and **Panel C:** Heart Rate; values shown are mean ± SE. Study conditions are as follow: white bars = rest, striped bars = set 1, black bars = set 2, gray bars = set 3. *Significantly different from baseline; $P < 0.001$; †Significantly different from Bench Press; $P < 0.001$; ‡Significantly different from Bicep Curl; $P < 0.05$.

There was no significant interaction between exercises and sets for any of the dependent variables. **CONCLUSION**: In conclusion, these differences occurred due to the relationship that exists between cardiac output, stroke volume, and heart rate.

High Speed Cycling and the Law of Initial Values in Parkinson's Disease

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Wilder (1958) described the law of initial values (LIV) as a phenomenon of increased excitation due to stimuli when initial values are low, and *vice versa*. Our research program is focused on exercise interventions for people with Parkinson's disease (PD) and the size of the training effect appears to vary based on the subject's baseline fitness. **PURPOSE**: To determine the extent to which the LIV is expressed in functional data obtained from people with PD who were part of an interval-based exercise intervention. It was hypothesized that subjects with poorer initial values would show the greatest increase in fitness. **METHODS**: 31 people with PD exercised on stationary recumbent bicycles twice per week in a six-week program. High speed and low pedaling resistance emphasized neural activation while reducing musculoskeletal and cardiovascular strain. 30-min. sessions included five min. of warm-up and cool-down at preferred pedaling cadence. In the middle 20 min., subjects executed 20, 15-s fast intervals. Maximum revolutions per minute (RPM-max) were obtained for the first and last training sessions. Timed up and go test (TUG), Activities-specific Balance Confidence Scale (ABC), 36-item Short Form Survey (SF36), and dominant hand isometric grip strength (DGrip) were administered pre-and post-training. ANCOVA and Pearson correlation coefficients describe relationships between pre-training scores and change scores on these five measures. **RESULTS**: There were moderate-strong negative correlations between pre-training

scores and change scores (TUG r= -.385, p= .035, n=30; ABC r= -.492, p= .006, n=28; SF36 r= -.294, p= .121, n=28; DGrip r= -.386, p= .029, n=31; RPM-max r= -.462, p= .020, n=25). When corrected mathematically for initial values (ANCOVA, Microsoft Excel), the correlations all become zero, indicating that the size of the effect was indeed related to baseline fitness. **CONCLUSION**: As hypothesized, the LIV is expressed in this population such that baseline status predicts a meaningful amount of variance in training effects. The indication that a low-fit person has a greater capacity for physical improvement compared with a high-fit person supports our idea that this intervention is meant for the onset of an exercise regimen that will eventually follow the principles of progression, overload, and specificity.

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Evaluating the Effectiveness of a Health Promotion Intervention in an Urban Population Regarding Stair Utilization

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PURPOSE: The purpose of this study was to assess the effectiveness of a stairwell intervention at Jefferson Station in Philadelphia, Pennsylvania. This study had two aims; 1) to determine if stair utilization increased during and after the intervention periods, 2) to understand the underlying factors related to stair and escalator utilization during the intervention. METHODS: The intervention was conducted at one stairwell/escalator bank between the hours of 11am and 1pm for three days a week for four weeks in September, 2016. We used six stair riser banners (5x48 in. removable banners) that were placed on 6 out of the 35 stairs each separated by 3 steps that were designed to be read as individuals climbed the stairs or escalator. The banners contained two health related messages. Baseline (no banners), intervention (banners present) and post-intervention (no banners) data was collected. Observations were conducted on Tuesdays and Wednesdays and interviews were conducted on Thursdays. RESULTS: A total of 1,719 (n = 1,719) individuals were observed and a total of 50 interviews were conducted over the 12 day/4 week study period. Stair utilization increased from baseline by 3% in male and 5% in female observees. Sixteen percent of those interviewed indicated they changed behavior (took the stairs) because of the motivational signs that promoted healthy behaviors. CONCLUSION: While changes in stair use declined after the intervention, this simple, low-cost model was feasible and with modifications has the potential to change behaviors in thousands of commuters at Jefferson station if implemented Station wide.

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Does Fatiguing Exercise Influence Performance on an Affordance-Based Action Boundary Task?

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Perception-action coupling describes the dynamic interaction between the person and their environment. External and internal stimuli provide valuable information regarding the opportunities for action, or affordances, which underlie functional goal-directed movement. However, systemic stressors (sleep deprivation, anxiety, brain injury, etc.) affect perceived affordances in animal-environment systems. Little is known about the influence of exertional fatigue on an affordance-based task. PURPOSE: Examine the effect of fatigue on the accuracy of affordance-based action boundary accuracy task after a maximal performance swim. METHODS: 13 competitive swimmers completed a baseline (BL) evaluation of the Perception-Action Couple Test (PACT) prior to a maximal 500m swim test (for time) and 30 sec maximum effort tethered swim test (TST). Participants completed a PACT evaluation 10 (Post Fatigue 1-PF1) and 30 (Post Fatigue 2-PF2) minutes after protocol. After testing for normality, a within-subjects repeated measure ANOVA was conducted across all time-points (BL, PF1, and PF2) for movement time (MT), initiation time

(IT), reaction time (RT), and % accuracy in PACT program scores. RESULTS: Six females (27.3 ±7.2 y.o.) and three males (26.6±3.8 y.o.) completed all assessments. There was no statistically significant difference between BL and PF1 or PF2 time-points for movement time, initiation time, reaction time, or % accuracy. ($p>.05$). However, a trend toward decreased % accuracy near the affordance-action boundary was noted. CONCLUSIONS: An affordance-based task is not influenced by exertional fatigue 10 or 30 minutes following a maximal swimming bout. Sensorimotor alterations experienced from exertional fatigue can be influenced by a variety of internal and external factors. The interrelationship between fatigue effects (magnitude and duration) and rest duration on perception-action assessments warrant further consideration. Due to the ambiguous trend for performance alterations at the action-boundary threshold, future studies should continue to investigate internal and external factors that influence affordance-based tasks.

High Dietary Potassium Attenuates Effect of High Dietary Sodium on Vascular Function

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Dietary factors such as low potassium and high sodium diets are considered risk factors for cardiovascular disease. While the role of these two nutrients on blood pressure (BP) is well known, their impact on the vasculature has received less attention. Salt loading has been shown to result in endothelial dysfunction independent of BP however the potential protective role of potassium on the vasculature is underexplored. PURPOSE: The purpose of this study was to determine if dietary potassium can offset the deleterious effect of high sodium on brachial artery flow-mediated dilation (FMD) in normotensive adults. METHODS: Twenty-two subjects (11M, 12F; 27±1yr) completed 7 days each of the following two diets: moderate potassium/high sodium (MK/HS: 65/300mmol) and high potassium/high sodium (HK/HS: 120/300mmol) in random order (controlled feeding study). Twenty-four ambulatory BP and urine was collected and brachial artery FMD was measured on the last day of each diet. RESULTS: Mean arterial pressure was lower on the HK/HS diet compared to MK/HS (83±1 vs. 85±1 mmHg; $p<0.01$). Urinary sodium excretion levels were elevated on both diets confirming dietary compliance while urinary potassium was elevated on the HK/HS diet compared to MK/HS (73.9±6.2 vs. 44.5±2.4 mmol/24h; $p<0.05$). FMD was greater on HK/HS compared to MK/HS (6.3±0.7 vs. 4.9±0.6%; $p<0.05$). CONCLUSION: These data suggest that dietary potassium may provide vascular protection against the deleterious effects of high sodium on the vasculature in normotensive adults.

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Using Near Infrared Spectroscopy to Access Muscle Post-exercise Oxygen Debt

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Post-exercise muscle oxygenation recovery, measured by near infrared spectroscopy, reflects a balance between oxygen supply and oxygen consumption within the muscle. PURPOSE: This study examined the differences between forearm muscle oxygen recovery kinetics after ischemia and after ischemia with exercise to determine the oxygen debt associated with exercise. METHODS: Three men and two women (26 to 52 years) performed a 6 minute (min) blood flow occlusion only trial and two occlusion trials with 30 second (s) and 2 mins of maximal static handgrip exercise respectively (5s work/rest cycle). Continuous wave near infrared spectroscopy was used to measure the flexor digitorum superficialis percent oxygen saturation throughout all three trials. A one-way repeated measures ANOVA was used to determine differences between trials with significance set at 0.05. RESULTS: There were significant differences between all trials ($p<0.001$) for the percent oxygen saturation area under the curve during 3 min of recovery. The occlusion only condition had the greatest area (20,781±2,116 %-s) followed by occlusion with 30s exercise (19,263±2,201 %-s) and occlusion with 2 min exercise (17,601±1,523 %-s). Compared to the occlusion only trial, the percentage of oxygen debt for 30s of handgrip exercise was 7.4±2.7% and

15.2±1.5% for 2 min of handgrip exercise ($p<0.001$). CONCLUSION: These results demonstrate that near infrared spectroscopy can be used to determine post-exercise oxygen debt from muscle oxygen saturation recovery kinetics. Oxygen debt is associated with the degree of muscle anaerobic metabolism required during exercise. Further study into the application of near infrared spectroscopy to access muscle oxygen debt and anaerobic metabolism for both athletic and clinical populations is suggested.

