

PC1 PreConference Tutorial: Rapid Research Race

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Purpose: The Rapid Research Race (RRR) Preconference presents SEACSM research within three minutes. The research diversity throughout the region will be presented. **Methods:** Within this session, both PhD students and faculty give the attendee the opportunity to learn about a variety of quality research projects. **Results:** Each speaker presents current laboratory and original research findings in two minutes. They will then have a one-minute question-and-answer session, following each presentation. **Conclusions:** Come and network with these researchers and learn about all great research in a short span of time. **The following individuals scheduled to present.**

Ayland Letsinger, Ph.D., Post-doctoral fellowship, National Institute of Environmental Health Sciences, Raleigh, NC; The gut microbiome modulates diet's effect on the regulation of physical activity.

Nicolas Clark, Ph.D. student, University of Central Florida; Heart rate variability threshold response to energy drinks containing different amounts of caffeine.

Brian B. Parr, Ph.D., Associate Professor, University of South Carolina Aiken; Assessment of fitness and functional movement deficits in normal, overweight and obese adults.

Jason Thomas, Ph.D. student, Georgia State University; Validity of optical heart rate sensors in fitness wearable devices.

Peter M. Magyari, Associate Professor, University of North Florida; The effect of exercise during pregnancy on body weight and litter size in obese Wistar Rats and their offspring.

Megan Ware, Ph.D. student, University of Georgia; Reshaping clinical fatigue.

Travis Anderson, Ph.D. student, University of North Carolina-Greensboro; Individualized training load trends are associated with physical performance in competitive collegiate soccer matches.

Zacharias Papadakis, Assistant Professor, Barry University; The myth of VO₂ ratio-scaling.

Alana J. Turner, Ph.D. student, Mississippi State University; Postural Strategies during Sensory Organization Test: Role of Military Footwear Type and Load Carriage Workload.

Dulce Gomez, Ph.D. student, Auburn University; The mitochondria: A potential player in racial disparities in endothelial dysfunction

Samantha Cohen, Ph.D. student, University of Mississippi; Sedentary Behavior and Prevalence of Hypertension among African Americans: the Jackson Heart Study.

PC2 BUILDING YOUR CAREER IDENTITY: PROFESSIONAL DEVELOPMENT FOR EXERCISE SCIENCE STUDENTS

Ashlyn N. Schwartz¹, Lindsay P. Toth², Brian B. Parr³. ¹University of Tennessee, Knoxville, TN; ²University of North Florida, Jacksonville, FL; ³University of South Carolina Aiken, Aiken, SC.

Preparing for a position in the field of Exercise Science or entrance into a graduate or professional degree program requires developing materials, fostering skills, and identifying strategies to secure a position. Written and spoken communication in professional settings and online platforms are essential means of advancing careers. However, many students are not aware of essential resources and skills to enhance their professional development in these ways. The purpose of this tutorial is to empower student and new professional members to pursue their own career pathway by providing access to tools and strategies to strengthen professional development. Discussion topics will include resume and curriculum vitae development, building and utilizing social media platforms for professional purposes, and learning competencies of professional socialization, communication, and relationship building. This interactive session will include an opportunity for students pursuing undergraduate, graduate, and post-doctoral positions to learn about techniques and resources to implement and to develop a professional identity. Time for questions and discussions will be included at the end of the presentation.

IT'S NOT ALWAYS WHAT YOU KNOW, BUT WHO YOU KNOW: LESSONS IN NETWORKING

Emily E. Bechke¹, Jonathan J. Ruiz-Ramie², Ashlyn N. Schwartz³. ¹University of North Carolina-Greensboro, Greensboro, NC, ²University of South Carolina, Columbia, SC, ³University of Tennessee, Knoxville, TN.

PC3

The purpose of this preconference tutorial is to engage student members in the fundamentals of networking during the SEACSM Annual Meeting. Attendees will have the opportunity to engage with current and past SEACSM Student Representatives to learn how to use networking to enhance their professional careers inside and outside of the conference setting. Discussion topics will include; (1) key tactics to networking, (2) utilizing events and social media to increase opportunities for networking, and (3) networking and professional development. This fun and interactive setting is designed to be welcoming and encourage first-time attendees to expand their social network during the conference. Time for discussion and questions will be included at the end of the presentation.

D1 CLINICALLY SIGNIFICANT WEIGHT LOSS & AUTONOMIC FUNCTION

Joshua Eric McGee. *East Carolina University, Greenville, NC.*

BACKGROUND: Obese individuals have a greater prevalence of cardiovascular disease and susceptibility to autonomic dysfunction [i.e. reduced heart rate variability (HRV)] than lean individuals. This study aimed to determine if a combined hypocaloric diet and aerobic exercise intervention improves HRV in obese adults. **METHODS:** Fifteen obese adults (51.5±9.9 yrs; weight: 92.7±15.4 kg; BMI: 34.1±4.0 kg/m²) participated in a 10-week medical weight loss program (OPTIFAST) and supervised exercise training program (50-75% VO₂max) to achieve clinically significant weight loss (CWL) (≥7%). Baseline and follow-up time-domain (i.e. RMSSD) and frequency-domain [i.e. normalized units of low (LFnu) and high (HFnu) frequency and LF/HF ratio] values were captured (Zephyr Bioharness 3, Medtronic, Annapolis, MD), along with aortic blood pressures (SphygmoCor XCEL, AtCor Medical, Sydney, Australia). Paired *t*-tests and bivariate correlations were calculated.

RESULTS: Weight loss was significant ($p < 0.001$). RMSSD and HFnu increased (both $p < 0.05$), while LF/HF ratio and LFnu decreased (both $p < 0.01$). Change in aortic systolic pressure was positively associated with delta HFnu ($r = 0.554$, $p < 0.05$), but negatively with delta LFnu ($r = -0.555$, $p < 0.05$) and delta LF/HF ratio ($r = -0.547$, $p < 0.05$).

CONCLUSIONS: CWL from diet and aerobic exercise training increases vagal tone and decreases sympathetic activity, thus, improving autonomic balance in obese individuals at risk for cardiovascular disease. Supported by NIH Grant 1R56HL132961-01A1

D2 EFFECTS OF BEETROOT JUICE COMPONENTS ON EXERCISE TOLERANCE AND CARDIOMETABOLIC HEALTH IN INDIVIDUALS WITH OBESITY

Christian E. Behrens, Rakesh P. Patel, Braxton A. Linder, Khandaker A. Ahmed, Brenda M. Bertrand, Jose R. Fernandez, Gordon J. Fisher, FACSM. *The University of Alabama at Birmingham, Birmingham, AL.*

BACKGROUND: Routine exercise training is known to improve health outcomes in individuals with obesity (IO); however IO seldom adhere to exercise programs. Thus, it is critical to identify novel strategies that can improve exercise capacity (EC) and lead to greater adherence in IO. Beetroot juice (BRJ), high in inorganic dietary nitrate, has been shown to consistently improve exercise performance in athletes, individuals with cardiopulmonary diseases, and non-obese lean individuals. These improvements may be explained by reduced oxygen uptake (VO₂) during exercise, enhanced blood flow, and greater mitochondrial efficiency. To date, we are aware of no studies that have compared the effects of BRJ, sodium nitrate (NaNO₃), denitrified BRJ (PLA), and control (CON) conditions for improving EC and cardiometabolic health in IO. Therefore, the purpose of this study was to determine if BRJ improves EC, exercise efficiency (EE) and cardiometabolic health in IO and identify possible mechanisms of action. **METHODS:** Vascular health, VO₂ on a cycle ergometer during submaximal- and maximal- exercise, and time to exhaustion (TTE) were assessed in 16 sedentary IO in a randomized crossover design for the following 4 conditions: 1) consumption of BRJ, 2) NaNO₃, 3) PLA, or 4) CON. Study visits were at least 72 hours apart.

RESULTS: A significant main effect of time was observed for submaximal exercise VO₂ (0.021), TTE VO₂ (0.008), TTE VO₂ Max (0.014) and TTE (seconds) ($P = 0.018$). Post hoc analyses demonstrated lower VO₂ during submaximal exercise in BRJ versus placebo ($P = 0.009$), and nitrate alone ($P = 0.024$). A higher mean VO₂ was observed during the TTE test for all three conditions relative to control ($P < 0.05$). VO₂Max was significantly higher during BRJ ($P = 0.026$) and PLA ($P = 0.001$) conditions relative to control, with the NaNO₃ condition trending higher ($P = 0.051$) relative to control. TTE was greater between BRJ and CON ($P = 0.004$) with no other differences between conditions. No other significant changes were observed for exercise or vascular health measures.

CONCLUSIONS: In this analysis of 16 IO, consumption of BRJ improved EE during submaximal cycling exercise by 4.56% compared to PLA and 4.87% compared to the NaNO₃ condition. All three supplemented conditions resulted in increased VO₂ and VO₂Max during the TTE. Finally, BRJ resulted in a 19% improvement in TTE compared to CON. These results suggest that consumption of BRJ may improve cycling efficiency and exercise capacity in IO.

D3 FACTORS AFFECTING ASYMMETRICAL KNEE FLEXION AND VARUS MOMENTS DURING GAIT FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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BACKGROUND: Following anterior cruciate ligament reconstruction (ACLR), reduced knee flexion and varus moments during gait in the ACLR leg are commonly observed and have been associated with subsequent knee osteoarthritis. However, a lack of understanding of the factors leading to asymmetrical knee loading limits effective clinical interventions. This study aimed to identify the underlying biomechanical factors by examining joint kinematics and ground reaction forces (GRFs) that occurred at the time of peak knee joint moments.

METHODS: 23 subjects with unilateral ACLR (14 men; age: 25.1±6.3 yrs; 14.4±17.2 months post-ACLR) walked at a self-selected speed. Peak knee flexion and varus moments during gait were calculated for each leg using motion analysis and force platforms. Lower-limb joint angles/excursions and GRFs at the peak knee moments were identified. Pearson correlation coefficients were used to examine the association of between-limb differences in knee flexion/varus moments with between-limb differences in joint kinematics and GRFs. Stepwise regression was used to identify the main predictors of knee loading asymmetries.

RESULTS: Limb asymmetry in peak knee flexion moment during gait was positively correlated with asymmetry in knee flexion angle ($r = .75$, $P < .01$) and excursion ($r = .52$, $P < .01$), knee internal rotation (IR) excursion ($r = .61$, $P < .01$), and posterior ($r = .67$, $P < .01$) and vertical ($r = .58$, $P < .01$) GRFs. Knee flexion angle and posterior GRF were the main predictors of asymmetrical knee flexion moment, together explaining 68% of data variation ($R^2 = .68$). Limb asymmetry in peak knee varus moment was only negatively correlated with asymmetry in knee valgus angle at peak varus moment ($r = -.66$, $P < .01$).

CONCLUSIONS: Reduced knee flexion moment in the ACLR leg during gait was associated with smaller knee flexion/IR and posterior/vertical GRFs, while reduced varus moment was associated with greater knee valgus. Further research is needed to determine whether interventions aimed at increasing knee flexion (e.g., visual feedback, quadriceps strengthening) and posterior GRF (e.g., heel strike, longer step length), and reducing knee valgus (e.g., pelvis/hip control and strengthening) of the ACLR leg may help resolve asymmetrical knee loading that may ultimately reduce knee OA risk post-ACLR.

D4 THE IMPACT OF RESIDUAL LUNG VOLUME METHOD ON MULTI-COMPARTMENT MODEL BODY COMPOSITION ASSESSMENT

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BACKGROUND: Researchers use both direct and indirect nitrogen analysis to determine residual lung volume (RLV) for body composition assessment. However, the agreement between direct and indirect methods, and thus the impact on percent fat (%fat), has yet to be examined. The purpose of this study was to compare multi-compartment %fat using direct and indirect measures of RLV.

METHODS: Thirty-four healthy adults (53% female; 37.7 ± 15.5 y; 27.6 ± 7.0 kg·m⁻²) participated in this study. RLV was measured via oxygen dilution using direct (DIR) and indirect (IND) nitrogen analysis. Participants also completed hydrostatic weighing, dual energy X-ray absorptiometry, and bioimpedance spectroscopy for body density, bone content, and total body water. Two, three, and four-compartment (2C, 3C, and 4C) model %fat was calculated using RLV from both DIR and IND nitrogen analysis. Agreement for each model was assessed using paired *t* tests and Bland-Altman analysis. Significance was accepted at $p < 0.05$.

RESULTS: Strong correlations (ICCs > 0.98) were observed for all %fat models between RLV methods. Measures of %fat using IND were larger than DIR (mean differences, 0.7 to 1.6%fat, all $p < 0.001$). However, the magnitudes of the differences were small (Cohen's *d*, 0.08 to 0.17). Additionally, the range of individual differences between IND and DIR was less than 4.0%, with 3C and 4C producing especially narrow limits of agreement (±1.4%fat and 1.9%fat) compared to 2C (±3.4%fat).

CONCLUSIONS: Multi-compartment models using DIR and IND nitrogen analysis to determine RLV demonstrated strong agreement. The more complex models (3C and 4C) were less affected by RLV method than the 2C model and produced limits of agreement less than ±2.0%fat. The results presented here indicate that DIR and IND nitrogen analysis may be used interchangeably for the assessment of body composition when using 3C and 4C models.

D5 THE ASSOCIATION BETWEEN BODY MASS INDEX AND BODY FAT PERCENTAGE: A COMPARISON BETWEEN RACES

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BACKGROUND: Body mass index (BMI) is commonly used as a proxy for body fat percentage (%BF) to assess obesity and obesity-related disease risk. Observed differences in fat-free tissue between races may influence the utility of BMI and lead to misclassification of obesity in racial minorities. The purpose of the present study was to evaluate the association between BMI and %BF in a multi-ethnic sample of adults stratified by race. Secondary analyses evaluated the relationship of BMI and %BF after accounting for age and sex.

METHODS: A sample of 872 adults (51.7% female, Age: 23.9±8.0 yrs; Ht: 173.1±10.9 cm; Wt: 76.9±21.1 kg; BMI: 25.4±5.0 kg/m²) were included in analyses. Height was measured with a stadiometer, weight was measured by a calibrated scale, and %BF was measured by a total body dual-energy X-ray absorptiometry scan. Participants were stratified by race (Asian[A]: n=74; Black[B]: n=152; White[W]: n=646). Pearson's correlations assessed the association between BMI and %BF. Multiple regression analyses evaluated the unique contribution of BMI after accounting for age and sex.

RESULTS: For all races, there was a moderate correlation between BMI and %BF (W: R=0.524, R²=0.275, p<0.001; B: R=0.500, R²=0.250, p<0.001; A: R=0.395, R²=0.156, p=0.001). After accounting for age and sex, BMI explained more of the variance in %BF for Black and Asian participants (W: R²=0.268, p<0.001; B: R²=0.325, p<0.001; A: R²=0.197, p<0.001).

CONCLUSIONS: Although significant, BMI only explained 15.6-27.5% of the variance in %BF. For Asian and Black participants, BMI uniquely contributed more to the variance in %BF after accounting for age and sex, compared to the unadjusted correlation. BMI alone may not be an appropriate estimate of %BF for the classification of obesity, especially for Asian individuals. Obesity classification may be improved in minorities by reevaluating BMI norms to consider age and sex or utilizing more accurate body composition measurements.

D6 PREDIABETES PHENOTYPE DOES NOT EXACERBATE MICROVASCULAR INSULIN SENSITIVITY IN METABOLIC SYNDROME

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BACKGROUND: Metabolic syndrome (MetS) and elevated glucose each promote microvascular dysfunction. Whether in combination these two conditions create increased dysfunction is not clear. Here, we tested whether glucose status worsens microvascular insulin sensitivity in MetS.

METHODS: Thirty-two sedentary, obese adults (54.2±1.2yrs; 35.9±1.3kg/m²; VO₂max: 19.9±1.3ml/kg/min) with MetS (≥3 ATP III criteria) were classified as normal glucose tolerant (NGT; n=8, 6F), impaired fasting glucose (IFG; n=10, 7F) or IFG with impaired glucose tolerance (IFG+IGT; n=14, 11F) according to ADA criteria using a 75g OGTT. Capillary perfusion (microvascular blood volume; MBV), filling rate (microvascular flow velocity; MFV) and blood flow (MBF=MBV*MFV) were assessed as the change before and after a 2hr euglycemic-hyperinsulinemic clamp (90mg/dl, 40mU/m²/min) using contrast enhanced ultrasound. Glucose infusion rate (GIR) was used to determine metabolic insulin sensitivity while carbohydrate oxidation (CHO_{ox}) was measured before and after the clamp to understand nutrient utilization. T-tests, repeated measures ANOVAs and correlations were used when appropriate. Significance was accepted as P≤0.05

RESULTS: There were no differences in age, BMI, VO₂max or GIR (NGT: 2.26±0.48 vs. IFG: 2.66±0.46 vs. IFG+IGT: 1.91±0.37mg/kg/min, P=0.44) among groups. Insulin did not stimulate capillary perfusion (NGT: 0.16±0.19 vs. IFG: -0.02±0.14 vs. IFG+IGT: 0.08±0.12AI, P=0.40), filling rate (NGT: 0.006±0.005 vs. IFG: 0.003±0.004 vs. IFG+IGT: 0.004±0.004sec⁻¹, P=0.11) or blood flow (NGT: 0.02±0.02 vs. IFG: 0.01±0.01 vs. IFG+IGT: 0.01±0.01AI/sec, P=0.21). CHO_{ox} was likewise unresponsive to insulin (P=0.34). Although age, BMI, fasting and 2hr glucose concentrations did not relate to insulin effects on microvascular function, fasting triglycerides was related to insulin-stimulated MBF (r=-0.39, P=0.03).

CONCLUSIONS: Prediabetes phenotype does not worsen microvascular insulin sensitivity in adults with MetS. Future work is warranted to examine the effects of different therapies (lifestyle, medication) on microvascular function.

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D7 ARE THERE RACIAL DIFFERENCES IN MITOCHONDRIAL RESPIRATION AND BIOGENESIS IN HUVECS

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BACKGROUND: African Americans (AA) exhibit a low grade of chronic systemic inflammation, an exaggerated response to inflammatory cytokines, and a higher prevalence of endothelial dysfunction compared to Caucasians (CA). TNF- α , an inflammatory cytokine, is known to cause mitochondrial dysfunction. Within the mitochondria, superoxide dismutase 2 (SOD2) is the main antioxidant scavenger to buffer against a rise in superoxide radicals. We have previously shown that AA endothelial cells (ECs) exhibit lower SOD2 protein expression and heightened oxidative stress that contributes to racial differences in endothelial function. Therefore, we conducted this study to investigate racial differences in TNF- α -induced effects on mitochondrial respiration and key regulators of mitochondrial biogenesis in Human Umbilical Vein Endothelial Cells (HUVECs).

METHODS: HUVECs (n=6 cell lines; 3 CA & 3 AA) were cultured in one of two conditions: Control or TNF- α (10 ng/mL) for 4 hours. All experiments were conducted between passages 6-7. Western blotting procedures were used to measure protein expression for regulators of mitochondrial biogenesis (PGC1- α , TFAM, and NRF1). An oximeter chamber (Hansatch Instruments) was used to measure basal and maximal respiration rates in cells suspended in complete media. Respiration rates were normalized to number of viable cells (nmol/min/10⁶ ECs). A two-way ANOVA was used to compare all conditions.

RESULTS: No racial differences were found in mitochondrial respiration or protein expression of PGC1- α , TFAM, and NRF1 at baseline or in response to TNF- α stimulation.

CONCLUSIONS: Whereas mitochondrial function has been shown to influence racial differences in endothelial dysfunction, there were no racial differences in markers of mitochondrial biogenesis or mitochondrial respiration in response to an inflammatory stimulus. Future research should move towards investigating state III and IV complex activities in isolated mitochondria.

D8 EFFECTS OF SIMULATED WEIGHT LOSS ON LOWER EXTREMITY ELECTROMYOGRAPHY DURING LEVEL AND INCLINED WALKING

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BACKGROUND: Obesity increases lower extremity electromyography (EMG) activity during walking which is reduced with weight loss. **Purpose:** To determine how simulated weight loss, independent of changes in body volume, affects lower extremity EMG activity.

METHODS: Eight obese females (36.32 ± 4.0 kg/m²) walking at a self-selected speed (2.3 ± 0.4 mph) on a lower body positive-pressure treadmill during four conditions; control (CON), 10% incline (INC), 25% body weight support (BWS), and 25% BWS with 10% incline (BWS+INC). EMG activity of the vastus lateralis (VL), vastus medialis (VM), semitendinosus (ST), and medial gastrocnemius (MG) was collected during the final 30s of each stage and normalized to maximal voluntary isometric contraction (MVIC). Total EMG activity (iEMG), total spectral power (TSP), peak frequency (PF), and median frequency (MF) were calculated over 20 consecutive gait cycles for each subject.

RESULTS: Compared to CON, INC increased iEMG by approximately 35% in both VL and MG (p = 0.010 and 0.015, respectively). Conversely, BWS decreased iEMG of the VL (28%, p = 0.037) during level walking. Compared to INC, iEMG was lower in BWS+INC in VL (34%, p = 0.002) and MG (23%, p <0.001). Compared to CON, TSP was higher in INC for the VL (205%, p <0.001) and MG (56%, p <0.014). BWS significantly decreased TSP compared to CON in the MG (31%, p = 0.009). TSP was lower in BWS+INC compared to INC alone for VL (57%, p <0.001) and MG (31%, p = 0.083). Compared to CON, INC increased PF of the VL (28 v. 40Hz, p = 0.037), but this effect was prevented by BWS+INC. MF was not significantly affected by INC or BWS.

CONCLUSIONS: Simulated weight loss reduces EMG activity of the VL and MG, particularly during incline walking which is largely due to reduced EMG amplitude, not recruitment of different motor unit pools.

M1 VALIDITY ASSESSMENT OF SKINFOLD EQUATIONS TO ESTIMATE BODY COMPOSITION IN DIVISION-I MALE ATHLETES

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BACKGROUND: Body fat percentage (BF%) can be a major determinate in athletic performance. Traditional skinfold (SF) equations are often validated within a general population and may produce inaccurate results when applied to athletes. **PURPOSE:** To assess the validity of an athlete-specific (RT) and traditional skinfold equation (TSF) to a criterion 4-compartment model (4C) to estimate BF% in male collegiate athletes.

METHODS: Forty-eight Division-I male athletes performed four body composition tests (i.e., SF, dual-energy x-ray absorptiometry, bioelectrical impedance spectroscopy, and air displacement plethysmography). Body density was used to predict BF% using two SF equations (i.e., RT & TSF). The 4C BF% model was derived using total body water, body volume, body mass, and bone mineral density. Agreement between RT, TSF, and 4C was based on *r*-values, standard error of estimate (SEE), constant error (CE), and 95% limits of agreement (LOA).

RESULTS: 4-C (14.6±6.5%) displayed significantly greater BF% values as compared to RT (10.3±6.6; $p<0.01$; $d=0.7$; SEE=4.5). There were no statistical differences between TSF (13.96±6.3; $p=0.99$; $d=0.1$; SEE=4.5%) and 4-C. TSF displayed ± 12.4 LOA's around a CE of 0.7%. For RT, 95% LOA's were ±13.0 with a CE of -4.3%.

CONCLUSIONS: The RT equation had an unacceptable SEE and an excessive number of outliers (n=30) removed (i.e., unreliable BF%); thus, further research is warranted into the application of male athlete SF equations. However, the TSF, while not statistically significant, also provided a SEE outside of an acceptable range (i.e., 4.0%).

M2 DOES PHYSICAL ACTIVITY DURING LATE PREGNANCY IMPACT AN INFANT'S BODY COMPOSITION AT BIRTH?

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BACKGROUND: Exercise is typically regarded as having a positive impact on maternal and infant health. However, the relationship between maternal physical activity and infant body composition is unclear. The goal of the project is to determine how a physically active lifestyle during late pregnancy influences infant body composition.

METHODS: Pregnant women (34-39 weeks gestation) with low-risk pregnancies were given the Pregnancy Physical Activity Questionnaire (PPAQ) and an accelerometer to wear on their non-dominant wrist for 7 consecutive days. Approximately 24-48 hours after delivery, infant body composition was assessed utilizing air displacement plethysmography at the patients' bedside.

RESULTS: 43 pregnant women have participated to-date (age: 30.7±4.5 years, pre-pregnancy BMI: 25.6±5.5 kg/m²). Based on the PPAQ, maternal occupational activity and infant body fat percentage are negatively correlated ($r=-0.350$; $p=0.021$). There were no significant correlations between infant adiposity and maternal physical activity levels (sedentary, light, moderate) assessed via accelerometer, even after controlling for maternal body mass index. When women were divided up into the most active and least active pregnant women, active women tended to have leaner babies (13.0±3.5% vs. 14.9±6.6%); however, this result did not achieve statistical significance ($p=0.28$). Infant body fat percentage was not related to maternal body mass index ($r=-0.183$; $p=0.246$) or gestational weight gain ($r=0.108$; $p=0.583$). Maternal pre-pregnancy BMI and sedentary time were positively correlated ($r=0.359$; $p=0.029$).

CONCLUSIONS: Maternal physical activity does not appear to have a strong influence on infant body composition. However, mothers who have jobs involving physical activity may have leaner infants.

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M3 COMPARISON OF WAIST AND HIP CIRCUMFERENCE MEASURES FROM 3-DIMENSIONAL TECHNOLOGY AND MANUAL MEASUREMENTS

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BACKGROUND: Three-dimensional (3D) scanning technology is becoming increasingly popular to obtain quick anthropometric and body composition measurements and may be a practical alternative to manual assessment methods. The purpose of this study was to compare waist and hip circumferences measured from a 3D scan to manual measurements in healthy adults.

METHODS: Data was collected on 66 healthy male (n=22) and female (n=44) young adults (Mean ± SD: Age: 20.6 ± 1.1 yrs, BMI: 22.6 ± 2.0 kg/m²). Manual measurement of the waist was assessed at the narrowest part of the trunk region, and hip circumference was measured at the widest region of the buttocks. Circumferences were measured twice by the same researcher and averaged. Measurements corresponding to the same waist and hip regions assessed manually were automatically determined by the 3D scanner software. Paired-samples t-tests were utilized to determine differences between methods for the total sample and each sex. Manual measurements were used as the criterion to evaluate prediction error (standard error of the estimate [SEE]).

RESULTS: For the total sample, the 3D scan significantly underestimated waist (Mean difference (3D - manual) [MD]: MD: 6.3 ± 2.2 cm; $p<0.001$) and hip (MD: 2.8 ± 2.3 cm; $p<0.001$) circumferences compared to manual assessments. For the men, the 3D scanner significantly underestimated waist (MD: 6.6 ± 2.1 cm; $p<0.001$) and hip (MD: 2.2 ± 1.9 cm; $p<0.001$) circumferences. The same trend was seen for the waist (MD: 6.1 ± 2.2 cm; $p=0.000$) and hips (MD: 3.0 ± 2.5 cm; $p<0.001$) in women. Prediction error of hip circumference was greater for women (SEE=2.42 cm) compared to men (SEE=1.94 cm); waist circumference error was similar for women (SEE=2.14 cm) and men (SEE =2.05 cm).

CONCLUSIONS: 3D technology may underestimate waist and hip circumference estimates compared to manual techniques in normal weight adults. However, 3D technology may be useful to provide quick anthropometric measurements.

M4 ACUTE EFFECTS OF A HIGH GLYCEMIC INDEX MEAL COMBINED WITH PROLONGED SITTING ON VASCULAR FUNCTION

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BACKGROUND: Repeated exposure to acute prolonged sitting has been associated with increased risk for cardiovascular disease through endothelial dysfunction and increased arterial stiffness. Additionally, the Western diet, which commonly includes highly refined sugars with a high GI, has been shown to increase risk for developing cardiovascular diseases. The combined effects of these health behaviors upon cardiovascular function is unknown. Therefore, the purpose of this study was to investigate the acute effects of PS and consumption of a low or high GI meal on local and central arterial stiffness.

METHODS: 18 young, healthy participants (21± years, 70% F, 25.5±6.1 kg/m²) were randomized to: 3h sitting with a high GI beverage (HGI) or a low GI beverage (LGI). Central and peripheral arterial stiffness and function were assessed by measuring carotid-femoral (cf), brachial-femoral (bf), and femoral-ankle (fa) pulse wave velocity (PWV), respectively. For all outcomes, the effects of time (Pre vs. Post) and condition (LGI vs. HGI) were analyzed using linear mixed models with fixed effects of condition and random effect of time and participant.

RESULTS: A significant interaction effect was observed for bfPWV ($p=0.027$). bfPWV increased by 0.27 m/s in the LGI condition (95% CI: 0.2517, 0.669) and 0.45 m/s in the HGI condition (95% CI: 0.068, 0.485). There was no significant time x condition interaction or condition effect for faPWV ($p=0.178$). However, a significant time effect was observed ($\chi_{\text{interaction}} \text{ vs } \text{faPWV}=0.38 \text{ m/s}$; 95% CI: 0.219, 0.897).

CONCLUSIONS: Prolonged sitting significantly increases measures of peripheral and central arterial stiffness. The consumption of an HGI beverage led to larger increases in central arterial stiffness.

M5 THE ASSOCIATION BETWEEN ECHO INTENSITY AND NORMALIZED TORQUE AND POWER AS MEASURES OF MUSCLE QUALITY

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BACKGROUND: Previous studies have traditionally examined muscle quality by normalizing muscle strength (i.e., peak torque [PT]) to a measure of muscle mass. However, echo intensity (EI) or the quantitative gray-scale analysis of ultrasound (US) images has more recently been used to examine muscle quality. Given both measures are used interchangeably to quantify muscle quality; the relationship between these methods warrants further study. The purpose of this study was to assess the association between US derived EI and PT and peak power (PP) values normalized to limb lean mass (LLM) and limb fat mass (LFM).

METHODS: Thirty-nine healthy men (32.7 ± 8.2 yrs) completed one visit, where LLM and LFM were assessed with a regional limb-specific dual energy X-ray absorptiometry scan. Panoramic B-mode US imaging was used to determine subcutaneous fat corrected EI of the vastus lateralis. Peak torque was determined from three isometric maximum voluntary contractions on a calibrated isokinetic dynamometer with two minutes of rest between each. Peak power was determined from five consecutive isometric contractions at 40% PT. Peak torque and PP were then normalized to both LLM and LFM. Pearson's product-moment correlation coefficients were used to determine the association between EI and each of the normalized PT and PP values.

RESULTS: An increase in EI values was related to decreases in PT/LFM ($r=-0.666$, $P<0.001$) and PP/LFM ($r=-0.727$, $P<0.001$); however, there were no significant correlations between EI and both PT/LLM and PP/LLM ($P\geq 0.157$).

CONCLUSIONS: The lack of association between EI and traditional measures of muscle quality (PT and PP normalized to LLM) suggests they cannot be used interchangeably. Further, EI's significant relationship with LFM normalized strength values may suggest that EI is more sensitive to skeletal muscle adiposity.

M6 THE EFFECTS OF VISUAL FEEDBACK ON PHYSIOLOGICAL AND PERCEPTUAL RESPONSES DURING A VIRTUAL CYCLING CLASS

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BACKGROUND: Virtual cycling classes offer riders a unique exercise experience through cycling feedback of cadence, resistance and total work output on multi-touch consoles; however, despite popularity, little is known regarding physiological and perceptual responses when cycling with performance feedback in comparison to a typical Spin bike which lacks feedback. **PURPOSE:** This study compared intensity selection and perceptual responses between receiving cycling feedback vs. no feedback when completing a virtual Spin class.

METHODS: Individuals ($N = 14$) of varying aerobic fitness (VO_2 max 41.0 ± 8.0 ml/kg/min) completed a VO_2 max trial and two cycling sessions. Each session, completed on a Peloton bike, consisted of a preselected 30-minute Spin class; one session was completed with cycling feedback (VIS) of cadence, resistance, and total work output, and the other with no feedback (NOF). Following each bout, session RPE (SRPE) was estimated and a Physical Activity Enjoyment Scale (PACES) completed. Paired t-tests were used to compare cadence, resistance, and total work of the warm-up, workout, and cool-down of each session. Perceptual measures of SRPE and PACES were also compared between sessions using paired t-test.

RESULTS: Warm-up cadence was significantly higher for VIS (93.3 ± 6.7) vs. NOF (85.3 ± 12.3) ($p < 0.01$); whereas, cool-down resistance was significantly lower ($p < 0.01$) for VIS (30.2 ± 3.4) vs. NOF (36.0 ± 6.0) with no significant differences for workout portion. Perceptual measures were not significantly different, except for accomplishment approaching significance ($p = 0.09$) with a greater response for VIS vs. NOF. Lastly, the majority (93%) of participants preferred VIS over NOF.

CONCLUSIONS: Results suggest cycling feedback could assist exercisers in achieving instructor suggested intensity during warm-up and cool-down. Therefore, cycling feedback has the potential to improve exercise adherence due to increased preference and sense of accomplishment.

M7 REDUCED UNFOLDED PROTEIN RESPONSE IS ASSOCIATED WITH ANABOLIC RESISTANCE FOLLOWING MECHANICAL OVERLOAD IN APCMIN/+ MICE

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BACKGROUND: Although resistance exercise is a promising intervention to combat cancer cachexia, reduced anabolic response to the therapy has been reported. Unfolded protein response (UPR) plays an essential role to mediate exercise-induced adaptation in skeletal muscle. However, the change of UPR in response to increased weight-bearing on cachectic muscle is unknown. The purpose of this study was to determine whether UPR after 7-day mechanical overload would be altered in *Apc^{Min/+}* mice.

METHODS: Cachectic *Apc^{Min/+}* (Min, n=5) mice and age-matched Wild-type (WT, n=5) mice were used. Synergist ablation (SA) surgery were performed on the left leg whereas the right leg served as an internal control. At day 7 following the SA surgery plantaris muscles were excised. After proteins were extracted from the tissues, western blotting was performed using 80–120 µg of total protein. Paired t-test (control vs. overloaded muscle) and unpaired t-test (WT vs. Min) were used for statistical analysis.

RESULTS: At the time of SA surgery, Min mice lost 9.8% of body weight (BW) compared to their peak BW. Control plantaris weight in Min mice was smaller than that of WT mice (15.1 mg±0.3 vs. 18.7 mg±0.6, respectively). Seven-day mechanical overload increased plantaris weights in both mice, but the degree of hypertrophy in Min mice was less than that of WT mice (21.3%±4.6 vs. 43.3%±5.8, respectively). Western blot analysis showed Min mice had reduced phosphorylation (p-) of p70S6K subsequently the mechanical overload compared to WT mice (1.9-fold vs. 4.2-fold, respectively). In coincidence, the phosphorylated levels of eukaryotic translation initiation factor 2 (p-eIF2α), an indicator of UPR activation to attenuate general protein translation, were decreased in Min mice in response to the mechanical stimulus. Furthermore, when a relationship between the levels of p-p70S6K and p-eIF2α was examined, p-p70S6K levels were dependent on p-eIF2α levels in both mice ($p < 0.01$), but the slope of regression curve in Min mice was smaller than WT mice ($p < 0.01$).

CONCLUSIONS: These results suggest that decreased anabolic response following mechanical overload may attribute to reduced UPR in cachectic mice.

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M8 OCCUPATION-SPECIFIC PHYSICAL DEMANDS AND PHYSIOLOGICAL STRAIN OF AMERICAN FOOTBALL REFEREES WHILE OFFICIATING

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BACKGROUND: Occupational incidences of sudden cardiac death (SCD) are greater among workers that experience high levels of physical exertion, physiological strain, and extreme thermal environments. American football referees fall under this distinction, yet are underrepresented in occupational research. The purpose of this study is to bridge this gap by quantifying the physical demands and physiological strain they experience while officiating.

METHODS: Twelve male officials (mean±SD; age=43±11 y, body mass index [BMI]=31.9±7.2 kg/m², 67% white), across 3 games, provided urine samples for urine specific gravity (U_{SG}) determination, ingested core temperature (T_c) pills, and wore GPS-enabled performance monitoring systems. Outdoor conditions were monitored using a weather meter. Analyses included descriptive statistics and bivariate correlations.

RESULTS: Games lasted ≈2.5 h and evening weather conditions were typical of the Southeastern US (wet bulb globe temperature: 23.5±2.2°C, relative humidity: 72.5±9.2%). Across all 3 games, officials were hypohydrated (58%, $U_{SG}>1.020$); they covered an average of 5.5±1.6 km (total distance) at a speed of 1.9±0.3 kmph, with corresponding T_c and heart rate (HR) values of 37.4±0.4°C (peak T_c =38.3±0.4°C) and 132±16 bpm (peak HR: 169.2±17.5 bpm), respectively, across all referees and over the entire sampling period. Higher relative humidity at the start of each game was associated with greater physiological strain (average HR: $r=0.61$, $P=0.04$; peak HR: $r=0.56$, $P=0.06$). Pre-game hydration status ($r=0.50$, $P=0.09$) and BMI ($r=0.50$, $P=0.09$) tended to elicit greater physiological strain (defined as the proportion of the game spent above 85% of age-predicted maximal HR).