Six-week Pilates Program Improved Postural Stability, Balance, and Isometric Back Strength in College-aged Athletes

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Pilates training engages core musculature and utilizes controlled repetitions of various movements to improve muscular strength and endurance, flexibility, balance, and posture. Although a growing body of research identifies the benefits of Pilates training for middle-aged and older adults, little emphasis has been placed on evaluating athletic populations. PURPOSE: To determine the effects of a short-term Pilates training program on postural stability, balance and core isometric back strength in NCAA DIII and competitive club sport athletes. METHODS: The experimental group of 16 off-season college-aged female athletes participated in a supervised Pilates training program, which took place two times each week for six weeks. The 30-minute Pilates sessions consisted of body weight training that progressed to the incorporation of dumbbells. Pre- and post-test measurements were taken in three functional tests, which included Force Plate Tandem Balance (FPTB), Limits of Postural Stability (LPS), and Biering-Sorensen Back Extension (BSBE). A control group of 10 college students, who maintained their normal physical activities, but were not involved in the Pilates training program, completed pre- and post-testing for comparison. RESULTS: There were no significant differences between the experimental and control groups at baseline testing. The control group did not show any significant changes between pre- and post-test measurements. The experimental group decreased path length in the FPTB assessment (39.8 inches vs. 36.5 inches, $p<0.05$). The experimental group also exhibited significant improvement in postural control score on the LPS assessment (37.1 vs. 47.4, $p<.001$). Finally, there was a significant increase in seconds held during the BSBE assessment among the experimental group (172.4 seconds vs. 187.7 seconds, $p<.05$). CONCLUSION: A six-week progressive Pilates program contributed to significant decreases in single-foot sway, increases in postural stability, and increases in isometric back strength in female college-aged athletes.

Self-Induced Myofascial Release with the Thera-Band® Roller Massager™ Improves Muscle Soreness and Cutaneous Blood Flow

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Delayed onset muscle soreness (DOMS) peaks 24-48 h after an intense or novel exercise. DOMS results in pain, reduces maximal muscle strength, and limits capacity to perform further exercise. Myofascial release (MR) is purported to decrease DOMS severity, in part by facilitating increased local blood flow. PURPOSE: This study examined the effects of self-administered MR with the Thera-Band® Roller Massager™ on DOMS severity and local cutaneous blood flow. METHODS: Thirteen young (22±1 yr), healthy men and women elicited bilateral DOMS in the quadriceps (unilateral pulsed squats to failure). Following exercise, one leg was randomly assigned the treatment leg (TL) and received 60 s of self-induced MR at 5.8 kg of force, with the contralateral leg serving as a control (CL). Skin blood flow (Full-field Laser Perfusion Instruments, Moor Instruments) and neurosensory thresholds (Neurometer CPT, Neurotron, Inc.) were measured over both quadriceps before exercise, after exercise, and after MR. Subjective ratings of quadriceps muscle soreness were obtained for each leg (VAS 0-10). MR, skin blood flow, neurosensory thresholds, and soreness measures were repeated 24, 48, and 72 h after the initial bilateral DOMS protocol. RESULTS: Perceived soreness increased to the same extent in both legs after exercise (CL: 0.5±0.3 vs

4.6±0.4 Au; TL: 0.5±0.3 vs 4.9±0.6 Au; p<0.05) but was reduced after MR in TL (MR: 2.0±0.4 vs. post-exercise: 4.9±0.6 Au; p<0.05). Microvascular blood flow was the similar after the exercise bout in TL (pre-exercise: 0.54±0.04 vs. post-exercise: 0.56±0.04; p=0.85) but increased after MR compared with immediately after exercise (MR: 0.82±0.07 flux/mmHg vs. post-exercise 0.56±0.04 flux/mmHg; p<0.05). There was no change in sensory thresholds after MR (all p>0.05). Muscle soreness peaked at 48 h and was reduced by 72 h (p<0.05); however, there were no differences in soreness ratings between TL and CL at 24, 48, and 72 h post-exercise (p>0.05). CONCLUSION: These data suggest that 60 s of self-administered MR acutely reduces muscle soreness, which may be related to increased microvascular blood flow and not alterations in sensory nerve thresholds. MR did not affect muscle soreness on subsequent days, which may be explained by potential crossover effects to the non-massaged leg.

Statement of Disclosure: Member of the Performance Health Theraband Research Advisory Committee (LM Alexander)

Association Between Aerobic Combat Swimming Performance and Anaerobic Kicking Power in Adult Fitness Swimmers

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The Combat Swimmer is trained to endure fin swimming of distances up to 11km to travel to an assigned mission location and maintain stealth status. They are expected to complete locomotion while reserving the ability to produce immense power and maintain composure for the designated Special Forces operation upon landfall. To date there lacks investigations on the associations between aerobic Combat swimming (CS) and anaerobic Combat kicking performance. PURPOSE: To examine associations between force production during an anaerobic Tethered Kicking Test (TKT) at baseline (BTKT) and immediately post 500m aerobic CS fatigue TKT (PTKT). A secondary aim examined relationships between TKT force and CS 500m fatigue swim performance. METHODS: Eleven male and female competitive swimmers (27.7 ± 8.8years; 173.7 ± 8.6cm; 73.5 ± 14.5kg) completed two sessions. The TKT consisted of a 30s maximal effort flutter kicking against a fixed line connected to the Futek™ submersible S-Beam load cell force transducer measuring force differences (peak force (Fpk;N), mean force (Fmn; N/sec) and fatigue index (FI; N/sec)). The BTKT occurred following the Combat Swim 500m fatigue Swim (CSFS) orientation trial. The CSFS was performed wearing full combat gear including helmet, fatigues, webbing, training rifle, boots and fins. A second TKT was performed immediately following a CSFS (PTKT). Fpk and Fmn were collected for all TKT trials. Pearson correlations were conducted for Fpk, Fmn, and FI for both BTKT and PTKT trials, and correlated to CSFS performance time. RESULTS: There was no significant correlation between CSFS time and BTKT or PTKT force measures. BTKT was significantly correlated to PTKT for Fpeak (r=0.784, p<.001), Fmean (r=0.856, p<.001) and FI (r=0.758, p<.001). CONCLUSIONS: The series of anatomical and environmental constraints in the CS task raises questions regarding energy system reliance throughout a BTKT or PTKT test. As a CS completes a CSFS test, it is possible that the level of fatigue may impair the CS to a degree that they would be unable to maintain a high intensity throughout a PTKT. Future studies should continue to explore how combat swimming tasks impact energy system pathways and reliance as well as neuromuscular patterns related to the skill demands of combat swimming.

Hip Strength Influences Ground Reaction Force Attenuation on a Side Leap in Collegiate Dancers

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PURPOSE: The vast majority of dance-related hip injuries are due to overuse, muscular compensation secondary to strength imbalances, and lower extremity misalignment. Altered landing mechanics may decrease force attenuation capacity at ground contact so evaluation of jump landing strategies exhibited by

dancers and differences elicited post fatigue on a side leap maneuver might elucidate injury risk. The purpose of this study was to examine pre to post fatigue ground reaction force attenuation differences potentially influenced by strength and alignment factors. METHODS: 16 healthy female dancers from a university dance team, each with at least 6 years of competitive experience, participated. A cross-sectional design was used. Independent variables were strength and agonist-antagonist strength ratios (eccentric strength levels for hip extensors, flexors, abductors, adductors, lateral and medial rotators, and knee extensors), q-angle, foot type and time (pre v post fatigue). Dependent variables were peak vertical force, rate of loading, and anterolateral shear force composite. RESULTS: Independent t-test showed dancers with higher composite hip strength scores had significantly lower peak normalized vertical force ($p = .01$, $t = 2.16$) and vertical rate of loading ($p = .004$, $t = 2.16$) pre-fatigue on a side leap landing, compared to a weaker group. No other group differences in strength, static Q-angle, foot mobility or fatigue were statistically significant. CONCLUSIONS: Dancers in a hip strong group were better able to attenuate vertical force at ground contact pre-fatigue. Possibly, those with greater hip strength pre-fatigue might be better equipped to maintain effective ground force attenuation strategies when landing from a higher leap post fatigue. However, leap height differences between pre- and post-fatigue conditions were not directly measured. Traditional analyses concerning dance-related impact landings have focused on vertical components and associated predictive alignment flaws. However, the lateral nature of landing a side leap maneuver might redirect some of the landing force attenuation load from sagittal and vertical components to lateral shear force. Future research models should consider multi-directional forces imposed at ground contact during complex landing maneuvers.

Prediction Of Carotid Artery Intima-Media Thickness From Biomarkers In Persons With Spinal Cord Injury

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Cardiovascular disease (CVD) is more prevalent in persons with spinal cord injury (SCI) than in the general population. Cardiometabolic disorders and an increase in systemic inflammatory burden have been shown to be associated with increased carotid intima-media thickness (cIMT), which is a potent clinical marker of CVD. PURPOSE: To develop a prediction equation for cIMT in persons with SCI using clinical markers for lipid [high density lipoprotein cholesterol (HDL-C) and triglycerides (TG)], carbohydrate metabolism [fasting plasma glucose (FPG), fasting plasma insulin (FPI)] and inflammation [glycan *N*-acetylglucosamine (Glyc-A) and high-sensitivity C-reactive protein (hsCRP)]. A prospective observational study was performed of outpatients with chronic SCI (>1 year). METHODS: Carotid ultrasound and fasting blood samples were determined in 55 male subjects with SCI [31 with paraplegia (PARA) and 24 with tetraplegia (TETRA)]. Calculation of cIMT thickness was performed with a program to analyze cIMT on still images obtained during the sonographic study. The software provided an integrated area of cIMT along the length of the near wall where the border was automatically recognized identifying the distance between the lumen intima-media interface. Multiple regression models were performed to determine the best predictive variables for cIMT from serum HDL-C, TG, FPG, FPI, Glyc-A, and hsCRP. RESULTS: The a priori comparison for cIMT values between the TETRA and PARA groups failed to reach significance (0.91 ± 0.29 vs. 1.1 ± 0.41mm, respectively; $P=0.09$) and, as such, the groups were combined to predict cIMT in the statistical modeling. The best predictor variables that remained in the model to generate the final equation were: $cIMT = 0.008(FPI) + 0.002(Glyc\text{-}A) - 0.164$; $r^2 = 0.33$, $P<0.0001$. The individual predictor variables both had unique significant contributions to the model (FPI: partial $r = 0.30$, $P<0.05$; Glyc-A: partial $r = 0.40$, $P<0.01$); all other variables were removed from the model. CONCLUSION: Our findings suggest that standard cardiometabolic and inflammatory biomarkers may be used to predict cIMT,

information that can be used clinically to identify potential carotid atherosclerotic burden in persons with chronic SCI.

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Effects of Different Exercise Modalities on Executive Cognitive Function

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Previous studies show a positive correlation of effect between cognitive function and chronic exercise (exercising for 3-12 weeks). However, there is little research on the neurological effects of acute, single session, exercise. Furthermore, no study has compared the effects of acute exercise on cognitive function using different exercise modalities. PURPOSE: To compare the acute effects of moderate-intensity treadmill and cycle ergometry exercise on cognitive function in males and females. METHODS: 22 subjects (11 male and 11 female, age 20 ± 2 yrs, 32.8 ± 7.2 ml/kg/min) completed a crossover, repeated measures study in which each subject completed a 20 min moderate-intensity exercise session on a treadmill (TREAD) and a cycle ergometer (CYCLE). Each session was separated by seven days. Prior to starting an exercise session, subjects were connected to an electroencephalogram (EEG) machine and completed four cognitive tests which included Stroop A, Stroop B, Trail Making A (TMA), and Trail Making B (TMB). During each cognitive test, subject's brain wave activity, number of errors, and the amount of time it took to complete the test was recorded. Once the cognitive tests were completed, subjects were randomized into either the TREAD or CYCLE condition. Subjects completed a 5 min warm-up on the designated exercise machine and then completed 20 min of exercise at 40-59% of subject's maximum heart rate. Immediately after the 20 min, subjects were reconnected to the EEG machine and completed the same four cognitive tests. Then a 5 min cool down was completed. RESULTS: A significant ($P<.05$) difference was found in time to completion for TMA. Time to completion significantly ($P<.05$) improved from pre (16.84 ±4.4) to post (14.7±4.2) in the TREAD condition, and significantly ($P<.05$) improved from pre (16.7±4.6) to post (13.5±4.7) in the CYCLE condition. Additionally, a significant (<.05) difference was found in time to completion for TMB. Time to completion significantly ($P<.05$) improved from pre (33.9±12.1) to post (27.1±11.1) in the CYCLE condition. CONCLUSION: Acute exercise on a treadmill or a cycle ergometer is beneficial for improving cognitive function.

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Effect of Continuous BFR Exercise on Tissues Oxygenation Characteristics in Incomplete Spinal Cord Injured Patients

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Previous reports indicate that blood flow restriction (BFR) maximizes muscular adaptations to low-intensity exercise, which may be particularly beneficial for individuals with incomplete spinal cord injuries (ISCI's). However, the effects of BFR exercise on tissue oxygenation characteristics have not yet been reported in this population. PURPOSE: To examine the effect of discontinuous BFR exercise on localized tissue oxygenation in a sample of subjects with iSCI's. METHODS: Nine individuals with iSCI's (all classified as ASIA-D) completed two bouts of unilateral knee extension (3 sets x 10 reps), which were matched for work and performed in a counterbalanced order. One set included BFR (125% of venous occlusion pressure; BFR), which was applied throughout exercise and rest. A control session was also performed without BFR. Tissue oxygenation characteristics were collected from the rectus femoris, and compared to baseline across time, sequentially between sets and rests, and between conditions. RESULTS: Oxyhemoglobin decreased

during each set of CON (peak diff.= -93.0±99.0 NU), and was significantly lower throughout all of CON compared to BFR (peak diff.= -88.6±73.2 NU; all $p<0.05$). Deoxyhemoglobin significantly increased between sets of CON compared to baseline (peak diff.= +25.6±33.6 NU), and throughout all but the first set of exercise in BFR (peak diff.= +153.5±86.8 NU, all $p\leq0.05$). Total Hb significantly increased from each set of exercise to its subsequent rest period in both conditions (Peak diff.= 117.23±70.2 NU and 98.1±67.4 NU in CON and BFR, respectively), and was higher throughout BFR exercise compared to CON exercise ($P\leq0.003$ for all). Lastly, tissue oxygenation index decreased from the first rest period throughout the exercise bout compared to baseline in CON (peak difference= -3.2±2.4 %), throughout the entire exercise bout compared to baseline in BFR (peak difference= -8.0±3.5%), and across the entire exercise bout in BFR compared to control ($p<0.03$ for all comparisons). CONCLUSIONS: These data suggest that BFR knee extension exercise at 125% of venous occlusion pressure is sufficient in eliciting significant venous and arterial restriction during knee extension exercise in this population, but seems to leave the muscle pump intact.