CONCLUSIONS: Football referees experience elevated levels of physiological strain while performing officiating duties. Individual and environmental factors appear to influence levels of strain and should be explored in a larger and more diverse sample of referees to identify patterns and develop strategies to best mitigate strain and prevent SCD.

U1 GATHERING YOUR SEA LEGS - EXTENDED DURATION IN AN OFFSHORE ENVIRONMENT INCREASES POSTURAL SWAY

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BACKGROUND: Mal de débarquement syndrome (e.g. sea legs), the feeling of continuous movement following exposure to boat movement, may negatively impact postural control. This field-based study examined possible changes in postural control after prolonged exposure to boat movement at sea.

METHODS: Balance of 24 adults (13M, 11F; age: 35±12 y; height: 170.3±8.8 cm; mass: 84.2±17.0 kg) was assessed in the bilateral stance on a force platform before (PRE) and after (POST) a 7-hour deep sea fishing excursion. Eyes open (EO), eyes closed (EC), eyes open on foam surface (EOF), and eyes closed foam surface (ECF) conditions were tested and average sway, sway velocity, and sway range in the medial/lateral (ML) and anterior/posterior (AP) directions were compared PRE/POST using a paired *t*-test ($p < 0.05$).

RESULTS: Significantly greater ML sway ($p = 0.004$; PRE: 0.40±0.14 cm vs POST: 0.47±0.17 cm), ML sway range ($p = 0.001$; PRE: 2.42±0.66 cm vs POST: 2.87±0.99 cm), AP sway ($p = 0.045$; PRE: 0.63±0.17 cm vs POST: 0.72±0.30 cm), and AP sway range ($p = 0.020$; PRE: 4.01±0.80 cm vs 4.64±1.56 cm) were observed at POST during EOF. During ECF, significantly greater ML sway ($p = 0.027$; PRE: 0.49±0.13 cm vs POST: 0.56±0.15 cm) and AP sway ($p = 0.020$; PRE: 0.87±0.21 cm vs POST: 0.98±0.24 cm) were observed at POST.

CONCLUSIONS: These findings suggest that 'sea legs' impairs the ability to utilize appropriate sensory information in conditions dependent on somatosensory and vestibular feedback resulting in increased postural sway.

U2 INFLUENCE OF TYPE 2 DIABETES AND CARDIOVASCULAR DISEASE FAMILY HISTORY ON METABOLIC SYNDROME SEVERITY

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BACKGROUND: Family history of cardiovascular disease (CVD) is considered a strong predictor of developing metabolic syndrome (MetS), in part through promoting endothelial dysfunction. In addition, a family history of type 2 diabetes (T2D) relates to lower metabolic insulin sensitivity and may compound their MetS risk severity. We examined in people with MetS if a family history of CVD and T2D (CVD+T2D) increases MetS risk severity compared to individuals with a family history of CVD only (CVD).

METHODS: Twenty, middle-aged obese individuals with MetS (55.9 ± 6.5yrs; 32.5 ± 3.6kg/m²) were divided into CVD (n=9; 6F) or CVD+T2D (n=11; 9F). MetS was defined using the NCEP ATP III criteria. MetS severity Z-score was calculated from waist circumference, blood pressure, fasting blood glucose, triglycerides, and high-density lipoproteins. Metabolic insulin sensitivity (i.e. glucose infusion rate, GIR) was measured using a 2-hr hyperinsulinemic-euglycemic (40 mU/m²/min, 90 mg/dl) clamp. Insulin-stimulated brachial artery flow-mediated dilation (FMD) was also measured as the change from fasting to 2-hr during the clamp to assess endothelial function and gain tissue-specific insight into the origin of insulin action.

RESULTS: There was no difference in anthropometrics between groups. There was also no statistical difference between CVD and CVD+T2D in MetS severity (2.62±1.12 vs. 1.65±0.56, $P = 0.42$), GIR (2.35±0.55mg/kg/min vs. 2.63±1.56 mg/kg/min, $P = 0.86$), or insulin-stimulated FMD (0.33±1.57% vs. 1.68±1.19%, $P = 0.52$). However, waist circumference was inversely correlated to GIR ($r = -0.63$, $P = 0.01$).

CONCLUSIONS: In adults with MetS, T2D family history does not exacerbate MetS severity in adults with CVD family history. However, waist circumference appears to be important for lowering metabolic insulin sensitivity. Thus, targeting abdominal fat may contribute to improved metabolic health independent of T2D and/or CVD family history.

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U3 VALIDATION OF HEART-FEMORAL PULSE WAVE VELOCITY AS A MEASURE OF CENTRAL ARTERIAL STIFFNESS

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BACKGROUND: Central Pulse Wave Velocity (PWV) is the gold-standard measure of arterial stiffness and an important clinical parameter for evaluating cardiovascular risk. The most frequently used measure of central PWV is carotid-femoral PWV (cfPWV); however, cfPWV may be unsuitable for use in patients who are obese, have had an ischemic stroke, or those with advanced carotid artery atherosclerosis. A potential alternative is heart-femoral PWV (hfPWV), which is simpler to conduct as the measurement does not require assessment of the carotid artery. The aims of this study were to determine (1) the strength of the association between cfPWV and hfPWV; and (2) determine whether change in cfPWV is associated with change in hfPWV.

METHODS: Thirty healthy participants (23.5 y ± 2.9, 53% F, BMI 24.1 ± 2.3) were recruited for Aim 1, and 20 participants (24.1 ± 3.1, 55% F, BMI 23.9 ± 2.5) for Aim 2. Using Doppler ultrasound, cfPWV was measured using the foot-foot method on ECG-gated doppler waveforms captured from the common carotid and superficial femoral arteries. hfPWV was measured using the R wave to the foot of the superficial femoral artery doppler waveform. To induce change in cfPWV (Aim 2) the upper leg was occluded to 60 mm Hg. To estimate inter-individual associations between cfPWV and hfPWV (Aim 1), Pearson's product moment correlation was used. To estimate intra-individual associations between change (cuff vs. baseline) in cfPWV and change in hfPWV (Aim 2), the repeated measures correlation package for R was used.

RESULTS: There was a large positive correlation ($r = 0.72$, 95% CI 0.48-0.86, $P < 0.001$) between hfPWV and cfPWV (Aim 1). There was also a large positive correlation between change in cfPWV and change in hfPWV ($r = 0.83$, 95% CI 0.61-0.93, $P < 0.001$).

CONCLUSIONS: The current findings indicate that cfPWV and hfPWV are strongly associated, and that change in cfPWV is strongly associated with change in hfPWV.

U4 EFFECTS OF YOGA PARTICIPATION ON DYNAMIC BALANCE AND CORE STRENGTH

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BACKGROUND: Yoga is identified by the NIH as a top-10 complementary health approach and continues to grow in popularity and practice. Previous studies investigated physical changes in older adult populations related to stroke recovery, cancer, and fall prevention. Yet, few studies examined college-aged populations and findings are limited to outcomes of perceived stress. The purpose of this study was to investigate the effects of participation in a structured yoga class on dynamic balance and core endurance.

METHODS: 17 students enrolled in introductory yoga (3M,14F; 21.94±2.68yrs; 167.98±11.32cm; 67.43±14.07) participated. We used a pre-posttest design in a laboratory setting. Within the first 2 weeks we assessed balance using a modified Star Excursion Balance Test (SEBT) in 3 directions: anterior (AR), posterolateral (PL), posteromedial (PM). Participants completed a series of single-leg reaches in each direction for maximal distance, in a randomized order. Up to 6 practice trials were allowed, followed by 3 test trials that were averaged and normalized to true limb length. To assess core endurance, participants held a high plank (HP) and bilateral side planks (SP), during a single trial for maximal time, with 1-minute of rest between trials. All participants reported for follow-up testing 8-weeks later. We used SPSS v.24. for all statistical analyses with an alpha level < 0.05. Separate 2x2 repeated measures ANOVAs were used to assess for limb by time differences in each direction of the SEBT and SP. A paired *t*-test was used to determine differences in HP performance.

RESULTS: For all SEBT directions there were no significant interactions (AR: $P = 0.454$, PM: $P = 0.307$, PL: $P = 0.479$). There were also no main effects for limb (AR: $P = 0.640$, PM: $P = 0.805$, PL: $P = 0.920$) or for time (AR: $P = 0.131$, PM: $P = 0.088$, PL: $P = 0.472$). In the SP, there was no significant interaction ($P = 0.780$) and no main effect for side ($P = 0.073$) or time ($P = 0.331$). There were no significant differences in HP ($P = 0.788$).

CONCLUSIONS: A structured 8-week yoga intervention does not produce significant improvements in dynamic balance or core endurance. The large variance in performance likely limited our findings. Future directions of study include assessments of strength, flexibility and using modified methods for progressively assessing core endurance.

U5 INFLUENCE OF WALKING AND SITTING TIME ON PHYSIOLOGICAL AND BEHAVIORAL MEASURES OF STRESS IN WOMEN

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BACKGROUND: Epidemiological studies suggest that regular participation in physical activity (PA) may help to prevent the development of depression and anxiety disorders in women, however the precise mechanisms by which PA may be protective against these disorders is not fully understood. Considering that impaired stress regulation has been strongly linked to both the etiology and maintenance of depression and anxiety, this study aimed to investigate whether regular PA is associated with behavioral and physiological measures of stress regulation in women.

METHODS: Following a two-tiered screening process, 26 women (18-45y, mean age: 24.7 +/- 6.8y) who were medication-free and had regular menstrual cycles completed: (1) an enrollment visit, (including the assessment of habitual PA, trait anxiety, perceived stress, sleep quality, and cardiorespiratory fitness (CRF) via maximal oxygen consumption during exercise); (2) a one-week sleep monitoring period (including daily sleep diaries and wrist actigraphy); and (3) measurement of salivary cortisol levels. Saliva was collected during the follicular phase of the menstrual cycle, in order to control for the strong influence of ovarian cycle hormone fluctuations on physiological and behavioral stress measures.

RESULTS: Higher self-reported total walking time per week was significantly associated with lower levels of perceived stress ($r = -.41$, $p < 0.05$), and lower trait anxiety ($r = -.51$, $p < 0.01$). Higher CRF was also associated with lower levels of perceived stress ($r = -.32$, $p = 0.10$; trend). Consequently, higher total time spent sitting per week was significantly associated with higher salivary cortisol levels ($r = .71$, $p < 0.001$; $n = 21$).

CONCLUSIONS: Results suggest that, in women, regular PA may help to improve stress processing and associated physiological markers of stress, namely circulating cortisol. Further investigation, including objective measures of physical activity are needed to confirm these relationships.

U6 EFFECTS OF PICKLE JUICE ON PERCEPTION OF EFFORT AND HEAT STRAIN IN FEMALE SOCCER PLAYERS

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BACKGROUND: Pickle juice (PJ) has been used as an ergogenic aid in sport performance. This study examines the effect of pickle juice on rating of perceived exertion (RPE) and thermal sensation (TS) on female soccer players in a hot and humid environment during a simulated soccer match.

METHODS: 10 female soccer players completed two 85 minute simulated soccer match intensities on a treadmill at a WBGT of 31.2 degrees Celsius and 80% relative humidity in a in a heat chamber which allowed control of the environment. Sessions were separated by at least 72 hours and were counterbalanced, with one session was conducted with water (H2O) and with the PJ session subjects drank 2 boluses of pickle juice equivalent to 1 ml of pickle juice per kg of mass and water ad libitum. Subjects reported RPE and TS every 15 mins (0,15,30,45,60, & 75 mins). Repeated measures ANOVA were conducted to detect any differences.

RESULTS: Subjects who ingested PJ reported lower RPE and TS scores overall ($p=0.132$). RPE following PJ ingestion was lower at 60 mins (PJ = 10.9+/-2.0 vs. H2O 13.4+/-3.0), and at 75 mins (PJ =13.9+/-3.0 vs. H2O = 15.4+/-3.0) compared to water only. TS was lower throughout PJ exercise trials compared to H2O (mean difference=0.14, $p=0.251$).

CONCLUSIONS: The results of this study suggest that PJ may subjectively reduce the perception of exertion and perception of heat strain. Lower perceptions of heat strain and exercise intensity may improve psychological and physiological performance of the athletes in the hot and humid environment. This study was partially supported by The Pickle Juice Company, The Orr Endowed Research Grant, and The Southeastern Kinesiology Foundation

U7 POLYPHENOL RICH SUPPLEMENTATION ON MARKERS OF RECOVERY FROM INTENSE RESISTANCE EXERCISE

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BACKGROUND: While resistance exercise is a powerful stimulus to induce gains in strength and hypertrophy, paradoxically resistance exercise increases markers of oxidative stress, skeletal and cardiac muscle damage, and transiently reduces physical performance. These responses to exercise are a necessary part of the adaptation process, providing the level of stress does not exceed the ability of the body to recover. The purpose of this study was to assess whether polyphenol supplementation, previously shown to have anti-oxidative properties, reduces muscle damage and soreness and whether the recovery of physical performance is enhanced as a result.

METHODS: 15 men (mean age: 26.2±5.3 years; height: 184.3±8.2 cm; weight: 92.9±15.6 kg; barbell back squat 1RM: 146.8±30.6 kg) completed a randomized, cross-over, placebo controlled design where subjects performed 6 sets of 10 barbell back squats at 85% 1-repetition maximum and were assessed for markers of recovery immediately, 1-, 3-, 24- and 48-hours following the protocol on two occasions; once following 1 week of 500mg of tart cherry supplementation (TC) and once following a placebo (PL) supplement. Markers of recovery included plasma creatine kinase MB isoenzyme (CKMB), muscle soreness by visual analog scale, countermovement vertical jump height (CMJ) by forceplate, and grip strength by isokinetic dynamometer.

RESULTS: With regards to muscle damage, there was a statistically significant ($p=0.003$) increase in CKMB concentration in the PL when compared to the TC group (PL: 21.1±11.5 ng·ml⁻¹ vs. TC: 0.0±11.3 ng·ml⁻¹) 60 min post. There was a statistically significant ($p=0.015$) increase in muscle soreness in the PL when compared to the TC group (PL: 5.2±2.9 cm vs. TC: 3.2±1.3 cm) at 48 hours. There were no statistically significant differences jump power or handgrip dynamometer strength, although there was a trend ($p=0.08$) towards significance (PL: -0.1±3.4 kg vs. TC: 1.5±2.9 kg) in grip strength.

CONCLUSIONS: In conclusion, polyphenol supplementation was shown to reduce soreness following intense resistance exercise. In addition, polyphenols were shown to reduce CKMB, a marker of cardiac muscle damage. In this study, the damage protocol was not sufficient to cause reductions in power performance, and thus the supplement was unable to demonstrate reduced attenuations of performance as a result of the decreased damage.

U8 THE EFFECTS OF ANXIETY ON THE UNPLEASANTNESS OF EXPERIMENTALLY-INDUCED DYSPNEA DURING EXERCISE

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BACKGROUND: Negative affective states can impact the perception of breathlessness in patients with cardiopulmonary disease. Yet, it is unclear how anxiety may alter experimentally-induced dyspnea during exercise in otherwise healthy adults. The purpose of this study was to examine emotional responses to experimentally-induced dyspnea in students of various anxiety levels.

METHODS: Subjects (N=18, 13 females, 21±2 y, 169.1±8.7 cm, 69.9±13.7 kg) were categorized (Minimal, Mild, Moderate) based on responses to the Generalized Anxiety Disorder (GAD-7) questionnaire. Subjects completed four cycling tests at 50% of their predetermined maximal aerobic capacity and separated by 20-min of rest. During the exercise, dyspnea was induced via 1) external dead space (DS), 2) resistance loading (RS), or 3) lessened via a heliox gas inspirate (HEL) and compared with control (CON). Ratings of perceived breathlessness (RPB) and unpleasantness of breathlessness (RPU) were collected during exercise. At rest, subjects rated unpleasantness and accompanying negative feelings (depression, anxiety, frustration, anger, and fear) associated with their dyspnea during exercise using a visual analog scale (VAS).

RESULTS: No group by challenge interactions were observed for perceptual measures. During CON exercise, RPB and RPU were 2±1AU and 1±1AU, respectively. Use of DS, but not RS or HEL, significantly altered RPB (3±1AU) and RPU (3±1AU) compared with CON ($p<0.05$). VAS ratings of unpleasantness and anxiety, but not depression, frustration, anger or fear, were increased during DS compared with CON ($p<0.05$). GAD-7 scores were positively correlated with VAS ratings of unpleasantness and depression during CON ($p<0.05$).

CONCLUSIONS: Individuals of various anxiety levels had similar distress ratings to experimentally-induced dyspnea. Additionally, a chemical (CO₂) stimulus during exercise was perceived to be more unpleasant and anxiety-inducing than resistance loading, which was similar to control.

RF1 HIGH CONCENTRATED BEETROOT JUICE SUPPLEMENT IMPROVES CYCLING METRICS

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BACKGROUND: High Concentrated Beetroot Juice Supplement Improves Cycling Power, VO₂, Time to Exhaustion, Heart Rate and Anaerobic Threshold in Trained Cyclists. The purpose of the study was to determine the effects of a single dose of a high concentrate dietary nitric oxide (NO₃⁻) on cycling power, VO₂, time to exhaustion, heart rate, and anaerobic threshold in trained cyclists.

METHODS: Twenty-one male and female cyclists (16 males and 5 females) participated in a double-blind, randomized study in which the subjects consumed either a single-dose (5 ounces) of a low dose organic beetroot juice (placebo) or a highly concentrated beetroot endurance superfood 2 hours before performing a volitional maximal cycling test on a stationary trainer. The subjects performed a baseline cycling test to volitional fatigue following a ramped protocol.

RESULTS: Compared to the placebo group, the intervention group increased power in watts 5.97%; VO₂ peak 3.57%; time to exhaustion 3.23%; heart rate threshold at 210 watts 3.77%; and anaerobic threshold 6.63%.

CONCLUSIONS: A single-dose of a highly concentrated nitric oxide dietary supplement 2 hours before intensive cycling improved peak power (watts), increased time to exhaustion, increased VO₂ peak, higher anaerobic threshold, and a reduced heart rate at sub-anaerobic threshold.

RF2 RELATIONSHIP OF SLEEP QUANTITY AND QUALITY TO RECOVERY AND PERFORMANCE IN PROFESSIONAL SOCCER PLAYERS

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BACKGROUND: Monitoring training load is an important consideration for athletes who are subjected to various amounts of stress throughout a competitive season. Increasingly, sleep monitoring has been implemented to gauge recovery in an effort to quantify acute effects of practice and avoid overtraining during the season. **PURPOSE:** To determine the relationship between self-reported quantity and quality of sleep to recovery and performance metrics in soccer players.

METHODS: 22 professional soccer players were monitored during the course of a nine month competitive season. Prior to the start of each practice, players self-reported quantity of sleep in hours (HRS), as well as quality of sleep (SQS) and perceived recovery (PRS) via 10-point Likert-based scales with verbal anchors. Players also recorded a pre- and post-practice vertical jumps. Change of post- to pre-practice vertical jumps (ΔVJ) were used for analysis. Pearson correlations for continuous variables, and Spearman-rho correlations for categorical variables, were used to determine the relationship of HRS and SQS to PRS and ΔVJ .

RESULTS: A significant, very weak, positive correlation was found between HRS and PRS ($r = 0.13, p < 0.01$) and a weak positive correlation existed between HRS and SQS ($r = 0.36, p < 0.01$). SQS showed a significant, weak, positive correlation with PRS ($r = 0.31, p < 0.01$) and a weak, negative correlation with ΔVJ ($r = -0.10, p < 0.01$).

CONCLUSIONS: Increases in quantity and quality of sleep were related to higher perceived recovery in professional soccer players. However, given the weak nature of the relationship, caution should be taken when applying self-reported sleep variables to determine pre-training recovery.

RF3 DETERMINATION OF A NOVEL BODY FAT PREDICTION EQUATION IN COLLEGIATE ATHLETES

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BACKGROUND: Body fat percentage (BF%) prediction equations are traditionally based upon a 3- or 7-site skinfold (SF) assessment. While athlete-based algorithms exist, the standard error of the estimate (SEE) for these equations may range from ~3.4 to >3.9%. **PURPOSE:** The purpose was to determine a novel skinfold regression equation to 1) reduce the number of SF sites needed; and 2) reduce the SEE, as compared to a traditional model, for determining BF% in collegiate male and female athletes.

METHODS: Ninety-nine (males: n=29; females: n=70) division-I athletes underwent a battery of body composition testing to estimate BF% using an athlete-specific SF equation (i.e., ASF). The new regression model (NM), for each gender, was determined via forward method regression using SF thickness from each of the seven sites (i.e., chest, triceps, midaxillary, suprailiac, subscapular, abdomen, and thigh), age, height, and weight as independent variables and a criterion 4-compartment model (4C) as the dependent variable. SEE, adjusted *r*-squared and 95% limits of agreement (LOA) between the new SF models (NM) and existing model were used to compare predicted BF%.

RESULTS: For males, TSF BF% was significantly lower than 4C ($p < 0.01$) and had a SEE = 4.4%, $r^2 = 0.29$, and 95% LOA of ± 8.6 around a constant error of 5.02%. However, for males, NM provided an equation utilizing only midaxillary and weight as 4C BF% predictors (SEE=3.57%; $r^2 = 0.53$; LOA's ± 6.99) and displayed no significant differences in mean BF% ($p = 1.0$). For females, TSF elicited a SEE=3.68%, $r^2 = 0.42$, and 95% LOA of ± 7.21 with a constant error of 2.7% and BF% was significantly lower than 4C ($p < 0.01$). NM, using midaxillary and triceps SF thickness, reduced SEE to 3.48% and LOAs to ± 6.82 and increased r^2 to 0.47, with no mean difference to 4C ($p = 1.0$).

CONCLUSIONS: Reassessment of SF BF% equations may be warranted as new models may reduce prediction error associated with multiple site testing (i.e., 3- vs 7-sites). Additionally, consideration of the midaxillary as a potential universal SF site may be warranted within 3-site SF BF% equations.

RF4 IMPACT OF VIRTUAL REALITY GENERATED CONSTRUCTION ENVIRONMENTS AT DIFFERENT HEIGHTS ON POSTURAL STABILITY

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BACKGROUND: Falls due to postural instability are common in construction work environments especially from a height. The purpose of the study was to investigate the impact of virtual reality (VR) generated work environments at different virtual heights on postural stability.

METHODS: Nineteen healthy adults were analyzed for static standing postural stability study tested in real (No VR) environment and in three VR environments, randomly assigned, at virtual heights of 0ft (VR0), 40ft (VR40) and 120ft (VR120). Postural stability was quantified using center of pressure postural sway variables and analyzed using a one-way repeated measures ANOVA. Additionally, all participants completed a simulation sickness questionnaire (SSQ) before and after VR exposure and a presence experience questionnaires (PQ) after VR exposure.

RESULTS: Significant postural instability ($p < 0.05$) was identified between VR conditions and No-VR condition, in which increased postural instability was evident in all VR conditions compared to No-VR condition. Among the VR conditions, VR40 induced the greatest postural instability compared to other VR conditions. Scores from the SSQ for all participants except one (excluded) were within a pre-post score difference of 5. Scores from the PQ were (mean = 104.21, SD = 14.03, Min = 72, Max = 129).

CONCLUSIONS: Findings suggest that VR environments regardless of virtual height, induced significantly increased postural instability, which can be attributed to visual sensory conflicts of the postural control system resulting from VR use. Differences in postural stability at different VR heights could be attributed to the saturation of visual cues. Participants' responses on SSQ and PEQ confirmed the feasibility of using VR to represent realistic immersions in virtual heights.

RF5 CHARACTERIZING 7 DAY 24-HOUR URINARY HYDRATION MARKERS IN COLLEGE-AGED MEN AND WOMEN

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BACKGROUND: Maintaining a day-to-day state of euhydration is advantageous for acute and long-term health. However, little data exists examining 24h hydration status in free-living emerging adults (18 - 25y). Thus, the purpose of this study was to assess 24h urinary hydration markers across 7 days in male and female college students.

METHODS: Eighteen participants (male, n=11; female, n=7; mean±SD; age, 23±3y; height, 164.6±15.3cm, body mass, 73.48±15.86kg; body fat, 19.4±9.4%) provided a 24-hour urine sample on 7 consecutive days. Measures of 24h urine volume (U_{VOL}), urine osmolality (U_{OSM}), urine specific gravity (U_{SG}), and urine color (U_{COL}) were assessed each day. Differences in 24h urinary hydration markers between weekdays and weekend days were assessed.

RESULTS: Across 7 days, mean U_{VOL} , U_{OSM} , U_{SG} , and U_{COL} was 1.59±0.89 L, 628±284 mOsm·kg⁻¹, 1.020±0.007, 3.8±1.6, respectively. There were no differences (all $p > 0.05$) between weekday and weekend days for mean U_{VOL} (1.61±0.82 vs. 1.56±0.72 L), U_{OSM} (626±270 vs. 627±235 mOsm·kg⁻¹), U_{SG} (1.020±0.007 vs. 1.020±0.006), and U_{COL} (3.8±1.4 vs. 3.8±1.5). Mean weekend day measures of U_{VOL} (adj $R^2 = 0.507$, $p = 0.001$), U_{OSM} (adj $R^2 = 0.547$, $p < 0.001$), U_{SG} (adj $R^2 = 0.551$, $p < 0.001$), and U_{COL} (adj $R^2 = 0.608$, $p < 0.001$) were all significantly associated with mean weekday measures.

CONCLUSIONS: Our results suggest that, in this sample population of college students, individuals tended to have stable 24-hour urinary hydration measures across weekdays and weekend days. Despite finding relative stability in 24 hour urinary hydration markers across a week, we are unable to discuss factors associated with day-to-day variation in these measures. Integrating other factors such as previous personal and family medical history, physical activity, dietary intake, body composition, racial/ethnic background, and socioeconomic status may further elucidate variations in day-to-day hydration status and the role hydration plays in emerging adults on health.

RF6 THE RELATIONSHIP BETWEEN MENTAL TOUGHNESS AND THE ERGOGENIC EFFECTS OF MUSIC DURING EXERCISE

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BACKGROUND: Previous research has found that both music and mental toughness (MT) may affect exercise performance; however, no study has examined the relationship between MT and music on exercise performance. Therefore, the purpose of this study was to examine the associations among MT, aerobic fitness, and music during exercise.

METHODS: Thirty-one recreationally-active individuals (22.13±2.11 yrs, 25.15±2.94 BMI, 42.89±5.31 mL·kg⁻¹·min⁻¹; 65.5% male) were recruited for this study. Participants completed a MT questionnaire and performed a VO_{2max} test on the treadmill. Participants then completed two counterbalanced, experimental trials consisting of exercise with: 1) no music; and 2) self-selected music from a personalized playlist. For each experimental trial, participants performed a time-to-exhaustion (TTE) run at 80% VO_{2max} , separated by at least 48 hours. Independent sample t-tests were used to examine differences between the two trials, while Pearson correlations were conducted to examine the associations among aerobic fitness, MT, and TTE for both music and non-music conditions. Linear regression was used to investigate relationships between MT and change in exercise performance (ΔTTE) between music conditions.

RESULTS: There were no significant differences between minutes in TTE for the no music condition (TTE_{NM}; 12.23±5.24) and self-selected music condition (TTE_{SSM}; 14.18±4.79). Moderate to strong correlations with VO_{2max} were observed for TTE_{SSM} ($r = .39$, $p = 0.030$), TTE_{NM} ($r = .52$, $p = 0.003$), and MT ($r = .40$, $p = 0.024$). Linear regression revealed that a higher MT score was associated with a smaller change between the two performance trials ($F_{1, 29} = 4.42$, $r = -.63$, $p = 0.040$), irrespective of order effect or aerobic fitness.

CONCLUSIONS: Associations existed between aerobic fitness, MT, and exercise performance for both music and non-music trials. Participants with greater MT experienced less of a change between performance trials, suggesting that individuals with greater MT may demonstrate consistent patterns of performance, irrespective of aerobic fitness or the presence of external factors. Understanding the relationship between MT and music during exercise may allow exercise professionals to better tailor their training programs to each individual, increasing exercise performance and adherence.

RF7 EFFECTS OF FOOT ROTATION ON KNEE JOINT REACTION FORCES DURING RUNNING

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BACKGROUND: Altering foot rotation reduces external knee adduction moments during walking and running. However, reducing moments may not result in reduced joint reaction forces. The purpose of this study was to examine the effects of internal and external foot rotation on knee joint reaction forces during running.

METHODS: Motion capture and force data were recorded on nineteen healthy adults (22.3±4.0 years, 67.99±10.27 kg, and 1.77±0.10 m) running at 3.5 m/s with normal and maximal comfortable external (EXT) and internal (INT) foot rotation. Next, musculoskeletal simulations were performed using the Rajagopal 2015 model and OpenSim (SimTK). All data were low pass filtered at 10 Hz. Models were scaled to each subject's anthropometric parameters. Inverse dynamics were derived by combining inverse kinematics and force data. Muscle excitations were derived using Static Optimization, including muscle physiology parameters. Joint Reaction Forces were obtained by combining inverse kinematics, force data, and muscle excitations. Forces were normalized to a full stride (stance: 0-36% & swing: 37-100% stride). A within-subjects ANOVA via Statistical Parametric Mapping determined differences in resultant knee joint reaction force waveforms.

RESULTS: The EXT condition decreased early stance (0-2% stride) and late swing phase (92-100% stride) forces, but increased forces during early swing phase (44-46% stride) compared to normal (all $p < 0.01$). The INT condition reduced forces during late swing phase (92-94% stride) compared to normal (all $p < 0.01$). The EXT reduced forces during early stance (0-1% stride) and late swing (97-100% stride) compared to INT (all $p < 0.01$).

CONCLUSIONS: Despite the known success of altered foot rotation on reducing external knee adduction moments during walking and running, forces were only reduced during low-loading portions of running. Thus, it appears altered foot rotations do not improve knee loading during running.

RF8 ASSESSING ENERGY AVAILABILITY AND MACRONUTRIENT CONTENT DURING A DIVISION I SOCCER SEASON IN FEMALE ATHLETES

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BACKGROUND: Low energy availability (EA) is related to adverse physiological effects including hormonal disruption. The purpose of this study was to evaluate in-season changes in EA and to assess biomarkers related to EA, macronutrient intake, body composition (BC), and exercise energy expenditure (EEE).

METHODS: Prior to preseason and weeks 2, 4, 8 & 12, female collegiate soccer players (N=11) underwent blood draws to assess thyroid hormones, leptin (LEP), growth hormone (GH), IGF-1, total cortisol (CORT) and prolactin (PRL) and BC tests to determine fat free mass (FFM) and percent body fat (%BF). The Polar TeamPro system was used to assess EEE/kg during all training throughout the season. Energy intake (EI), protein (PRO), carbohydrate (CHO) and FAT per kg were tracked via 3-day diet logs. EA was calculated as $EI_{AVG} - EEE_{AVG} / FFM$ for each time block. RM-MANOVAs with univariate follow-ups were conducted to assess changes in energy status, BC and EEE. Area under the curve (AUC) was calculated for biomarkers, EA, macronutrients and BC. Pearson-product correlations were used to assess AUC relationships with significance set at $P < .05$. Trends were considered $P < 0.1$.

RESULTS: Time main effects were seen for all macronutrients, EA, EI and EEE, with the highest values seen during preseason ($P < .05$). Time main effects were seen with increases in FFM and declines in %BF ($P < .05$). EA correlated with GH ($r = .63$), PRL ($r = .65$) and FreeT₄ ($r = .69$). %BF correlated with CORT ($r = .70$) and LEP ($r = .71$), with a trend for T₄ ($r = .55$). FFM correlated with PRO ($r = -.65$), with trends for FAT ($r = -.57$), IGF-1 ($r = .58$), FreeT₄ ($r = .53$) and CORT ($r = -.57$). PRO correlated with GH ($r = .73$), PRL ($r = .75$) and FreeT₃ ($r = .61$), with a trend for EEE ($r = .53$). FAT correlated with GH ($r = .65$), PRL ($r = .76$) and FreeT₄ ($r = .60$), with a trend for IGF-1 ($r = -.57$). CHO correlated with LEP ($r = .60$) and PRL ($r = .62$). EEE correlated with LEP ($r = -.63$) and trended with PRL ($r = .56$).

CONCLUSIONS: EA was reportedly highest in preseason and declined as the season progressed, despite increases in FFM. Adherence and accuracy challenges with self-reported EI limits the feasibility of this method in teams. Associations between BC, EEE and markers of stress/metabolism point to the efficacy of biomarker monitoring as a method to assess metabolic status and recovery in athletes, thus enabling in-season adjustments to training and nutrition.

P1 MEASURING LIMB OCCLUSION PRESSURE USING DIFFERENT VASCULAR DOPPLERS

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BACKGROUND: Blood flow restriction (BFR) in physical therapy settings requires personalized restriction pressures in order to remain a safe rehabilitation modality. Measuring limb occlusion pressure (LOP) is one method of setting the pressure relative to each patient and is performed with a vascular doppler and inflatable cuff. Several dopplers are available, but have not been compared. This study was performed to compare the Hokanson MD6 and the Edan SonoTrax vascular dopplers in measuring LOP.

METHODS: In a randomized crossover design, 20 participants (women=10, men=10) visited the laboratory once. Arm and thigh circumferences were measured. After 10min of rest, LOP was measured in the arm and leg with 5cm and 10cm wide inelastic cuffs, respectively. Measurements were repeated every 5min until LOP was measured in both limbs with both dopplers. Bland-Altman analyses (MD6 - SonoTrax) were performed and limits of agreement (LOA) calculated. Two one-sided tests of equivalence with lower and upper equivalence bounds of -5 mmHg to 5 mmHg were calculated. Results are reported as mean (95%CI) for Bland-Altman analyses and mean (90%CI) for equivalence testing.

RESULTS: Arm LOP measurement showed a mean bias of 0.6 (-1.3 - 2.4) mmHg, with upper and lower LOA of 8.4 (5.1 - 11.7) mmHg and -7.3 (-10.6 - -4.0) mmHg, respectively. Thigh LOP measurements showed a mean bias of -1.5 (-4.4 - 1.4) mmHg with upper and lower LOA of 10.5 (5.5 - 15.5) mmHg and -13.5 (-18.5 - -8.5) mmHg, respectively. Equivalence testing determined that both doppler measurements were equivalent in the arm (0.55 (-0.99 - 2.1) mmHg, $p = .547$) and leg (-1.5 (-3.87 - 0.87) mmHg, $p = .288$).

CONCLUSIONS: The SonoTrax measured LOP equivalently to the MD6. Physical therapists wanting to use BFR therapy should feel comfortable using either vascular doppler in their clinic.

P2 CORRELATION BETWEEN CONTRACEPTION USE AND TYPE IN THE SETTING OF ANTERIOR CRUCIATE LIGAMENT INJURIES

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BACKGROUND: Females are at increased risk of anterior cruciate ligament (ACL) injury. There are multiple well-known factors that lead to this increased risk of injury including anatomy, biomechanics, and hormonal factors. Limited studies have suggested the possible risk reduction with the use of oral contraceptives; however, minimal research has examined the risk of ACL tears with long acting reversible contraceptives (LARC). The purpose of this study is to evaluate the association between ACL injuries and contraception use and type.

METHODS: Retrospective chart review of all females ages 15-45 treated at the UMC Sports Medicine Clinic in Tuscaloosa, AL between 2011 and 2018 was performed (N= 2875). Based on ICD diagnosis code or reviewing MRI results, seventy females with ACL tears were identified during the review. To establish a base rate of contraceptive use, the type of contraceptive use was also documented. The types of contraception were coded into no contraception, oral contraception pills (OCs), and LARC (e.g. IUD). A logistical regression analysis was performed to determine if contraceptive type predicted ACL tears.

RESULTS: Patients on no contraceptives comprised 68.3% of the sample and made up 81.1% of the ACL tears; patients on oral contraceptives made up 24.4% of the sample and made up 11.4% of the sample, and patients on LARC made up 6.2% of the sample and comprised 7.1% of tears. Oral contraceptives were associated with a lower chance of ACL tears ($B = -.95$, $p = .012$). LARC was not associated with ACL tears ($B = -.19$, $p = .68$) compared to individuals on oral contraceptives, individuals on no contraceptives were more likely to sustain an ACL tear (OR = 2.6, 95% CI = 1.23- 5.46).

CONCLUSIONS: Oral contraception demonstrated a significant protective effect against ACL injuries. Long acting contraception did not demonstrate a statistically significant change in ACL injury rate.

P3 THE IMBALANCE OF DISTAL ELECTROMYOGRAPHY IS NOT ACUTELY ALTERED BY EXERCISE MODE POST STROKE

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BACKGROUND: Exercise interventions that approximate the stepping motion are thought to be useful in gait recovery after stroke. However, it remains unknown if hemiparetic asymmetry remains consistent between exercise modes. Our purpose was to examine contralateral mEMG (i.e., affected leg vs. non-affected leg) of chronic stroke survivors (SC) (10 ± 5 years post) and age plus sex-matched control (HC) on the NuStep Cross Trainer (NS) and Treadmill (TM).