Central Hemodynamics and Wave Separation Analysis in Lower Body Aerobic Exercise

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In young healthy adults, acute lower body aerobic exercise increases central systolic blood pressure (cSBP) and central pulse pressure (cPP) while a reduction in cSBP and cPP are observed post exercise. Exercise induced alterations in central hemodynamics, such as augmentation pressure (AP) and index (AI), suggest changes in surrogate measures of wave reflection. However, wave separation analysis provides a more comprehensive method to examine relative contributions of the forward pressure wave (Pf), backward pressure wave (Pb), and reflection magnitude (RM = Pb/Pf) to central pressure. PURPOSE: To determine the effect of acute exercise on Pf, Pb, and RM using wave separation analysis. METHODS: High fidelity applanation tonometry was used to record radial artery pressure waveforms in 24 young (25 ± 3 years) male (n = 12) and female (n = 12) subjects during seated rest, incremental recumbent cycle exercise at 40, 50, and 60% age-predicted HR max, and 5 and 10 minute seated post exercise. Radial waves were calibrated to respective brachial mean and diastolic pressure. Central pressure waves were synthesized from the calibrated radial pressure wave using a generalized transfer function and Pf, Pb, and RM were derived from wave separation analysis. Data were analyzed by repeated measures ANOVA with post-hoc analyses when appropriate. RESULTS: As expected, cSBP and cPP were increased during all exercise intensities ($p<0.05$) while cSBP and cPP were reduced post exercise ($p<0.05$). Pf was increased at 40, 50, and 60%HRmax vs rest (27.6 ± 1.0, 38.7 ± 2.8, 44.2 ± 1.9 vs 24.3 ± 1.2mmHg, $p < 0.05$). Pb was increased at 60%HRmax vs rest (15.6 ± 1.3mmHg vs 13.2 ± 0.9mmHg, $p < 0.05$) and was reduced at 10-min post exercise vs rest (9.7 ± 0.9 vs 13.2 ± 0.9mmHg, $p < 0.05$). Lastly, RM was reduced at 50, 60%HRmax, 5 and 10-minute post exercise vs. rest (32.8 ± 1.9, 34.8 ± 2.1, 40.0 ± 1.5, 41.4 ± 1.4 vs 52.7 ± 3.3%, $p < 0.05$). CONCLUSION: RM is reduced during lower body aerobic exercise coupled with an increase in Pf while a decrease in RM is maintained post exercise as a result of a decrease in Pb. These findings suggest that the increase in exercising cSBP and cPP during exercise is driven by increased Pf while post exercise reductions in cSBP and cPP may be a result of reduced Pb.

The Effects of Self-Myofascial Release vs. Instrument Assisted Soft Tissue Mobilization on Performance

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Self-Myofascial Release (SMR) and Instrument Assisted Soft Tissue Mobilization (IASTM) both relieve adhesions and restrictions in muscle tissue. These tools are popular however there is limited research as to their efficacy on improving athletic performance. PURPOSE: The objective of this study was to determine if using pre-exercise SMR or IASTM would improve performance on measures of vertical and horizontal power. The researchers also examined if any differences in perceived pain existed between the two manual

therapy interventions. METHODS: A total of 29 male and 22 female college students volunteered to participate in the study. Subjects were required to meet the American College of Sports Medicine recommendations for physical activity. Subjects were randomly assigned to receive either IASTM or SMR. Vertical power was assessed by a vertical jump test and horizontal power was measured by a 40 yard (yd) sprint. In the first session, body fat percentage and baseline measurements for the vertical jump and 40 yd sprint were collected. During the second session, the subjects received either SMR or IASTM prior to their vertical jump test and 40 yd sprint. Subjects were asked to rate the level of pain they perceived after the massage intervention using a visual analog scale. Subjects then repeated the vertical jump and 40 yd sprint tests. A dependent t-test was used to determine differences in pain between the two massage interventions. A 2 x 2 ANCOVA was used to determine if differences existed between genders and the two types of manual therapy. RESULTS: There was no interaction ($p > .05$) between the massage intervention and gender for both the vertical jump and 40 yd sprint tests. There was a significant main effect for vertical jump and SMR ($p = .04$). Gender also had a significant main effect for both the vertical jump ($p = .04$) and the 40 yd sprint ($p = .02$). There were no significant differences between massage interventions for the 40 yd sprint times ($p = .73$). There were no significant differences in perceived pain between the massage interventions ($t (49) = -1.60$, $p > .05$). CONCLUSION: The use of SMR prior to exercise may improve vertical power in recreational athletes, and was not perceived to be more painful than IASTM. However, neither SMR nor IASTM improved horizontal power.

Effects of Fatigue Induced by Intermittent Running on Muscular Strength, Power, and Glycogen Content

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A majority of ACL injuries in female soccer players occur in the presence of fatigue. Reductions in lower extremity muscular strength and power due to fatigue can predispose female athletes to a higher risk of ACL injuries. Decreases in muscle glycogen content have also been reported after soccer play. PURPOSE: To investigate the relationship between muscle glycogen content with knee strength and power in the presence of fatigue. METHODS: Seventeen female subjects participated in the study (age: 21.5±2.9yrs). Before and after an intermittent running protocol, subjects completed testing including maximal isokinetic knee flexion and extension muscular strength normalized to their body weight (%BW), a depth-jump onto a force plate to measure reactive strength index (RSI), and ultrasound-based muscle glycogen content of six lower limb muscle groups. Paired t-tests or Wilcoxon signed- rank tests compared strength, RSI, and muscle glycogen content pre- and post-fatigue. Correlation analyses examined the relationships between the baseline muscle glycogen level and the changes (post/pre-fatigue values) in muscle glycogen content with the changes in muscular strength and power. Significance was set at $p<0.05$ a priori. RESULTS: After the fatigue protocol, knee flexion strength [(129.1±22.7 pre-fatigue; 115.9±25.7 post-fatigue)($p=<0.001$)] knee extension strength [(231.9±28.5 pre-fatigue; 218.8±39.6, post-fatigue)($p=0.016$)] and the flexion/extension strength ratio [(55.8±8.5 pre-fatigue; 53.4±10.2 post-fatigue)($p=0.039$)] were significantly decreased while RSI was significantly increased [(0.671 ± 0.236 pre-fatigue; 0.749 ± 0.276 post-fatigue)($p=0.006$). There were no significant differences in muscle glycogen content pre- to post-fatigue protocol. There were no significant correlations ($p>0.05$) other than the baseline vastus medialis muscle glycogen content being significantly correlated to the changes in knee flexion strength [($r=-0.616$)($p=0.008$)] and knee extension strength [($r=-0.603$)($p=0.010$)]. CONCLUSIONS: The current running protocol that simulated soccer play caused fatigue as revealed by significant decreases in lower limb strength. Methodological considerations should be explored further to understand the relationship between glycogen to performance parameters.

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The Effects of Aerobic, Concurrent, and Resistance Exercise on Compensatory Eating Behaviors

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Obesity is a worldwide epidemic and can be defined as a disorder of positive energy balance, which occurs when the amount of energy consumed is greater than the amount of energy expended. PURPOSE: To observe the differences in compensatory eating behaviors between four groups (aerobic training, concurrent training, resistance training, and a non-exercise control) in recreationally active, resistance trained, college-aged subjects. METHODS: Ten recreationally active college-aged (21.7 ± 1.3yrs) males and females participated in this study. A 5-week, randomized, crossover design with one full week between each session. Preliminary assessments consisted of a PAR-Q, informed consent, body composition, rep-set best, and VO_{2max}. Aerobic exercise (AE) consisted of 30-minutes of cycling at 70% HR_{max}. Resistance exercise (RE) consisted of seven, full-body circuit of three sets of 12 repetitions at 70% set-rep best. Concurrent exercise (CE) consisted of four resistance exercises at the same intensity with 15-minutes of cycling at 70% HR_{max}. The control (CON) consisted of 30-minutes of sitting. Food logs via MyFitnessPal were required for the 24-hour period following each session. SPSS 24.0 was used for data analysis using one-way and two-way ANOVAS and deltas. Level of significance was set at $p \leq 0.05$. RESULTS: There were no significant difference in total caloric (CON: 2,145 ± 807.9kcal, AE: 2,040 ± 657.2kcal, CE: 1,973 ± 764.8kcal, RE: 2,354 ± 1,077.0kcal, p = 0.743), carbohydrate (CON: 219 ± 66.4g, AE: 244 ± 87.3g, CE: 204 ± 55.4g, RE: 237 ± 94.9g, = 0.657), fat (CON: 57 ± 21.9g, AE: 58 ± 24.0g, CE: 59 ± 31.3g, RE: 63 ± 23.8g, p = 0.964), or protein intake (CON: 97 ± 48.6g, AE: 101 ± 48.0g, CE: 89 ± 53.4g, RE: 99 ± 46.4g, p = 0.942), HR (CON: 77 ± 10.3bpm, AE: 151 ± 21.9bpm, CE: 153 ± 16.2bpm, RE: 136 ± 15.8bpm, p = 0.122), or RPE (CON: 6 ± 0.0, AE: 11 ± 2.1, CE: 12 ± 1.9, RE: 10 ± 2.7, p = 0.147) between the four sessions. CONCLUSION: These findings demonstrate that the exercise-induced caloric deficit was not compensated via an increase in caloric and/or macronutrient intake, therefore, resulting in a negative energy balance. Further, the aforementioned findings provide evidence that exercise is a viable mechanism to create an energy deficit, which can ideally lead to successful weight loss.

Cardiorespiratory Fitness and Cancer in Women

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The preventive role of cardiorespiratory fitness (CRF) in cancer is not well established among women. PURPOSE: The current study sought to evaluate the association between CRF, cancer incidence and cancer mortality in women. METHODS: Maximal exercise testing was performed in pilot cohort of 184 women (59.3±15.2 years) free from malignancy at baseline who were followed for a mean of 12±6.9 years. Multivariate Cox hazard analyses were conducted for all-type cancer incidence and cancer mortality. Population Attributable Risks (PAR) and Number Needed to Treat (NNT) were determined for low CRF (<5 METs). RESULTS: During the follow-up, 11.4% were diagnosed with cancer and 3.2% died from cancer. CRF was inversely associated with cancer outcomes. For every 1 MET higher CRF there was a 19% reduction in cancer incidence [Hazard Ratio (HR) 0.81, 95% Confidence Intervals (CI) (0.68 to 0.96), p=0.016)] and a 38% reduction in cancer mortality [HR 0.62, 95%CI (0.42 to 0.92), p=0.017]. The PARs% and NNT for low CRF were 12.3% and 16.6% and 5 and 9 for cancer incidence and cancer mortality, respectively. CONCLUSIONS: Higher CRF is associated with lower risk for cancer incidence and cancer mortality in women, suggesting a potential protective benefit of CRF in cancer prevention. Eliminating low CRF as a risk factor would potentially prevent considerable cancer morbidity and mortality and reduce its associated societal-economic burden. Achieving CRF of ≥5 METs could be a cost-effective strategy for primary cancer prevention programs. Future prospective, larger cohorts are needed to ascertain these findings.

Post-Traumatic Stress Disorder, Obesity, and Marijuana Use in Marine Corps Veterans

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Higher rates of obesity are seen in people diagnosed with Post-Traumatic Stress Disorder (PTSD). Those with PTSD often turn to substance use/abuse. There is a lack of information on the relationship between marijuana use, PTSD, and obesity in military veterans. PURPOSE: This study examined the association between marijuana use, PTSD, and obesity in Marine Corps veterans. METHODS: A survey assessing Marine Corps veteran demographic information (height, weight), service history (years of service, number of deployments), and health habits (exercise, substance use, and PTSD history) was administered via a Facebook group of Marine Corps veterans. One hundred (70 male, 30 female) subjects completed the survey. Paired sample t-tests were used to compare dependent variables between PTSD and non-PTSD subjects. RESULTS: Subjects with PTSD had been deployed more times (1.90±1.73 times) vs subjects without PTSD (0.94±1.12; p=0.02). Subjects with PTSD had a higher body mass index (BMI) (34.15±8.23 kg/m^2) vs subjects without PTSD (28.14±4.71 kg/m^2; p=0.004). Subjects with PTSD did not consume alcohol (AL; 2.76±1.2), tobacco (TO; 1.48±1.87), or marijuana (MJ; 0.90±1.67) to a greater extent vs. subjects without PTSD (AL: 3.08±0.96; p=0.27; TO: 1.30±1.68; p=0.27; MJ: 0.68±1.2; p=0.58). Subjects with PTSD did not exercise more frequently (2.23±1.91) vs subjects without PTSD (2.05±2.16; p=0.65). CONCLUSION: BMI is significantly higher in Marine Corp veterans diagnosed with PTSD compared to veterans without PTSD while substance use and exercise was not different between groups.

Ground Contact Times and Flight Times at Different Running Speeds in Novice and Competitive Runners

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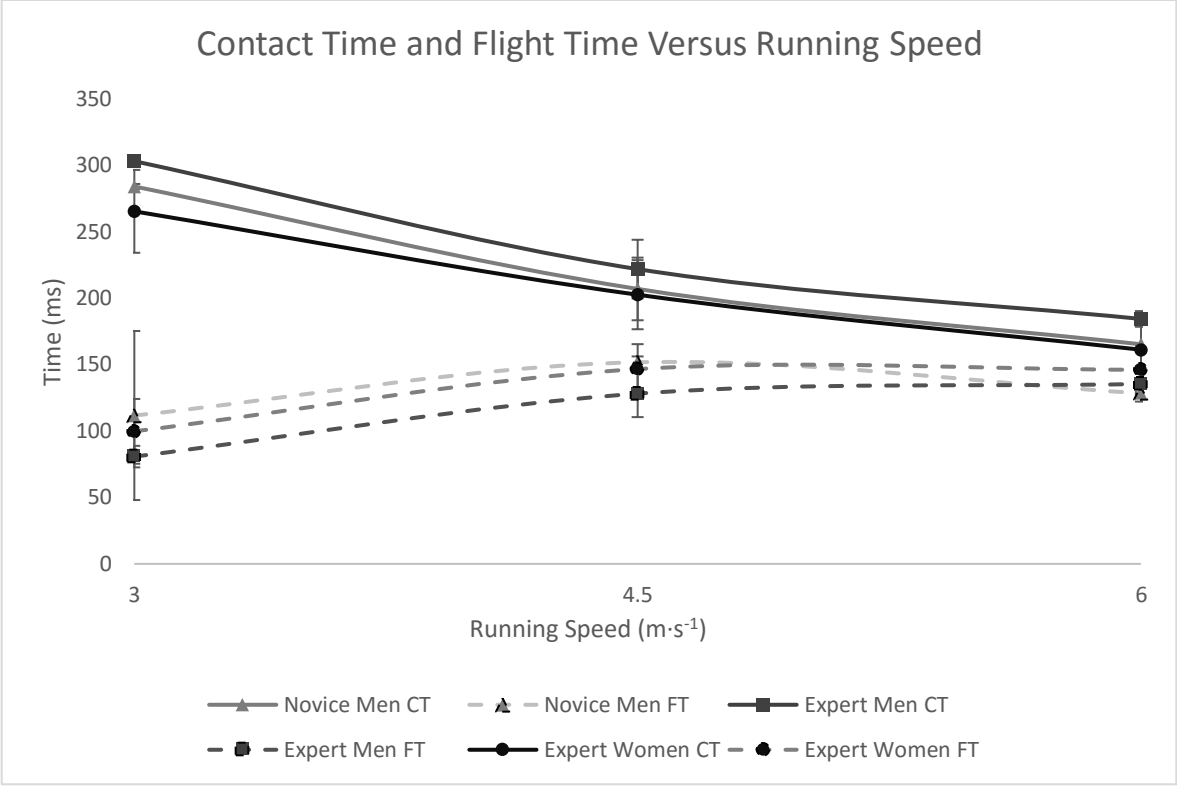
While there is a known relationship between ground contact time (CT) and flight time (FT) at different running speeds, it is unknown if this pattern differs between experienced and novice runners. PURPOSE: To determine if the pattern of changing ground contact times and flight times as running speeds increase differs between novice and experienced runners. METHODS: Two expert men (184.8±3.2 cm, 79.5±5.4 kg), 2 novice men (173.1±2.2 cm, 75.3±0.6 kg), and 4 expert women (168.8±2.9 cm, 66.2±9.0 kg) were recorded at 240 frames per second while running 50 m on a rubber track at speeds of 3.0 m·s-1, 4.5 m·s-1, and 6.0 m·s-1. The videos were analyzed to measure CT and FT for both the right and left legs, and the averages of both legs were used for further analysis. Comparisons were made using a 2-way (group x speed) repeated measures ANOVA. RESULTS: As running speed increased, CT decreased similarly for all runners from 279.5±26.4 ms at 3.0 m·s-1, to 208.5±22.6 ms at 4.5 m·s-1, and 168.0±17.1 ms at 6.0 m·s-1. There were significant differences in CT between speeds in all groups ($p<0.0001$), but no differences between groups (p=0.3815) and no significant group x speed interaction (p=0.8282). FT increased from 98.0±31.4 ms at 3.0 m·s-1 to 143.3±17.1 ms at 4.5 m·s-1 and 139.0±15.2 ms at 6.0 m·s-1, but these differences were not statistically significant (p=0.0699). There were no significant differences in FT between groups (p=0.5980) and no significant group x speed interaction (p=0.0715). CONCLUSIONS: Novice and experienced runners do not appear to differ significantly in their patterns of CT and FT across the range of speeds used in this study.