METHODS: In order to determine self-selected (SS) cadence, each participant performed a 10 minute (min) pretest on the NS and TM at an RPE between 12 and 16. After returning to resting heart rate and blood pressure, participants performed a 5-minute exercise bout on the NS and TM at the SS. The exercise order was randomized. mEMG values were recorded from the rectus femoris (RF), vastus medialis oblique (VMO), semitendinosus (ST), tibialis anterior (TA), medial gastrocnemius (MG) and soleus (SOL) bilaterally. mEMG amplitudes (uV) were converted to a percentage of isometric maximum voluntary contraction (%mvc). Five separate 2 x 2 repeated measures ANOVA were used to examine the effect of limb (i.e., affected vs. non-affected) and exercise mode (i.e., TM vs. NS) on mEMG.

RESULTS: SC (n = 15) and HC (n = 19) did not differ in age or BMI; $p > .05$. The repeated measures ANOVA found no interaction or main effects for the proximal musculature (i.e., RF, VMO, ST); $p > .05$. However, main effects for limb were detected for the distal musculature (i.e., MG, SOL, and TA); $p < .05$. The non-affected MG produced higher mEMG ($M = 105.08\%mvc$; CI = 39.52% - 170.64%) than the affected side ($M = 48.92\%mvc$; CI = 33.58% - 64.26%); $p = .047$. The non-affected SOL produced higher mEMG ($M = 121.65\%mvc$; CI = 20.68% - 222.61%) than the affected side ($M = 47.96\%mvc$; CI = 15.49% - 80.43%); $p = .042$. Post-hoc analysis revealed the non-affected TA produced higher mEMG ($M = 33.29\%mvc$; CI = 21.76% - 44.81%) than the affected side ($M = 18.79\%mvc$; CI = 14.30% - 23.29%); $p < .001$.

CONCLUSIONS: Distal musculature demonstrated higher mEMG in the non-affected limb despite exercise mode. This gives preliminary evidence supporting the use of the NS to elicit mEMG values similar to the TM in the proximal musculature.

P4 KNEE AND HIP KINEMATICS IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY DURING SINGLE-LEG DROP LANDINGS

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BACKGROUND: Anticipating inversion perturbations elicits a proximal joint movement strategy in healthy subjects, however, this has not been examined in individuals with chronic ankle instability (CAI). This study compared knee and hip kinematics during unanticipated and anticipated inversion perturbations in individuals with CAI and healthy controls.

METHODS: Adults with CAI (n=15; age: 21±2y; height: 1.7±0.1m; mass: 73.4±15.2kg) and matched controls (n=15; age: 22±2y; height: 1.7±0.2m; mass: 75.5±13.0kg) completed unanticipated and anticipated 30 cm single leg drop-landings onto a 20° inverted platform. 3D knee and hip kinematics were assessed from 200 ms pre- and post-landing using a 2 (group) x 2 (landing) statistical parametric mapping ANOVA ($p < 0.05$).

RESULTS: No interactions or group effects were found ($p > 0.05$). Anticipated landings had significantly greater pre-landing knee ($p < 0.001$; mean difference: 2.6±0.3°) and hip adduction ($p < 0.001$; mean difference: 3.6±0.5°). During post-landing, significantly less knee ($p = 0.014$; mean difference: 6.8±1.4°) and hip flexion ($p = 0.048$; mean difference: 4.8±0.4°), and knee ($p = 0.002$; mean difference: 4.1±0.7°) and hip abduction ($p = 0.040$; mean difference: 4.0±0.8°) were found during anticipated landings.

CONCLUSIONS: Preparatory changes in the frontal plane were similar in both groups, which likely occur to position the proximal joints in an advantageous position to assist with ankle joint stabilization upon landing.

P5 ANKLE KINEMATICS DURING INVERSION PERTURBATIONS IN SUBJECTS WITH CHRONIC ANKLE INSTABILITY

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BACKGROUND: Although reduced ankle joint stabilization is well-documented in individuals with chronic ankle instability (CAI), anticipatory strategies to inversion perturbations has received less attention in CAI cohorts. As such, this study examined ankle kinematics during unanticipated and anticipated inversion perturbations in individuals with and without CAI.

METHODS: Participants with CAI (n=15; age: 21±2y; height: 1.7±0.1m; mass: 3.4±15.2kg) and controls (n=15; age: 22±2y; height: 1.7±0.2m; mass: 75.5±13.0kg) completed unanticipated and anticipated single leg drop-landings onto a 20° laterally inclined force platform from a height of 30 cm. Ankle kinematics were analyzed from 200 ms pre- to 200 ms post-landing using a 2 (group) x 2 (landing condition) statistical parametric mapping analysis of variance (p<0.05).

RESULTS: Significant group main effect revealed greater ankle internal rotation in the CAI group from 130-200 ms post-landing (p=0.035; mean difference: 6.05±1.45°). Further, anticipated landings resulted in significantly greater ankle inversion from 200 ms pre-landing to 10 ms post-landing (p<0.001; mean difference: 4.34±1.37°), but was significantly less from 32-200 ms post-landing (p<0.001; mean difference: 4.59±1.58°) regardless of group.

CONCLUSIONS: While similar ankle frontal plane movement was observed in both groups, greater ankle internal rotation during forced inversion of the ankle complex upon landing could be associated with recurrent injury in CAI.

P6 POSTURAL SWAY VARIABILITY INCREASES AFTER A DEEP SEA FISHING EXCURSION - A FIELD-BASED STUDY

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BACKGROUND: Coordinated motor responses are warranted in order to maintain postural equilibrium. Feelings of passive movement often experienced following exposure to boat movement (e.g. sea legs) may result in postural corrections that are more variable and less efficient. Therefore, the purpose of this study was to examine changes in postural sway variability after an extended duration on a boat at sea.

METHODS: Postural sway was assessed in the bilateral stance on a force platform in 24 adults (13M, 11F; age: 35±12 y; height: 170.3±8.8 cm; mass: 84.2±17.0 kg) before (PRE) and after (POST) a 7-hour deep sea fishing excursion. Standard deviation (SD) of the sway excursion and sway velocity were analyzed in the medial/lateral (ML) and anterior/posterior (AP) directions during 30 s trials in the following conditions: eyes open (EO), eyes closed (EC), foam surface eyes open (FEO), and foam surface eyes closed (FEC). Dependent sway variables were compared PRE/POST using a paired t-test (p<0.05).

RESULTS: Significantly greater ML SD sway excursion was found at POST during EC (p=0.04; PRE: 0.10±0.04cm vs POST: 0.13±0.06cm) and FEO (p<0.01; 0.28±0.07cm vs POST: 0.34±0.11cm). AP SD sway excursion was also significantly increased at POST during FEO (p=0.03; PRE: 0.47±0.11cm vs POST: 0.55±0.20cm) and FEC (p=0.02; PRE: 0.65±0.16cm vs POST: 0.76±0.21cm).

CONCLUSIONS: Extended durations on a boat at sea increase the variability of postural sway upon returning to land. This likely results from the inability to use appropriate sensory information during balance conditions dependent on vestibular and somatosensory feedback.

P7 AGE-RELATED CHANGES IN POSTURAL CONTROL AFTER EXPOSURE TO AN OFFSHORE ENVIRONMENT

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BACKGROUND: The feeling of passive movement after exposure to boat movement at sea (e.g. sea legs) can negatively impact postural control, however, age-related changes in postural control after an extended duration on a boat at sea has not been investigated. This study examined the impact of age on time-to-boundary (TTB) measures of postural control after exposure to an offshore environment.

METHODS: A median age of 35 separated participants into Old (n=12) and Young (n=12) groups. Postural control was assessed on a force platform before (PRE) and after (POST) a 7-hour deep sea fishing excursion in the bilateral stance with eyes open (EO), eyes closed (EC), foam surface eyes open (FEO), and foam surface eyes closed (FEC). TTB measures of postural control (minimum, average, standard deviation (SD) of minima) were computed in the medial/lateral (ML) and anterior/posterior (AP) directions and analyzed using a 2 (group) x 2 (time) mixed ANOVA (p<0.05).

RESULTS: No significant interactions or main effects were found for EO and EC (p>0.05). Significantly less TTB SD AP was found for the Old group at POST (p=0.001; Old: 0.47±0.20s vs. Young: 0.78±0.20s) during FEO. The old group had significantly less TTB average AP during FEO (p=0.038; Old: 0.69±0.22s vs. Young: 0.90±0.23s) and FEC (p=0.049; Old: 0.36±0.34s vs. Young: 0.48±0.33s), and significantly less TTB SD AP during FEC (p=0.019; Old: 0.25±0.14s vs. Young: 0.42±0.12s) compared to the Young group.

CONCLUSIONS: Our findings may indicate that postural control corrections are negatively impacted in older adults after extended durations on a boat at sea.

P8 PILOT STUDY OF HEAD KINEMATICS IN RODEO

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BACKGROUND: Concussions account for 12.8% of rodeo injuries and concussion protocols in rodeo are lacking compared to other high risk sports. In rodeo, the athlete's head is often unprotected and is exposed to a unique loading environment, interacting with the animal they are competing with and often coming in contact with the ground, the animal, and/or the perimeter of the competition ring. Head impact sensors allow for the study of head kinematics in this unique environment. The objective of this study was to pilot a mouthpiece-based sensor in the sport of rodeo to measure head kinematics associated with typical rodeo events.

METHODS: A custom mouthpiece equipped with an accelerometer and gyroscope was deployed in a rodeo athlete during two horse riding sessions, two roping events, and two bull riding events. Head kinematic data, including linear and rotational acceleration, and rotational velocity at the head center of gravity were analyzed alongside time-synchronized video footage to determine how the positions and movement of the animal corresponded to head kinematics of the athlete.

RESULTS: During bull riding events linear accelerations ranged from 2.0 to 13.3 g when the animal's hooves made contact with the ground. Linear accelerations during roping events ranged from 2.5 to 7.6 g when the equine pushed off their back hooves. During equine practice sessions average linear accelerations corresponded to changes in the horse's gait, resulting in 1.1, 2.4, and 2.5 g for walking, trotting, and loping, respectively. Furthermore, during a bull riding event, the subject received direct head contact following a fall to the ground, resulting in peak resultant linear acceleration of 24.8 g.

CONCLUSIONS: Results demonstrate that rodeo athletes are exposed to a wide range of head accelerations during normal participation of the sport that correspond to the animal's movement. This pilot study provides a framework for future study of head kinematics and head impact exposure in rodeo and yielded the first head kinematic data in rodeo.

P9 POSITION AND TIME: EXAMINATION OF LESS SCORES FOR DIVISION 1 BASKETBALL PLAYERS

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BACKGROUND: The anterior cruciate ligament (ACL) is responsible for stabilizing the knee by limiting the movement of the tibia anteriorly. The injuring of this ligament is one of the most prevalent sports related knee injuries to occur in athletics, specifically female athletes. **Purpose:** The purpose of this research was to examine differences in LESS (Landing Error Scoring System) scores between frontcourt and backcourt, male and female, NCAA Division 1 basketball players and to measure any changes in LESS scores between the beginning and end of the season.

METHODS: Participants were 24 Division 1 basketball athletes (10 female, 14 male). They completed a LESS screen (three consecutive jumps per screen) while being filmed in the frontal and sagittal plane and these videos were analyzed using a visual analysis computer system (Dartfish). These screens were scored by the researcher using the LESS scoring sheet determined by Padua and then analyzed with an ANOVA 2x2 repeated measures test in SPSS to test for statistical significance. Statistical results were considered significant if they had a P value $\leq .05$.

RESULTS: Results showed no statistically significant difference in LESS scores between position ($p=0.650$) or gender ($p=0.904$), but there was a significant decrease in preseason LESS scores versus postseason LESS scores with a significance of $P \leq 0.001$.

CONCLUSIONS: Overall, this sample of Division 1 basketball athletes' LESS scores did not seem to differ based on gender or position which would conclude that the athletes training regiments may be similar to each other and not determined by ACL risk, gender, or positions. The significant decrease in preseason LESS scores to postseason LESS scores could be attributed to the similar training regiments as well.

P10 FITNESS ASSESSMENTS IN PRESCHOOLERS

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BACKGROUND: Fitness assessments are an essential indicator in monitoring physical health. While a series of musculoskeletal fitness tests have been established to be both reliable and valid within adolescent and adult populations, the development of such tests are limited within young children. The purpose of this study was to investigate the reliability of an upper body and lower body strength test within young children.

METHODS: Thirty-two preschool students (mass: 18.9 kg \pm 3.67; height: 1.07 m \pm .05) performed three trials of two tasks; bench press (BP) and mid-thigh pull (MTP), in a randomized order, at maximum effort. A purposely built small bench press/mid-thigh pull apparatus was constructed for this project. The apparatus was comprised of an elevated (5 in) platform upon which the toddler could either stand or lay down. The bar was attached to a bracket that passed under the platform, such that when the bar was lifted away from the platform the bracket would make contact with a force plate (Vernier Software & Technology, Beaverton, OR, USA) attached to the underside of the platform. Vertical reaction forces were measured and averaged.

RESULTS: Participants performed each task at three different times during the academic year to determine relative test-retest reliability. The results of a two-way mixed model with absolute agreement revealed an intraclass correlation coefficient (ICC) (2,k) = .733 (95% CI: .515 - .862) for the BP task and ICC(2,k) = .603 (95% CI: .277 - .801) for the MTP.

CONCLUSIONS: Two of the greatest challenges to collecting fitness data from young children is their level of enthusiasm to perform the task and their capability to execute what is being asked of them. The purpose of this project was to develop two tasks that would allow for fitness assessments of young children that they would be eager to try and be persistent in their performance of the task. While the preschool aged children were eager to try the task, not all of the children readily grasped the objective of the task. The moderate and fair correlations for the BP and MTP tasks, respectively, indicate that modifications to this task are needed to more fully assess these two fitness measures in this population.

P11 POWER IN PRE-SCHOOLERS

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BACKGROUND: Musculoskeletal fitness tests have been established to be both reliable and valid within adolescent and adult populations, however the development of such tests are limited within preschool age children. The purpose of this study was to investigate the efficacy of a fitness measure designed for preschool age children. Children readily engage in activities that involve climbing and moving to an elevated height. Therefore, a modified Margaria power test was developed to assess lower extremity power.

METHODS: Thirty preschool aged children served as participants for this project. Informed consent and assent were obtained for and by each participant. Male (n=14) and female (n=16) children (mass 18.37 kg \pm 3.44, height 1.06 m \pm 0.06) were asked to sprint up a ramp at an incline of 27 degrees for 3 trials. Step length, and time of step were utilized to calculate lower extremity power, and the interclass correlation coefficient was utilized to determine if the performance was consistent.

RESULTS: Participants performed each task at two different times during the academic year to determine relative test-retest reliability. The results of a two-way mixed model with absolute agreement revealed an intraclass correlation coefficient (ICC) (2,k) = .824 (95% CI: .628 - .921) for the average work, ICC(2,k) = .768 (95% CI: .505 - .893) for the average power, ICC(2,k) = .839 (95% CI: .661 - .928) for the peak work, and ICC(2,k) = .772 (95% CI: .516 - .897) for the peak power.

CONCLUSIONS: Large ICC's indicate that the child performed at the same level each time. Future research should investigate whether this performance is not only consistent, but also indicates a maximum effort performance. Secondary measures should also be considered to assure that the original measures are valid in this unique environment and population.

P12 EFFECTS OF MAXIMALIST RUNNING SHOES ON GAIT MECHANICS

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BACKGROUND: Maximalist running shoes have become a recent trend in the ultra-distance running and triathlon communities to negate the injury-inducing effect of large numbers of impacts accrued over ultra-distances. Therefore, the purpose of this project was to investigate the differences in ground reaction forces when jogging in a maximalist, full-cushion, and preferred running shoe.

METHODS: Ten recreationally trained, females running at least 3 miles/30 minutes, 3 times/week, were recruited for this study. Following a treadmill warm-up, participants completed several practice jogging trials, at a self-selected pace, to establish their pace for data collection. Participants ran at this established pace along a runway making right foot contact with a force plate (1000 Hz) embedded in the runway. Participants ran while wearing maximalist; traditional, neutral cushioned; and current, preferred running shoes. Following a randomized order for condition, participants completed three trials for each condition. Maximalist and traditional shoes were provided during data collection. Separate repeated-measures ANOVAs were run on average rate of force application, peak vertical ground reaction force, braking impulse, and propulsive impulse.

RESULTS: The main effect for average rate of force application was significantly different, $F(1.017, 9.156) = 6.702, p < 0.05$; however, post-hoc analyses between shoes were not statistically significant. The remaining variables were not significantly different.

CONCLUSIONS: Based on the data, there is an effect of shoe type on the average rate of force application; however, it is unclear how the shoe types are different. As the post-hoc analyses and remaining variables were not statistically significant, no specific shoe type appears to be mechanically better or worse than the others. Therefore, it would be up to the individual to determine which type of shoe would be best for performance and injury reduction.

P13 DISTANCE RUNNING STANCE PHASE JOINT KINEMATICS AND STRIDE-TO-STRIDE VARIABILITY: 10 VERSUS 20 STRIDES

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BACKGROUND: Distance running studies commonly use 10 strides (or fewer) for kinematic analysis; however, with improved technology and software it has become easier to analyze more strides. The purpose of this study is to compare sagittal plane kinematics for 10 strides versus 20 strides and determine if there are significant differences in stance phase lower body joint angles and stride-to-stride variability (SSV).

METHODS: Eighteen highly-trained (30-80 miles per week) adult runners participated in the study (5 females, 13 males, 34.8±10 years). For the treadmill gait analysis, 9mm spherical retro-reflective markers were applied according to Pohl et al., (2010). Data were collected at 200Hz using 6 Vicon Bonita cameras and 3DGAIT software. Runners completed two, 4-minute trials at their preferred pace. For the stance phase, hip and ankle joint waveforms were normalized to 101 data points. An average waveform was then generated for both 10 strides and 20 strides. Waveforms were then compared to determine the average difference for the two trials. To assess SSV, standard deviations (SD) were calculated across the 10 or 20 strides (for each of the 101 data points). Then, the overall SD was determined by calculating the mean of the 101 SDs. For both SSV and joint angles, a 2 by 2 repeated measures factorial ANOVA was used to test for main effects and interaction (SSV- joint vs. strides; joint angle - joint vs. strides) at $p=0.05$.

RESULTS: For SSV, there was no significant main effect ($p=0.31$) for 10 strides ($1.30^{\circ}\pm 0.08^{\circ}$) vs. 20 strides ($1.41^{\circ}\pm 0.08^{\circ}$). However, there was a significant main effect for joint ($p<0.001$), with the knee ($1.56^{\circ}\pm 0.41^{\circ}$) showing greater SSV than the hip ($1.15^{\circ}\pm 0.30^{\circ}$). For joint angles, there was no significant main effect ($p=0.96$) for 10 strides ($1.62^{\circ}\pm 0.34^{\circ}$) vs 20 strides ($1.64^{\circ}\pm 0.34^{\circ}$). There was also no significant main effect for joint ($p=0.81$) between the hip SSV ($1.62^{\circ}\pm 1.22^{\circ}$) and knee SSV ($1.64^{\circ}\pm 1.56^{\circ}$).

CONCLUSIONS: Increasing from 10 to 20 strides did not appear to significantly impact the kinematic data for the knee or hip.

P14 PREFERRED LEG DRIVES SEATED AND BILATERAL RECUMBENT STEPPER IN CHRONIC STROKE AND HEALTHY CONTROL

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BACKGROUND: The NuStep Cross Trainer (NS) approximates the bipedal and upright stepping pattern. However, it is unknown how the history of stroke may influence the recumbent exercise. The purpose of this study was to examine performance outcomes on the NS in a chronic stroke condition (SC) and an age plus sex-matched control (HC).

METHODS: In order to determine cadence, each participant performed a 10 minute (min) pretest on the NS at an RPE between 12 and 16. After returning to resting HR and BP, participants then performed a 5-min exercise bout on the NS.

RESULTS: SC and HC did not differ in age (*Mdn*: 66 years vs. 57 years, respectively) or BMI (Stroke: $M = 27.02 \pm 4.57$ vs. Healthy: $M = 26.46 \pm 4.63$), $p > .05$. There were no differences in RPE, METS, elevation gain (ft), estimated energy cost (k/cal), average (avg) speed (mph), avg steps per min, or avg bilateral power (W) between the HC ($n = 19$) and SC ($n = 15$); $p > .05$. However, HC produced higher total steps ($M = 723.18$ steps ± 137.64) compared to the SC ($M = 597.67$ steps ± 116.90); $t(30) = 2.683$, $p = .012$. Total step distance (miles) for the HC (mean rank = 19.74) was also greater than the SC (mean rank = 11.77), $U = 62.0$, $z = -2.363$, $p = .018$. However, Δ avg pedal power (W) between the HC's limbs (left-right) ($M = -2.00 \pm 3.528$) was not different than SC (affected non-affected) ($M = -3.50 \pm 4.852$); $t(29) = .997$, $p = .32$. HC Δ ROM (in) (mean rank = 17.50) did not differ from SC (mean rank = 13.62), $U = 85.5$, $z = -1.214$, $p = .252$. The SC did not demonstrate strength deficits on their affected side; $p > .05$. Bilateral comparison revealed the SC's affected side contributed less pedal power ($18.08W \pm 9.61$) than the non-affected side (21.58 ± 10.34); $p = .030$. HC produced higher levels of force on their preferred right leg ($M = 48.68$ lbs ± 10.05 lbs vs. $M = 44.42 \pm 9.78$); $p < .001$. No ROM difference was observed between limbs in HC or SC; $p > .05$.

CONCLUSIONS: Healthy participants covered more distance by producing more steps (not Δ ROM) in the 5-minute exercise bout on the NS. The mechanical coupling of the NS seems to encourage equal ROM contribution, but the preferred leg will contribute higher avg power in both SC (i.e., via non-affected) and the HC (i.e., via right leg).

P15 STANDING BALANCE MUSCLE ACTIVATION AT THE ANKLE JOINT IS NOT ASSOCIATED WITH SLIP SEVERITY

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BACKGROUND: During a slip, we must detect the slip in order to slow progression and generate corrective responses. Standing balance has been used as a measure of sensory system integrity, and associated with the ability to detect a slip. Suggesting poor balance performance is related to increased fall risk, due to the delay in detection and development of corrective responses. However, muscle activity during quiet stance has yet to be examined. Thus, the purpose of this study was to examine muscle activity during quiet stance between individuals who experience a hazardous, and non-hazardous slip, after an induced slip.

METHODS: Standing balance was recorded under six sensory conditions: eyes open, eyes closed, eyes open with sway referenced vision, eyes open with sway referenced support, eyes closed with sway referenced support, and eyes open with sway referenced vision and support. Surface EMG was recorded during balance testing from the left leg tibialis anterior and medial gastrocnemius. Raw EMG data were collected at 1,500 Hz, Band-pass filtered (20-250Hz) and rectified prior to analysis. Variables of interest were mean muscle activity, and mean muscle activity normalized to maximal voluntary contractions. Following balance testing, participants completed slip testing including normal gait and an unexpected slip trial. The slip was classified as either hazardous or non-hazardous based on heel slip distance, and velocity and muscle activity was examined between groups using independent t-tests, with an alpha level of 0.05.

RESULTS: The final analysis sample included 73 participants, with 46 trials classified as non-hazardous, and 27 classified as hazardous. Results indicated no significant differences in muscle activity or percent activation between hazardous, and non-hazardous slips for all muscles and balance conditions (all $p > 0.05$).

CONCLUSIONS: Findings herein suggest that average activity at the hip and knee during standing balance are not related to slip detection and the recovery response. Though more work is required to examine if varied muscle activity patterns during quiet stance, such as co-contraction in the extremity, is associated with fall risk.

P16 THE EFFECTS OF GOLF SPECIFIC FOOTWEAR ON MUSCLE ACTIVATION DURING STANDING POSTURAL CONTROL

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BACKGROUND: Various types of golf footwear are available for use in the sport. However, little is known about how these types of golf footwear affect neuromuscular control of the lower extremities over prolonged periods of standing and walking. Thus, the purpose of this study is to examine the effects of durations of walking/standing while barefoot (BF) and wearing a dress shoe (DS), tennis shoe (TS), and minimalist (MIN) style golf shoe, on muscle activity of the lower extremity during standing postural control.

METHODS: Six male adults with no history of neuro-musculoskeletal disorders completed this study. Standing balance measures were recorded under two different sensory conditions: eyes open, and eyes closed. Surface EMG was recorded during balance testing from the left leg tibialis anterior, and medial gastrocnemius. Raw EMG data were collected at 1,500 Hz, Band-pass filtered (20-250Hz) and rectified prior to analysis. Variables of interest were the mean muscle activity of the corresponding muscle. The testing sessions consisted of a counter balanced allocation of footwear over 4 separate testing days, separated by at least 48 hours. Each session included muscle activity measures during standing balance every 60 minutes, for 4 hours, with measurements at baseline, 60, 120, 180, and 240 minutes. A 4x5 repeated measures ANOVA was used to analyze the results, with an alpha level of 0.05.

RESULTS: A significant footwear by time interaction was observed in the eyes open condition for medial gastrocnemius muscle activity ($F(12,60) = 1.946$, $p = 0.04$). With the minimalist condition muscle activity significantly lower than the tennis shoe, and dress shoe at the 2 hour mark. Further, a footwear main effect was observed for the eyes closed condition ($F(3,12) = 3.969$, $p = 0.035$). With the minimalist condition significantly higher than the dress shoe.

CONCLUSIONS: These findings suggest that lower extremity muscle activity is altered by different golf shoes, and extended durations of standing walking. These results show the minimalist condition with lower muscle activity at 2 hours in the eyes open condition, but increased in the eyes closed condition. The findings herein may suggest that over the 4 hour period, more of a hip/knee postural control strategy is adopted in the dress shoe and tennis shoe, lending to why they exhibited increased activity at 2 hours, but less overall.

P17 ARE DISTANCE RUNNING LOWER BODY SAGITTAL PLANE KINEMATICS ALTERED BY METABOLIC TESTING?

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BACKGROUND: Distance running fitness is commonly assessed using metabolic analysis. During testing, the runner must wear a mask that covers the nose and mouth to collect expired air. It is unclear if this increased challenge alters running kinematics. In this study we thoroughly assessed the sagittal plane lower body joint angles. **PURPOSE:** Determine if there are significant differences between standard treadmill running kinematics and those collected during metabolic testing.

METHODS: Twenty higher mileage recreational runners participated (34.8±10.0 years; 20+ miles per week). Six Vicon Bonita cameras and 3DGAIT software were used to collect kinematic data (200 Hz). A metabolic cart (Parvo Medics TrueOne 2400) was used for heart rate collection and testing. Participants ran 4x4 minutes at preferred pace: 2 control runs (CON), 2 metabolic testing runs (MT). Ten strides were used to generate average stance and swing joint angle plots (normalized to 101 data points). The phase plots were then compared for CON and MT and average difference scores were calculated (to determine the kinematic change). Repeated measures ANOVA was used to test for significant differences among CON and MT running trials (p=0.05). Reliability was assessed for 8 discrete joint angles using ICC analysis.

RESULTS: For hip, knee, and ankle joint angle plot comparisons, there were no significant differences between CON and MT. Further, for the discrete kinematic measures, ICC scores were good-excellent (ICC=0.89-0.99) between CON and MT. A secondary joint comparison revealed that knee swing had the most variable phase plots (p<0.05) as the difference score (2.9°) was approximately 71% greater than the next closest condition which was hip swing (1.7°).

CONCLUSIONS: Results from this study support the validity of simultaneously conducting a kinematic and metabolic analysis. However, we recommend that clinicians and performance coaches use the approach in this study to confirm for each individual assessed.

P18 COMPARISON OF THE STRIDE-TO-STRIDE VARIABILITY OF RUNNING KINEMATICS FOR COLLEGIATE SWEEP OARSMEN AND DISTANCE RUNNERS.

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BACKGROUND: Competitive sweep rowing is asymmetric by nature because the athletes only use one oar. This may cause musculoskeletal asymmetries and/or asymmetric movements. In this study, we examine the distance running kinematics of rowers. **PURPOSE:** Compare distance running lower body sagittal plane kinematics for college rowers and college distance runners to determine if there are significant differences in stride-to-stride variability (SSV). We hypothesized that the rowers would have increased SSV.

METHODS: Eight college distance runners and eight college varsity rowers participated in the treadmill running study (16 males, 8 rowers 20.3±1.2 years, 8 runners 20.9±2.2 years). For the gait analysis, 9 mm spherical retro-reflective markers were applied and stride foot contact and toe-off were determined according to Pohl et al., (2010). Six Vicon Bonita cameras collected the kinematic data at 200 frames per second. Participants ran for 3 minutes at their preferred pace and data was collected in the last minute. For each stance and swing, data were normalized to 101 points. To assess SSV, standard deviations was calculated across the 10 strides (for each of the 101 data points). Then, and the overall standard deviation was calculated by taking the mean of the 100 SDs. For stance and swing, 2 by 2 repeated measures factorial ANOVAS were used to test for main effects and interaction (group - rowers vs. runners; joint - knee vs. hip) at p=0.05.

RESULTS: For swing, there was no significant main effect (p= 0.82) for runners vs. rowers at the knee (runners=2.04°±0.21°; rowers=2.22°±0.21°) or hip (runners=1.56°±0.21°; rowers=1.48°±0.21°). However, there was a significant main effect for joint (p<0.001), with the knee (2.13°± 0.15°) being greater than the hip (1.52°± 0.15°). For stance, there was no significant main effect (p= 0.20) for runners vs. rowers at the knee (runners=1.81°±0.15°; rowers=1.37°±0.15°) or hip (runners= 1.24°±0.15°; rowers=1.28°±0.15°). However, there was a significant main effect for joint (p<0.001), with the knee (1.59°± 0.11°) being greater than the hip (1.26°± 0.11°).

CONCLUSIONS: Surprisingly, rowers appeared to generate consistent running kinematics.

P19 LOCOMOTOR-RESPIRATORY COUPLING AND ATTENTIONAL STRATEGIES IN HEALTHY, BUT UNTRAINED, INDIVIDUALS

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BACKGROUND: Locomotor-respiratory coupling (LRC) is a subconscious synchronization of locomotor and breathing patterns, with beneficial effects on energetic and perceptual responses to exercise. It is unknown if attentional focus, which impacts locomotion and ventilation, independently, alters LRC. The purpose of this study is to examine the role of attentional focus on LRC during exercise in untrained individuals.

METHODS: Two male subjects (25 ± 1 yr, 175.7 ± 0.8 cm, 82.1 ± 8.3 kg, VO₂max: 49.9 ± 3.5 ml·kg⁻¹·min⁻¹) ran on a motorized treadmill at three predetermined submaximal speeds under associative (ASSOC) and dissociative (DISSOC) attentional focusing conditions. During ASSOC subjects listened to prompts to focus on their breathing and leg movements; during DISSOC subjects watched a lighthearted sitcom. To measure the degree of LRC during exercise, light-weight, plastic event switches were strategically placed on the bottom of both feet to measure the ground-foot contact. Inspiratory flow, expiratory flow and oxygen consumption (VO₂) were continuously measured. Running economy was calculated as the slope of VO₂ vs running speed. Subjects rated their attentional focus following the test using an attentional focusing questionnaire; composite score was calculated as dissociative score - associative score + 100.

RESULTS: Average LRC during ASSOC was 36.6 ± 6.0% and during DISSOC was 53.3 ± 23.8%. Relative VO₂ (ASSOC: 34.7 ± 4.6 ml·kg⁻¹·min⁻¹; DISSOC: 33.7 ± 6.2 ml·kg⁻¹·min⁻¹), as well as running economy slopes (ASSOC: 162 ± 18 ml·kg⁻¹·km⁻¹; DISSOC: 172 ± 35 ml·kg⁻¹·km⁻¹) were similar between conditions. Attentional focusing composite scores were 89 ± 13 and 90 ± 6 for ASSOC and DISSOC, respectively.

CONCLUSIONS: These preliminary results suggest that LRC and running economy are independent of attentional focus in untrained runners.

P20 DISTANCE RUNNING STANCE PHASE JOINT KINEMATICS AND STRIDE-TO-STRIDE VARIABILITY: 10 VERSUS 20 STRIDES

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BACKGROUND: Distance running motion capture has advanced which has made it possible to collect many strides, however the optimal number of strides for data collection remains unclear.

METHODS: Eighteen experienced (30-80 miles per week) adult runners participated in the study (5 females, 13 males, 34.8±10 years). For the gait analysis, 9mm spherical retro-reflective markers were put on according to Pohl et al., (2010). Data were collected at 200Hz using 6 Vicon Bonita cameras. The runners performed two, 4-minute trials at their preferred pace. For each joint, swing data were normalized to 100 points. For both analyses, data were collected for 25 seconds during the last minute of the trial and the first 20 strides were analyzed. For the swing phase, hip and knee joint waveforms were normalized to 101 data points. An average waveform was then generated for both 10 strides and 20 strides. Waveforms were then compared between the two trials to determine the average difference between the 10 stride and 20 stride waveforms. To assess SSV, standard deviations (SD) were calculated across the 101 data points for 10 or 20 strides. Then, the overall SD was calculated with the mean of the 101 SDs.

RESULTS: For SSV, there was a significant main effect (p<0.001) for 10 strides (1.36° ± .133°) vs. 20 strides (1.473° ± .133°) in hip swing however, there was no significant main effect for SSV (p=0.365), with knee swing (2.144° ± .238°) being greater than the hip (2.504° ± .238°). For hip swing joint angle, there was no significant main effect (P=.973°) for the 10 stride (2.41° ± .503°) vs 20 stride approach (2.45° ± .711°). For Knee swing joint angle, there was no significant main effect (P=.973) for the 10 stride (3.47° ± .873°) vs 20 stride approach (3.50° ± .873°).

CONCLUSIONS: Increasing 10 stride analyses to 20 stride analyses did not appear to significantly impact swing joint angle in the knee or hip.

P21 IS DISTANCE RUNNING STRIDE-TO-STRIDE VARIABILITY ALTERED BY METABOLIC TESTING?

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BACKGROUND: Distance running metabolic testing requires wearing a mask and headgear that may alter running kinematics. The effects may be subtle; therefore, thorough assessments are needed. In this study we focus on stride-to-stride variability (SSV) of lower body sagittal plane joint angles during stance and swing. **PURPOSE:** Compare standard treadmill running kinematics to those collected during metabolic testing (MT) and determine if there are significant differences in joint angle SSV for the hip, knee, and ankle. We hypothesized that SSV would be elevated for MT running.

METHODS: Twenty higher-mileage recreational runners participated (34.8±10.0 years; 20+ miles per week). Six Vicon Bonita cameras and 3DGAIT software were used to collect kinematic data (200 Hz). A metabolic cart (Parvo Medics TrueOne 2400) was used for heart rate collection and testing. Participants ran 4x4 minutes at preferred pace (2 control runs (CON) and 2 MT runs. Data were collected during the final minute of each trial. Ten consecutive strides were used to generate average stance and swing joint angle plots (normalized to 101 data points). SSV was determined by assessing the standard deviations among the 10 strides (at the 101 data points). One-way repeated measures ANOVAs were used to test for significant differences (p<0.05) among CON running trials and MT running trials. Bonferroni post-hoc analysis was used for follow-up testing.

RESULTS: Contrary to the hypothesis, there were no significant differences in SSV among CON and MT trials. Secondary analysis revealed significant joint differences with knee swing SSV being significantly greater (p<0.01) than all the other joint/phase conditions. The knee swing SSV (2.09°) was approximately 38% greater than the next closest condition which was knee stance (1.51°) and nearly twice as great as ankle stance and hip stance.

CONCLUSIONS: Our preliminary SSV results suggest that metabolic testing has minimal impact on lower body running kinematics. Thorough assessment of the other planes and joint angle plots are needed to clearly understand this topic.

P22 BODY MASS INDEX AFFECTS KINEMATIC AND KINETIC PARAMETERS DURING THE WINDMILL SOFTBALL PITCH

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BACKGROUND: Previous research shows that softball pitchers who experience pain tend to be taller and heavier, with a higher body mass index (BMI). As sports participation and obesity rates rise, it is pertinent to understand the effects of BMI on windmill pitching mechanics, and its potential effect on the high injury rates in softball.

METHODS: Thirty-seven NCAA Division I female softball pitchers (19.8 ± 1.3 yrs.; 173.7 ± 87.8 cm; 79.0 ± 12.4 kg, BMI = 26.2 ± 4.2 kg/m²) threw three rise balls to a catcher at regulation distance (43 feet). An electromagnetic motion tracking system and force plate were used to obtain kinematic and kinetic data (normalized to body mass) during each pitch. Data were averaged across three trials and analyzed at the pitching events of top of backswing, foot contact, ball release, and follow through. Stepwise multivariate regression analysis was performed on those kinematic and kinetic variables that correlated with BMI.