Validity of the Fitbit Charge HR2 for Measuring Step Count and Heart Rate During Exercise

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Wearable activity trackers have gained popularity over the past decade, developing into a multi-billion dollar industry. The potential of these devices to support behavior change interventions are promising. Yet, before such interventions can be considered, the examination of the validity of fitness trackers is imperative. The present study examines one of the most popular devices in the market, the Fitbit Charge HR2, which was released in 2016. Currently, there is a lack of evidence of its validity to track activity indicators (e.g., heart rate, steps). PURPOSE: To test the validity of the Fitbit Charge HR2 monitor in step count and heart rate (HR) during exercise. METHODS: Thirty-two healthy volunteers (age 22.7±6.1, 20 female) participated in the study. Participants completed four 6-minute trials (i.e., lying in a supine position and moving at 3.5, 5, and 6.5 miles per hour (mph) on a treadmill). Data were collected on the Fitbit Charge HR2, a Polar H7 chest strap, and by a count of videotaped steps. Statistical analyses included mean absolute percentage errors, one-sample t-tests, and intraclass correlation coefficients (ICC). RESULTS: The Fitbit Charge HR2 significantly underestimated HR for all four trials (mean differences=-1.7- -12.7, SDs=9.3-18.4; *p*s<.01). For HR, ICCs ranged from .44-.66, indicating only modest agreement between the Fitbit and the Polar H7 chest strap. The Fitbit Charge HR2 also significantly underestimated step count for walking at 3.5 mph (mean difference=-13.0, SD=19.0; *p*<.01) with an acceptable ICC (.77). However, for running at 5 and 6.5 mph, no significant underestimation was found. Accordingly, the ICCs revealed an excellent agreement of .99 between the Fitbit and counted steps for both trials. CONCLUSION: The Fitbit Charge HR2 acceptably measured step count for moving at jogging or running speeds. For the measurement of HR and step count at lower speeds the accuracy was questionable and the use of other devices may be advisable.

Comparisons of Body Consciousness and Expected Barriers and Outcomes for Women Performing Two Exercise Regimens

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PURPOSE: Young females report feeling pressure to obtain a certain physical appearance and experience barriers (both psychological and environmental) to exercise unique to this population. The purpose of this study was to compare body consciousness and expected outcomes and barriers to exercise between young, active females engaging in two different exercise regimens; high intensity interval training (CrossFit) versus traditional fitness facility workouts (Gym).
METHODS: Active (exercise at least 3 times/week) females between 18-35 years old were recruited to complete an online survey that measured body consciousness [Objectified Body Consciousness Scale (OBC)] and expected outcomes and barriers for exercise. Responses were compared between CrossFit and Gym using independent samples t-tests. Results were considered significant at $p<0.05$. RESULTS: Participants (n = 53; CrossFit n=28, Gym n=25) were 24.8±5.2 years and 92.5% white. CrossFit scored significantly ($p=0.019$) lower on the body shame scale (3.4±1.1 vs. 4.2±1.3) and significantly higher ($p=0.012$) on the control scale (5.5±1.0 vs. 4.8±0.9) of the OBC. CrossFit also scored significantly ($p<0.001$) higher on overall expected outcomes from exercise (56.0±4.5 vs. 50.9±5.2), and particularly expected psychological outcomes ($p<0.001$;23.4±2.4 vs. 19.5±3.5). Additionally, CrossFit scored significantly lower on overall barriers to exercise ($p<0.001$;25.3±8.2 vs. 33.6±7.2), specifically related to time ($p=0.021$; 12.0±4.6 vs. 14.8±3.9) and effort ($p<0.001$; 12.1±4.5 vs. 16.8±3.5) compared to Gym. CONCLUSION: Results showed that there are differences in how young females feel about their bodies as well as what they expect to achieve from exercise and the barriers that prohibit them from exercising. Females engaging in CrossFit report more positive feelings about their bodies and more control over what their bodies look like. They also expect to achieve more benefits from exercise and report fewer barriers to performing exercise. Overall, participating in CrossFit is associated with some positive outcomes for young active females.

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

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Dehydration reduces plasma volume and concentrates electrolytes. Water deprivation (WD) studies in animals demonstrate that elevated blood electrolyte concentration is associated with altered sympathetic outflow and blood pressure (BP) regulation. However, it remains unclear if WD augments BP responses to sympathoexcitatory maneuvers. PURPOSE: We tested the hypothesis that WD elevates plasma osmolality and consequently augments BP reactivity. METHODS: Twenty healthy young adults were recruited (10M/10W; age: 24±1 yrs; BMI: 24±1 kg/m^2; BP: 109±2/61±2 mmHg) to complete two hydration conditions in random order. A normal hydration (NH) and WD visit were separated by at least one week. Daily water intake for the NH condition was 23mL H_2O/kg bodyweight/day for 3 days prior to testing. The WD condition included a stepwise reduction in water intake over 3 days then a 16hr water restriction prior to testing. Beat-by-beat BP was measured continuously with finger photoplethysmography throughout a 10-min baseline, handgrip exercise (HG), post-exercise ischemia (PEI), and a cold pressor test (CPT). Isometric HG was performed at 30% of maximal voluntary contraction for 2 mins and PEI immediately followed by rapidly inflating an upper arm cuff to 250mmHg for 3 mins (to isolate the metaboreflex). Following HG & PEI, participants rested quietly for 10 mins prior to a 2-min hand-in-ice H_2O CPT. The peak responses were calculated as the absolute 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 5.6±1.4% during WD. Plasma osmolality (287.0±1.0 vs. 290.0 ±1.0 mOsm/kg H_2O, $p<0.05$), urine osmolality (481±137 vs. 708±42 mOsm/kg H_2O, $p<0.05$), urine specific gravity (1.015±0.002 vs. 1.022±0.001, $p<0.05$), and thirst rating on a 0-10 scale (1.7±0.4 vs. 6.7±0.4, $p<0.05$) were

higher for the WD condition, suggesting mild dehydration. Mean BP responses were augmented following WD during HG (Δ12.8±1.7 vs. 18.7±2.0 mmHg, p<0.05), PEI (Δ8.8±1.0 vs. 14.7±2.4 mmHg, p<0.05), and CPT (Δ14.9±2.0 vs. 18.6±2.3 mmHg, p=0.05). CONCLUSION: These preliminary findings suggest that short-term water restriction augments BP responses during low intensity isometric exercise and the CPT, suggesting enhanced BP reactivity.

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The Effect of Differing Fluid Replacement Strategies on Running Performance

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Distance running has become an increasingly popular activity in the United States within the last several decades. In order to maximize performance and to decrease the advent of fatigue in these types of long-distance races, endurance athletes must adhere to proper hydration practices. PURPOSE: To determine the effects of drinking water and a carbohydrate-electrolyte supplement (CES) ad libitum and beyond the dictates of thirst on measures of hydration status and physical performance in exercise-trained individuals. METHODS: Eight recreational endurance runners (6 men and 2 women; age: 25.00 ± 7.19 years; weight: 68.78 ± 10.71 kg; height: 174.00 ± 7.54 cm) participated in a crossover, repeated-measures study in which they were randomly assigned to complete four 60-minute self-paced running time trials (TT) on a treadmill, using differing hydration protocols, separated by 7 days. The protocols included hydrating with water or a CES (1) according to thirst sensation (thirst driven - TD) or (2) drinking beyond the dictates of thirst (5oz every 15 minutes; programed fluid intake - PFI), as recommend by the American College of Sports Medicine. Body weight, core temperature, and urine specific gravity (USG) were measured pre-TT and post-TT. Rating of perceived exertion (RPE), perceived thirst, affect, and heart rate (HR) were recorded pre-trial, at regular 10-minute intervals during the TT, and post-trial. The distance completed was recorded at 10 minute intervals during the TT and immediately after the TT. RESULTS: There was no significant improvement on running performance between the four conditions (TD water: 6.89 ± 1.38; PFI water: 7.18 ± 0.97; TD CES: 7.21 ± 1.04; PFI CES: 7.21 ± 1.04 miles; $p = 0.226$). There were no significant differences in RPE, affect, HR, USG, body weight, and perceived thirst between the four conditions ($p > 0.05$). CONCLUSION: PFI offers no performance benefits over TD fluid intake during running performance lasting sixty minutes in a thermoneutral environment. There were no cardiovascular, thermoregulatory, or hydration differences between conditions. The consumption of a CES did not lead to better performance compared to water. These findings may have practical application for recreational endurance runner's hydration strategies.