RESULTS: Trunk flexion at ball release (R = .382, p = .020), shoulder distraction force at top of backswing (R = -.341, p = .039), and shoulder distraction force at ball release (R = .366, p = .026) served as independent correlates of BMI. A post-hoc stepwise regression model was used as a follow-up analysis. Trunk flexion (t = 2.88, p = .007) and shoulder distraction force at ball release (t = 2.78, p = .009) correctly predicted 26% of variance in BMI (R² = .303, Adj. R² = .262).

CONCLUSIONS: Pitchers with higher BMI experienced greater shoulder distraction force and more trunk flexion at ball release. Although pitchers do not regularly train to optimize body composition, striving for appropriate player physique may decrease injury susceptibility and excessive joint loads at the shoulder.

P23 EFFECTS OF ELEMENTAL BODY ALIGNMENT SYSTEM ON THE FLEXIBILITY OF HIGH SCHOOL DANCERS

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BACKGROUND: Elemental Body Alignment System (EBAS) is a somatic practice, and through the regular practice of somatics, a plethora of benefits have been observed. The primary purpose of this research study is to examine the effects EBAS has on the flexibility of high school dancers.

METHODS: The study utilized one control group and one experimental group. The experimental group received EBAS training once a week for six-weeks. Flexibility was measured pre- and post-intervention for both groups over all six-weeks. Goniometric measurements included ankle plantar flexion, ankle dorsiflexion, hip external rotation, and hamstring flexibility. Data was analyzed with the use of a two-tailed T-test in SPSS V21.0.

RESULTS: Significant increases in flexibility were seen in the EBAS group in two instances: the left hamstring and the external rotation of the left hip. The flexibility of the EBAS group's left hamstring was initially significantly less flexible than the control group (p=0.054); however, by the end of the study, the two groups achieved incredibly similar measurements (p=0.637). At the start of the study, the control group demonstrated more external rotation in the left hip than the EBAS group (p=0.256). The final measurement showed a significant difference in which the control group lost range of motion and the EBAS group far exceeded its original measure (p=0.012). Multiple trends of positive acute change, though not significant, were seen in the EBAS group more frequently than the control group.

CONCLUSIONS: The hypothesis was supported, and practicing Elemental Body Alignment System may help to improve flexibility. Additional research studies could explore the effects of EBAS on various populations and over longer periods of time.

P24 LONGITUDINAL CHANGES OF SNATCH BARBELL KINEMATICS AND KINETICS IN AN ELITE WEIGHTLIFTER

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BACKGROUND: Despite the popularity of the snatch, limited research exists on the barbell kinematic and kinetic techniques which help lifters efficiently execute the movement, particularly as they develop their technique over time. Even more unknown, are the changes that occur in world-caliber youth weightlifters as they move into adulthood.

METHODS: A current youth world record holder at 62, 69, and 73 kg weight classes completed snatches using 80% of his one-repetition maximum at ages 13 (62 kg) and 19 (73 kg) years. Simultaneously, three-dimensional barbell kinematic data were recorded from a 12-camera motion analysis system from which a battery of barbell kinematic and kinetic variables were computed. Qualitative analysis of 2-dimensional barbell trajectory and kinetic quiver plots were conducted between the two sessions.

RESULTS: From 2014-2019, there was a 46.3% decrease in total lift time. Increases were found in: (a) total lift absolute and relative peak vertical force (73.3% and 58.0%, respectively), (b) total lift power (259.2% and 229.4%, respectively), (c) first pull absolute and relative peak vertical force (73.3% and 58.1%, respectively), (d) first pull power (182.0% and 158.8%, respectively), (e) second pull absolute and relative peak vertical force (177.1% and 157.9%, respectively), and (f) second pull power (266.3% and 229.4%, respectively). In addition, barbell trajectory showed a decrease in horizontal distance (78.6%) and peak anteroposterior displacement (85.7%) over the same time period. Likewise, peak horizontal power decreased by 364.1% during the second pull.

CONCLUSIONS: The results presented describe key performance variables that can be measured to assess and evaluate technical proficiency, strength, and power development in youth weightlifters. Training adjustments can be made to optimize these variables such that technical proficiency increases during lifters' developmental years. Future research should examine the same variables at a higher intensity and into adulthood.

P25 INFLUENCE OF ANKLE FLEXIBILITY ON THE SINGLE LEG BALANCE TEST USING A BIODEX BALANCE SYSTEM

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BACKGROUND: Ankle range of motion (ROM) is believed to be one of the contributing factors in balance deficits. Multiple studies have investigated balance in reference to vision, strength, vestibular function, proprioception, and sensation. However, most of these studies have utilized geriatric, athletic, or injured populations focusing on static balance measures. Although there are multiple factors that play a role in balance, the purpose of this study was to assess the influence of ankle flexibility on dynamic single leg balance in fit and unfit males.

METHODS: Twenty-five male subjects (age = 22 ± 2 years; ht. = 179 ± 7 cm; wt. = 85.6 ± 15 kg) were recruited for this study. Ankle flexibility (which includes dorsiflexion, plantarflexion, eversion, and inversion) was measured in degrees for both legs with a goniometer. Subjects then completed four trials, of which the first two trials were familiarization, of the single leg balance test for each leg on a Biodex Balance System. Mean stability index (SI) was calculated for the last two trials and both a Pearson Correlation and Independent T-test were utilized.

RESULTS: No significant correlations between overall stability and dorsiflexion ($p = 0.899$), plantarflexion ($p = 0.790$), eversion ($p = .704$), and inversion ($p = .550$) on the left and right ankle were present ($p < 0.05$). However, there was a significant correlation between inversion of the left ankle and medial/lateral SI ($p = 0.022$); and between dorsiflexion of the left ankle and anterior/posterior SI ($p = 0.049$). No significant differences for ankle flexibility or SI occurred between unfit and fit individuals ($p > 0.05$).

CONCLUSIONS: Results suggest ankle ROM may be a contributing factor in dynamic balance on the non-dominant leg.

P26 ASSOCIATION BETWEEN LONG HEAD BICEP TENDON AND SHOULDER RANGE OF MOTION AND ISOMETRIC STRENGTH

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BACKGROUND: The long-head biceps tendon (LHBT) is placed under a large amount of stress during the windmill softball pitch and is susceptible to injury. Limited shoulder range of motion (ROM) is an injury risk factor in throwing sports and may be related to acute changes in the LHBT. Understanding this potential relationship could prove beneficial in comprehending injury pathology in youth softball pitchers. Therefore, the purpose of this study was to identify ROM and isometric strength (IS) measures associated with LHBT changes during pitching a simulated game.

METHODS: Eleven youth softball pitchers (12.5 ± 2.3 years; 162.7 ± 9.7 cm; 57.6 ± 17.9 kg) volunteered to participate. Dominant shoulder internal and external ROM and IS were collected prior to the simulated game. Dominant shoulder LHBT measurements (transverse width, transverse depth, and longitudinal depth) were collected, via ultrasound imaging, pre and post pitching a simulated game. The average differences of each LHBT measurements, from pre to post pitching, were used for analysis. Pearson product correlation was run between shoulder ROM and IS and the change in LHBT transverse width, depth, and longitudinal depth.

RESULTS: No significant correlations between internal and external ROM and IS were found with the changes in LHBT measures.

CONCLUSIONS: This study aimed to identify relationships in shoulder ROM and IS and acute changes in the LHBT following a simulated game. Although no significant relationships were found, further investigation into changes of the LHBT, ROM, and IS pre and post a pitching a simulated game is warranted. While the current study included youth pitchers research on older and more experienced athletes should be considered as it may present contrasting results.

P27 NEUROMUSCULAR CONTROL AT THE HIP AND KNEE DURING BALANCE IS NOT ASSOCIATED WITH SLIP DETECTION

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BACKGROUND: During the detection of a slip, sensory inputs must relay that the slip is occurring and signal the central nervous system for recovery response selection. Decrements in standing balance have been associated with increased slip severity, due to decreased sensory system integration, and function. However, muscle activity of the lower extremity has not been examined during quiet stance, to examine how neuromuscular control during quiet stance, may relate to slip detection. Thus, the purpose of this study was to examine lower extremity muscle activity during quiet standing between individuals who fall, and recover, after an induced slip.

METHODS: Standing balance was recorded under six sensory conditions: eyes open, eyes closed, eyes open with sway referenced vision, eyes open with sway referenced support, eyes closed with sway referenced support, and eyes open with sway referenced vision and support. Surface EMG was recorded during balance testing from the left leg vastus medialis, and semitendinosus. Raw EMG data were collected at 1,500 Hz, Band-pass filtered (20-250Hz) and rectified prior to analysis. Variables of interest were the mean muscle activity, and mean muscle activity normalized to maximal voluntary contractions. Following balance testing, participants completed slip testing including normal gait and an unexpected slip trial. The slip was classified as either a fall or recovery, based on a cutoff of 30% body weight on the safety harness during the slip, and muscle activity was examined between groups using independent t-tests, with an alpha level of 0.05

RESULTS: After exclusions, the final analysis sample included 73 participants, with 48 trials classified as recoveries, and 25 classified as falls. Results indicated no significant differences in mean muscle activity, or percent activation between falls and recoveries for all muscles and balance conditions (all $p > 0.05$).

CONCLUSIONS: Findings herein suggest that average activity at the hip and knee during standing balance are not related to slip detection and the recovery response. Though more work is required to examine if varied muscle activity patterns during quiet stance, such as co-contraction in the extremity, is associated with fall risk.

P28 GAIT COMPARISONS AT BASELINE AND POST CONCUSSION RETURN TO PLAY IN DIVISION ONE ATHLETES

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BACKGROUND: Healthcare professionals use the Standardized Assessment of Concussion, Balance Error Scoring System, ImPact, and a graded symptoms checklist (GSC) to determine when an athlete returns to play after a concussion. However, gait is not usually considered before this process begins. Research has examined the effect concussions have on an individual's gait pattern, however most research has utilized a control group instead of the individual's baseline. Therefore, the purpose of this study was to assess differences in gait in Division 1 athletes between an individual's baseline and at return to play following a concussion.

METHODS: Fourteen division 1 collegiate athletes (18 ± 0.64 years) participated in baseline data collection before their first collegiate season and when they were symptom free from a concussion. Symptoms were assessed using the GSC. Athletes completed at least 6 trials of normal walking on a 4.9 m instrumented walkway. Dependent variables were average velocity, step length (left and right), heel to heel base of support (left and right), swing, and stance percent of the gait cycle (left and right). Differences in gait characteristics were assessed using paired samples t-tests.

RESULTS: There were no statistically significant differences in the gait variables assessed ($p > 0.05$).

CONCLUSIONS: When an athlete is symptom free and can begin the return to play process, their gait pattern was similar to their baseline. No significant change in an athlete's gait at return to play can imply that there are minimal impairments to the individuals' gait, when adequate rest is taken.

P29 LOWER LIMB MUSCLE ACTIVITY DURING MULTI-PLANAR GRADED STEPPING TASKS

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BACKGROUND: Hip and knee muscle strengthening is a common focus of rehabilitation. However, a majority of clinicians rely on open kinetic chain (OKC) vs. closed kinetic chain (CKC) exercises despite evidence substantiating the benefits of CKC exercises. Therefore, the purpose of this study was to investigate lower limb muscle activity during CKC multiplanar graded stepping tasks to aide in rehabilitation intervention.

METHODS: Sixteen subjects, 18-55 years (mean=25.7 years), underwent pre-participation screen, followed by performance of six conditions: step up, step down, lateral step down, half step up, half step down, and half lateral step down. Performance was randomized by task and limb and performed over 10 seconds at 45 beats per minute (bpm) utilizing MetroTimer (ONYX Apps). Surface EMG was collected with Delsys Trigno wireless surface EMG sensors, and kinematics were collected with a 14 camera Vicon Bonita 10 camera system.

RESULTS: A two-way mixed model ANOVA was applied, and a significant main effect for limb occurred with glute medius ($F_{(1,16)}, p=0.028$) and biceps femoris ($F_{(1,16)}, p=0.0036$), while a significant main effect for condition occurred with vastus lateralis and medialis ($F_{(5,80)}, p<0.001$), anterior tibialis ($F_{(5,80)}, p<0.001$) and rectus femoris ($F_{(5,80)}, p<0.001$). Statistical analysis was performed utilizing R for Statistical Computing (Version 3.6.1)

CONCLUSIONS: Graded stepping tasks are an important functional task and should be incorporated into rehabilitation programs. Additionally, prioritizing early CKC interventions may better prepare patients for safer interactions and independence within variable environments.

P30 THE VALIDITY AND RELIABILITY OF A 2-DIMENSIONAL BODY COMPOSITION IMAGING METHOD IN ADULTS

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BACKGROUND: Body volume (BV) is one component of 3-compartment (3C) body composition model, and is commonly assessed using underwater weighing (UWW). However, BV obtained from a single 2-dimensional digital image has been proposed as an alternative method. The purpose of this study was to determine the validity of a digital image-derived 3C model (IMAGE-3C) for estimating relative adiposity (%Fat) when compared to an underwater weighing (UWW-3C) criterion.

METHODS: Female participants were recruited for this study (n=5, 20.33±/3.35 yrs., 26.46±/13.56 kg/m²). Body mass was measured (nearest 0.1 kg) using a digital scale (Tanita BWB-800), and standing height was measured (nearest 0.1 cm) using a stadiometer (SECA 213). Total body water (TBW) was obtained using bioimpedance spectroscopy (ImpediMed SFB7). A single digital image of each participant was taken from the rear/posterior view using an Apple 12.9 inch iPad Pro Wi-Fi 64GB. A paired sample T-test and an Intraclass Correlations Coefficient (ICC) were used to examine differences and the strength of association, respectively, between the IMAGE-3C and UWW-3C.

RESULTS: No differences (p=0.12) were observed between IMAGE-3C (21.66±/7.75 %Fat) and UWW-3C (21.72±/7.73 %Fat), and there was a near-perfect agreement (ICC > 0.99) between the two methods.

CONCLUSIONS: The IMAGE-3C model appears to be a valid method of estimating %Fat in a small convenience sample of female participants.

P31 AGREEMENT OF BIOELECTRICAL IMPEDANCE DEVICES FOR ESTIMATING BODY COMPOSITION IN FEMALE ATHLETES

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BACKGROUND: Body fat percentage (BF%) can be estimated via various measures, including predictions based on total-body water; however, these methods lack validity assessment in female athletes. To assess the agreement of bioelectrical impedance analysis (BIA) and bioelectrical impedance spectroscopy (BIS) against a criterion 4-compartment (4C) model for estimating BF% in collegiate female athletes.

METHODS: Thirty-nine Division-I female athletes performed four body composition tests (i.e., BIS, BIA, dual-energy x-ray absorptiometry, and air displacement plethysmography). Criterion 4C model of BF% estimation was derived using body volume, total-body water, body weight, and bone mineral density. Agreement between BIS, BIA, and 4C was based on r-values, standard error of estimate (SEE), constant error (CE), and 95% limits of agreement (LOA).

RESULTS: The 4-C (27.7±4.8%) displayed significantly lower BF% values as compared to BIS (32.2±4.1%; p<0.01; d=0.99; SEE=3.90%) and no difference with BIA (28.8±4.3%; p=0.22; d=0.25; SEE=3.70). BIS displayed ± 8.0 LOA's around a CE of 4.5%. For BIA, 95% LOA's were ±8.5 with a CE of 1.1%.

CONCLUSIONS: Results indicated that estimations of BF% based on total body water via BIS may provide overestimations in collegiate female athletes.

P32 EFFECTS OF ADIPOSITY GRADE AND BODY COMPOSITION ON ADJUSTED RESTING ENERGY EXPENDITURE IN WOMEN

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BACKGROUND: Fat-free mass (FFM) accounts for 80% of variance in resting energy expenditure (REE), but this relationship is nonlinear. The purpose of this study was to compare adjusted REE (REEa) and contributions of skeletal lean mass (SM) and fat mass (FM) to REEa in women at varying levels of adiposity.

METHODS: REE was measured via indirect calorimetry (REEm), and body composition data was obtained from dual-energy X-ray absorptiometry in 182 female subjects (Mean±SD: Age 24.2±9.1 yrs, Ht 164.6±6.0 cm, Wt 69.0±22.5 kg). The sample was divided into tertiles by body fat percent (%fat); Tertile 1 (T1): %fat=18.5-28.4%; Tertile 2 (T2): %fat=28.5-33.8%; Tertile 3 (T3): %fat=34.0-61.0%. To normalize and compare groups, REE was predicted (REEp) to account for differences in FFM and age. REEa was then calculated from REEm, REEp, and mean REEm per tertile, as previously described. Contributions (mass × metabolic rate, kcal/kg/day) of FM and SM were calculated as percentages of REEa. One-way ANOVAS were conducted.

RESULTS: FM in T3 (37.4±21.1 kg) was significantly higher than T1 (14.8±2.3 kg, p=0.001) and T2 (19.6±3.1 kg, p=0.001). No differences occurred in SM (p>0.05). T1 had significantly lower REEa than T2 (mean difference (MD)±SE: -92.5±30.0 kcal/day, p=0.007) and T3 (-318.9±29.5 kcal/day, p=0.001); REEa in T2 was significantly lower than T3 (-226.4±30.0 kcal/day, p=0.001). Expenditure attributed to SM in T1 was significantly higher than T3 (MD±SE: 3.2±0.8%, p=0.001). Difference in FM contribution between T1 and T2 lacked significance (p=0.210), but T1 had a significantly lower FM contribution than T3 (MD±SE: -5.1±0.6%, p=0.001); T2 had a significantly lower FM contribution than T3 (MD±SE: -3.9±0.6%, p=0.001).

CONCLUSIONS: Despite similarities in SM, women with elevated %fat experienced lower SM contribution and higher FM contribution to REEa. As adiposity increases, REE increases; FM may explain more of the variance in REE between women of different levels of adiposity.

P33 COMPARISON OF ATHLETIC SKINFOLD VERSUS TRADITIONAL SKINFOLD EQUATIONS IN MALE, ENDURANCE ATHLETES

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BACKGROUND: Traditional skinfold (TSF) equations take into account a given fat-free body density (FFBd) for predicting body fat percentage (BF%). However, endurance athletes generally possess a FFBd of 1.097 g/cm³ as compared to the general population of 1.10 g/cm³. Despite this difference, endurance-athlete specific equations, using skinfolds, have been derived to estimate BF%. To assess the validity of an endurance-athlete specific and TSF to a criterion 4C model (4C) to predict BF% in collegiate male athletes.

METHODS: Twenty-three Division-I male athletes performed four body composition tests (i.e., SF, bioelectrical impedance analysis, air displacement plethysmography, and dual-energy x-ray absorptiometry). Body density, based on a three site SF, was used to predict body fat percentage (BF%) using two equations (i.e., ET & TSF). Agreement between ET, TSF, and 4-C was based on *r*-values, standard error of estimate (SEE), constant error (CE), and 95% limits of agreement (LOA).

RESULTS: The criterion 4-C (14.07±5.59) displayed significantly greater BF% values as compared to ET (10.66±4.07; *p*<0.01; *d*=0.70; SEE=3.61); however, no statistical difference existed with TSF (12.19±4.01; *p*=0.06; *d*=0.39; SEE=3.61%) and 4-C. TSF displayed ± 7.86 LOA's around a CE of -1.88% and ET demonstrated 95% LOA's that were ±7.98 with a CE of -3.41%.

CONCLUSIONS: Results suggests that using an endurance-specific athletic skinfold formula may significantly underestimate BF% in male athletes. Therefore, future research should examine an alternative algorithm for endurance athletes based on differences in FFBd.

P34 CHILDREN'S CHANGES IN PERCEPTIONS AND BODY COMPOSITION FOLLOWING A FAMILY-BASED FITNESS INTERVENTION

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BACKGROUND: Childhood obesity is a major health concern that has more than doubled in children and adolescents in the past 30 years, with nearly one in five children aged 6 to 19 years categorized as obese. The purpose of this study was to assess the effectiveness of a family-based fitness intervention on body composition, fitness status, and children's perception of physical activity.

METHODS: Participants consisted of ten obese children who completed a family-based fitness intervention one time per week for 10-weeks (600 minutes of intervention). iDXA assessed body composition, FITNESSGRAM assessed fitness status and semi-structured interviews assessed children's perception of physical activity pre and posttest.

RESULTS: Following the intervention, children had a significant increase in lean mass (*p* < .001) and bone mineral content (*p* < .001), with no significant changes in overall fat mass (*p* = .08). Sit-ups increased significantly (*p* = .04) by an average of 7.5 sit-ups, while there were no significant differences in PACER (*p* = .51) or push-ups (*p* = .77). Four main themes emerged from the pre- and post-intervention interviews. Themes at post-test centered on increases in outdoor play and decreases in screen time.

CONCLUSIONS: Results from this study indicate a family-based intervention had an influence on children's appreciation for and engagement in physical activity, as well as, healthy body composition and fitness outcomes.

No funding was utilized for this intervention.

P35 EFFECTS OF VARYING ARM POSITION ON DUAL ENERGY X-RAY ABSORPTIOMETRY (DXA) ARM COMPOSITION RESULTS

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BACKGROUND: Controlling for food intake, exercise, and overall body position may help decrease error during dual energy x-ray absorptiometry (DXA) scanning. Previous evidence suggests lateral position of the legs during DXA scanning does not negatively influence leg composition accuracy and may allow for more detailed analysis of quadriceps and hamstring muscles. However, the influence of varying arm position during DXA arm composition analysis is unknown. The purpose of this study was to investigate how prone, supine, and lateral arm positions influence DXA arm composition results.

METHODS: College-aged male and female participants were recruited. In a crossover design, participants were scanned three times under different arm positions: 1) Supine, 2) Prone, and 3) Lateral. Lean mass, fat mass, region % fat, and bone mineral content (BMC) were analyzed.

RESULTS: Lean mass was significantly higher during the lateral arm position scan compared to supine (*p*=0.026) and prone (*p*=0.034). Fat mass and region % fat were significantly lower in the lateral arm position versus supine (*p*<0.05) and prone (*p*<0.05). BMC was largely unaffected by arm position (*p*=0.37).

CONCLUSIONS: Findings suggest that arm position influences arm composition results. Practitioners interested in arm composition results should standardize for arm position for accuracy.

P36 ASSOCIATIONS BETWEEN ANXIETY, STRESS, AND RESTING METABOLIC RATE

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BACKGROUND: Although little research has examined the associations between anxiety and stress and resting metabolic rate (RMR), at least one previous study has shown elevations in RMR among men with high trait anxiety.

METHODS: The RMR of 53 participants (30.3 ± 10.9 years; 23 men, 30 women) was tested with a metabolic cart during two visits. Participants completed the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA), Anxiety Sensitivity Index (ASI)-3, and Perceived Stress Scale (PSS)-14 during the first visit, and the STICSA-state was again completed during visit two. Participants had body composition measured using air displacement plethysmography at the second visit. Changes in absolute RMR and STICSA-state scores between the visits were compared using paired t-tests and Wilcoxon signed-rank tests. In addition, RMR values were expressed relative to lean mass (kcal/kg of lean mass), and associations between psychological measures and relative RMR were examined using Spearman's rank-order correlations. Lastly, a one-way ANOVA compared relative RMR values between participants with low, moderate, and high STICSA-trait scores. A two-sided *p*-value of 0.05 was used to determine statistical significance.

RESULTS: Median scores on the STICSA-state declined significantly from 27.0 at visit one to 25.0 at visit two (*Z*-statistic = -2.39, *p* = 0.017). Average RMR across both visits was 1,588 kcal/day, with a difference of -2.5 kcal/day (95% confidence interval, -26 to 31 kcal/day) between visits (*t* = 0.17, *p* = 0.86). No significant correlations were found between any of the psychological measures (STICSA, ASI-3, PSS-14) and relative RMR (all *rho* < 0.10). Mean relative RMR was 30.2 ± 3.8, 29.0 ± 1.9, and 29.5 ± 3.2 kcal/kg of lean mass among the low, moderate, and high STICSA-trait groups (*p* = 0.56).

CONCLUSIONS: None of the psychological measures tested correlate with RMR. More research on the subject is needed to resolve the mixed findings in the literature.

P37 THE EFFECT OF WALKING VERSUS RIDING ON ENERGY EXPENDITURE IN GOLF

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BACKGROUND: Research has shown that increases in physical activity (PA) may potentially decrease health issues and risk factors associated with obesity, diabetes, and cardiovascular disease (CVD). According to the 2018 PA guidelines, individuals should expend between approximately 562.5-1106.25 kcals/wk while engaging in moderate-intensity exercise (3-5.9 METs or 45-64% V_O2max) to achieve health benefits. Golf may appeal to those who are at an increased risk for CVD by increasing energy expenditure (EE) and potentially eliciting health benefits. Objective: To compare the EE associated with playing golf, either walking (W) or riding in a cart (R).

METHODS: Twenty-five participants (30.87±12.71 y.o., 88.23±15.06 kg) completed nine holes of golf W and/or R (14 R and W, 7 only R and 4 only W). The following measurements were collected: 1) medical history, 2) demographic info, 3) pre/post BP, 4) pre/post HR, 5) height, 6) weight, 7) dietary intake. While playing golf, each participant wore an accelerometer to determine EE. Significance was set at $p < 0.05$.

RESULTS: Completing nine holes while W required an EE of 624.07 kcal compared to 335.72 kcal R ($p < 0.001$).

CONCLUSIONS: Our data indicate a significant difference in EE when comparing W and R, suggesting a greater intensity in W vs. R. The data suggests that an individual could potentially meet the weekly 2018 PA guidelines requirements by playing nine holes while W twice a week (1248.14 kcal) or R three times a week (1007.16 kcals). This data indicates that golf, W or R, may elicit health benefits.

P38 COMPARISON OF 7 DIFFERENT BODY COMPOSITION MEASURES AMONG FEMALE COLLEGIATE ATHLETES

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BACKGROUND: Accurately measuring body composition (BC) can assist strength and conditioning coaches in structuring training regimens for ideal physique and performance. Multiple compartment models take greater individual variation into account, which may provide better estimates when determining BC.

PURPOSE: The purpose was to compare 6 different modalities to measure BC among female collegiate athletes against a criterion 4-compartment model (4C).

METHODS: Sixty female NCAA Division-I athletes underwent a series of BC testing in one single session (i.e., 4C (including total body water, body volume, body weight, bone mineral density), dual x-ray absorptiometry (DXA), air displacement plethysmography (ADP), 3-site skinfold (SF), bioelectrical spectroscopy (BIS), hand-to-foot bioelectrical impedance (HF-BIA), foot-to-foot bioelectrical impedance (FF-BIA)). Repeated measures analysis of variance was used to determine mean differences between the various measures. Bonferroni post hoc procedures, with an alpha level of 0.05, was used for follow-up procedures.

RESULTS: When compared to the criterion 4C (30.0.5 ± 6.08%), all measures except DXA (29.54 ± 6.3%; $p = 1$) and BIS (28.94 ± 5.95%; $p = 1$) produced significantly smaller estimates of body fat percentage (BF%). Additionally, ADP recorded the lowest BF% (22.82 ± 6.29%) and was significantly less than all measures except SF (23.77 ± 5.29%; $p = 1$) and FF-BIA (23.58 ± 5.25%; $p = 1$). There were no differences between SF and FF-BIA ($p = 1$), BIS and HF-BIA ($p = 0.38$), or BIS and DXA ($p = 1$).

CONCLUSIONS: When compared to 4C, 3-compartment models provided a better estimate of BF% than 2-compartment models. However, large variation exists between BC methods when performed among female athletes.

P39 BODY COMPOSITION CHANGES OVER ONE YEAR IN COLLEGIATE FEMALE COMPETITIVE DANCERS

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BACKGROUND: Athletes in sports where aesthetics are a prominent aspect of the culture may deal with body image issues. Understanding logical longitudinal body composition (BC) alterations can be of value in these sports. Therefore, the purpose of this study was to assess longitudinal BC changes in collegiate female competitive dancers.

METHODS: Data were collected on eight female collegiate dancers over one year with measurements in December (D1), April (A1), and the following December (D2). Each visit, body weight (BW), body fat percentage (BF%), fat mass (FM), and fat-free mass (FFM) were measured via air displacement plethysmography. A repeated measures ANOVA and Bonferroni post hoc were used to assess mean changes.

RESULTS: Over one year, BW ($p = 0.62$) and FM ($p = 0.28$) were not statistically altered. However, FFM statistically increased from D1 to D2 (D1: 42.0±3.1 kg, D2: 43.2±3.7 kg; $p = 0.004$). BF% statistically decreased from A1 to D2 (A1: 23.6±4.8%, D2: 21.4±5.1%; $p = 0.02$). There were no other statistical differences.

CONCLUSIONS: This study indicated that BF% decreased over one year primarily due to an increase in FFM. Monitoring longitudinal changes in BC can provide valuable feedback for practitioners. Further BC research is needed in this potentially sensitive population.

P40 LONGITUDINAL BODY COMPOSITION ALTERATIONS IN NCAA DIVISION-1 FOOTBALL PLAYERS

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BACKGROUND: Body composition is a vital fitness component for performance and health. However, there is limited research examining longitudinal changes in body composition of NCAA Division-1 (D1) football players. Therefore, the purpose of this study was to assess longitudinal body composition alterations over a two-year period in NCAA D1 football players.

METHODS: Thirty-nine male NCAA D1 football players participated in this study. Data were collected on three occasions, each July over consecutive years. Each visit, body weight (BW) was measured with a calibrated digital scale. Body fat percentage (BF%), fat mass (FM), and fat-free mass (FFM) were measured using air displacement plethysmography. Mean changes in each variable were analyzed with a repeated measures ANOVA and, as needed, a Bonferroni post-hoc.

RESULTS: Over the two year period, BW increased from 111.0±17.0 kg to 113.1±17.5 kg ($p = 0.006$). During year one, FFM increased from 87.1±6.2 kg to 88.5±6.7 kg ($p = 0.013$) and then remained unchanged. Throughout year two, FM increased from 23.4±13.3 kg to 25.3±13.9 kg ($p = 0.022$) and BF% increased from 19.7±8.9% to 21.1±9.3% ($p = 0.027$). There were no other statistical differences.

CONCLUSIONS: FFM increased over the course of the first year. However, participants experienced a significant increase in both FM and BF% without any further FFM changes over the course of the second year. The FM and BF% changes seen in this study elucidates the value of regular body composition assessment in collegiate athletes.

P41 COMPARING BODY COMPOSITION BETWEEN DIVISION I CROSS COUNTRY RUNNERS AND NORMAL WEIGHT YOUNG ADULTS

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BACKGROUND: Endurance training is a potent stimulator for aerobic fitness; it can also influence body composition and muscle characteristics. Intramuscular fat has been shown to be elevated as a result of endurance training yet is also elevated among individuals with greater body fat; this relationship has not yet been explored. The purpose of this study was to examine the differences in body composition, particularly lean mass (LM) and fat mass (FM), between a normal weight, college-age cohort and a collegiate endurance cohort matched for percent fat (%fat). An exploratory aim was to assess and compare muscle quality and size.

METHODS: 30 Division I cross country athletes (XC) and 30 normal-weight recreationally active (NW) college students (Mean \pm SD: age: 19.7 \pm 1.6 yrs, weight: 62.1 kg \pm 9.2, %fat: 18.0 \pm 5.2%) completed a full body dual-energy x-ray absorptiometry scan (DXA) to assess FM, LM, and %fat. Echo-intensity (EI) and cross-sectional area (mCSA) were measured from a panoramic ultrasound of the vastus lateralis to evaluate muscle quality and size. A one-way ANOVA test was utilized.

RESULTS: In the men, there was no significant difference in FM ($p=0.523$); LM ($p=0.176$); or mCSA ($p=0.823$) between XC and NW. There was a significant difference for EI between XC (87.2 \pm 7.9 au) and NW (76.4 \pm 3.7 au; $p=0.24$). In the women, there was no significant difference for FM ($p=0.393$); LM ($p=0.321$); or EI ($p=0.929$). mCSA was significantly different with higher mCSA values for NW (20.2 \pm 2.4 cm) vs. XC (16.5 \pm 2.6 cm; $p=0.05$).

CONCLUSIONS: For males and females, there was no significant body composition differences between cohorts, however, there were differences observed in muscle characteristics. Male XC runners had greater EI, indicating higher fat or connective tissue infiltration into the muscle at the same %fat as NW. Further research is needed to fully understand the implications of increased intramuscular fat for performance in XC runners.

P42 RELATIONSHIP BETWEEN BODY COMPOSITION, STRENGTH, PHYSICAL ACTIVITY AND DIETARY INTAKE IN AORTIC VALVE REPLACEMENT PATIENTS

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BACKGROUND: Low skeletal muscle mass compromises recovery, quality of life and survival following transcatheter aortic valve replacement (TAVR). However, it is unknown how skeletal muscle and fat tissue relate to strength, physical activity (PA) and dietary intake. The purpose of the study was to determine the relation between skeletal muscle and fat tissue (skeletal muscle index (SMI)), intermuscular adipose tissue (IMAT), visceral adipose tissue (VAT)), strength, PA, and dietary intake in TAVR patients.

METHODS: Ten (5 women and 5 men) TAVR patients (age:73.0 \pm 7.0 yrs) received CT-scans assessed from a single cross-sectional image at the level of third lumbar vertebrae. Strength was assessed using a 60° isometric extension and flexion protocol on a Biodex System. PA and dietary habits were assessed using pedometers and three-day food logs, respectively. Measurements were assessed ~6 months post-TAVR. Pearson product moment correlations were used to analyze variables.

RESULTS: The average BMI and steps/day classified participants as obese (35.6 \pm 11.7 kg/m²) and sedentary (2212 \pm 1351 steps/day). SMI for participants was 48.2 \pm 9.0 cm²/m² with 4 participants having low muscle tissue (Females: <39 cm²/m², Males: <55 cm²/m²). Participants consumed 1613 \pm 483 kcals/day, 0.74 \pm 0.48 g/kg/day protein, 1.9 \pm 0.70 g/kg/day carbohydrate, and 0.76 \pm 0.30 g/kg/day fat. Protein intake and IMAT ($r=-0.742$), SMI and peak extension strength ($r=0.890$), caloric intake and peak flexion strength ($r=0.778$), and fat intake and VAT ($r=0.780$) were significantly ($p<0.05$) correlated.

CONCLUSIONS: Our findings indicate that increased protein intake and reduced fat intake could positively influence muscle quality and fat tissue in TAVR patients via reduction of IMAT and VAT. Additionally, the application of modalities to elevate SMI, such as exercise training and/or protein supplementation, could help to improve leg strength and subsequent functional performance.

P43 ACCURACY OF REE PREDICTION EQUATIONS IN OVERWEIGHT YOUNG ADULT WOMEN

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BACKGROUND: Setting realistic energy intake and expenditure goals is a cornerstone of effective behavioral weight loss (BWL) programs. However, many of the often utilized resting energy expenditure (REE) prediction equations were not specifically developed for overweight or obese individuals. Therefore, the purpose of this study was to evaluate the accuracy of common REE prediction equations in overweight, young adult women enrolling in a BWL program.

METHODS: REE was measured (REEM) in 220 women (22.2 \pm 2.1 yrs; 33.7 \pm 5.0 kg/m²) using indirect calorimetry (Fitmate GS, COSMED, Chicago, IL). REE was predicted (REEP) using 6 equations (WHO, Mifflin-St. Jeor (MS), Harris-Benedict (HB), Owen, Frankenfield (FR), and University of Kansas (KU)). Differences in REEM and REEP were analyzed using paired t-tests and associations were assessed with Pearson correlations. Accuracy was determined as the percentage of REEP within \pm 10% of REEM.

RESULTS: Significant differences ($p<0.001$) were observed between REEM (1496 \pm 234 kcal/d) and all REEP (WHO: 2218 \pm 234 kcal/d; MS: 1665 \pm 181 kcal/d; HB: 1726 \pm 157 kcal/d; Owen: 1449 \pm 114 kcal/d; FR: 1665 \pm 158 kcal/d; KU: 1641 \pm 177 kcal/d). Correlations between REEM and REEP ranged from .646 to .654 ($p<0.001$). The Owen equation was most accurate with 63.2% of REEP within \pm 10% of REEM. Other equations, with the exception of WHO, were accurate in the range of 30.9-44.1%.

CONCLUSIONS: In our sample of overweight women, all equations demonstrated low accuracy in predicting REEM. Population-specific equations are needed to improve REE prediction when measured REE values are not available. This work was supported by NIH R01DK103668 to JGL.

P44 ASSOCIATIONS BETWEEN BODY COMPOSITION, STRENGTH, AND FUNCTION IN OLDER ADULTS AT RISK FOR MOBILITY DISABILITY

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BACKGROUND: We examined associations between body composition, strength, and physical function in older adults with obesity and cardiovascular disease (CVD) or metabolic syndrome (MetS), a population at higher risk for mobility disability.

METHODS: Participants (n=249, age=66.8 \pm 4.7 yrs, BMI=34.4 \pm 3.7 kg/m², female=71.1%, CVD=26.1%, MetS=84.3%) were assessed on body composition (total body fat mass, total body lean mass) via DXA, concentric knee extension strength, and physical function using gait speed (m/s) over 400m. Statistical analyses included Pearson partial correlations controlling for sex and age, and a regression analysis to examine if body composition moderated the association between strength and function.