Comparison of Measured and Predicted Resting Energy Expenditure Equations in Obese Pre-bariatric Surgery Patients

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PURPOSE: To compare measured resting energy expenditure (MREE) to predicted resting energy expenditure (PREE) determined by three pre-programmed multi-frequency bioelectrical impedance analysis prediction equations in obese pre-bariatric surgery patients. METHODS: Ninety women and twenty-six men (age: 42.6 ± 11.0 years, BMI: 48.1 ± 9.1 kg/m^2) were included in this sample. After 3 hours of seated rest, MREE was measured prior to bioelectrical impedance analysis (SECA-mBCA 514) body composition assessment. MREE was obtained over a 10-minute period using a hand-held indirect calorimetry device (Korr REE-VUE). Three preprogrammed equations in the bioelectrical impedance analyzer (i.e. Mueller 2004, Liu 1995, and FAO/WHO/UHU) were used to calculate PREE. RESULTS: The mean MREE determined by indirect calorimetry was 2164.1 ± 460.2 kcal. The PREE values (mean ± SD) for the Mueller, FAO/WHO/UHU, and Liu equations were 2182.5 ± 427.8 kcal, 2129.2 ± 521.2 kcal,

and 2352.2 ± 473.4 kcal, respectively. Following statistical comparison, no significant differences were observed between MREE and PREE determined by the Mueller (14.6 ± 313.6 kcal, p = 0.896) and FAO/WHO/UHU (-38.8 ± 371.8 kcal, p = 0.102) equations. However, a significant difference was observed between MREE and PREE by Liu (184.2 ± 333.3 kcal, p = 0.003). CONCLUSIONS: Our findings indicate that the Mueller and FAO/WHO/UHU programmed bioelectrical impedance analysis equations produce similar resting energy expenditure values as indirect calorimetry. These findings are important to weight management clinics without access to indirect calorimetry that currently use or are considering the use of this bioelectrical impedance analysis technology for their patients. Resting energy expenditure can be predicted in obese patients prior to individualized diet and exercise programming.

Effects of a Short-Term Neuromuscular Training Program on Jump Performance and Landing Mechanics

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Non-contact knee injuries are prevalent in sports that involve jumping and cutting. Further, implementing an effective training protocol can be challenging due to restrictions from the academic calendar and rules of the athletic governing body. PURPOSE: To investigate changes in jump performance and jump landing mechanics in collegiate team sport athletes after a short-term neuromuscular training (NMT) protocol. METHODS: 9 healthy athletes (6 females, height = 1.60 ± 0.02m, mass = 59.4 ± 5.1kg; 3 males, height = 1.71 ± 0.07m, mass = 69.8 ± 13.6kg) volunteered and provided written informed consent. The pre- and post-test measure was a repeat vertical jump task, where subjects performed two consecutive jumps aiming to maximize height and minimize ground contact time (GCT). Subjects performed three trials with one-minute rest between each trial. Two cameras (60Hz) filmed trials from the frontal and sagittal plane. Variables of interest were Vertical Jump Height (VJH), GCT, Reactive Strength Index (RSI), and Landing Error Scoring System (LESS) scores. Video review was used to determine GCT and flight time, with VJH calculated from flight time ($VJH=1/8 \bullet g \bullet t^2$). Two investigators independently analyzed landing mechanics using LESS. NMT protocol included 12 one-hour sessions over six weeks, on non-consecutive days (Mon-Thu). Each session included warm-up, jump training, sprint training, and strength training. RESULTS: Effect Size (ES) statistics were calculated for each variable. Improvements were seen in RSI, GCT, and LESS, with ES values of 2.2, 1.5, and 0.6, respectively. VJH showed only trivial changes (ES < 0.2). CONCLUSION: A short-term NMT program can improve jump landing mechanics and enhance performance in explosive jumping tasks.

Table 1: Pre- and Post-Test Results for RSI, GCT, VJH, and LESS

	RSI		GCT (s)		VJH (m)		LESS	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	0.92	1.30	0.37	0.28	0.35	0.35	5.44	4.44
SD	0.17	0.36	0.06	0.05	0.06	0.07	1.70	1.67
Effect Size	2.2		1.5		0.0		0.6	

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Sex Hormone-Binding Globulin and Resting Testosterone Levels in Relation to Weight Status: NHANES 2003-2004

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Resting testosterone level (RTL) has been shown to negatively correlate with BMI and adiposity. Sex hormone binding globulin (SHBG) is the primary carrier protein for testosterone, and therefore plays a major role in determining its bioavailability. However, little is known about how the relationship between

the two is altered by weight status. PURPOSE: To evaluate the relationship between sex hormone-binding globulin and resting testosterone levels in men of different weight categories. METHODS: A total of 142 male subjects' ages 18-35 from the 2003-2004 National Health and Nutrition Survey Examination were analyzed. Subjects were grouped based upon weight status as defined by BMI and included 60 normal (N), 45 overweight (OW), and 37 obese (OB) subjects. Body fat percentage (BF%) was determined by DXA scan. Bivariate correlation coefficients were calculated between SHBG and RTL; SHBG and BF%; and SHBG and predicted maximal oxygen consumption (VO_2max). Partial correlation coefficients were calculated between SHBG and RTL controlling for BF% and for SHBG and RTL controlling for VO_2max. All relationships were analyzed including all subjects combined and separated by weight status. RESULTS: The bivariate correlations between SHBG and RTL were significant and positively correlated between the OW ($r=0.330$, $p=0.027$) and OB ($r=0.517$, $p=0.001$) groups only. After controlling for BF%, this relationship was only significant in the OW group ($r=0.400$, $p=0.039$). When controlling for VO_2max the N group had a negative relationship ($r=-0.427$, $p=0.001$), but the other two weight groups had a positive relationship (OW: $r=0.322$, $p=0.033$; OB: $r=0.486$, $p=0.003$). CONCLUSION: The result show that the relationship between SHBG and RTL is different depending on weight status, negatively for normal weight and positively for OW and OB. Also, VO_2max may have an effect on resting testosterone, but likely does not influence SHBG. These findings are important as SHBG can affect the bioavailability of testosterone.

Is the Sport Supplement Deer Velvet Antler Effective for Injury Repair?

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Supplements such as insulin-like growth factor 1 (IGF-1) and deer velvet antler (DVA) have been used by many athletes to improve performance and increase recovery time from an injury. Many supplement brands claim that DVA can increase cell growth and repair, however there is little research backing these claims. PURPOSE: The goal of this project is measure cellular proliferation of mouse fibroblasts when treated with DVA. METHODS: The effects of DVA on cell proliferation were tested using MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) and wound healing assays. Cells were treated with 50ng/ml IGF-1 for a positive control, 1.25 µl/ml DVA, and 5.0 µl/ml DVA, or left untreated. All cells were grown in Dulbecco Modified Eagle Medium absent of serum. Following 12 hours of treatment, an MTT assay was performed. Wound healing assays were used to strengthen proliferation results. 3T3 cells were grown on collagen treated 6-well plates and scratched after 24 hours of growth. Cells were then treated with the same doses as the MTT assay. Measurements of the scratches were taken at 24 and 48 hour using an Olympus inverted microscope and Infinity Analyze software. RESULTS: Our results thus far demonstrated that DVA at a concentration of 1.25 µL/mL, and IGF-1 at a concentration of 50 ng/mL causes a significant increase in cellular proliferation, $p=0.039$ and $p=0.035$ respectively. DVA at a higher concentration failed to show a significant increase in cell number. CONCLUSIONS: A low dose of deer velvet antler can increase cell proliferation equal to the growth exhibited by insulin-like growth factor 1.

Antibiotics Reduce While Forced-Exercise Increases Inflammation in the Small Intestine

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Risk of metabolic and intestinal inflammatory disorder development increases significantly with age. In contrast, exercise has shown to reduce disease risk and promote longevity. Interestingly, adenylyl cyclase 5 knock out (AC5KO) mice demonstrate an enhanced exercise capacity and improved longevity. PURPOSE: We aimed to examine the inflammatory status along the gastrointestinal tract of AC5KO mice compared to Wild type (WT) mice. METHODS: 21 C57BL WT and AC5KO male mice were randomly

assigned to one of 2 groups: (1) sedentary and (2) exercise for 12 weeks. Mice had *ad libitum* access to food and water. Exercised mice were trained for 4 weeks at 60-70% max speed for 1 hr each session, 5 d/wk. WT sedentary and exercised groups were given antibiotics via oral gavage during the last 7 days of the exercise protocol. At the end of 4 weeks, mice were sacrificed and intestinal tissues were fixed for histological analysis and immunohistochemistry for cyclooxygenase-2 (COX-2), a marker of inflammation. Group means of staining score were analyzed using a one-way ANOVA and LSD post hoc tests. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. RESULTS: In the duodenum, COX-2 expression was isolated in the lamina propria and staining occurred predominately within macrophages. COX-2 expression in the duodenum was less in sedentary animals given antibiotics ($p \leq 0.015$). In the ileum, COX-2 expression was localized to both the crypts and lamina propria. Expression in ileal crypts was less in sedentary animals given antibiotics compared to WT exercised animals ($p = 0.02$) while expression in the ileal lamina propria was increased in WT exercised animals ($0.001 \leq p \leq 0.009$). CONCLUSIONS: Antibiotics reduce small intestinal inflammation. COX-2 expression localizes differently in the mucosa along the small intestine. Forced-exercise increases inflammation to a greater degree in the lamina propria of the distal small intestine.