RESULTS: We found significant correlations between strength and physical function ($r=0.353$, $p<0.0001$), lean mass and strength ($r=0.449$, $p<0.0001$), and fat mass and physical function ($r=-0.260$, $p<0.0001$) but not lean mass and physical function ($r=-0.049$, $p=0.44$) nor fat mass and strength ($r=0.123$, $p=0.0554$). Regression analysis revealed that strength (B=-0.553, $p<0.0001$) and fat mass (B=-0.244, $p<0.0001$) but not lean mass (B=-0.146, $p=0.075$) independently predicted function; there were no interactions between the predictor variables.

CONCLUSIONS: There were small associations between body composition, strength and function. However, body composition did not moderate the association between strength and function in this sample. Funded by the NIH/NHLBI (R18 HL076441) and the NIA (P30 AG021332)

P45 RELATIONSHIP BETWEEN BODY COMPOSITION AND MOTOR SKILLS IN 3-5 YEAR OLDS: NATIONAL YOUTH FITNESS SURVEY

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BACKGROUND: Factors such as obesity and motor skill development are associated with the health and development of young children and tend to track into adulthood. Early childhood is considered a critical time period for obesity incidence and motor skill development.

METHODS: Data from 3-5 years old children (N=342, 51% males) who participated in the 2012 National Youth Fitness Survey were analyzed. Body mass index (BMI), along with age- and sex-adjusted BMI percentiles were calculated. Scores were placed into categories of underweight/healthy weight, overweight, or obese. Skinfold measurements (calf and triceps) were taken and percent body fat (%BF) was calculated sex-specific equations. Motor skills were determined by the Test of Gross Motor Development-2nd Edition. Linear regression analyses were performed to determine the associations among BMI category and Locomotor, Object Control, and overall Gross Motor Quotient (GMQ) controlling for sex, race, and poverty index ratio. Regression analyses were also conducted between %BF and Locomotor, and Object Control Motor Skills and GMQ controlling for sex, race, and poverty index ratio.

RESULTS: Most children were classified as underweight/healthy weight (69%) and 31% were overweight or obese. Average BF% was (M(SE)=17.02 (0.27)). In regard to GMQ, the mean percentile was 41.43 (1.36). Neither BMI category or BF% was related to Locomotor, Object Control, or GMQ ($p=0.32-0.71$, and $p=0.18-0.63$, respectively).

CONCLUSIONS: Given the inconsistent findings in the literature, additional research is needed to elucidate these relationships between body composition and motor skill development. Using different measures of weight status may provide additional insight into associations between weight status and motor skill development in young children.

P46 TEST-RETEST RELIABILITY OF TOTAL BODY VOLUME DERIVED FROM A SINGLE 2 DIMENSIONAL DIGITAL IMAGE

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BACKGROUND: Time-efficient, accurate and cost-effective methods to estimate body composition in field settings are limited. We have recently developed an automated image analysis program (AIAP) to accurately acquire body composition from a single 2-dimensional (2D) digital photograph, taken on a smartphone or tablet. The purpose of this study was to evaluate the test-retest reliability of the AIAP when estimating total body volume (BV).

METHODS: A convenience sample of participants was recruited for this study ($n=13$, 22.0 ± 4.4 yrs., 69.2% female, 24.8 ± 4.1 kg/m²). Body mass was measured (to the nearest 0.1 kg) with a calibrated digital scale (Tanita BWB-800, Tanita Corporation, Tokyo, Japan), and a standing height was measured (to the nearest 0.1 cm) with a stadiometer (SECA 213, Seca Ltd., Hamburg, Germany). Two digital images of each participant were taken from the rear/posterior view using an Apple 12.9-inch iPad Pro, Wi-Fi 64GB. A paired sample T-test was used to examine potential differences between BV obtained from the two images (BV₁, BV₂). An Intraclass Correlations Coefficient (ICC) was used to determine the strength of the association between BV₁ and BV₂.

RESULTS: No differences were observed between BV₁ and BV₂ (72.2 ± 14.6 L versus 72.2 ± 14.6 L, respectively, $p=.966$), with excellent agreement between the two measures ($ICC>.999$).

CONCLUSIONS: The AIAP yielded near-perfect reliability within our small sample and should be considered a reliable tool for the estimation of BV. Data collection is ongoing, but preliminary results are promising. A larger sample size is needed to confirm these findings.

P47 EFFECT OF A KETOGENIC DIET ON ANTHROPOMETRICS, BODY COMPOSITION, AND METABOLIC HEALTH MARKERS IN WOMEN

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BACKGROUND: Low calorie, low carbohydrate diets improve markers of metabolic health, but it is unclear if these improvements are due to calorie reduction or decreases in dietary carbohydrates. The purpose of this study was to examine how a 21-day, eucaloric, low carbohydrate, high fat, or ketogenic, diet affected anthropometrics, body composition, and metabolic health markers in women.

METHODS: Twenty-two women (Age (yr.) 42.2 ± 8.1 , Ht. (cm) 164.2 ± 5.9 , BMI 27.3 ± 6.0) participated in a 21-day dietary intervention. A 3-day diet record, anthropometrics (waist circumference (cm); waist to hip (cm)), body composition (InBody 570) and fasted capillary blood glucose (mg/dL) were measured before (PRE) and after (POST) the dietary intervention. Women followed a eucaloric, free-living well-formulated ketogenic diet (10% CHO, ~20% PRO, ~70% FAT). Dietary compliance measures included weekly 3-day diet records (kcal) and daily blood ketone levels (mmol/L). Data were analyzed using paired sample t-tests ($p\leq 0.05$).

RESULTS: Women maintained eucaloric diets (PRE: 1938kcal vs POST: 1836kcal) and adopted a ketogenic diet (PRE: 36% CHO, 17% PRO, 45% FAT vs POST: 13% CHO, 20% PRO, 65% FAT) ($p\leq 0.05$). Despite consistent calories, body weight significantly decreased (PRE 73.9kg vs POST 72.3kg) but no differences were observed in waist circumference or waist to hip ($p\leq 0.05$). Women significantly decreased fat mass (PRE 33.3% to POST 32.0%) but not fat-free mass (PRE 58.3% to POST 58.3%) ($p\leq 0.05$). Fasting blood glucose decreased (PRE 94.0mg/dL to POST 89.9mg/dL) and fasting blood ketones increased (PRE 0.3mmol/L to POST 0.8mmol/L) from PRE to POST ($p\leq 0.05$).

CONCLUSIONS: Women following a 21-day ketogenic diet experienced decreases in total body weight, improvements in body composition, and improvements in fasting glucose despite consistent, not calorie reduced, dietary profiles. This study was funded in part by W Products.

P48 BODY ESTEEM IS LOWER FOLLOWING BODY COMPOSITION TESTING

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BACKGROUND: Optical body fat scanners are making body composition testing more accessible and affordable. While it is great that people can more easily track their body fat and not just their weight, it is not known how body composition testing influences body esteem. It is common for individuals to feel pressure to conform to society's socially defined standard of beauty and attractiveness, resulting in feelings of body dissatisfaction and negative feelings towards one's self-perception of physical attractiveness. However, the link between how body composition testing may affect a person's body esteem has not been explored. In this study, we examined how exposure to body fat results from a DXA (dual x-ray absorptiometry) scan and the image from an optical body fat scanner impacted how individuals felt about their bodies.

METHODS: Participants ($n = 45$; 27% male; age = 28.7 ± 12.3 years; BMI = 26.2 ± 4.7 kg-m²) completed the Body Esteem Scale (BES) at three different time points: 1) baseline measurement, 2) after receiving body fat results from their DXA scan, and 3) after viewing their 3D image from an optical body fat scanner.

RESULTS: The BES contains 15 positive items and 9 negative items. ANOVA with repeated measures indicated significant changes for both the positive ($p = .034$) and negative items ($p = .015$) after body composition testing. Scores decreased on 5 (of 15) positive items and increased on 5 (of 9) negative items. Effect sizes (partial eta squared) were largest for an increase in these items: I feel ashamed of how I look ($\eta_p^2 = .163$), My weight makes me unhappy ($\eta_p^2 = .128$), and My looks upset me ($\eta_p^2 = .132$) and a decrease in: I like what I see in the mirror ($\eta_p^2 = .15$).

CONCLUSIONS: Receiving body composition results from a DXA and an optical body fat scanner negatively impact body esteem. It is important to understand how individuals are affected by these data in order to provide best practice when delivering results about sensitive information, like body fat. Instead of serving as motivation, this may result in decreasing self-esteem and potential adoption of maladaptive weight control behaviors. This project was funded by the University of South Alabama CEPS Research Development Grants Program.

P49 BODY COMPOSITION USING AIR DISPLACEMENT PLETHYSMOGRAPHY IN OBESE ADULTS: EFFECT OF ESTIMATED VERSUS MEASURED THORACIC GAS VOLUME

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BACKGROUND: Air displacement plethysmography (ADP) is a common body composition estimation device that is used frequently in clinical practice. Obesity alters operational lung volumes at rest, which is a key component for calculations of density to estimate % body fat (%BF) via ADP. ADP accounts for lung volumes by either a regression equation or plethysmographic measurement. The purpose of this study was to analyze the agreement between estimates of %BF utilizing two different methods to account for lung volumes, and to compare these results to %BF from dual X-ray absorptiometry (DXA) in normal weight and obese individuals.

METHODS: Predicted ($vt_{g, pred}$) and measured ($vt_{g, meas}$) thoracic gas volumes were recorded in normal weight (NW; N=17, body mass index (BMI): $22.5 \pm 2.0 \text{ kg} \cdot \text{m}^{-2}$) and obese (OB; N=9, BMI: $32.1 \pm 1.9 \text{ kg} \cdot \text{m}^{-2}$) adults (24.0 ± 5.8 yr). Subjects completed body composition measurements via the ADP device with the predicted (%BF $vt_{g, pred}$) and measured lung volume methods (%BF $vt_{g, meas}$), as well as with a DXA scan (%BF $_{DXA}$). Potential interactions were assessed using a group by method repeated measures analysis of variance.

RESULTS: No significant group by method interaction ($p=0.11$) was observed for $vt_{g, pred}$ (NW: 3.34 ± 0.23 L; OB: 4.00 ± 0.51 L) and $vt_{g, meas}$ (NW: 3.32 ± 0.74 L; OB: 3.58 ± 0.91 L). However, there was a significant group by method interaction ($p=0.001$) for measures of %BF (%BF $vt_{g, pred}$, NW: $25.0 \pm 6.3\%$, OB: $32.9 \pm 4.3\%$; %BF $vt_{g, meas}$, NW: $24.8 \pm 5.2\%$, OB: $32.2 \pm 4.9\%$; %BF $_{DXA}$, NW: $26.3 \pm 4.9\%$, OB: $30.9 \pm 3.0\%$).

CONCLUSIONS: The difference between predicted and measured thoracic gas volume was not greater in obese adults compared to normal weight adults. Estimations of %BF are dependent on BMI and measurement technique, as ADP appears to under- and overestimate %BF in NW and OB adults, respectively, compared with DXA.

P50 VALIDITY OF BODY COMPOSITION BY INBODY 770 BIOIMPEDANCE ANALYZER

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BACKGROUND: To test the validity of InBody 770 bioimpedance analyzer (IB770) against isotope dilution (D2O) for total body water (TBW) and against DXA for percent body fat (PBF).

METHODS: Fifty-eight apparently healthy women (mean age 21.2 ± 2.6 years, BMI 26.7 ± 6.3) visited the KSU Human Performance Laboratory after an overnight fast. Subjects were given a 10g deuterium oxide solution (Cambridge Laboratories) to drink within 5 minutes and were asked to remain still in a reclining chair for 4 hours before providing a urine sample. Subjects were assessed via DXA for PBF and IB770 for both TBW and PBF. Frozen urine samples were shipped to an external laboratory for assessment by mass spectroscopy. One extreme outlier was excluded from analysis due to probable D2O measurement error. Correlation analyses were used to assess the validity of TBW and PBF measures from IB770 compared to those from D20 and DXA.

RESULTS: IB770 measures for TBW and PBF were strongly correlated with D20 ($r=.976$, $p<0.001$) and DXA ($r=.961$, $p<0.001$), respectively.

CONCLUSIONS: These data suggest that IB770 is a valid method for estimating TBW and PBF and may be a viable alternative to D20 and DXA.

P51 ESTIMATION OF VISCERAL ADIPOSE TISSUE: A DEVICE COMPARISON

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BACKGROUND: Visceral adipose tissue (VAT) is a significant risk factor for cardiometabolic disease. Various body composition devices now provide an estimate of VAT. The purpose of this study was to evaluate the relationship between estimates of VAT from bioelectrical impedance (BIA), brightness-mode ultrasound (US), and dual-energy x-ray absorptiometry (DXA).

METHODS: VAT was estimated in 124 adults (66% Female; Mean \pm SD: Age: 25.4 ± 8.9 yrs; BMI: $25.4 \pm 5.5 \text{ kg} \cdot \text{m}^{-2}$; %BF: $29.7 \pm 10.5\%$). VAT area (cm^2) was estimated from a BIA system specific algorithm. VAT thickness (cm) was estimated using US, quantified as the distance between the linea alba and aorta. VAT volume (cm^3) was estimated from the DXA predefined android region. Linear regression was used to evaluate the relationship between estimates and to identify factors that may contribute to estimate differences, in the entire group and by sex.

RESULTS: In the full group, VAT estimates from all three methods were significantly correlated [BIA-DXA ($R=0.768$; $R^2=0.589$); BIA-US ($R=0.545$; $R^2=0.297$); DXA-US ($R=0.785$; $R^2=0.616$) ($p<0.001$)]. In men, stronger relationships were observed with DXA [BIA-DXA ($R=0.852$; $R^2=0.727$); BIA-US ($R=0.774$; $R^2=0.600$); DXA-US ($R=0.878$; $R^2=0.772$) ($p<0.001$)]; in women, weaker relationships were observed with US [BIA-DXA ($R=0.890$; $R^2=0.793$); BIA-US ($R=0.567$; $R^2=0.321$); DXA-US ($R=0.690$; $R^2=0.477$) ($p<0.001$)]. In men, total body water (TBW) explained 31.9% and 12.0% of the variance in the difference between BIA-DXA and BIA-US, respectively; %BF explained 13.1% of the variance in the difference between DXA-US (all $p<0.05$). In women, %BF explained 28.9%, 34.0%, and 15.6% of the variance in the difference between BIA-DXA, BIA-US, and DXA-US, respectively (all $p<0.001$).

CONCLUSIONS: BIA and US are cost-effective alternatives to DXA. BIA may provide a more comparable estimate to DXA, while greater variability may occur when comparing with US, especially in women. Differences between estimates may be influenced by TBW and %BF.

P52 RELATIONSHIP BETWEEN BPAQ DERIVED PHYSICAL ACTIVITY AND BONE MINERAL DENSITY IN AGED INDIVIDUALS

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BACKGROUND: The bone specific physical activity questionnaire (BPAQ) is used to correlate physical activity habits with bone mineral density (BMD) and has been validated in younger populations. However, there are distinct changes in BMD with ageing and recall of past physical activity habits is worse in older individuals. Currently, the validity of the BPAQ in relation to older populations is unknown. Therefore, the purpose of this study is to determine the relationship between BPAQ derived scores and dual energy x-ray absorptiometry (DXA) BMD values in aged individuals.

METHODS: Aged male and female participants volunteered. Participants completed the BPAQ for past and current physical activity habits. Total, past, and current BPAQ scores were calculated. Anterior-posterior (AP) spine and dual-femur DXA scans were completed on each participant. Relationships between current, past, total BPAQ scores and AP spine and dual-femur BMD results were analyzed.

RESULTS: There were weak relationships for AP scan BMD and current ($r^2=0.01$; $p=0.96$), past ($r^2=0.11$; $p=0.66$), and total ($r^2=0.12$; $p=0.64$) BPAQ scores. Furthermore, only weak relationships were found for dual-femur scan BMD and current ($r^2=0.22$; $p=0.52$), past ($r^2=0.04$; $p=0.78$), and total ($r^2=0.07$; $p=0.73$) BPAQ scores.

CONCLUSIONS: Findings suggest that the BPAQ should be used with caution when assessing aged populations.

P53 THE EFFECT OF THERMOGENIC NUTRITIONAL SUPPLEMENTATION ON RESTING METABOLISM IN COLLEGE-AGE FEMALES

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BACKGROUND: Global increases in the incidence of obesity and the ensuing clinical co-morbidities has increased interest in the use of thermogenic supplements formulated to increase resting metabolism to increase energy expenditure and fat utilization. The purpose of this study was to assess the effect of new capsaicin-based thermogenic supplements on resting oxygen consumption (VO₂), carbon dioxide production (VCO₂) and respiratory quotient (RQ).

METHODS: Twenty-two untrained females (21.1±4.2 years) visited the lab on six occasions for measurements of pre-supplementation (PRE) resting energy expenditure (REE) for 30-60 min followed by the ingestion of a placebo or supplement (Shred, Shred 2.0, Capsimax 50, Capsimax 100, Capsimax 200) with at least three days separating conditions. Resting VO₂, VCO₂, and RQ were re-assessed for 90-120 minutes post-supplementation (POST). Changes in metabolic markers between treatment groups and over time were assessed in 5-minute intervals over the course of the 90-minute assessment using a two-way repeated measures ANOVA.

RESULTS: PRE VO₂ (2.5 ± 0.3 ml·kg⁻¹·min⁻¹; 0.21±0.03 L·min⁻¹), VCO₂ (0.18 ± 0.03 L·min⁻¹), and RQ (0.85 ± 0.06) were lower than any given 5-minute interval POST (p<0.05). VO₂ (ml·kg⁻¹·min⁻¹) was elevated at 5 min POST (2.99 ± 0.5 ml·kg⁻¹·min⁻¹) compared to each subsequent 5 min interval (p<0.05) with no differences noted after 10 minutes (2.7 ± 0.4 ml·kg⁻¹·min⁻¹). VCO₂ and VO₂ (L·min⁻¹) were elevated at 5 min POST compared to subsequent 5-minute intervals until 80 min (VCO₂; 0.22 ± 0.04 to 0.19 ± 0.03 L·min⁻¹) and 70 min (VO₂; 0.25 ± 0.04 to 0.23 ± 0.03 L·min⁻¹; p<0.05). There were no changes in VCO₂ at 10 minutes (0.19 ± 0.03 L·min⁻¹) compared to any other time point POST. VO₂ (L·min⁻¹) briefly increased from 35-45 minutes POST (0.23 ± 0.04 L·min⁻¹) compared to 20 min POST (0.22 ± 0.03 L·min⁻¹; p=0.002); no further changes occurred after 45 minutes. There were no changes in RQ during POST. There were no interaction effects (time*treatment) or treatment differences in metabolic markers.

CONCLUSIONS: Observed time effects are postulated as a result of the elevated REE caused by changes in subject position during supplement consumption, rather than supplementation. This study suggests that new thermogenic supplementation has no effect on metabolism.

P54 INFLUENCE OF POST-EXERCISE NUTRIENT INTAKE ON RECOVERY AND SUBSEQUENT EXERCISE PERFORMANCE IN YOUTH CYCLISTS

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BACKGROUND: The purpose of this study was to determine if chocolate milk (CM) consumption after high-intensity cycling affected post-exercise recovery and subsequent exercise performance in youth cyclists, compared to carbohydrate (CHO) and placebo (PL) beverages.

METHODS: Eight youth cyclists (15-18 y, VO_{2peak} = 61.8±7.7 mL·kg⁻¹·min⁻¹) completed two exercise sessions on three separate occasions. The first exercise session (EX1) included 30 min of constant-load cycling, and 60 min of standardized high-intensity intervals. Subjects consumed a recovery beverage (PL, CHO or CM) immediately following EX1 and again 2 h after EX1. A standardized lunch was consumed 4 h post-EX1, and a second exercise session (EX2) was completed 7 h after EX1. EX2 consisted of 30 min of constant-load cycling followed by a simulated 30 km time trial (TT). Ratings of muscle soreness, and mental and physical energy/fatigue were obtained prior to EX1, 4 h post-EX1, and pre-EX2. TT power output (W) was used to assess subsequent exercise performance.

RESULTS: Changes in muscle soreness over time were not significantly different between treatments. However, soreness was significantly elevated in PL from pre-EX1 (44±23 mm) to 4 h post-EX1 (67±22 mm) and pre-EX2 (68±20 mm). Soreness tended to be elevated in CHO from pre-EX1 (37±26 mm) to 4 h post-EX1 (52±28 mm; p = 0.051) but not at pre-EX2, and soreness was not elevated at any post-exercise timepoint in CM. Physical fatigue ratings increased significantly from pre-EX1 to pre-EX2 in PL, but not CHO or CM. In addition, changes in physical fatigue after exercise tended to be less pronounced with CM versus other treatments (p-values for treatment x time effects: 0.03 - 0.19). Average TT power was similar between PL (181±27 W), CHO (197±39 W) and CM (195±38 W).

CONCLUSIONS: CM ingestion after exercise may confer recovery benefits in youth cyclists, as demonstrated by the absence of elevated muscle soreness and fatigue ratings post-exercise. However, significant treatment x time effects were not consistently observed across all soreness/fatigue measurements. Subsequent cycling performance was not significantly different between treatments. However, TT performance effects (~8% higher power in CM/CHO versus PL) may be functionally relevant if upheld in trials with larger sample sizes.

P55 EFFECTS OF EXERCISE TRAINING ON CIRCULATING BRANCHED-CHAIN AMINO ACID AND KETONE LEVELS IN DIABETICS

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BACKGROUND: Elevated levels of circulating branched-chain amino acid (BCAA) and ketone bodies are recognized as biomarkers for cardiovascular disease (CVD) and other pathological conditions in type-2 diabetes mellitus (T2DM). Aerobic exercise interventions have previously shown decreases in levels of these markers, suggesting improved metabolic status and reduced risk of CVD. However, the efficacy of resistance training and concurrent programs in reducing BCAA and ketone body levels has not been well researched.

METHODS: The current study was performed as a secondary analysis of the HART-D trial. HART-D was a 9-month randomized, controlled exercise-training trial of 262 participants with T2DM. Participants were randomized to one of four groups; non-exercise control, aerobic training (AT), resistance training (RT), or a combined aerobic-resistance training (ATRTR). The effects of the 9-month intervention on BCAAs (leucine, valine, and isoleucine) and ketone bodies (β-hydroxy-butyrate, BHB; acetoacetate, AcAc; and acetone) were examined using generalized linear models adjusting for age, race, sex, and baseline BMI.

RESULTS: AcAc (p=0.006), acetone (p=0.003), and total ketone body (p=0.01) concentrations decreased in the RT group compared to the control group. Acetone (p=0.004) also decreased in ATRTR compared to the control group.

CONCLUSIONS: Our results suggest that RT and ATRTR programs could improve ketone body metabolism in those with T2DM.

P56 DOES VARYING THE FATTY ACID COMPOSITION OF A HIGH-FAT MEAL MODIFY POSTPRANDIAL LIPEMIA

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BACKGROUND: The western diet is typically high in saturated fats (SF) or omega-6 polyunsaturated fatty acids (O6) with insufficient amounts of omega-3 polyunsaturated fatty acids (O3). When chronic, this diet has been associated with an increased risk of cardiovascular, metabolic, and respiratory diseases. The purpose of this study was to examine the effect of varying the fatty acid composition of an acute High-Fat Meal (HFM) on postprandial lipemia.

METHODS: Fifteen individuals [6 M, 9 F; body mass index (BMI) = 25.3 ± 6.6 kg/m²] consumed three HFM smoothies separated by a minimum of 48 hours. The three smoothies were high in SF [63% total fat, <0.02% from O3 and O6], O6 [15:1 O6 to O3], and O3 [15:1 O3 to O6]. All were standardized to 12 kcal/kg body weight, 63% total fat, and 0.72 g/kg sugar. Blood triglycerides (TG) were collected at baseline, 2 hr and 4 hr postprandially.

RESULTS: There was a significant main effect of time for SF HFM and O3 HFM in TG from baseline to 4 hr (P=0.001 and 0.006), and a quadratic effect in TG from baseline to 4 hours in O6 HFM, where TG increased from baseline to 2 hr and returned near baseline values at 4 hr (P<0.001). There was an interaction effect between condition and time effect for TG (P<0.05) and no difference between O3 and O6 TG concentrations at any time point (P>0.05). The TG concentrations were significantly lower from 2 hr to 4 hr postprandially in the high O6 (P=0.005) and high O3 HFMs (P=0.033) compared to the SF HFM, which was increased from 2 to 4h.

CONCLUSIONS: O6 and O3 HFMs led to a more accelerated peak in postprandial TG and trended towards baseline by 4 hr. The SF HFM resulted in a sustained elevation in TG with significantly higher concentrations at 4 hr than at baseline. These findings suggest that varying types of fatty acids can lead to markedly different metabolic responses and that diets high in SF could have prolonged exposure to high blood triglycerides, increasing the risk of atherosclerosis and other chronic diseases.

P57 CHANGES IN FAT AND CARBOHYDRATE OXIDATION FROM REST TO EXERCISE AFTER DIFFERENT FASTING LENGTHS

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BACKGROUND: It is unclear how length of fasting after a pre-exercise meal effects fuel use responses from rest and to during exercise. The purpose of this study was to examine the changes in fat (fatox) and carbohydrate (carbox) oxidation rates during rest and exercise after various fasting lengths.

METHODS: Subjects completed 3 experimental trials in a random order. Trials were preceded by a standard meal (19.4 ± 1.8% of daily energy expenditure) followed by a fast for 12 hrs, 3 hrs or 1 hr. Each trial consisted of 30 mins of rest and 30 mins of exercise at 55% of maximal oxygen uptake (VO₂max). VO₂ and carbon dioxide production (VCO₂) were averaged over the final 10 minutes of rest and exercise. The equations fatox = 1.695*VO₂-1.701*VCO₂ and carbox = 4.585*VCO₂-3.226*VO₂ were used to calculate oxidation rates (g*min⁻¹). Two-way repeated measures ANOVAs and one-way repeated measures ANOVAs analyzed differences. Significance was established if P<0.05.

RESULTS: There was no significant interaction for fatox and carbox. There were significant main effects of time. Fatox increased from rest to exercise in the 1hr (0.34 ± 0.10 g*min⁻¹ vs. 8.43 ± 4.00 g*min⁻¹), 3hr (0.30 ± 0.10 g*min⁻¹ vs. 7.56 ± 3.53 g*min⁻¹) and 12hr (0.30 ± 0.04 g*min⁻¹ vs. 7.34 ± 3.00 g*min⁻¹) trials. In each trial, carbox increased from rest (1hr = 0.34 ± 0.10 g*min⁻¹; 3hr = 0.27 ± 0.09 g*min⁻¹; 12hr = 0.30 ± 0.07 g*min⁻¹) to exercise (1hr = 2.18 ± 0.81 g*min⁻¹; 3hr = 1.90 ± 0.64 g*min⁻¹; and 1.92 ± 0.55 g*min⁻¹). Relative percent changes from rest to during exercise were not different between 1hr, 3 hrs and 12 hrs for fatox (2472.1 ± 959.0% vs. 2470.8 ± 979.1% vs. 2408.8 ± 1138.5%) and carbox (577.1 ± 243.3% vs. 632.1 ± 265.5% vs. 586.2 ± 306.0%).

CONCLUSIONS: Fatox and carbox responses from rest to during exercise were similar between trials. This indicates a standard meal and resting oxidation rates could control for differences in substrate use during exercise, regardless of fasting length.

P58 AEROBIC OVERTRAINING PROTOCOL MITIGATES GLUCOSE INTOLERANCE AND DOES NOT IMPAIR RUNNING PERFORMANCE IN C57BL MICE

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BACKGROUND: It is unclear what role glucose uptake may play in contributing to glycogen depletion in overtraining. Therefore, the purpose of the study was to determine if a treadmill overtraining protocol would affect glucose tolerance, as a measure of glucose uptake.

METHODS: C57BL mice were divided into a sedentary control group (CON; n = 6), an exercise group (EXE; n = 6), and an overtraining group (OTS; n = 6). Body weight, a glucose tolerance test (GTT), and exhaustion velocity (EV) were measured at baseline and repeated post-intervention. All groups exercised for a total of 8 weeks. The EXE group exercised for 60 minutes at 60% EV, 5 days per week. The OTS group matched the EXE group for the first 5 weeks, then increased to 90 minutes at 90% EV, 5 days per week, 2 times per day, for 3 weeks. All data are presented as mean ± SEM.

RESULTS: There was a significant group (F= 31.62; p < 0.01), time (F= 91.24; p < 0.01), and interaction effect (F= 9.03; p < 0.01) for performance, as measured by EV. However, EV did not differ between the EXE (24.4 ± 1.7 m/min) and OTS (25.0 ± 0.2 m/min) groups post-intervention (p = 0.91). There was significant group (F= 14.46; p < 0.01) and interaction effects (F= 17.37; p < 0.01), but not time (F= 0.84; p < 0.37) for GTT area under the curve (AUC). The AUC post-intervention for CON, EXE, and OTS were 42413.3 ± 1799.9 AU, 31948.3 ± 2019.6 AU, and 25563.3 ± 816.7 AU, respectively. Body weight significantly increased in all groups (CON = 5.77 ± 0.98 g; EXE = 4.48 ± 0.62 g; OTS = 1.88 ± 0.36 g), though the increase was significantly greater in the CON (p < 0.01) and EXE (p = 0.04) groups compared to the OTS group.

CONCLUSIONS: The findings of the current study indicate that treadmill exercise at speeds of 60% and 90% of exhaustion threshold result in enhanced glucose tolerance and attenuated weight gain in mice in a dose-dependent manner. A more robust training protocol is likely necessary to truly induce overtraining and determine its effects on glucose tolerance.

P59 A 28-DAY CARBOHYDRATE RESTRICTED DIET IMPROVES MARKERS OF CARDIOVASCULAR DISEASE IN FIREFIGHTERS

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BACKGROUND: Research shows firefighters (FF) consume excessive amounts of refined carbohydrates and express some of the highest rates of cardiovascular disease in North America. Therefore, provided these findings, the primary aim of the study was to examine the effects of a 28-day carbohydrate restricted (<25% of calories) diet (CRD) on cardiometabolic markers in professional FF.

METHODS: Fifteen male FF (age = 33.5 ± 9.7 yrs; height = 1.78 ± 0.06 m; mass = 89.1 ± 12.7 kg; fire-service = 7.9 ± 7.4 yrs) completed three sessions (Trial 1 [15 day habitual western-diet], Trial 2 [Baseline], and Trial 3 [Post-28 day CRD]). Blood was sampled pre- and post-CRD and analyzed for markers of cardiovascular disease including c-reactive protein (CRP), insulin, human growth hormone (HGH), adiponectin, amylase, creatine kinase, malondialdehyde (MDA), cortisol, advanced oxidation protein products (AOPP), triglycerides, soluble intracellular adhesion molecule-1 (sICAM-1), nitric oxide oxidation products (NO₃+NO₂), albumin, glucose, and a lipid panel. Data were assessed for normality using Shapiro-Wilk's test prior to proceeding with parametric or non-parametric tests. All blood markers were analyzed using a dependent t-test, with the exception of creatine kinase, AOPP, CRP, insulin, and HGH which were analyzed using a Wilcoxon matched-pairs signed-rank test.

RESULTS: Upon completion of the CRD, blood markers AOPP, adiponectin, and sICAM-1 significantly decreased (p < 0.05). There were increases (p < 0.05) to total cholesterol, high-density cholesterol, and HGH. Creatine kinase approached a significant decrease (p = 0.06) and all other markers remained non significant.

CONCLUSIONS: Overall, this study suggests that a 28-day CRD can drastically improve markers of cardiovascular disease with no significant detriments to heart health and offer clinicians a diet intervention for the management and a possible treatment approach to cardiovascular disease.

P60 EFFECT OF AEROBIC EXERCISE DURING PREGNANCY ON BIOMARKERS OF MATERNAL METABOLISM

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BACKGROUND: Although chronic exercise results in metabolic adaptations at rest (↓glucose, ↓lipids, ↓lactate) in nonpregnant population, little is known about the maternal metabolic adaptations due to aerobic exercise at recommended levels throughout pregnancy.

METHODS: To address this gap in knowledge, women were randomized to moderate intensity (40-59% VO_{2peak}) aerobic exercise (n=10) or light intensity (<40% VO_{2peak}) stretching/ breathing control group (n=4). All women trained 50 minutes, 3 times per week, from 16 weeks to delivery. Fasted blood samples were collected at 16 and 36 weeks via fingerstick. Cholestech and Lactate Analyzers were used to determine maternal glucose, lactate and lipid (TC, TG, LDL, HDL) profiles. Mann-Whitney U Test were performed to compare the between-group medians, accounting for the distribution, for all maternal metabolic biomarkers. Due to the small sample size, the p-value from the Fishers Exact test was used to determine statistical significance (p<0.05).

RESULTS: The aerobic group has significantly decreased TG (p=0.02) at 36 wks, with trends toward lower TC:HDL Ratio (p=0.14) at 36 wks and change in TG from early to late pregnancy (p=0.20). No significance was seen for other maternal metabolic biomarkers.

CONCLUSIONS: Aerobic exercise during pregnancy positively supports maternal metabolic normalization for TG. Lack of significant findings may be due to small sample size. These data suggest aerobic exercise during pregnancy may help normalize maternal lipids during pregnancy. Funded by AHA Grant #15GRNT24470029.

P61 CORRELATION BETWEEN FATMAX AND VT1 IN ADOLESCENT BOYS AND GIRLS

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BACKGROUND: Childhood obesity is a serious problem in the United States and regular physical activity has been shown to improve adolescent's fitness as well as control body weight. The primary aim of this study was to examine if the heart rate (HR) at maximal fat oxidation (Fatmax) is correlated with the HR at the first ventilatory threshold (VT1) in adolescent males and females. The secondary aim was to quantify the Fatmax in absolute terms (Fatmaxabs) in adolescent boys and girls and the intensity at which Fatmax occurs relative to HR peak (%Fatmax).

METHODS: Forty-five healthy adolescents (22 boys, 16.0 ± 1.1 y.o and 23 girls, 15.7 ± 1.7 y.o.) participated in this study. Participants performed a cardiopulmonary exercise test (CPET) to measure the Fatmaxabs, %Fatmax, the HR at Fatmax (FatmaxHR) and the HR at VT1 (VT1HR). The CPET was performed on a cycle ergometer using a 15W-per-minute incremental protocol. Metabolic analysis was performed using the COSMED K5 metabolic cart and fat utilization was calculated as: fat oxidation (g/min) = 1.695*VO₂-1.701*VCO₂. The Fatmax was identified as the highest 1-min average Fatmaxabs value during the CPET. The VT1 was identified using the ventilatory equivalent method as primary criteria and the V-slope method as secondary criteria. Pearson Correlation Coefficient and Effect Size (R₂) and independent-samples t-test were applied to measure the correlation between VT1 and Fatmax to screen for differences between the two groups.

RESULTS: FatmaxHR was found to be highly correlated with VT1HR in both boys (R₂=0.9288, p<0.01, range 106 to 143 bpm) and girls (R₂=0.825, p<0.01, range 102 to 161 bpm). %Fatmax was 58.9 ± 5.2% in boys and 64.2 ± 7.4% in girls. The absolute Fatmax was significantly higher in boys than in girls (0.32 ± 0.14 g/min vs 0.24 ± 0.11 g/min, p=0.04).

CONCLUSIONS: A strong correlation between Fatmax and VT1 was exhibited in both adolescent boys and girls and boys reported a higher absolute Fatmax at a lower relative exercise intensity than girls.

P62 THE EFFECT OF BODY FAT PERCENTAGE ON FAT UTILIZATION IN NORMAL AND OVERWEIGHT ADOLESCENTS

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BACKGROUND: The increased prevalence in adolescent obesity is problematic as obesity is linked to a series of health issues including cardiovascular disease, metabolic diseases, and cancer in adults. Excess adiposity may alter substrate utilization thus altering metabolic functions. This study aimed to identify correlations between body fat percentage (%BF) and maximal fat utilization (Fat_{max}) in normal weight and overweight adolescents.

METHODS: Forty-five adolescents (11 to 17 years; M=22 and F=23), were recruited for this study. Body fat percentage (%BF) was measured via the BodPod. Subjects were divided into normal weight (males: %BF≤23%, females: %BF≤29%; n=31) and overweight (males: %BF≥24%, females: %BF≥30%; n=14) groups. All subjects performed a graded exercise test (GXT) with a 15-watt per minute incremental protocol on a cycle ergometer. Metabolic measures were recorded using the COSMED Quark CPET metabolic cart. Fat oxidation was calculated using the formula: g/min = 1.695*VO₂-1.701*VCO₂. Fat_{max} was identified as the highest 1-min average fat oxidation value during the GXT. An independent samples t-test was used to identify differences in Fat_{max} between groups. A bivariate Pearson's correlation was performed to determine correlations between %BF and Fat_{max}.

RESULTS: The average %BF in normal weight subjects was 16.6%±6.5% and 35.8%±5.5% in overweight subjects. Absolute Fat_{max} (Fat_{max}Abs) in normal weight subjects was 2.61mg/min±1.08mg/min and in overweight subjects was 3.15mg/min±0.18mg/min. Statistical analyses showed a positive correlation in Fat_{max}Abs and %BF in overweight subjects (r=0.672, p=0.008), and a negative correlation in Fat_{max}Abs and %BF in normal weight subjects (r=-0.405, p=0.028).

CONCLUSIONS: Levels of adiposity seen in overweight adolescents might impact substrate utilization and instigate increased proficiency in fat oxidation. This may be due to increased bioavailability of fat as an energy source as compared to the normal weight counterpart.

P63 EFFECT OF A 21-DAY WELL-FORMULATED KETOGENIC DIET ON PSYCHOLOGICAL HEALTH IN WOMEN

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BACKGROUND: Mental health is a growing issue amongst women. Evidence suggests dietary interventions positively affects mental well-being. Carbohydrate restricted, high fat, moderate protein diet, or a well-formulated ketogenic diet (WFKD), improves metabolic health but there is limited information on how it effects mental health in women. The purpose of this study was to examine the effect of a WFKD on psychological health outcomes in women.

METHODS: Twenty-two women (Age (yr.) 42.2 ± 8.1, Ht. (cm) 164.2 ± 5.9, BMI 27.3 ± 6.0) participated in a 21-day pilot study. Women completed a 3-day diet record and self-reported inventories to assess psychological health; including Pittsburgh Sleep Quality Index (PSQI), Profile of Mood States (POMS); Perceived Stress Scale, Trait Anxiety Inventory (TAI), and Insomnia Symptoms Index before (PRE) and after (POST) the intervention. Women attended biweekly diet education classes to learn how to adopt a free-living WFKD and dietary compliance included weekly 3-day diet records and daily capillary blood ketone levels (mmol/L). Data were analyzed using paired t-tests (p≤0.05).

RESULTS: Women successfully adopted a WFKD by decreasing dietary carbohydrate (PRE 36% to POST 13%) and increasing dietary fat (PRE 45% to POST 65%) while maintaining dietary protein (PRE 17% to POST 20%) during the intervention. Ketones significantly increased from PRE (0.3mmol/L) to POST (0.8mmol/L) (p≤0.05) and 59% of women reached nutritional ketosis (≥0.5mmol/L) by POST testing. Women reported improvements from PRE to POST intervention for all the self-reported measures with significant improvements for the POMS (55% improvement) and TAI (59% improvement) (p≤0.05).

CONCLUSIONS: After 21 days on a WFKD, women reported improvements on psychological health outcomes, including decreased levels of tension, anger, fatigue, depression, and trait anxiety. This study was funded in part by W Products

P64 FASTING BLOOD GLUCOSE PREDICTS VASCULAR HEALTH IN APPARENTLY HEALTHY INDIVIDUALS

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BACKGROUND: Arterial stiffness and high blood pressure are both major risk factors for cardiovascular disease, the leading cause of death worldwide. Although impaired glucose metabolism is often implicated in the pathogenesis of aortic stiffening and hypertension, this relationship is incompletely understood. The present study aimed to characterize relationships between fasting blood glucose and vascular health in apparently healthy individuals.

METHODS: Thirty-one healthy individuals (14 females, 30±10 yrs, 24.7±3.2 kg/m²) free of cardiovascular disease, diabetes, hypercholesterolemia, and not using medication were recruited. Fasting (>10 hours) blood glucose was assessed, and vascular health was characterized via pulse wave analysis, which measured brachial and aortic pressures, pulse pressure, and augmentation pressure (a measure of systemic arterial stiffness).

RESULTS: Brachial and aortic systolic (122.6±11.4 and 107.6±9.9 mmHg) and diastolic (76.1±9.0 and 76.9±9.1 mmHg) pressures were within normal range. Initial regression models for age, gender, body mass index (BMI), and fasting glucose failed to predict (P>0.05) vascular indices. However, fasting blood glucose (84.2±7.5 mg/dl) independently predicted brachial diastolic (P=0.02, β=0.41), aortic systolic (P=0.03, β=0.38), and aortic diastolic (P=0.01, β=0.46) pressures. No relationships (P>0.05) were observed between fasting blood glucose and pulse pressure (30.7±6.4 mmHg) or augmentation pressure (2.0±3.9 mmHg).

CONCLUSIONS: These data demonstrate a relationship between fasting blood glucose and blood pressure in apparently healthy individuals, which was more pronounced centrally than peripherally. This finding highlights the possible involvement of glucose metabolism in the etiology of cardiovascular disease risk.

P65 THE EFFECTS OF ORAL CONTRACEPTIVES ON CENTRAL AND PERIPHERAL BLOOD PRESSURES

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BACKGROUND: Oral contraceptive use, even low-dose formulas, is linked with slight elevations in brachial blood pressure, thought to be related to the composition of estrogen and progesterone. Hypertension stimulated by oral contraceptives is seen in approximately 5% of women consuming high-dose formulas. It is unknown if hormonal birth control may also increase central pressure, which is more strongly related to future cardiovascular events and is affected differently by medications compared to brachial blood pressure. The purpose of this study is to determine if oral contraceptive use results in alterations in central blood pressure in young, healthy females.

METHODS: Thirty-four young (ages 18-40) females (20 not on oral contraceptives, 14 on oral contraceptives) free of disease underwent measurements of central (aortic and carotid) and peripheral (brachial) blood pressures. Participants were 4 hours fasted and refrained from caffeine, alcohol, and exercise for 24 hours prior and were tested during the early follicular phase of their menstrual cycle.

RESULTS: Independent t-tests were performed to determine significance between groups, with $p < 0.05$. Females on oral contraceptives had significantly higher brachial systolic (SBP) and diastolic blood pressures (DBP) and carotid and aortic SBP and DBP compared to females not taking any form of birth control. (SBP = 120 vs 110 mmHg, DBP = 72 vs 64 mmHg, carotid SBP = 113 vs 103 mmHg, carotid DBP = 72 vs 64 mmHg, aortic SBP = 103 vs 96 mmHg, aortic DBP = 72 vs 65 mmHg, respectively).

CONCLUSIONS: Females taking hormonal birth control exhibited higher peripheral and central pressures compared to females who did not take a hormonal birth control. This indicates that oral contraceptive use has the ability to increase central blood pressure, which is a better predictor of cardiovascular disease and stroke.

P66 ASSOCIATION BETWEEN HEART RATE VARIABILITY AND PERCEIVED PAIN IN RESPONSE TO FOAM ROLLING

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BACKGROUND: Foam rolling (FR) is a common and inexpensive self-massage strategy that has been shown to transiently alter cardiac-autonomic modulation, inferred from heart rate variability (HRV). FR can be perceived as painful or relaxing depending on various factors, which may help explain HRV responses. Thus, we aimed to determine the association between HRV and perceived pain from an acute bout of FR.

METHODS: Healthy adult men ($n = 7$) and women ($n = 7$) performed an acute bout of FR, targeting the gastrocnemius, knee flexors, knee extensors, latissimus dorsi, upper back, and elbow extensors for 30 s bilaterally. Using a standardized scale, perceived pain ratings were provided following FR of each muscle group and summed to generate an overall intra-individual perceived pain rating. Seated measures of the natural logarithm of the root-mean square of successive RR interval differences (LnRMSSD, a parasympathetic HRV index) were obtained at 5-10 min pre- (T1, following 5-min for stabilization), 5-10 min post- (T2) and 25-30 min post-FR (T3) using a portable electrocardiograph sensor.

RESULTS: Repeated measures ANOVA showed no change ($P = 0.07$) in LnRMSSD across time (Ln units, $T1 = 4.03 \pm 0.52$, $T2 = 3.88 \pm 0.56$, $T3 = 3.94 \pm 0.55$). Changes in LnRMSSD from T1 to T2 ($r = 0.01$) and T1 to T3 ($r = 0.26$) were not associated with pain scale sum ($P > 0.05$). However, baseline LnRMSSD (T1) was inversely associated with pain scale sum ($r = -0.66$, $P < 0.01$).

CONCLUSIONS: FR did not systematically alter HRV, nor did individual changes in HRV correlate with perceived pain ratings. Those with lower pre-FR HRV reported higher perceived pain during FR. Basal cardiac-autonomic activity may therefore influence pain sensitivity to FR in healthy adults.

P67 ACUTE RESPONSE OF BLOOD LIPID PROFILES TO DIFFERENT INTENSITIES OF EXERCISE IN OBESE MEN

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BACKGROUND: Exercise has been widely recommended for people at any age to improve cardiovascular health due to its positive effects on blood lipids and lipoproteins. However, the effects of different intensities of exercise on lipid profiles in obese men are unclear. The current study examined the effect of different intensities (low vs. high) of an acute cycling exercise on changes in blood lipids and lipoproteins.

METHODS: In a randomized, cross-over design, fifteen obese ($BMI > 30 \text{ kg/m}^2$) sedentary (less than 2 days per week of physical activity) male volunteers, the ages between 18 and 30 participated in the study. The participants performed a single bout of cycling exercise (average energy expenditure ~ 300 kcal) at two different intensities in random order [low-intensity: 50% of maximal heart rate and high intensity: 80% of maximal heart rate]. Overnight fasting blood samples were collected at baseline, immediate post-exercise (IPE), 1-hr PE, and 24-hr PE for each intensity of exercise to determine blood lipids and lipoproteins (TC, TG, LDL-C, and HDL-C). A 2(intensity) X 4 (time) ANOVA with repeated measures was used to examine the mean differences in intensity and time on blood lipids and lipoproteins. The LSD pairwise comparisons were conducted as post hoc to locate the significant mean differences. A p -value $< .05$ was set for the statistical significance.

RESULTS: Either low- or high-intensity exercise did not significantly alter TC, TG, LDL-C and HDL-C. There was no significant interaction between intensity and time on blood lipid profiles.

CONCLUSIONS: Regardless of the intensity level, acute exercise may not alter blood lipid profiles in obese men due to the short volume and duration. Therefore, future research should determine if different intensities of chronic exercise alter blood lipid profiles in obese men.

P68 SEX DIFFERENCES IN CARDIOVASCULAR RESPONSES TO ACUTE RESISTANCE EXERCISE

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BACKGROUND: Hypertension is associated with arterial stiffening, a risk factor for cardiovascular disease. During resistance exercise there is a short-term, but significant, increase in pressure. In males, an acute bout of resistance exercise has been shown to increase large artery stiffness, which persists for up to 30 minutes after the training session. Because of the vasodilatory effects of estrogen, it is possible females may be better protected from this elevated pressure load and subsequent arterial stiffening. The purpose of this study was to compare blood pressure and arterial stiffness in males and females before and following an acute resistance exercise bout.

METHODS: Seven males and 11 females (mean age = 26 years) not currently resistance training underwent measurements of aortic and brachial blood pressures and aortic stiffness (central pulse wave velocity, cPWV; left ventricular ejection time, LVET) before, immediately after, and 30 minutes after a full body resistance exercise bout. Values across the 3 time points were compared between sexes using an ANOVA and when the interaction was significant, followed up with appropriate t-tests.

RESULTS: Aortic stiffening was seen following resistance exercise in males only, demonstrated through increases in cPWV (5.6 to 6.3 to 5.6 ms^{-1}) and decreases in LVET (325 to 303 to 300 ms). Females had no change in either measure at any time point. Males increased brachial SBP (119 to 126 to 124 mmHg) compared to females (113 to 112 to 110 mmHg) and DBP changed similarly with no sex differences. Both aortic systolic (99 to 95 to 94 mmHg) and diastolic (68 to 60 to 65 mmHg) pressure decreased immediately in females compared to males (101 to 101 to 99 mmHg; and 70 to 65 to 64 mmHg, respectively).

CONCLUSIONS: Females appear to be protected from the acute aortic stiffening and increased blood pressure seen in males following resistance exercise. This may be due to the vasodilatory effects of estrogen.

P69 THE ACUTE EFFECTS OF PROLONGED SITTING WITH OR WITHOUT A HIGH GLYCEMIC INDEX MEAL ON CEREBRAL BLOOD FLOW IN HEALTHY ADULTS

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BACKGROUND: Exposure to acute prolonged sitting reportedly leads to decreased cerebral blood flow. However, it is unclear whether or not a high glycemic index meal will exacerbate the detrimental effects of prolonged sitting on cerebral blood flow. The study purpose was to determine if prolonged sitting (3-hr) resulted in a decreased total brain blood flow (QBF) and whether this decrease is exacerbated by a high glycemic index meal (HGI).

METHODS: Twenty participants (22.6 [3.1] y, 33% F, 24.3 [3.7] kg/m²) were recruited to participate in an HGI and low glycemic index (LGI) condition. Using Doppler Ultrasound, total brain blood flow (QBF, ml/min) was calculated using the equation: (internal carotid artery [ICA] blood flow + vertebral artery [VA] blood flow) x 2.

RESULTS: For QBF, there was no interaction effect (P=0.189) or time effect (P=0.340), however, there was a significant, small condition effect (P=0.04, ES: -0.06). For LGI, QBF decreased by -2203.2 ml/min (95% CI: -5136 to 730), and for HGI, QBF increased by 74 ml/min (95% CI: -2571 to 2719). Most of this change was driven by the internal carotid artery BF, where there was no interaction effect or time effect, however, there was a significant, small condition effect (P=0.043, ES: -0.11).

CONCLUSIONS: Prolonged sitting does decrease total brain blood flow, but contrary to expected, a HGI meal results in an increase in total brain blood flow.

P70 ENDOTHELIAL FUNCTION CONTRIBUTES TO ACUTE CHANGES IN PULSE WAVE VELOCITY

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BACKGROUND: Pulse-wave velocity (PWV) can potentially be used to assess acute change in endothelial function. Previous studies have reported that increasing or decreasing nitric oxide bioavailability results in reciprocal changes to PWV. However, nitric oxide is not the only molecule regulating endothelial function and at this time, no in-vivo studies have examined whether PWV changes in acute, non-specific endothelial dysfunction. **PURPOSE:** Determine effects of acute endothelial dysfunction on PWV. In this study, retrograde shear stress was induced by increasing retrograde flow for 30 minutes. Our hypothesis is that acute endothelial dysfunction will result in decreased in PWV.

METHODS: Twenty-two young, healthy adults (23.8 years [SD 4.1], 16 F, BMI 22.8 kg/m² [SD 2.8]) were recruited. PWV and flow-mediated dilation (FMD) were measured at baseline and immediately following the endothelial dysfunction protocol. FMD was measured to confirm the presence of endothelial dysfunction. PWV was measured between the upper arm and wrist using an oscillometric device, and brachial FMD using ultrasound. The association between PWV and FMD was assessed using Pearson's product moment correlation. Linear mixed models were used to assess baseline versus endothelial dysfunction protocol changes in PWV and FMD, controlling for within-subject changes in mean arterial pressure and the shear rate area under the curve, respectively

RESULTS: At baseline, there was a large association between FMD and PWV ($r = 0.60$, 95%CI: 0.23, 0.81). Following the endothelial dysfunction protocol, there was a moderate significant increase in PWV ($\Delta = 0.38$ m/s, 95%CI: 0.07, 0.69, ES = 0.5) and a large significant decrease ($\Delta = -3.10$, 95%CI: -4.15, -2.05, ES = -1.3) in FMD.

CONCLUSIONS: Acute change in PWV is at least partially driven by changes in endothelial function, indicating that PWV could be a useful tool for assessing endothelial function changes.

P71 FEASIBILITY OF ASSESSING PULSE WAVE VELOCITY IN NEONATES

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BACKGROUND: Cardiovascular disease (CVD) risk trajectory begins in early childhood and can be influenced by genetic and environmental factors. Carotid-femoral pulse wave velocity (cfPWV) is considered the gold standard for assessing CVD risk trajectory; however, there are no normative cfPWV data in children. Further, while cfPWV may be suitable for use in children, it is challenging in neonates. Brachial-femoral PWV (bfPWV) is less obtrusive and carotid and brachial waveforms have similar contours at this age. Our purpose was to: (a) use meta-regression to determine the normal rate of cfPWV progression in children, and (b) determine the feasibility of assessing bfPWV using an oscillometric technique in neonates. We hypothesized that (a) cfPWV will increase with age, starting at birth, and (b) mean bfPWV values will overlap with the intercept (year 0) from the normative data generated from the meta-regression. **METHODS:** Electronic databases were searched from inception to May 2018 for all studies that reported cfPWV in children (<19 y). Random effects meta-regression was used to quantify the association between time (years) and cfPWV. bfPWV in 5 neonates (1-2 days old; mean weight 3.65 kg [SD: 0.52]) was assessed using oscillometric cuffs, attached to the upper right arm and thigh, via the VICORDER[®].

RESULTS: (a) Meta-regression findings (9 studies): the increase in cfPWV per year (age) was 0.12 (95%CI: 0.07, 0.16) m/s. The cfPWV intercept (0 y) was 3.61 (95%CI: 3.07, 4.16) m/s. (b) bfPWV was successfully collected in all neonates with a mean of 3.64 (95%CI: 3.31, 3.97) m/s.

CONCLUSIONS: cfPWV increases at a rate of 0.12 m/s per year in children. Mean values of the bfPWV from the neonates overlap with the intercept from the meta-regression analysis. Evaluating bfPWV using an oscillometric technique is feasible and yields comparable results to published cfPWV data in children.

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P72 CARDIOVASCULAR RESPONSES TO PHYSIOLOGICAL STRESS IN ANXIOUS AND NON-ANXIOUS YOUNG ADULTS

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BACKGROUND: High trait anxiety is associated with the incidence of high blood pressure and cardiovascular disease later in life. However, it is unknown if otherwise healthy anxious young adults already exhibit markers of cardiovascular dysfunction. The primary objective of this study is to examine cardiovascular function in anxious vs. non-anxious college-aged students.

METHODS: Non-anxious (n=4) and anxious (n=8) subjects between the ages of 18-25 years were recruited from a university setting and surrounding area. Anxiety classification was determined by the General Anxiety Disorder-7 questionnaire. Beat by beat systolic (SBP) and diastolic (DBP) arterial blood pressure via finger photoplethysmography and heart rate (HR) were continuously measured in subjects during resting conditions with 6 min each of spontaneous and controlled (12 breaths per min) breathing, a 2 min cold pressor test (CPT), a 5 min dynamic submaximal handgrip test (DHG), and 6 min each at 30° and 60° head up tilt (HUT).

RESULTS: SBP, DBP, and HR were similar between non-anxious and anxious students under both resting conditions. During the CPT, the SBP change from baseline to peak tended to be greater in anxious ($\Delta 31 \pm 18$ mmHg) compared with non-anxious ($\Delta 17 \pm 11$ mmHg) subjects (p=0.09); HR and DBP responses were similar. SBP, DBP, and HR were also similar between groups during DHG and 30° HUT. During 60° HUT, HR tended to be higher in anxious (93 ± 11 bpm) compared with non-anxious (80 ± 9 bpm) subjects (p=0.07), but blood pressures were not significantly different.

CONCLUSIONS: Further research is warranted; however, the preliminary results suggest that anxiety in the college-aged population can negatively impact the cardiovascular responses to painful and orthostatic challenges.

P73 SEX DIFFERENCES IN MAXIMAL OXYGEN UPTAKE: WHAT ARE THE BIGGEST CONTRIBUTORS?

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BACKGROUND: Previous investigations in maximal aerobic capacity (VO_{2max}) have attributed sex differences to anatomical and physiological parameters. The purpose of this study was to determine the main factor affecting VO_{2max} in a sample of physically active young adults.

METHODS: Sixteen college-aged students (18-25 years, 8 males and 8 females) participated in one laboratory visit including body composition, hematocrit (HCT), and VO_{2max} assessment. Lean body mass (LBM) and fat mass (FM) were obtained from a whole-body DEXA scan. Hematocrit (HCT) was determined using a finger prick blood sample and validated by measures of urine specific gravity (USG) to control for hydration status. A graded exercise test was performed on the cycle ergometer using 25 watt (W) per minute and 20 W per minute incremental protocols for men and women respectively. VO_{2max} , cardiac output max (Qmax) and stroke volume max (SVmax) were recorded using the COSMED Quark CPET metabolic cart. Cardiac output was determined using the Fick principle. Test measure means were grouped by sex and analyzed for significance using a one-way ANOVA. A Pearson's R correlation was performed to determine the association between variables of HCT, LBM, SVmax, Qmax, absolute VO_{2max} .

RESULTS: Males showed significantly greater measures of height (177.94 cm \pm 5.74 cm vs. 166.6 cm \pm 3.1 cm; $p < 0.01$), LBM (63.70 kg \pm 7.51 kg vs. 43.85 kg \pm 1.90 kg; $p < 0.01$), HCT (46.9% \pm 3.5% vs. 42.2% \pm 3.0%; $p < 0.05$), absolute VO_{2max} (3.377 L/min \pm 0.464 L/min vs. 2.439 L/min \pm 0.300 L/min; $p < 0.05$), Qmax (20.4 L/min \pm 2.3 L/min vs. 14.84 L/min \pm 1.80 L/min; $p < 0.01$) and SVmax (110.1 mL \pm 13.5 mL vs. 78.24 mL \pm 7.47 mL; $p < 0.01$) compared to females. Pearson's R correlation analysis showed that absolute VO_{2max} (L/min) was positively correlated with Qmax ($R = 0.989$), SVmax ($R = 0.958$) and LBM ($R = 0.777$).

CONCLUSIONS: Sex differences in maximal aerobic capacity should be understood predominantly as a consequence of maximal cardiac output and sex-related differences in body size and lean mass.

P74 SEX DIFFERENCES IN ARTERIAL STIFFNESS AND EJECTION DURATION IN PRE- AND POST- PUBERTAL CHILDREN

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BACKGROUND: The introduction of sex hormones due to pubertal onset evokes sex dependent systemic cardiovascular changes in growing children. This study evaluated known indicators of central and peripheral arterial stiffness in pre-adolescent and adolescent children to observe sex differences in measures of arterial stiffness in relation to biological maturation.

METHODS: The study participants were comprised of 97 children, ages 7-17 years old, 52 adolescents (24M, 28F; 15.7 \pm 1.5 years) and 45 pre-adolescents (18M, 27F; 8.4 \pm 1.7 years). Standard anthropometric measurements were taken, followed by cardiovascular health measurements, including augmentation index normalized at 75 bpm (AIx75), carotid to femoral pulse wave velocity (Cf-PWV), aortic systolic pressure (ASP), aortic pulse pressure (APP) and ejection duration (EjDur), expressed as a percentage, using AtCor Sphygmocor Xcel. Participants were divided into four groups by sex and maturational status. An independent samples t-test was applied to screen for differences between groups.

RESULTS: Cf-PWV was higher in adolescents compared to pre-adolescents (boys: 5.0 \pm 0.8 m/s vs. 4.1 \pm 0.5 m/s, $p < 0.05$; girls: 4.9 \pm 0.4 m/s vs. 4.0 \pm 0.6 m/s, $p < 0.05$). AIx75 was lower in adolescent girls compared to their pre-adolescent counterpart (-0.7 \pm 8.5% vs. 25.2 \pm 1.6%, $p < 0.05$). ASP was higher in adolescent boys compared to their pre-adolescent counterpart (93.4 \pm 8.0 mmHg vs. 100.4 \pm 10.6 mmHg, $p < 0.05$). APP was higher in adolescent boys compared to their pre-adolescent counterpart (30.8 \pm 5.2 mmHg vs. 35.0 \pm 5.1 mmHg, $p < 0.05$). EjDur was lower in adolescent girls compared to their pre-adolescent counterpart (38 \pm 4.7% vs. 44 \pm 1.4%, $p < 0.05$).

CONCLUSIONS: Puberty increases central arterial stiffness in boys and girls while different sex hormones may affect differently cardiovascular parameters increasing aortic pressures in adolescent boys and decreasing systemic stiffness and peripheral resistances in girls.

P75 EFFECT OF AEROBIC AND RESISTANCE EXERCISE TRAINING ON ENERGY EXPENDITURE IN OVERWEIGHT PATIENTS WITH HFPEF

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BACKGROUND: Previous studies have demonstrated that aerobic exercise (AE) along with caloric restriction (CR) is very beneficial in older, overweight heart failure patients with preserved ejection fraction (HFpEF). However, few studies have evaluated the impact of resistance training (RT) in these patients. Consequently, little is known about energy expenditure (EE) associated with these types of exercises in overweight HFpEF patients. Therefore, the purpose of this study was to determine if there were differences in EE between overweight HFpEF patients participating in AE alone versus AE+RT.

METHODS: Seven HFpEF participants of the *Studies Examining Caloric Restriction and Exercise Trial II (SECRET II)* participated in this study. All *SECRET II* participants were following a CR diet and were randomized into either an AE (n=4) or AE+RT (n=3) group. Each participant wore the COSMED K5 system during a single exercise session (~1 hr) in order to determine the total EE (kcal) for each session. An independent t-test was used to compare the mean total EE, during one exercise session, between the two groups.

RESULTS: Despite similar exercise duration, the mean total EE for AE+RT (319 \pm 197 kcal) was higher than for AE (213 \pm 71 kcal) only; but this difference was not statistically significant ($p = 0.165$).

CONCLUSIONS: Data from this study suggests that AE+RT results in ~100 kcal more per exercise session than AE alone. Thus, it appears that AE+RT over time may promote greater weight loss and other functional benefits in older, overweight HFpEF patients.

P76 REPRODUCIBILITY OF PHYSIOLOGICAL RESPONSES DURING AEROBIC AND RESISTANCE EXERCISE IN PATIENTS WITH HFPEF.

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BACKGROUND: Previous studies have examined the acute effects of aerobic exercise (AE) on heart rate (HR), oxygen consumption (VO_2), respiratory exchange ratio (RER), ratings of perceived exertion (RPE) and energy expenditure (EE) in patients with heart failure and preserved ejection fraction (HFpEF). However, little is known about the acute physiological effects of resistance training (RT) in these patients. The objective of this study was to examine the reproducibility of common physiological values during AE and RT in HFpEF patients.

METHODS: Expired gas and HR data were obtained each minute using the COSMED K5 metabolic system, as well as RPE data, while participants (n=3) of the *Studies Examining Caloric Restriction and Exercise Trial II (SECRET II)* engaged in a bout of either AE alone or AE + RT training on two occasions, separated by 7-10 days. Data collected was averaged over the full bout (~60 min) of exercise. Paired T-Tests were performed and level of significance set at $p \leq 0.05$.

RESULTS: Paired T-Tests revealed no significant differences between Day 1 vs. Day 2 for HR (101. \pm 13.1 vs 100. \pm 18.0 b/min), VO_2 (10.1 \pm 1.34 vs 10.4 \pm 1.52 ml/kg/min), RER (0.85 \pm 0.03 vs 0.84 \pm 0.03), RPE (10.5 \pm 1.40 vs 10.8 \pm 1.02), or EE (190. \pm 74.1 vs 191. \pm 67.3 kcal) during bouts of AE and/or RT.

CONCLUSIONS: These data indicate that older overweight HFpEF patients have a reproducible acute physiological response to AE and RT, and the COSMED K5 metabolic system can be used to quantify these responses.

P77 AGREEMENT BETWEEN MANUAL AND SOFTWARE BASED ULTRA-SHORTENED HRV CALCULATIONS FOR RMSSD

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BACKGROUND: Heart rate variability (HRV) is a noninvasive tool for assessing autonomic regulation of the heart. HRV is often utilized as a marker of stress and recovery in athletes, however, the analysis of the electrocardiography (ECG) data is primarily done via expensive analyzing software. The purpose of this study was to determine the agreement of manual calculations of the root mean square of successive differences (RMSSD) from Excel (EXC) to Kubios Premium (KUB).

METHODS: 28 NCAA Division-1 swimming student-athletes ($f=10$, 20.9 ± 1.6 yrs; 184.7 ± 9.8 cm; 81.3 ± 12.2 kg) completed 10-minute measurements of HRV by 3-lead ECG. Measurements were taken in 3 body positions: supine, seated, and standing. Following a stabilization period, 60 seconds of R-R intervals were compared in EXC and KUB. ECG data was collected using a BIOPAC MP150 BioNomadix Wireless system (BIOPAC System, Inc., Goleta, CA).

RESULTS: Compared with the RMSSD obtained by KUB, the EXC measures were nonsignificantly different across all body positions: supine ($p = 0.439$), seated ($p = 0.700$), and standing ($p = 0.171$). Bland-Altman analysis indicated minimal bias and tight limits of agreement ($CE \pm 1.96SD$) in each body position, supine (-0.20 ± 2.70), seated (0.05 ± 1.41), and standing (0.10 ± 0.74). Effect sizes across 3 body positions were small, Cohen's d ranging from -0.01 to 0.01 . Correlations were very strong across all 3 positions, ($r \geq 0.99$).

CONCLUSIONS: Results indicate that in Division-1 athletes manual EXC calculations are an acceptable alternative to software calculation for RMSSD, independent of body position. The practicality of using EXC over KUB may be useful for coaches and practitioners in the field.

P78 CENTRAL ARTERIAL STIFFNESS IN NORMAL WEIGHT AND OVERWEIGHT PRE AND POST PUBERTAL CHILDREN

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BACKGROUND: It is well known that obesity is a risk factor for high blood pressure in children and adolescents. The study of blood pressure in overweight children have gained increased attention since elevated blood pressure in children has been found to have a strong association with structural and functional abnormalities of large artery stiffness. The purpose of this study was to assess how overweight and pubertal development affect central artery stiffness and blood pressure in pre-adolescents through adolescents.

METHODS: Forty-four pre-adolescent (Pre-A, 8.2 ± 1.5 y.o) and 32 adolescent (Adol, 15.6 ± 1.8 y.o) children participated in this study. Among the pre-adolescent group, 31 were normal weight (NW, BMI 15.9 ± 1.4 kg/m²) and 13 were overweight (OW, BMI 22.3 ± 3.9 kg/m²). Among the adolescent group, 22 were normal weight (NW, BMI 20.8 ± 2.0 kg/m²) and 13 were overweight (OW, BMI 28.2 ± 4.3 kg/m²). Carotid to femoral pulse wave velocity (cf-PWV), aortic systolic pressure (ASP), aortic pulse pressure (APP) and resting heart rate (HR), were measured using Sphygmocor Xcel (AtCor). Participants were divided into four groups by BMI (NW, BMI ≤ 85 th percentile; NW, BMI ≥ 85 th percentile) and age (Pre-A < 12 y.o, Adol ≥ 12 y.o) and 32 adolescent (Adol). An independent samples t-test was applied to screen for differences between groups.

RESULTS: cf-PWV was higher in Adol than Pre-a in both NW (4.0 ± 0.5 vs. 5.0 ± 0.7 m/s, $p < 0.01$) and OW (4.2 ± 0.5 vs. 5.0 ± 0.8 m/s, $p < 0.05$) (Figure 1). ASP was higher in Adol NW compared to their OW counterpart (90.7 ± 8.1 vs. 96.1 ± 6.9 mmHg, $p < 0.05$). APP was higher in Adol NW compared to their OW counterpart (77.0 ± 7.2 vs. 82.3 ± 5.1 mmHg, $p < 0.05$). HR was lower in Adol than Pre-a in both NW (79 ± 13.3 vs. 67 ± 10.4 bpm, $p < 0.01$) and OW (81 ± 9.2 vs. 72 ± 5.9 bpm, $p < 0.01$).

CONCLUSIONS: Being overweight increases ASP but not cf-PWV in children while puberty was found to be the predominant factor responsible for increases in central stiffness.

P79 CARDIOVASCULAR EFFECTS OF CAFFEINE DURING THIRD PERSON SHOOTING GAMES

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BACKGROUND: Caffeine is classified as an ergogenic aid due to its ability to increase mental alertness, attentiveness, enhance psychomotor performance, increase vigilance, prolong endurance and reduce reaction time. However, it is unknown how caffeine affects the cardiovascular system during third person shooting games. The purpose of this study was to assess the effects of caffeine supplementation on heart rate (HR) during third person shooting games.

METHODS: Fourteen volunteers with third person shooting game experience ($M = 10$, $F = 4$; Age: 22.14 ± 1.96 y; Height: 171.57 ± 0.1 cm; Mass: 77.11 ± 10.69 kg) played Fortnite on a PlayStation 4 (PS4). Two sessions were performed on separate days, non-caffeine (NON-CAF) and caffeine (CAF). HR was measured using an ECG (GE CASE Stress Test System Controller v 6.7), while blood pressure (BP) was measured manually using a blood pressure cuff. HR and BP were measured before and after each game and HR was measured during combat situations. Based on body mass, participants received 6 mg/kg of caffeine, after ingestion participants waited 20 minutes before playing 40 minutes of Fortnite. Maximum, minimum, and resting NON-CAF and CAF HR were analyzed using two-tailed paired T-tests ($p < 0.05$).

RESULTS: Resting CAF HR (77.14 ± 11.10 bpm) was greater than NON-CAF HR (69.21 ± 12.76 bpm). In game CAF HR (109.21 ± 16.15 bpm) was greater than NON-CAF HR (99.07 ± 16.78 bpm). Minimum NON-CAF (64.07 ± 10.69 bpm) and CAF HR (66.07 ± 8.46 bpm) were not different.

CONCLUSIONS: Ingesting 6 mg/kg of caffeine while playing third person shooting games increased resting HR while also increasing in-game max HR, which could lead to changes in game performance.

P80 ISOMETRIC EXERCISE TRAINING, REGARDLESS OF MUSCLE MASS, REDUCES RESTING BLOOD PRESSURE IN NORMOTENSIVE HEALTHY MALES

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BACKGROUND: Isometric exercise training (IET) is an effective adjunct for the management of resting blood pressure (RBP) but responsible mechanisms have not yet fully been identified. Isometric contractions reduce blood flow as a result of vascular compression altering intramuscular metabolism. In response, active muscle could increase the production and circulation of vasoactive molecules (e.g., VEGF) and alter inflammatory biomarkers (e.g., IL-6 and TNF- α), which may lead to adaptations in resistance vessels. We studied the influence of bilateral arm or leg IET on blood pressure and plasma VEGF, IL-6, and TNF- α over the course of 6-weeks.

METHODS: The study was approved by the UNC Charlotte IRB. Twenty-eight healthy and recreationally active normotensive males (19-25 years) gave written informed consent and were randomized to one of three conditions; double bicep curl IET (IBC), double leg extension IET (ILE), or control (CON). IET groups completed exercise sessions at 15% maximal voluntary contraction (6 x 2-minute contractions) 3 days per week for 6-weeks with RBP assessed at each visit. For a subsample ($n=17$), 3 blood samples (pre-, 1 hour post-, 24 hours post-training) were collected at the first and last training visits. The CON group performed all study procedures except IET.

RESULTS: Using a repeated-measures ANCOVA (controlling for acclimation RBP and cohort), a significant time by treatment effect was observed from Week 1 to Week 6, $F(2, 23) = 4.10$, $p = .03$, $\eta^2 = .263$. Specifically, IET resulted in a lower systolic RBP, but did not differ by IET group: IBC -4.4 ± 4.0 mmHg; ILE -4.3 ± 7.6 mmHg; CON 2.3 ± 4.0 mmHg. Diastolic RBP did not significantly change for any group. There were no acute or chronic IET effects on VEGF, IL-6, and TNF- α levels ($P > 0.05$).

CONCLUSIONS: 6-weeks of bilateral arm or leg IET resulted in significant reductions in systolic RBP. Due to the small sample size ($n=17$), power may have limited the ability to detect significant effects on circulating VEGF, TNF- α and IL-6. Research should continue to examine how IET alters RBP. The research was funded by Faculty Research Grant (J.M.B. & R.H.) and the Thomas L. Reynolds Graduate Student Research Award (B.D.H.G.).

P81 THE EFFECTS OF ICE AND BLOOD FLOW RESTRICTION TRAINING ON TORQUE PRODUCTION AND CELLULAR RESPONSES

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BACKGROUND: Blood flow restriction (BFR) induces myofiber swelling and hypoxia, enhancing hypertrophy. Though, the efficacy of high resistance loads ($\geq 65\%$ 1RM) with BFR for synergistically inducing these mechanisms has not been confirmed. This study was designed to determine if BFR or ice application during acute, heavy load resistance exercise impacts muscular performance and physiological adaptation.

METHODS: Eight resistance-trained men and women (25.75 \pm 5.8 yrs and 82.80 \pm 6.9 kg) participated in this study. Pre- and 1 hr post-exercise blood draws were taken during each trial for protein analysis. Participants did 5 sets of 5 maximal knee extension/flexion on an isokinetic dynamometer under three conditions: Control (CTL), Ice (ICE) and BFR. Blood plasma was isolated and analyzed via ELISA for VEGF. Repeated measures ANOVA with Bonferroni correction was used to determine significant changes in normalized peak torque (%MVMC) and VEGF values.