Acute Ultraviolet Radiation Exposure Attenuates Nitric Oxide-Mediated Vasodilation in the Cutaneous Microvasculature

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The bioactive metabolite of folate, 5-methyltetrahydrofolate (5-MTHF), is degraded by ultraviolet radiation (UVR) *in vitro*, and cutaneous UVR exposure may deplete bioavailable 5-MTHF in the exposed area. Adequate 5-MTHF is essential for full expression of nitric oxide (NO)-mediated vasodilation of the cutaneous microvasculature through its indirect role in enzymatic coupling of nitric oxide synthase. PURPOSE: To determine 1) the effects of acute UVR exposure on NO-mediated vasodilation in the cutaneous microvasculature, and 2) whether local delivery of 5-MTHF restores NO-mediated vasodilation after UVR exposure. We hypothesized that acute UVR exposure would attenuate NO-dependent vasodilation. We further hypothesized that local delivery of 5-MTHF would augment NO-dependent vasodilation after UVR exposure. METHODS: Two intradermal microdialysis fibers were placed in the ventral skin of both forearms in 7 healthy young adults (23±4 y; 4M/3F) for local delivery of lactated Ringers (control) or 5 mM 5-MTHF. One arm was randomly chosen for exposure to UVR (UVR; 300 mJ/cm^2) while the other served as control (CON). Following baseline measurements, a standardized local heating (42˚C) protocol induced cutaneous vasodilation. After a stable local heating plateau was induced, 15mM NG-nitro-L-arginine methyl ester was perfused at all sites to inhibit NO synthase. Red cell flux was measured at each site by laser-Doppler flowmetry (LDF). Cutaneous vascular conductance was calculated (CVC = LDF/MAP) for each phase of the local heating response (initial peak, heating plateau, NO-mediated vasodilation) and expressed as a percentage of maximum (%CVCmax; 28mM sodium nitroprusside, 43°C). RESULTS: No differences existed between UVR and CON in the initial peak (p=0.42) or heating plateau (p=0.38) across microdialysis sites. UVR exposure blunted NO-mediated dilation compared to CON (18.9±5.3 vs 41.4±6.2%; p=0.02) at the control site. Local delivery of 5-MTHF augmented NO-mediated vasodilation compared to the control site after UVR (40.5±7.6 vs 18.9±5.3%; p=0.003). CONCLUSION: NO-mediated vasodilation, a measure of vascular function, is attenuated after acute UVR exposure, but is restored with local delivery of 5-MTHF. Acute UVR exposure may impair NO-mediated vasodilation through photodegradation of 5-MTHF.

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Asymmetry of Ground Contact Times and Flight Times during Running at Different Speeds

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The ratio of flight time (FT) to ground contact time (CT) during running can provide an estimate of the vertical ground reaction force (GRF). However, there is an implicit assumption of symmetry that has not been verified. PURPOSE: To determine if there is asymmetry of the CT and FT during running at different steady speeds in both novice and competitive runners. METHODS: Two male novice runners, 2 male competitive sprinters, and 4 female competitive sprinters were filmed at 240 frames per second while running 50 m on a rubber track for three trials at speeds of 3.0 $m \cdot s^{-1}$, 4.5 $m \cdot s^{-1}$, 6.0 $m \cdot s^{-1}$, and each participant's maximum running speed. The CT and FT were determined for each trial from the video. For each speed, the average CT and FT were found for the right and left legs, and then these were recoded as greater and lesser sides in order to capture absolute symmetry. Comparisons were made using a 3-way (group x speed x side) repeated measures ANOVA. Effect sizes for the differences between the greater and lesser sides were calculated for each speed using Cohen's d. RESULTS: The greater and lesser sides were significantly different from one another for both CT ($p=0.0002$) and FT ($p=0.0002$). Speed was also a significant factor for both CT ($p<0.0001$) and FT ($p=0.0022$). There were no significant differences between groups and no significant interactions between any of the variables. Effect sizes for CT ranged from 0.21-0.39. Effect sizes for FT ranged from 0.28-0.72. CONCLUSIONS: The differences in CT and FT between limbs ranged from small to moderate, but they were consistent and significant. Great care should be used when using CT and FT to estimate the GRF during running.

	Contact Time (mean±sd, ms)			**Flight Time (mean±sd, ms)**		
Speed	**Greater Side†**	**Lesser Side**	**Effect Size**	**Greater Side‡**	**Lesser Side**	**Effect Size**
3.0 $m \cdot s^{-1}$	284.4 ± 25.8	274.6 ± 27.4	0.34	107.8 ± 35.6	88.1 ± 30.2	0.69
4.5 $m \cdot s^{-1}$	212.4 ± 24.0	202.3 ± 24.3	0.39	148.9 ± 13.4	141.6 ± 17.9	0.28
6.0 $m \cdot s^{-1}$	170.0 ± 17.5	166.1 ± 17.0	0.21	145.7 ± 16.7	132.3 ± 14.7	0.72
Max Speed (7.39±0.98 $m \cdot s^{-1}$)	143.6 ± 14.6	139.5 ± 13.9	0.27	128.6 ± 17.6	118.7 ± 12.1	0.64

Table 1. Contact times and flight times during running at different speeds.
† - Significantly different from lesser side, p=0.0002.
‡ - Significantly different from lesser side, p=0.0002.

The Effect of Physiological Performance Variables on 3000m Times in Collegiate Mid-Distance and Distance Runners

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Collegiately, mid-distance (MD) runners and distance (D) runners compete in the 3000m event. Previous research has identified VO_2max, velocity at lactate threshold (vLT), $\%VO_2max$ at lactate threshold, and running economy (RE) to correlate with 3000m performance. Research is lacking when considering if differences in these variables, and pacing strategy, affects 3000m performance between groups. PURPOSE: To identify how physiological performance variables relate to 3000m time, and if differences in these variables, and pacing strategies, occurs between groups. METHODS: 11 male NCAA Division II runners

(5 MD, 6 D) were used. Subjects completed a 3000m time trial on a synthetic 200m indoor track, where 3000m time and split times were recorded using a single-beam timing gate. A discontinuous 3-minute stage lactate threshold protocol was used to measure vLT, lactate threshold (LT), and running economy at 14.5km/h, 16km/h, and 17.5 km/h ($RE_{14.5}$, RE_{16}, $RE_{17.5}$). A modified Astrand VO_2max test was used to assess VO_2max, with the speed set at 16.1km/h and grade increasing 2% every two minutes. RESULTS: VO_2max ($r=-.629$), $RE_{14.5}$ ($r=.632$), RE_{16} ($r=.756$), %VO_2max at LT ($r=0.675$), 600-1200m time ($r=.784$), 1200-1800m time ($r=.962$), and 1800-2400m time ($r=.719$) significantly correlated to 3000m time ($p<0.05$), when merging subjects. In the D group, %VO_2max at LT ($r=.875$), RE_{16} ($r=.853$), 600-1200m time ($r=.882$), and 1200-1800m time ($r=.965$) significantly correlated to 3000m time ($p<0.05$). In the MD group, 1200-1800m time ($r=.932$) significantly correlated to 3000m time ($p<0.05$), and VO_2max had a trend towards significance with 3000m time ($r=-.829$, $p=.083$). Statistically different mean differences in VO_2max (D=67.00±2.64 vs MD=63.56±1.52ml/kg/min), and vLT (D=15.10±0.19 vs MD=14.33±0.35km/h) was observed between groups ($p<0.05$). A graphical difference in pacing strategy was observed between groups. CONCLUSION: 1200-1800m time is the most important split time for 3000m performance. VO_2max was the best physiological performance indicator in MD runners, and RE_{16} was the best physiological performance indicator in D runners. Runners should be trained differently according to their training status, to improve 3000m performance.