RESULTS: No significant differences for % MVMC during knee extension, but significant mean differences for flexion were observed between the CTL and BFR trials for %MVMC, 81.65 \pm 3.43% and 71.82 \pm 2.73%, $p=0.016$, respectively. No significant differences were observed between all other trial comparisons of %MVMC; CTL vs ICE, 76.69 \pm 3.51% for Ice ($p=0.164$), and ICE vs BFR ($p=0.054$). No significant differences for VEGF between all trials comparisons, CTL vs ICE ($p=0.812$), ICE vs BFR ($p=0.156$), and CTL vs BFR ($p=0.115$) were observed.

CONCLUSIONS: Preliminary results demonstrate that BFR enhances fatigue during high-intensity knee flexion.

P82 EFFECT OF BODY COMPOSITION ON PHYSICAL FUNCTION IN PATIENTS WITH COPD

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BACKGROUND: Obesity is associated with self-reported and performance-based physical dysfunction. Previous studies examining the role of body composition on physical function in patients with chronic obstructive pulmonary disease (COPD) have typically examined the role of a low body mass index (BMI). Recent studies examining the role of obesity on physical function in patients with COPD have produced conflicting results. Therefore, the purpose of this study was to examine the role of obesity on self-report and performance-based physical function in patients with COPD while controlling for disease severity.

METHODS: Participants included 291 patients with COPD who completed pulmonary function testing, two performance-based measures of physical function (six min walk distance (6MW), and stair climb time (SCT)) and a self-reported physical function questionnaire (PFQ). Hierarchical multiple regression analysis was used to determine the role of obesity in predicting physical function after controlling for the forced expiratory volume in one second (FEV₁).

RESULTS: BMI proved to be a significant predictor of performance-based physical function and self-reported physical function. BMI had a negative relationship with the 6MW (6MW = 425.2 + 2.0 (FEV₁) - 2.7 (BMI) [$p < 0.001$]), and a positive relationship with SCT (SCT = 12.6 - 0.1 (FEV₁) + 0.1 (BMI) [$p < 0.001$]) and self-reported physical function, where a higher score indicates lower physical function (PFQ = 1.53 - 0.004 (FEV₁) + 0.018 (BMI) [$p = 0.003$]).

CONCLUSIONS: After accounting for disease severity, BMI was shown to add significantly to the prediction of self-reported and performance-based physical function. More specifically, a high BMI was associated with poorer self-reported and performance-based physical function.

P83 QUALITY OF LIFE AND FATIGUE ARE RELATED TO EXERCISE PERCEPTIONS IN BREAST CANCER SURVIVORS

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BACKGROUND: Cancer-related fatigue negatively affects exercise adherence in breast cancer survivors (BCS). In addition, BCS experience losses in quality of life (QOL), strength, and physical function. More research is needed to determine the relationship of these outcomes with perceptions of exercise in BCS. Therefore, the purpose of this study was to examine the relationship between exercise perceptions and QOL, fatigue, strength, and physical function in BCS.

METHODS: Forty-four BCS (60 \pm 8 yrs) completed the Exercise Benefits/Barriers Scale, Functional Assessment of Cancer Therapy-Breast (FACT-B), and Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F). Isometric knee extension/flexion and one repetition maximum chest press were used to assess strength. The Continuous Scale-Physical Functional Performance test evaluated physical function. Pearson product-moment correlation coefficient was used to assess associations among variables. Significance was accepted at $p \leq 0.05$.

RESULTS: Total FACT-B and FACIT-F scores were negatively associated with exercise barriers (FACT-B: $r = -.66$; $p < .001$; FACIT-F: $r = -.69$; $p < .001$). There was no association between perceived exercise benefits and FACT-B or FACIT-F scores. The fatigue subscale was related to perceived barriers ($r = -.69$; $p < .001$) and benefits ($r = .31$; $p = .04$). There was no relationship between strength or function and exercise perceptions.

CONCLUSIONS: Findings suggest that regardless of strength or function, those with lower QOL perceived more exercise barriers. BCS with higher fatigue perceived more barriers and fewer benefits. Therefore, finding ways to minimize QOL losses and fatigue may improve perceptions of exercise in BCS.

P84 RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, STRENGTH, AND PHYSICAL FUNCTION IN BREAST CANCER SURVIVORS

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BACKGROUND: Side effects from cancer treatment lead to reduced physical activity (PA), placing breast cancer survivors (BCS) at a greater risk for losses in strength and physical function. Research is needed to determine the relationship between PA and these functional variables in BCS. Therefore, the purpose of this study was to determine the relationship between PA and upper body strength (UBS), lower body strength (LBS), and physical function in BCS.

METHODS: Forty BCS (60 \pm 8 yrs; BMI: 29.4 \pm 6.6) wore a Fitbit for 7 days to measure daily steps. One repetition maximum was used to measure UBS. Isometric leg extension and flexion using the Biodex assessed LBS. The Continuous Scale-Physical Functional Performance (CS-PFP) test measured physical function. Pearson product-moment correlations determined the relationship between variables. Significance was accepted at $p \leq 0.05$.

RESULTS: There was a positive correlation between PA and leg extension scores ($r = .36$; $p = .02$), but not for leg flexion or UBS. There was a positive relationship between PA and physical function ($r = .35$; $p = .03$) as well as function domains for LBS ($r = .33$; $p = .04$), balance ($r = .36$; $p = .02$), and endurance ($r = .39$; $p = .01$). No relationship existed between PA and domains for UBS and upper body flexibility.

CONCLUSIONS: Findings suggest that BCS with higher PA have higher LBS, but not UBS. Those who engaged in more PA had greater physical function, resulting from better performance in domains related to lower body function. Physical activity in the absence of consistent exercise may impact lower body strength and function, but not upper body. Therefore, BCS should engage in upper body-focused activities.

P85 EFFICACY OF WHOLETONES® MUSIC ON HEALTH BEHAVIORS: A SINGLE BLIND, RANDOMIZED, CONTROLLED, CROSSOVER PILOT

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BACKGROUND: Insomnia affects 33% to 55% of adults and is associated with decreased quality of mood, mental health, and cognitive abilities. Meta-analyses found that auditory stimulation prior to sleep resulted in improved sleep in clinical settings. The purpose of this trial was to examine the efficacy Wholetones® 2Sleep [WM] and Classical Music [CM] to improve sleep quality as well as the daytime consequences of the intervention in adults with insomnia symptoms in the home environment.

METHODS: Using a single-blind crossover design, participants were randomized to either the WM or CM condition for 10 days following baseline assessments, and then switched conditions for 10 days following a 4-day "washout". 38 adults (13:25, M:F) with measurable insomnia symptoms under the Insomnia Severity Index participated. The Pittsburgh Sleep Quality Index (PSQI), Profile of Mood States (POMS), Flinders Fatigue Scale, Trait Anxiety Inventory, Perceived Stress Scale, and Life Satisfaction Scale were used to measure cognitive states, mood, and mental health at day 0 and on day 10 following each condition. Tests for normality were employed to determine the use of appropriate transformation for data in t-test and ANOVAs for comparing delta score and raw score distributions respectively to determine group and time differences ($\alpha = 0.05$). Chi-squared was used to examine differences in number of individuals who improved between WM, CM, and baseline.

RESULTS: A significant main effect showed that the participants had significant improvements in their PSQI scores following both music conditions. Participants had significant improvements in their daytime fatigue, POMS, Perceived Stress, Anxiety, and Productivity following both music conditions. Significantly more participants were classified as good sleepers (total score < 5 on PSQI) following WM condition (57.89%, $n = 22$, $\chi^2 = 12.55$, $p < .01$) and CM (52.63%, $n = 20$, $\chi^2 = 9.71$, $p < .01$) compared to baseline. No significant condition x condition interactions were found.

CONCLUSIONS: Listening to music resulted in improved sleep quality and daytime mood in nonclinical populations in the home environment. No significant differences were found between treatments indicating that WM did not confidently improve sleep quality compared to CM. This study was funded in part by WholeTones Inc.

P86 EVIDENCE-BASED CLASSIFICATION IN POWERCHAIR FOOTBALL: IDENTIFYING TESTS OF IMPAIRMENT

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BACKGROUND: Powerchair football (soccer) is a Paralympic sport that is designed for individuals with severe physical impairments that require use of an electric wheelchair for competition. The sport is currently moving toward an evidence-based system of classification to determine eligibility of players and to group players appropriately for competition. Following determination of eligible impairment categories and identification of performance determinants for the sport (first two steps of the IPC process), the purpose of this study was to examine the ability of objective impairment and performance tests to discriminate among higher and lower functioning powerchair soccer players.

METHODS: Pilot testing of impairment and performance measures on 50 powerchair football players ($n = 37$ male, 13 females; Age = 26 ± 13 yrs; Playing Experience = 9 ± 6 yrs) with a variety of physical impairments (Cerebral Palsy = 10, Muscular Dystrophy = 7, Spinal Cord Injury = 9, Spinal Muscular Atrophy = 17, Other = 7) was conducted across two tournament sites. A k-mean cluster analysis was conducted on 12 impairment measures (e.g., cervical range of motion, grip strength, pinch strength, manual dexterity, trunk range of motion). Non-significant variables were deleted from the model. MANOVA was then used to validate the classification model on 6 measures of performance (e.g., forward slalom time, reverse slalom time, right and left spin kick time, right and left spin kick distance from target). IRB and consent approvals were obtained prior to the study.

RESULTS: Ten impairment variables were significant contributors to a three-cluster solution. There was a significant difference among means on forward slalom time ($F=7.19$, $p=.006$) and large effect sizes between groups on several performance measures (i.e., reverse slalom time, right and left reverse spin kick distance from target, right reverse spin kick time).

CONCLUSIONS: Current findings reveal the possibility of three impairment categories, as opposed to the two classes currently used by the international governing body, and viable measures of impairment and performance moving forward.

P87 COMPARISON OF CARDIOMETABOLIC RISK FACTORS OF OLDER MALES AND FEMALES IN AN ACTIVE URBAN COMMUNITY

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BACKGROUND: Life expectancy of females is greater than males and cardiometabolic (CMO) diseases may be partially responsible for the difference. The purpose of this study was to evaluate cardiometabolic risk factor indexes (CMO index) in older females and males to determine if men have greater or less risk of cardiovascular disease (CVD) as they age.

METHODS: The CMO index was the measured CMO value divided by the CMO risk levels. The participants were 173 older adults (158 females; 22 males) with a mean age of 75.2 years. The older females and males were evaluated for differences on the following CMO indexes: total cholesterol (TC), high (HDL) and low density lipoprotein cholesterol (LDL), Triglycerides (TG), glucose (GLU), HbA1c (glycosylated hemoglobin) and systolic (SBP) and diastolic blood pressures (DBP). They were also measured for body fat% and body mass index.

RESULTS: The females weighed less (76.9 kg vs 94.5 kg; $p < 0.05$), had similar BMI (29.8 vs 30.2; $p > 0.05$) values, but had a higher body fat% (41.7% vs 33.0%; $p < 0.05$) than the males. Functional ability as measured by the timed up and go test was not different between the sexes ($p > 0.05$). Based on CMO indexes (values >1) the females had risks for TC, HDL, GLU and SBP while the males had risk CMO indexes for HDL, TG and GLU. The females had favorable ($p < 0.01$) HDL and GLU values while males had favorable values for TC, SBP and DBP. The CMO indexes correlated more with each other ($p < 0.05$) for the females than the males.

CONCLUSIONS: This suggested that the CMO variables shared more covariability among older females than older males. These data suggest that older adults with relatively similar physical characteristics, males have a trend toward a better CMO profile than females and would be less likely to developing CVD than females. However, further research is needed on this topic to validate these findings.

P88 METABOLIC AND MOTOR PROFICIENCY PROFILES OF YOUTH WITH DOWN SYNDROME

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BACKGROUND: Two factors that have a significant impact on obesity levels are low resting metabolic rate (RMR) and insufficient physical activity (PA). Impaired RMR and neuromuscular coordination are common in youth with Down syndrome (DS) and may contribute to obesity. The purpose of this study was to determine the metabolic and motor proficiency profiles of a sample of youth with DS.

METHODS: Participants were youth with DS ($n=11$; 7 females; 16.8 ± 3.9 y) attending a weeklong therapeutic recreation camp. Height and weight were measured, body mass index (BMI) was calculated, and BMI percentiles were used to determine weight status. The participants' RMR was evaluated in a supine position in a quiet, dark room for 15 minutes using a portable metabolic system ($n=9$, Oxycon Mobile, Vyair). One-minute averages were collected, and the first five minutes were excluded from the analysis. A rolling average technique was used to determine the average for each 5-min interval. The lowest rolling average was considered the RMR. The Bruininks-Oseretsky Test of Motor Proficiency ($n=11$, BOT) Short Form was used to test motor proficiency. The BOT standard scores (range = 20 - 80) and age- and sex-specific percentiles were calculated for each participant. Spearman correlations were run to determine associations among BMI, RMR, and BOT scores.

RESULTS: The average BMI was 30.0 ± 7.2 kg·m⁻² (91% obese). Average RMR was 4.1 ± 1.8 ml/kg/min. The average standard BOT score was 26.8 ± 3.3 , average percentile was 1.4 ± 0.7 and all youth were classified as *Well-Below Average*. There were no significant correlations ($p > 0.05$): BMI and RMR ($\rho = -0.242$), BMI and BOT ($\rho = -0.167$), and BOT and RMR ($\rho = 0.23$).

CONCLUSIONS: RMR does not appear to be impaired in this sample. However, the extremely low motor proficiency scores may contribute to limited PA participation and obesity levels in this sample. PA programs and interventions should consider addressing strategies to improve motor proficiency in youth with DS.

P89 WINE AND EXERCISE IMPROVE GLYCEMIC CONTROL IN INSULIN-RESISTANT WOMEN

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BACKGROUND: Alcohol increases insulin secretion in response to ingested glucose and exercise enhances insulin sensitivity; therefore, we tested the hypothesis that the combination of wine and exercise would enhance glycemic control in insulin-resistant women.

METHODS: Four women, two with type 2 diabetes and two with pre-diabetes, completed four different 1-week treatment periods consisting of no alcohol and no exercise (CON), no alcohol and daily exercise (60 min at 60% heart rate reserve; EX), daily red wine (14 g ethanol) with dinner and no exercise (WINE), or daily wine with dinner and daily exercise (WINE + EX). During the last three days of each treatment period, each participant wore a continuous glucose monitor to continually record blood glucose data.

RESULTS: Average blood glucose levels over each 3-day period were 7.5 ± 0.5 , 7.7 ± 0.3 , 7.0 ± 0.4 , and 6.5 ± 0.6 mM for CON, WINE, EX, and WINE + EX treatments, respectively, with WINE + EX significantly lower than CON ($p = 0.01$). The percentage of time with blood glucose higher than 7.2 mM was $57 \pm 14\%$ for CON, $64 \pm 12\%$ for WINE, $38 \pm 12\%$ for EX, and $29 \pm 12\%$ for WINE + EX, which also was lower than CON ($p = 0.04$). Overnight (12:00-5:00 AM) blood glucose values were 7.1 ± 0.5 , 7.4 ± 0.3 , 7.2 ± 0.4 , and 5.9 ± 0.5 mM for CON, WINE, EX, and WINE + EX, respectively, which were not significantly different.

CONCLUSIONS: These preliminary results suggest that, while one week of exercise alone did not enhance glycemic control, the combination of exercise and a daily glass of wine improved glycemic control in insulin-resistant women.

P90 PHYSICAL ACTIVITY AND SLEEP PATTERNS IN CHILDREN WITH CEREBRAL PALSY

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BACKGROUND: Children diagnosed with Cerebral Palsy (CP) may be at a greater risk of not meeting recommended levels of moderate to vigorous physical activity (MVPA), accumulating high levels of sedentary behavior, and getting insufficient amounts of sleep compared to typically developing children. However, no studies have examined MVPA, sedentary behavior, and sleep quality in children with CP, using objective assessment measures. The purpose of this study was to examine activity and sleep levels in children with CP.

METHODS: Subjects consisted of 8 children (mean age: 11.13 years; 50% female) diagnosed with CP. Parents completed demographic surveys, while children wore ActiGraph GT9X accelerometers on their ankles, over a 7-day period, to measure both activity levels and sleep quality. Descriptive statistics were calculated for average number of minutes spent in MVPA, sedentary behavior, and total sleep duration, while sleep efficiency was calculated as a percentage. Additionally, frequencies were calculated to determine the percentage of the sample that met the recommended daily MVPA levels (60+ minutes), sleep duration (8 - 9 hours), and sleep efficiency criteria (> 85%).

RESULTS: On average, children participated in 18 minutes of MVPA, while spending 808 minutes (13.5 hours) in sedentary behavior. Children also slept an average of 7.1 hours per night, with a sleep efficiency of 95%. None of the children met the recommended levels of MVPA. Two (25%) of the 8 children got adequate amounts of sleep, however, all 8 children were classified as "efficient sleepers".

CONCLUSIONS: Children with CP demonstrate low levels of MVPA and insufficient sleep, however, individualized activity recommendations may be necessary for youth with CP. It is critical to develop Interventions to improve both MVPA and sleep duration in this population. Future research should focus on the effects of MVPA on other aspects of the child's life such as muscle development and stress levels.

P91 DOES GROUP EXERCISE INCREASE ACTIVITY LEVELS IN PERSONS WITH PARKINSON'S DISEASE?

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BACKGROUND: Parkinson's disease (PD) is a chronic and progressive neurologic disorder with symptoms of tremor, bradykinesia, rigidity, and gait and postural abnormalities. The purpose of this research study was to determine how group exercise affects free-living physical activity and physical function in persons with PD. The hypothesis was that participants who engage in a community exercise program will have a higher daily step count and daily average 5-min step rate, improved Timed-Up-and-Go (TUG) and faster 10-Meter Walk Test (10MWT) than participants that do not participate in community group exercise.

METHODS: Group exercise (EXE) participants were recruited from Rocksteady Boxing ($n = 4$). The control group (CON) participants were recruited from a local PD support group ($n = 5$). Each participant wore a Modus StepWatch for 7 days while step count and step rate were recorded. Participants also performed two physical function tests, the TUG and 10MWT. An independent samples t-test was used to analyze data.

RESULTS: A total of 10 participants volunteered to participate in this study; however, one of the participant's results was omitted due to confusion with procedural directions. There were 5 males and 4 females. Participants' mean (\pm SD) age was 69.3 (\pm 6.7) years in the EXE group and 73.4 (\pm 4.6) years in the CON group. The mean (\pm SD) BMI was 26.1 (\pm 8.4) kg/m² in the EXE group and 29.9 (\pm 7.4) kg/m² in the CON group. There was a statistically significant difference in daily step count (+1100.4 steps, $p = 0.01$), average 5-minute step rate (+13.7 steps/5-min, $p = 0.01$), and the TUG test (-6.0 sec, $p = 0.04$) between the EXE and CON groups. There were no statistically significant differences in both comfortable (-1.4 sec, $p = 0.23$) and fast-paced (-0.4 sec, $p = 0.78$) 10MWT time.

CONCLUSIONS: This study showed that individuals with PD who participate a group exercise program, such as Rocksteady Boxing, were more physically activity over a 7-day period compared to persons with PD who do not exercise. However, EXE participants showed no improvement in 10MWT time or step rate compared to the CON group. The EXE participants performed better on the TUG test indicating a reduced risk of falling. These results may be attributed to a greater leg strength, core stability, and balance resulting from participation in the community exercise program.

P92 ANALYSIS OF PAIN MEDICATION USE IN OLDER ADULTS WITH KNEE OSTEOARTHRITIS

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BACKGROUND: Knee osteoarthritis (OA), is the leading cause for disability in adults. Pharmacological treatment is the most common method patients employ to reduce pain and improve function; however, medication usage is seldom reported in clinical trials. This is due, in part, to the difficulty in recalling medication use with acceptable accuracy. The purpose of this study was to determine how pain medication use varied by gender, BMI class, and number of comorbidities in older adults with knee OA.

METHODS: The Strength Training for Arthritis Trial (START) was a randomized controlled trial in which 377 older adults with mild to moderate knee OA were randomized into either strength training or control groups. Here we report baseline medication use using a questionnaire adapted from the Atherosclerosis Risk In Communities (ARIC) study. Data were analyzed using a one-way ANOVA and independent t-tests to determine significance and frequencies.

RESULTS: Mean baseline characteristics of the participants included: age, 61.5 ± 8.1 years; BMI, 31.3 ± 5.4 kg/m²; %female, 60.7. Pain medication usage across gender was 72% for females and 74% for males, $p = 0.58$. Medication usage across BMI classes was 83% for 20-24.9 kg/m², 69% for 25-29.9 kg/m², and 73% for 30-34.9 kg/m², $p = 0.22$. Total comorbidities were categorized into those with 1-2 comorbidities and those with 3-7 comorbidities. Pain medication use in participants with 1-2 comorbidities was 74% and for 3-7 comorbidities pain medication use was 72%.

CONCLUSIONS: Pain medication usage was consistent across gender, BMI, and total number of comorbidities in older adults with knee OA.

P93 FLEXIBILITY TRAINING AND SHOULDER MOBILITY IN WOMEN WITH BREAST CANCER

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BACKGROUND: Early diagnosis and treatment have led to 5-year survival rates of almost 90% among women diagnosed with breast cancer. Although shoulder mobility declines have been observed, there is little known about whether women are engaging in flexibility programs during treatment. Purpose: To prospectively document the prevalence of flexibility training and assess the relationship between training and shoulder mobility in breast cancer survivors (BCS).

METHODS: Data were collected at diagnosis, 6- and 12-months post-surgery. Meeting flexibility guidelines was defined as 2 or more days per week of stretching to improve flexibility. Shoulder mobility was operationalized as flexion and abduction measured by goniometry.

RESULTS: BCS (n=396) were on average 57.2 ± 11.9 years and diagnosed with early stage breast cancer (90.7% Stage 0-II). 77 (19.4%), 43 (31.4%), and 44 (28.9%) met the flexibility guidelines at baseline, 6- and 12-months, respectively. Meeting flexibility guidelines was significantly (p<.01) correlated with better flexion and abduction at baseline (r = .245, .203) and 6-months (r = .264, .303). Although measures of shoulder mobility fell within normal limits prior to treatment, both measures of range of motion significantly (p<.01) declined over 12-months.

CONCLUSIONS: Given the positive association with range of motion, flexibility training could be a protective factor for further reductions in mobility. Future research should look at the efficacy of flexibility programs for improving shoulder mobility into survivorship.

P94 EFFECTS OF EXERCISE ON CARDIOVASCULAR DISEASE RISK IN OLDER AFRICAN AMERICAN COUPLES: A PILOT STUDY

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BACKGROUND: African Americans (AAs) have higher rates of obesity and many cardiovascular disease (CVD) risk factors compared to other races/ethnicities in the U.S. Romantic partners can positively influence health and health habits, yet how closely the partners need to work when adopting exercise is understudied. This study examines the effects of resistance training (RT) and walking on CVD risk factors in older AA couples.

METHODS: Seven (body mass index 31.2±4.3 kg/m²; 6022±1532 average steps/day) AA romantic couples (n=14; 7 females, 7 males; 63.5±8 yrs) completed a 12-week supervised RT (2 days/week) plus unsupervised walking intervention (≥30 minutes, 3 times/week). Couples were randomized to exercise together (ET) or individually (I). Waist and hip circumferences, body composition by iDXA, and resting blood pressure were assessed. Venous blood was assessed for glucose, hemoglobin A1c (HbA1c), total cholesterol (TC), high-density lipoprotein cholesterol, triglycerides, C-reactive protein, and fibrinogen. Tests were performed pre- and post-intervention. Repeated measures ANOVA was used to analyze dependent variables. Post hoc paired-samples T-tests were used to determine significant findings. Significance was accepted at p≤0.05.

RESULTS: A significant group x time interaction was found for TC, with no change in ET and a significant decrease in I (180.8±34.5 to 162.2±28.9). There were significant time effects for waist circumference (ET: 97.8±8.4 to 96.2±8.4 cm; I: 97.3±9.2 to 95.7±9.5 cm), body fat (ET: 37.8±6.6 to 37.5±7.1%; I: 38.0±9.4 to 37.0±9.9%), gynoid fat (ET: 39.2±7.8 to 38.9±8.2%; I: 38.5±9.2 to 37.5±9.7%), fat mass (ET: 36.3±5.6 to 35.6±8.1 kg; I: 33.7±9.8 to 32.9±10.4 kg), and HbA1c (ET: 5.8±0.5 to 5.7±0.4; I: 5.9±0.6 to 5.6±0.4%).

CONCLUSIONS: Twelve weeks of RT plus walking may improve CVD risk factors in older AAs, although these data only show a group effect for TC. The current study is ongoing and will continue to examine the intervention's effects in a larger sample.

P95 A COMPARISON OF FIREFIGHTERS HEALTH: ADMINISTRATORS VERSE SHIFT WORKERS

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BACKGROUND: Firefighter (FF) positions are divided into an administrative role (AD) or shift worker (SW). AD duties often lead to a more sedentary workplace lifestyle, which may have an effect on cardiovascular health. PURPOSE: To compare the physiological profile of AD and SW rural FF.

METHODS: 40 male FF (AD: 6, SW: 34) underwent body fat testing (%BF), performance testing for cardiovascular fitness (VO2max), vertical jump (VJ), estimated 1-repetition maximum bench press (1RM-BP) and leg press (1RM-LP), time until fatigue holding plank (TFP), and maximum push-ups (PU). A blood lipid profile of total cholesterol (TC), HDL cholesterol, Triglycerides (TG), LDL cholesterol, and blood glucose (BG) was performed. Independent sample t-tests were used to compare differences between groups (α=0.05) in each measured variable. Due to the discrepancy in numbers, equal variance was not assumed for all analyses.

RESULTS: Significant differences were found for %BF (AD: 34.5 ± 4.0%, SW: 29.5 ± 7.1%; p = 0.03), TC (AD: 206.5 ± 30.1 mg/dl, SW: 170.0 ± 29.8 mg/dl; p = 0.03), and LDL (AD: 131.8 ± 20.0 mg/dl, SW: 107.1 ± 30.4 mg/dl; p = 0.05). No differences were seen in HDL (p = 0.22), TG (p = 0.07), BG (p = 0.63), or in any of the muscular performance variables (all p > 0.05).

CONCLUSIONS: Results show that AD do not differ in muscular or cardiovascular performance values compared to SW. However, due to the significantly elevated blood lipid profiles, AD may be at a higher risk for cardiovascular disease than SW.

P96 EVIDENCE-BASED CLASSIFICATION IN POWERCHAIR FOOTBALL: DETERMINING THE DETERMINANTS

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BACKGROUND: Powerchair football (soccer) is a Paralympic sport that is designed for individuals with severe physical impairments that require use of an electric wheelchair for competition. The International Paralympic Committee (IPC) requires all Paralympic sports to develop an evidence-based classification system to: 1) determine eligibility for Paralympic competition, and 2) classify athletes appropriately for fairness. The purpose of this study was to complete the first step in the development of an evidence-based system by identifying the performance determinants of the sport.

METHODS: Data from the current international database were analyzed to determine which factors distinguished between players with high and low impairment. Data were delimited to players with impaired muscular power (N = 251; Muscular Dystrophy = 132, Spina Bifida = 7, Spinal Cord Injury = 23, Spinal Muscular Atrophy = 64, Myopathy = 10, Other = 15). Mann-Whitney U and chi-square tests were used to examine statistical differences between high point (PF2) and low point (PF1) players on ordinal (e.g., manual muscle tests scored 0 to 5) and categorical (stable/not stable) variables.

RESULTS: Significant differences were found between PF2 and PF1 players on measures of Head Control (head rotation, stable independent head control), Trunk Control (trunk flexion and extension, side flexion, trunk rotation), Limb Impairment (shoulder flexion, extension, and abduction, elbow flexion and extension, wrist flexion and extension), Visual Lag, Drive Control (reliant on head rest, joystick grip, joystick recovery, response to impact) and Secondary Factors (breathing, endurance, communication, volume).

CONCLUSIONS: Current findings support the use of some, but not all, domains of assessment for powerchair football players currently being used by the international governing body. These results will be used to develop objective measures of impairment and performance required for evidence-based classification.

P97 COMPARISON OF CARDIOMETABOLIC AND ANTHROPOMETRIC RISKS IN MULTIRACIAL OLDER ADULTS IN CHARLOTTE, NC

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BACKGROUND: There is a health disparity between African (AA) and European American (EA) and whether this is related to race, socioeconomic status (SES) or other factors is unclear. Therefore, the purpose of this paper was to determine if chronic disease risks are related to race in a multiracial community with similar SES values.

METHODS: The participants were 106 older adults (66 AA and 40 EA) from a working/middle class neighborhood (income \$46,364 - \$80,904) in an urban North Carolina community. The participants signed an institutional informed consent form and were evaluated for cardiometabolic (total cholesterol, high and low density lipoprotein, triglyceride, HbA1c, systolic -SBP- and diastolic blood pressures -DBP) and anthropometric (body mass index, body fat % -BF%- and timed up and go - Table 3) risks.

RESULTS: The participants differed only for body weight (AA 82.2 kg vs EA 67.2 kg) when evaluated for physical characteristics. Although the AA participants were heavier, had higher BMI, BF% and timed up and go time, the participants only differed ($p < 0.05$) for HDLs and HbA1c. The AA had a 17.6% higher HDL (64.7 vs 55.1 mg/dL) and 7.6% higher HbA1c (5.8 vs 5.4 mmol/mol) values than the EA. The AA also had 9% higher ($p > 0.05$) values for triglyceride than EA). Only SBP fell in the risk category and this was true for both groups. Both groups were moderately active as they participated in a health and fitness program at their community recreation center.

CONCLUSIONS: Although further research is needed to validate these results, the findings from this study suggests that race is not a significant contributor to racial health disparity as indicated by cardiometabolic risk in older adults with similar SES.

P98 COMPARISON OF CARDIO METABOLIC RISK INDEXES IN ACTIVE OLDER AFRICAN AND EUROPEAN AMERICANS

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BACKGROUND: The percent of healthy or quality years of life is 6.5% greater for European Americans (EA) than for African Americans (AA). This disparity is not totally related to any single variable, but appears to be considerably related to cardiovascular disease. Therefore, the purpose of this study was to evaluate cardio-metabolic risk indexes (CMO index) in older AA and EA adults.

METHODS: The CMO index was the measured CMO value divided by the CMO risk value for the selected variable. A CMO risk index > 1 for all variables, except HDL indicate a risk for developing CVD. The participants were 178 older adults (128 AA; 50 EA) with a mean age of 74.8 years. The older AA and EA signed institutional approved informed consent forms and were evaluated for differences on the following CMO indexes: total cholesterol (TC), high (HDL) and low density lipoprotein cholesterol (LDL), Triglycerides (TG), glucose (GLU), HbA1c (glycosylated hemoglobin) and systolic (SBP) and diastolic blood pressures (DBP). The participants were also measured for body fat% and body mass index.

RESULTS: The EA weighed less (71.8 kg vs 82.0 kg; $p < 0.05$), had smaller BMI (27.6 kg/m² vs 30.7 kg/m²) and body fat% (38.6% vs 41.3%) values than AA. The EA also had better functional ability as measured by the timed up and go test (6.8 sec vs 8.1 sec - $p > 0.05$). The older AA had a favorable lipid and lipoprotein profiles as indicated by their TC, HDL, LDL and TG indexes. Older EA had favorable blood pressure and glucose (as indicated by HbA1c) values.

CONCLUSIONS: These results suggests that lipids and lipoproteins have less impact on the CVD development in AA than EA. The main contributor to CVD in AA appears to be blood pressure. Further research is needed to validate these findings, but these data suggest that controlling for CMO risk requires different protocols for EA than for AA.

P99 IMPACT OF SOCIOECONOMIC STATUS ON CARDIOMETABOLIC RISKS IN OLDER COMMUNITY DWELLERS

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BACKGROUND: Aging is characterized by decreased functional ability and increased cardiometabolic (CMO) risks. Being physically active is believed to slow these diminishing characteristics in older adults. Therefore, the purpose of this study was to determine if CMO values would decline following a 12-month period in active older adults.

METHODS: The participants were 148 active older adults from the metropolitan area of a southern city. Activity ranged from participating in structured fitness classes to participating in limited physical activity. Overall, the community was active. The participants were measured for CMO risks and morphological characteristics initially and 12 months later and two tests were statistically evaluated for differences.

RESULTS: The participants were obese based on body fat% (40%) and overweight based on body mass index (BMI - 29.1). Triglyceride (Trig- 150 mg/dL) on the posttest and systolic blood pressure (137 mmHg) on the pretest were the only variables that met risk classification based on metabolic syndrome risk criteria. High density lipoproteins (59 to 62 mg/dL) improved on the posttest. Generally, there was a trend toward improvement for the other CMO variables. The percent different (%diff) between the variables for the two tests ranges from 0 for DBP to 13.6% for Trig. Trig had the largest %diff, but also had the largest variability between assessments and therefore, was not significant.

CONCLUSIONS: These data suggest that CMO variables remained stable in a physically active community of older adults during a 12-month period. Efforts are continuing to keep older adults active as they age.

P100 PEAK TORQUE ANGLE DURING KNEE FLEXION AND EXTENSION IN INDIVIDUALS WITH INCOMPLETE SPINAL CORD INJURY

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BACKGROUND: Previous studies indicate that chronic musculoskeletal conditions and acute injuries such as rheumatoid arthritis and individuals who have ACL reconstruction exhibit a shift in peak torque angle during isokinetic evaluation. The purpose of the present investigation was to identify the angle of peak torque in individuals with incomplete spinal cord injuries (iSCI).

METHODS: Individuals with chronic (> 1 yr.), incomplete spinal cord injuries were recruited to perform isokinetic knee extensions and flexions at 30, 60, and 120 degrees per second (deg/s). Movements were conducted using both the right and left legs. Both speeds and starting leg were randomized.

RESULTS: There were no significant differences in peak torque (PT) or peak torque angle (PTA) at 30, 60, or 120 deg/s. Also, there were no differences in PT or PTA by leg at the given speeds.

CONCLUSIONS: From the present study, there appeared to be little difference in peak torque or peak torque angle based on speed or direction of muscular contraction in individuals with iSCI.

P101 CHANGE IN QUANTITATIVE COMPUTED TOMOGRAPHY-DERIVED CORTICAL AND TRABECULAR BONE COMPARTMENTS AFTER SLEEVE GASTRECTOMY

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BACKGROUND: Most studies evaluating surgical weight loss associated bone loss use dual energy x-ray absorptiometry (DXA) acquired areal bone mineral density (aBMD). Volumetric bone mineral density (vBMD) acquired by quantitative computed tomography (QCT) is less susceptible to artifact than aBMD and allows for measurement of trabecular and cortical bone. Robust assessment of compartmental bone change provides insight into the biology of surgical weight loss associated bone loss.

METHODS: Data comes from an ongoing pilot RCT (NCT03411902) examining use of oral bisphosphonates as a counteractant strategy to surgical weight loss associated bone loss. Single energy helical CT scans of the hip region (superior acetabulum to mid-femur) were collected at baseline and six months (Siemens SOMATOM Definition Flash dual source CT scanner; Siemens Healthcare). Total hip, femoral neck, and trochanter cortical and trabecular vBMD were quantified using QCTPro software (Mindways Software, Inc., Austin, TX).

RESULTS: Data collection is ongoing. Currently, baseline demographic data are available for 24 individuals (age: 56±6.7 years, 83% female, 21% black, BMI: 44.8±6.1 kg/m²), and baseline and 6-month vBMD data are available for five participants. Among participants with follow up data, weight loss at six months was -15.7±5.5%. Trabecular vBMD declined at the total hip (-2.1±5.7%), femoral neck (-3.1±9.5%), and trochanter (-2.9±3.3%). In contrast, cortical vBMD increased at the total hip (+2.7±4.4%), femoral neck (+1.8±8.1%), and trochanter (+2.5±8.4%).

CONCLUSIONS: Initial estimates suggest that trabecular vBMD consistently decreases at the total hip, femoral neck, and trochanter while cortical vBMD is increased. Future analyses will assess compartment specific changes in the entire study sample, as well as treatment effects on CT-derived metrics of bone health.

This study was supported internally by the Wake Forest School of Medicine Center for Diabetes, Obesity, and Metabolism, and the Wake Forest University Translational Science Center and Department of Health and Exercise Science.

P102 ENDURANCE OF THE DORSAL AND VENTRAL MUSCLES IN THE NECK

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BACKGROUND: Previous studies have evaluated the strength of the muscles in the neck. However, there are few studies that have looked at the endurance of these muscles. The aim of this study was to measure the endurance index (EI) of the sternocleidomastoid and upper trapezius muscles of the neck.

METHODS: Nine young, healthy subjects aged 19-21 years were tested on both muscles on two separate days. Participants were tested in the supine position for the sternocleidomastoid muscle and prone position for the upper trapezius muscle. Muscle contractions were induced using twitch electrical stimulation at 5 Hz with custom-made tinfoil electrodes. Muscle acceleration (resultant vector) was measured using a triaxial accelerometer (Axivity, AX3). The EI was calculated as the ending acceleration as a percentage of the maximal acceleration.

RESULTS: The EI for the sternocleidomastoid muscle was 56.9 ± 17.4% and the EI for the upper trapezius muscle was 55.0 ± 18.3%. These values were lower than previously published values for the vastus lateralis muscle and the forearm flexors (78.0 ± 13.3% and 73.0 ± 17.3%, respectively). The coefficients of variation determined from the separate days of testing was 22.9% for the sternocleidomastoid and 20.0% for the trapezius muscle.

CONCLUSIONS: The high variation in the reproducibility of these tests reveals that the technique can be improved for further testing. However, the reduced endurance of these muscles in the neck could make fatigued athletes more susceptible to concussions caused by head impacts.

P103 VIDEO CAMERA ANALYSIS TO CAPTURE MUSCLE SPECIFIC ENDURANCE

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BACKGROUND: Previous studies have used an accelerometer to evaluate muscle specific endurance. The purpose of this study is to use serial correlations of videos of the skin collected by a camera phone to analyze changes in muscle contraction acceleration.

METHODS: Six young, healthy subjects aged 19-22 years were electrically stimulated on the quadriceps muscle while lying in the supine position. Muscle contractions were induced using twitch electrical stimulation at either a high intensity or a low intensity at 5 Hz with gel electrodes. A series of eight, 10 second videos were captured at 1080p and 60 fps. The position of the phone was either Fixed or Hand-Held. These videos were analyzed using sequential correlations of the area between the electrodes. Greater movement reduced the correlation of the images.

RESULTS: The Fixed high intensity correlations were lower than the Fixed low intensity (0.996 to 0.991, $p < 0.001$). There were no differences between Fixed and Hand-Held correlations for either the high intensity (0.991 ± 0.0027 and 0.992 ± 0.0013, $p = 0.17$) or low intensities (0.996 ± 0.0027 and 0.996 ± 0.0016, $p = 0.35$). The standard deviations for repeated measurements of the Fixed and Hand-Held stimulations were not different for the high and low stimulations ($p = 0.074$ and 0.13, respectively).

CONCLUSIONS: The Hand-Held method for capturing videos was noninferior to the Fixed condition because there were no differences in the correlational values and there was no increase in standard deviation. These results support the use of Hand-Held camera phone videos to assess muscle acceleration during muscle specific endurance tests.

P104 MITOCHONDRIAL CAPACITY OF DISTAL AND MIDLINE LOCATIONS IN THE VASTUS LATERALIS

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BACKGROUND: Muscle mitochondrial capacity is typically measured in one location in one muscle. This includes both invasive and noninvasive measurements. The aim of this study was to simultaneously measure the mitochondrial capacity using near infrared spectroscopy (NIRS) in distal and midline locations of the Vastus Lateralis.

METHODS: Nine young, healthy subjects aged 19-28 years were tested. Participants were tested in a supine position. Muscle contractions were induced using twitch electrical stimulation at 6 Hz with standard electrodes. Muscle oxygen saturation was measured using the NIRS OXYMON device, one receiver and two light sources were placed at each location on the right Vastus Lateralis. A blood pressure cuff placed proximal to the NIRS device was used to cut off circulation to measure muscle metabolic rate. Mitochondrial capacity was determined as the rate constant of recovery of metabolic rate after 30 seconds of electrical stimulation.

RESULTS: The mitochondrial capacity of the midline location was found to be $2.02 \pm 0.62 \text{ m}^{-1}$, while the distal location was $1.90 \pm 0.68 \text{ min}^{-1}$. The p value for comparison between muscle locations was 0.047, however the percentage difference between muscle locations was small (7.6%).

CONCLUSIONS: Due to variability in several test subjects, more additional subjects need to be tested. It will be important to understand potential differences in mitochondrial capacity within the same muscle when interpreting the results of future research studies.

P105 MUSCLE CHARACTERIZATION AMONG NORMAL WEIGHT OBESE YOUNG ADULTS

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BACKGROUND: Normal weight obesity (NWO) describes individuals who are characterized with a normal weight body mass index (BMI), but have an unhealthy amount of body fat. Increased adiposity in normal weight young adults increases risk of metabolic disorders. Muscle mass may have a protective effect against disease; muscle characteristics and intramuscular fat have not been described in a normal weight obese (NWO) sample. The purpose of this study was to evaluate muscle cross sectional area (mCSA) and echo intensity (EI) between normal weight lean (NWL) and normal weight obese (NWO) adults.

METHODS: Ninety-four young adults (Mean \pm SD; Age: 19.4 ± 1.4 years; Height: $169.0 \text{ N} \pm 9.7$ cm; Weight: 63.0 ± 9.7 kg; BMI: 21.9 ± 1.7 kg/m²), with a normal BMI ($18.5\text{-}24.9$ kg/m²) were evaluated as part of a larger longitudinal study. All participants completed a total body dual energy x-ray absorptiometry scan to obtain percent body fat (%fat). Using %fat in comparison to age and sex-matched %fat values from National Health and Nutrition Examination Survey (NHANES), participants were categorized as NWO if their %fat was $>50^{\text{th}}$ percentile, and NWL if $<50^{\text{th}}$ percentile. EI and mCSA were determined from a panoramic scan of the vastus lateralis from a portable ultrasound. Scans were performed at the midpoint of the thigh and were analyzed using ImageJ by the same technician. One-way analysis of variance (ANOVA) was used to identify between group differences.

RESULTS: There was no significant difference in mCSA ($p=0.859$) between NWO (19.4 ± 5.0 cm) vs. NWL (19.6 ± 5.0 cm). There was a significant difference for EI ($p=0.049$) between cohorts, with NWO resulting in higher EI (58.8 ± 17.2 au) compared to NWL (51.2 ± 11.4 au).

CONCLUSIONS: Despite having a normal BMI and similar muscle size, individuals classified as NWO appear to have a lower muscle quality compared to their lean counterparts. This difference may increase risk of cardiometabolic disease and lower muscle function.

P106 FEASIBILITY OF USING A BISPHOSPHONATE IN SLEEVE GASTRECTOMY PATIENTS FOR BONE LOSS PREVENTION

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BACKGROUND: Among older adults with severe obesity, the sleeve gastrectomy (SG) procedure yields rapid weight loss and cardiometabolic improvement; however, it is also associated with significant bone loss and increased fracture risk. Bisphosphonate use reduces osteoporotic fracture risk and may be effective in minimizing bariatric surgery associated bone loss; yet, this hypothesis has not been formally tested. The purpose of this study is to determine the feasibility of recruiting, enrolling, treating, and following 24 SG patients (40+ years old) into a randomized controlled trial (RCT) examining the efficacy of bisphosphonate use (versus placebo) in the prevention of bariatric surgery associated bone loss.

METHODS: Feasibility metrics include recruitment, retention, adherence, and adverse event reporting. Self-reported demographic characteristics and dual energy X-ray absorptiometry (DXA) acquired T-scores and 10-year major osteoporotic fracture (MOF) and hip fracture risk were also collected at baseline.

RESULTS: Study recruitment occurred over 17 months (3/5/18-8/31/19). A total of 70 patients met initial eligibility criteria and were referred by the clinic; of those, 32 were screened by telephone ($n=8$ excluded after screening), and 24 were randomized to bisphosphonate or placebo (recruitment yield: 34%; $n=12$ /group). On average, participants were 56 ± 7 years old at baseline, with a BMI of 44.8 ± 6.1 kg/m². The majority of the study sample was female (83%), white (79%), and postmenopausal (75%). Three participants (12%) presented with osteopenia, and MOF and hip fracture risk was low ($5.0 \pm 3.2\%$ and $0.3 \pm 0.4\%$, respectively). Data collection is ongoing. As of 9/11/2019, two participants have withdrawn, two mild adverse events have been reported (out of 104 contacts; one related and one unrelated), and among active participants, 96% of pills (103 out of 107 total) have been taken ($n=22 > 80\%$ compliant with medication protocol).

CONCLUSIONS: Use of bisphosphonates as a novel therapeutic to preserve bone density among SG patients appears feasible and well tolerated. Forthcoming intervention effects will be used to generate effect size estimates to appropriately power a subsequent trial.

P107 ELEVATED POST-MARATHON MITOCHONDRIAL DAMAGE-ASSOCIATED MOLECULAR PATTERNS (MTDAMPs)

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BACKGROUND: The purpose of these studies was to generate preliminary data describing mitochondrial damage-associated molecular patterns (mtDAMPs, which influence the immune system) in human plasma samples, after the muscle injury evoked by extreme exercise, such as a marathon. We hypothesized that circulating concentrations of mtDAMPs—specifically, mtDNA—are elevated post-marathon relative to pre-marathon. Digital droplet PCR (ddPCR), an extremely sensitive assay, enables evaluation of mtDAMP levels pre- vs. post-marathon.

METHODS: All procedures were IRB approved and all subjects ($n=11$) provided informed consent. Blood was obtained by antecubital venipuncture at baseline and within 48 hours post-race. Blood was centrifuged, plasma aliquoted, and stored at -80°C for further analyses. Total plasma DNA was isolated using a commercially available mini kit (Zymo Research). Cytochrome oxidase III (COX III) primers were used to query for evidence of mtDNA. Digital droplet PCR was performed using the Bio-Rad QX200 system and EvaGreen supermix.

RESULTS: Levels of mtDAMPs (reported as copies/microliter) consistently increase by up to 10-fold following a marathon, presumably because of skeletal muscle contraction-induced injury to the muscle cell membranes.

CONCLUSIONS: Mitochondrial DNA in the circulation increases following the marathon. This may play a role in mediating sterile inflammation after extreme exercise.

P108 EFFECT OF FORCE ACTIVATION OF NOTCH SIGNALING ON MTOR

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BACKGROUND: Notch signaling is a prominent pathway necessary for repair of injured muscle. The interactions of Notch with other signaling pathways, specifically mechanistic/ mammalian target of rapamycin (mTOR), in regulating myogenesis is not well known. Studies have been conducted on Notch inhibition, but little research has been conducted on activated Notch and the interactions with mTOR. This study was conducted to develop a Notch force activation protocol and to measure the effect of overexpressed Notch on C2C12 proliferation, differentiation and mTOR signaling.

METHODS: Notch signaling is force activated via suspension or adhesion. For suspension, Notch-1 antibody is introduced to a 12-well plate with C2C12 cells. For adhesion, Notch ligand, Delta-like Ligand 1 (DLL1), was mixed with Extracellular Matrix (ECM) and coated on a 12-well plate at different concentrations (control, 2.5ug, 5ug, and 10 ug) for 12 hours. C2C12 cells were seeded at a concentration of 15,000 cells/well and proliferated for 48 hours. Following designated time period, lysates were collected for Western Blots. Primary antibodies probed for Notch (Hes1) and total mTOR signaling (TmTOR).

RESULTS: Preliminary data for suspension was analyzed via a two-way ANOVA (time x treatment). There is a significant difference in percent change of proliferation at 48 hours ($p=0.02$). Preliminary data of adhesion was analyzed via one-way ANOVA. It shows no significant difference in TmTOR concentrations between the various Notch force activation concentrations in proliferating C2C12 cells ($p=0.4298$).

CONCLUSIONS: Preliminary data shows a stronger effect of suspension over adhesion for force activating Notch. Preliminary data also suggests that force activating Notch does not affect mTOR signaling. Experiments are currently testing the ideal DLL1 to activate Notch signaling, as well as examining the effect of force activating Notch on proliferation, differentiation and other markers of mTOR signaling. This is not indicative of specific mTOR, such as Phosphorylated mTOR, which should be tested in future research.

P109 A NOVEL METHOD FOR TESTING MUSCLE FUNCTION WITHOUT THE NEED FOR SUBJECT RESPONSIVENESS

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BACKGROUND: Recent advances allow researchers to assess muscle function directly by pairing an accelerometer with direct muscle stimulation. Previous studies have reported overall results for a given muscle with no attempts to examine differential responses across a healthy population.

METHODS: Electrodes were applied to stimulate the subjects' tibialis anterior (TA), and extensor carpi radialis (ECR), with an accelerometer attached to the muscle belly. The limbs were secured using a combination of orthopedic braces and a metal base plate. Electrical stimulations were applied to the muscle over three stimulation periods of three minutes each starting at 2 Hz, then moving to 4 Hz, and ending at 6Hz. Total acceleration from each twitch was calculated and used in a cluster analysis to examine heterogeneity of fatigue across a healthy population.

RESULTS: A hierarchical cluster analysis based on the overall decline of acceleration throughout the test identified high and low fatigue clusters in the ECR ($33.2 \pm 3.2\%$ vs $77.3 \pm 3.2\%$) and TA ($40 \pm 2.9\%$ vs $74.6 \pm 2.5\%$) respectively. The high fatigue cluster in the ECR was found to have significantly lower normalized twitch accelerations from the end of the 4Hz stimulation through the end of the 6 Hz stimulation period. In the TA, a cluster of individuals had significantly lower accelerations throughout the 2 Hz stimulation period, but significantly higher accelerations at the conclusion of the 6 Hz stimulation period.

CONCLUSIONS: Significant heterogeneity exists in healthy responses to a fatigue test in the ECR and TA muscles suggesting future studies should focus on categorizing more homogeneous groups of subjects. Future studies should examine whether this procedure can distinguish between normal and induced states of fatigue.

P110 THE IMPACT OF BLOOD FLOW RESTRICTION TRAINING DURING MAXIMAL INTENSITY RESISTANCE EXERCISE ON MUSCULAR PERFORMANCE.

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BACKGROUND: Blood flow restriction (BFR) training has been shown to increase hypertrophy at low resistance loads, even though it results in reduced performance capacity, likely as a result of metabolic stress. However, the effects of BFR use in conjunction with high intensity resistance training has not been thoroughly investigated. The purpose of this study is to analyze the effects of BFR training on indices of muscular performance. This study is still ongoing and further data will be collected.

METHODS: Eight resistance-trained men and women (25.75 ± 5.8 yrs, 178.68 ± 8.8 cm, 82.80 ± 6.9 kg, and $15.99 \pm 4.4\%$ fat) participated in this study. Participants completed five sets of five maximum knee extension/flexion on an isokinetic dynamometer under two conditions: Control (CTL) and BFR. Averages of peak torque as a percentage of body weight, degree of joint angle at peak torque, time to peak torque(sec), and force decay time(sec) for both extension and flexion on the right leg were analyzed using a paired samples t-test to determine significance.

RESULTS: A significant decrease in peak torque as a percentage of body weight during flexion was observed for the BFR trial when compared to CTL trial (CTL mean 60.1 ± 3.75 , BFR mean 52.8 ± 2.69 ; $p=0.009$). With one statistical outlier removed, a statistically significant difference was found in time to peak torque held(sec) during flexion between the CTL group and BFR group (CTL mean $0.062 \pm .003$, BFR mean $0.052 \pm .004$; $p=0.033$). No other statistically significant differences were found.

CONCLUSIONS: Though the study is ongoing, preliminary results demonstrate that BFR causes decreases in peak torque as a percentage of body weight and peak torque held (sec) during knee flexion.

P111 RELATIONSHIP BETWEEN SPRINT PERFORMANCE AND STRENGTH AND POWER IN DIVISION I COLLEGIATE FOOTBALL ATHLETES

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BACKGROUND: The ability to accelerate one's own body mass to the greatest extent is important aspect to sporting movements such as sprinting. As such, many times training of athletic populations is centered around the enhancement of strength and power to improve that ability. Therefore, the purpose of this investigation was to the examine relationships in sprint performance to measures of strength and power in American football athletes at the collegiate level.

METHODS: Sixty football athletes between the ages of 18 - 23 performed a battery of test including 9.1m- and 36.6m- sprints, 1RM back squat, 1RM clean, vertical jump (VJ) and broad jumps (BJ) at the end of the spring training period. The battery of test was performed over two days. Day 1 of testing consisted of 1RM back squat and 1RM clean. 48 hours after the first session sprint and jumps tests were performed. Sprint times were recorded using electronic timing gate. Vertical jump performance was assessed as jump height (cm) and broad jumps were assessed as distance (cm). Pearson Product Moment Correlations were used to determine the relationship between all measures. Relationships were interpreted as 0.0 - 0.1 trivial, 0.1 - 0.3 small, 0.3 - 0.5 moderate, 0.5 - 0.7 large, 0.7 - 0.9 very large, and 0.9 - 1.0 as nearly perfect.

RESULTS: Significantly very large relationships were seen between 9.1m sprints and BJ ($r = -0.85$) and 36.6m sprints and BJ ($r = -0.86$). Very large relationships were seen between both sprint distances and VJ performance ($r = -0.84$ and -0.85 respectively). Additionally, body mass showed a significant large relationship with 9.1m sprint times (0.69) and very large ($r = 0.73$) relationship with 36.6m sprints. VJ and BJ showed a nearly perfect relationship ($r = 0.92$), and 1RM squat and 1RM clean had a significantly large relationship ($r = 0.63$).

CONCLUSIONS: The results of this investigation show there is a level of specificity to being able to accelerate one's own body mass to the greatest extent which would be present in both sprinting and jumping. While force production is important to sprinting performance, the 1RM squat and clean could be performed at a velocity that is to slow translate directly to sprint performance.

P112 CORRELATION OF WELLNESS AND COUNTERMOVEMENT JUMP IN FEMALE COLLEGIATE LACROSSE PLAYERS

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BACKGROUND: Tracking self-reported wellness scores is a subjective way to provide a concept of general fatigue from stressors and training load, respectively. Counter movement jump (CMJ) is an objective measure that has been shown to correlate with neuromuscular fatigue and the recovery process. The aim of this study was to correlate self-reported wellness scores and CMJ data in order to assess overall fatigue and recovery in women's collegiate lacrosse players. A secondary aim was to evaluate differences in weekly evaluation of wellness and CMJ during the off-season (fall, $n = 12$) and in-season (spring, $n = 8$).

METHODS: In a study of Division I collegiate women's lacrosse, 29 athletes recorded their daily wellness scores throughout the fall and spring seasons. The wellness survey included questions related to muscle fatigue, energy level, sleep, and stress. CMJ was measured at the start of each week. Athletes completed three maximal effort jumps using a jump mat and the average of the three jumps was used for analysis. Corresponding wellness scores for each week were compared to the average CMJ for each athlete.

RESULTS: A Spearman's correlation showed a low, but significant correlation between CMJ and wellness ($\rho = .118$, $p = .009$). A Kruskal-Wallis test showed a significant difference between fall off-season and spring in-season for wellness (fall 70.2 ± 19.1 , spring 74.7 ± 15.7 , $p = .017$) and CMJ (fall 48.0 ± 4.8 cm, spring 46.9 ± 4.8 cm, $p = .030$).

CONCLUSIONS: Wellness scores can be used along with CMJ data to assess fatigue and recovery of female collegiate lacrosse players. The two metrics provide a well-rounded concept of fatigue, but one does not replace the other. Rather, they provide different perspectives on readiness. CMJ is related to physical recovery and wellness is related to mental fatigue, which may be unique to collegiate athletes.

P113 SORENESS AND FATIGUE AS THE KEY PERCEPTUAL INDICATORS FOR PREVIOUS DAY WORKLOAD IN ATHLETES

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BACKGROUND: As monitoring of athletes has become prominent throughout competitive sport, objective and subjective methods have proven valuable in informing of an athlete's physical condition and preparedness. However, it remains unclear how objective load metrics are reflected in self-reported subjective indices. Thus, the purpose of this study was to examine the relationship between objective markers of workload and subjective assessments of soreness, fatigue, and stress the following day.

METHODS: Twenty-six collegiate male soccer players (mean±SD; 20±1y; 75.83±5.90kg; 178.5±6.8cm) wore GPS-enabled heart rate monitors during every training session and match within the 2017 season. Objective load variables (total distance covered (TD), number of sprints (SP), number of accelerations (AC), number of decelerations (DC), and training load (TL)) were collected each day. Subjective load (soreness, fatigue, and stress) were reported on a 1-10 Likert scale the following morning. Mixed models tested the relation between subjective metrics and the objective metrics of the previous day's training or match.

RESULTS: Training load and deceleration numbers from the day before showed significant relevance to reported scores of soreness and fatigue. Heavier training loads resulted in higher soreness and fatigue scores (TL $P < 0.001$), just as lighter training loads resulted in lower soreness and fatigue scores. A similar positive correlation was found with the number of decelerations to reported soreness and fatigue (DC $P = 0.023$).

CONCLUSIONS: Lasting physiological impacts of the previous day's training load and decelerations were reflected in player-reported soreness and fatigue the following morning. This information may be utilized by coaching staff to; 1) adjust training based on subjective metric scores and 2) inform tapering strategies to maximize performance in matches.

P114 CARDIORESPIRATORY VARIATION DURING RUN-WALK EXERCISE: THE IMPACT OF GENDER, AGE, AND TRANSITION SPEED

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BACKGROUND: The run-walk method of racing (interspersing running with short walk intervals) is an emerging strategy for novice endurance runners, though large variations in velocity and cardiorespiratory effort with this strategy are associated with slower times and may contribute to decreased race performance. The purpose of this study was to investigate the effects of gender, age, and walk-run transition speed on cardiorespiratory variation during run-walk exercise

METHODS: Preferred running and walking treadmill speeds were determined for 30 recreational competitive distance runners (16 men). The preferred transition speed (PTS) between walking and running was also determined during the warm-up. Subjects then completed three rounds of run-walk exercise: 2 min of running followed by 2 min of walking for a total of 12 min of exercise. Metabolic and heart rate data were continuously collected using a metabolic cart and heart rate monitor. The variation in percent of heart rate reserve (%HRR_v) and VO₂ (VO_{2v}) were each calculated by dividing the average lowest value during the three walk segments by the average highest value during the three run segments. %HRR_v and VO_{2v} were compared between gender (men and women), between age group (subjects above and below 50 years old), and between PTS group (subjects with the highest and lowest PTS) using a series of independent t-tests

RESULTS: There was no significant difference in %HRR_v or VO_{2v} between the levels of the independent variables gender, age group, or PTS groups ($p > .05$ in all cases). There was a trend toward greater %HRR_v in younger compared to older subjects ($p = .051$, $d = 2.04$).

CONCLUSIONS: Cardiorespiratory variation during run-walk exercise was not significantly different as a result of gender, age, or walk-run PTS of the subjects in this study. Future studies should investigate the impact of physiological variation from run-walk exercise over a longer period of time or during actual race performance.

P115 DETERMINING INTERVENTION COMPONENTS FOR A PHYSICAL ACTIVITY PROGRAM DESIGNED FOR FORMER DIVISION I COLLEGE ATHLETES

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BACKGROUND: Emerging research shows retired college athletes experience detrimental physical/mental health declines following retirement from sport. Despite sports training, former college athletes exhibit substantial decreases in physical activity (PA) levels following retirement, which may contribute to these health declines. **PURPOSE:** Explore what intervention components would be attractive, effective, and feasible for a PA program designed for former Division I (D1) college athletes.

METHODS: Semi-structured, bracketed interviews were conducted with former D1 athletes retired <10 years and inactive based on the PA Guidelines for Americans (PAGA). Qualitative analysis was conducted via the Consensual Qualitative Research Method to determine domains, categories, and core ideas from participants' responses.

RESULTS: Participants (N=17, 7 men, 26±3years, 91% Caucasian) retired 3 months-10 years (4±3 years) and representing 9 sports and 13 conferences underwent individual interviews. Based on the PAGA, 18% were not meeting the muscle strengthening guidelines, 29% were not meeting the aerobic guidelines, and 53% were not meeting both thresholds. Constructed domains include: 1) The Recreated Team, 2) Program Needs, 3) Preventative Factors, 4) Timing.

CONCLUSIONS: Based on these domains, former D1 athletes indicated effective factors of a PA program include recreating the camaraderie and accountability of a sports team, periodic fitness testing, and electronic communication. Potential barriers include high cost, inconvenient scheduling, and lack of individual attention. Further, following a break after their last competition, participants stated they would have been ready to begin a PA program tailored for them within their first year of retirement. Future directions include testing optimal combinations of intervention components to maximize their effectiveness in a future program. Funding provided by the Association for Applied Sport Psychology 2019 Research Grant.

P116 POSITIONAL DIFFERENCES IN PHYSIOLOGICAL RESPONSES DURING MATCHES IN PROFESSIONAL SOCCER PLAYERS

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BACKGROUND: Understanding the physiological demands on individual positions of soccer players during matches can assist with individual and group training to maximize performance. Also, this information can help coaches make in-game adjustments and substitutions. **PURPOSE:** To examine the differences of in-game physiological performance metrics between positions in professional soccer players.

METHODS: 19 professional male soccer players categorized as Defender (D: n=8), Midfielder (M: n=7), or Forward (F: n=5) were monitored with an individual bioharness during the course of a season. Bioharness metrics of total distance (TD), maximum speed (MS), sprint distance (SD), number of sprints (#S), average heart rate (HR_{avg}), peak heart rate (HR_{peak}), and calories burned (CAL) were used for analyses. Matches were separated into first (H1) and second half (H2) for all analyses. Oneway ANOVAs were run for H1 and H2 comparing all variables of interest against position group.

RESULTS: A significant main effect difference was found in H1 for TD, MS, SD, and #S (all $p < 0.01$). LSD post-hoc analyses revealed that D ran less than M (-0.26 ± 0.09mi [mean difference], $p < 0.01$) and F (-0.31 ± 0.09mi, $p < 0.01$). MS was lowest in M compared to D (-1.65 ± 0.38mph, $p < 0.01$) and F (-1.56 ± 0.41mph, $p < 0.01$). F had higher SD (0.10 ± 0.02mi, $p < 0.01$; 0.09 ± 0.02mi, $p < 0.01$) and #S (8.6 ± 1.7 sprints, $p < 0.01$; 7.9 ± 1.7 sprints, $p < 0.01$) compared to both D and M, respectively. In H2, main effect differences were seen in MS ($p < 0.01$), #S ($p = 0.04$), and CAL ($p = 0.03$). MS was lowest in M compared to D (-1.75 ± 0.40mph, $p < 0.01$) and F (-1.23 ± 0.41mph, $p < 0.01$). F had more #S compared to M (4.2 ± 1.7 sprints, $p = 0.02$). F spent less CAL than D (-75.6 ± 31.1kcal, $p = 0.02$) and M (-76.7 ± 31.9kcal, $p = 0.02$).

CONCLUSIONS: While significant differences in performance metrics were seen in both halves, there was less variation in H2. This could mean that fatigue, subs, or tactic changes impact the variables of interest as games progress.

P117 NO CHANGES OF IN-GAME PERFORMANCE WITH CAFFEINE INGESTION IN 3RD PERSON SHOOTING GAMES

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BACKGROUND: Video games are growing in popularity among non-traditional athletes and Esports is a platform for these athletes to train, compete and perform. Therefore, it is important to examine the potential benefits of caffeine supplementation as an ergogenic aid in a sedentary non-traditional sport. The purpose of this study was to examine the effects of caffeine on in-game performance during third person shooting video games.

METHODS: Fourteen volunteers with third person shooting game experience ($M = 10$, $F = 4$; Age: 22.14 ± 1.96 y; Height: 171.57 ± 0.1 cm; Mass: 77.11 ± 10.69 kg) played Fortnite on a PlayStation 4 (PS4). Two sessions were performed on separate days, non-caffeine (NON-CAF) and caffeine (CAF). Based on body mass, participants received 6 mg/kg of caffeine. Following ingestion, participants waited 20 minutes before playing 40 minutes of Fortnite. Average hits, accuracy, headshots, and eliminations were analyzed using two-tailed paired T-tests ($p < 0.05$).

RESULTS: No significant differences were observed for in-game performance for: NON-CAF HITS (7.33 ± 6.96 avg), CAF HITS (6.65 ± 7.1 avg), NON-CAF ACCURACY (14.1 ± 10.24 %), CAF ACCURACY (13.79 ± 11.54 %), NON-CAF HEADSHOTS ($.66 \pm 1.01$ avg), CAF HEADSHOTS (1.15 ± 2.81 avg), NON-CAF ELIMINATIONS ($.36 \pm .59$ avg) CAF ELIMINATIONS ($.40 \pm .40$ avg).

CONCLUSIONS: Ingesting 6 mg/kg of caffeine while playing third person shooting games demonstrated no changes for in-game performance. Future studies should investigate dosage and physiological effects in third person shooting games.

P118 INFLUENCE OF FOCUS OF ATTENTION INSTRUCTION ON JUMP PERFORMANCE: ADDITIVE BENEFITS OF A MIXED FOCUS.

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BACKGROUND: Coaches often use instructions to direct performance with research suggesting externally focused instructions are most beneficial for performance. Recent research has suggested quality of instruction is an important consideration irrelevant of direction of focus. The purpose of this study was to investigate the influence of quality instructions, including a combination of internal and external focus, has on jump performance.

METHODS: 24 male collegiate athletes (21.4 ± 2.6 yrs; $71 \pm$ inches; 174 ± 5.2 lbs) participated. Participants warmed up on a Monark 874E bicycle for 5 minutes plus 10 bodyweight squats prior to jumping. A within-subjects design was used, with participants performing 3 trials under each instructional condition: Control (CON), Internal (INT), External (EXT) and Mixed (MIX). CON condition was performed first, with the order of experimental conditions counterbalanced. No performance feedback was provided throughout the experiment. A 2 minute rest was administered between trials, where participants were asked to complete a short questionnaire to confirm they were following the instructions.

RESULTS: SPSS v.24 was used to conduct a 4 (Instruction) x 3 (Trial) repeated measures ANOVA and post hoc analyses using a bonferroni adjustment. The data demonstrated a significant main effect for instruction $F_{(3,63)} = 9.117$, $p < 0.05$ but not for Trial or the Instruction x Trial interaction. Post hoc analyses demonstrated the MIX instruction condition resulted in longer jump distances than both the CON ($p = 0.006$) and EXT ($p = 0.0350$) conditions. The INT instruction condition resulted in longer jump distances than the CON ($p = 0.012$) condition and no differences existed between the MIX and INT, or the EXT and CON conditions.

CONCLUSIONS: The findings suggest an additive effect of INT and EXT instructions as demonstrated by the superior performance of the MIX condition, and a beneficial performance effect of high-quality INT instructions as used in this study. This study provides a more detailed investigation of the FoA instruction effect and yields important data to be considered by movement practitioners. As opposed to simply providing EXT focused instructions, practitioners should pay particular attention to developing high quality, goal-oriented instructions with both INT and EXT elements.

P119 INFLUENCE OF FOCUS OF ATTENTION INSTRUCTIONS ON JUMP PERFORMANCE: COMPARISON OF EXTERNAL FOCI OF ATTENTION

Terry M. Brown, Courtney F. Brooks, Anna E. Urbano, Anna E. Urbano, Leah M. Kay, Leah M. Kay, Tom E. Parry, Tom E. Parry. *College of Charleston, Charleston, SC.*

BACKGROUND: The goal of instructions is to direct a performers attention to relevant movement elements. Research has suggested externally focused instructions are more beneficial for performance than internal, however, limited research has compared different types of externally focused instructions. The purpose of this study was to investigate the influence of external environmental and movement related focus of attention instructions on jump performance.

METHODS: 16 female collegiate athletes (study (mean age 20.7 ± 1.4 yrs; 64 ± 2.5 inches; 145 ± 6.6 lbs) participated. Participants warmed up on a Monark 874E bike for 5 minutes prior to jumping. Using a within-subjects design, participants performed 3 trials under each instructional condition: Control (CON), Internal (INT), External (EXT), and Environmental-External (E-EXT). CON condition was performed first, with other experimental conditions being counterbalanced. No feedback was provided after each trial and 2 minutes rest was allowed between trials. Participants completed a short questionnaire to confirm they followed instructions on each trial.

RESULTS: SPSS v.24 was used for a 4 (Instruction) x 3 (Trial) repeated measures ANOVA with a bonferroni adjustment used on post hoc analyses. The data demonstrated a significant main effect for instruction $F_{(3,42)} = 10.807$, $p < 0.05$ but not for Trial or the Instruction x Trial interaction. Post hoc analyses showed the E-EXT condition jumped significantly further than the CON ($p = 0.001$), INT ($p = 0.001$), and EXT ($p = 0.019$) instruction conditions. No other differences existed between conditions.

CONCLUSIONS: The findings suggest external environmental (E-EXT) focus of attention instructions enhance performance greater than any other instruction condition. The most interesting finding is the fact that an EXT environmental focus demonstrated better performance than movement based external focus instructions. This highlights that simply providing EXT focus instructions does not benefit performance, and does not offer enhanced performance over quality INT instructions. It is suggested practitioners provide externally focused instructions, with an environmental targets to encourage maximal performance.

P120 COMPARISON OF TRAINING PERFORMANCE TO REPORTED PRACTICE INTENSITY IN PROFESSIONAL SOCCER PLAYERS

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BACKGROUND: Determining differences in training intensity may help players recover and avoid overtraining during the season. The purpose of this study is to determine the training (practice time [PT]) and performance (distance [D], max speed [Sp_{max}], number of sprints, [#S], average heart rate [HR_{avg}], and peak heart rate [HR_{peak}]) variations to coach reported practice intensities in professional soccer players.

METHODS: 22 players wore a HR monitor and GPS system via bioharness for 85 practices. Prior to the start of practice, the head coach denoted the intensity as light (L), moderate (M), or hard (H). A one-way ANOVA was run to determine the difference between intensity and all variables of interest. Post-hoc Bonferroni analysis was run on significant main effect differences.

RESULTS: A significant omnibus result was revealed for PT, D, Sp_{max} , #S, HR_{avg} , and HR_{peak} (all $p < 0.01$). Post-hoc analyses revealed PT was greater for H compared to M (8.9 ± 1.6 min [mean difference], $p < 0.01$) and L (13.1 ± 1.9 min, $p < 0.01$). D was greater in H compared to M (0.37 ± 0.08 km, $p < 0.01$) and L (1.39 ± 0.93 km, $p < 0.01$). Sp_{max} was less in L compared to M (-2.77 ± 0.32 kph, $p < 0.01$) and H (-3.26 ± 0.33 kph, $p < 0.01$). L saw less #S compared to M (-3.3 ± 0.6 , $p < 0.01$) and H (-5.1 ± 0.6 , $p < 0.01$). HR_{avg} and HR_{peak} were also significantly lower in L compared to M and H. H elicited higher HR_{avg} (4.7 ± 0.9 bpm, $p < 0.01$) and HR_{peak} (3.2 ± 0.8 bpm, $p < 0.01$) compared to M.

CONCLUSIONS: GPS and HR monitoring during training provides performance information that can be used to evaluate training goals.

P121 PHYSIOLOGICAL FACTORS INFLUENCING PERFORMANCE IN COLLEGIATE WOMEN'S SOCCER PLAYERS USING THE WHOOP SYSTEM

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BACKGROUND: Elite athletes, including collegiate soccer players, put a large amount of physical load on their bodies during training and competition. The goal of each athlete is to determine the optimal load so they can perform at their highest level. The WHOOP system allows for the determination of individual physiological measures that can aid in optimizing training in order for each athlete to perform at their highest level. Purpose: The purpose of this study was to investigate which of the physiological factors measured by the WHOOP system had the greatest impact on the INSTAT performance score for collegiate women's soccer players.

METHODS: Each player (n= 27) on the WFU Women's Soccer team wore the WHOOP system everyday throughout the season. For each day, strain and sleep performance were measured. Linear mixed model analyses were performed to determine which physiological measures from the WHOOP system were related to the INSTAT performance score per game.

RESULTS: Players who had higher strain measures in the days leading up to game day had a higher INSTAT score (B = 0.791, p = 0.021). Players who had higher mean sleep performance had higher INSTAT scores (B = 49.4, p = .055).

CONCLUSIONS: Results of this study suggest that having good sleep on average is more important than having good sleep on just the night before the game. Results also suggest that increasing strain leading up to game day can increase performance as measured by INSTAT scores.

P122 A MULTIFACETED EXERCISE INTERVENTION TO IMPROVE RIDER POSITION AND PERFORMANCE AMONG EQUESTRIAN ATHLETES

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BACKGROUND: To date, little research is available on equestrian athletes and exercise interventions that could benefit riding performance. As many riders do not participate in exercise beyond their riding training, the purpose of this study was to examine the effectiveness of an exercise intervention targeting local muscle endurance and balance to improve rider posture and overall riding performance.

METHODS: Seven subjects completed pre-intervention assessments (local muscular endurance, dynamic stability, dynamic balance, and a coach-administered riding assessment), a 10 week-intervention, post-intervention assessments and a post-intervention survey. The intervention included an exercise program, three times per week, targeting local muscle endurance, dynamic stability, and dynamic balance. Data were analyzed using repeated measures t-tests and percent change to examine pre-post differences. Participants also completed a post-intervention rider survey about their experience with the exercise program and perceived effects on pain, posture, and riding performance. Informed consent and IRB approval were obtained prior to the start of the study.

RESULTS: Statistically significant increases were seen in wall sit, plank endurance test, and plank right and left. In addition, meaningful performance changes (percent change) were seen in the horizontal hold test and the flexor endurance test. For riding performance, statistically significant increases were seen in 13/15 performance measures (e.g., upper back/shoulder position during the canter, sitting trot, and rising trot with and without stirrups). Post-intervention survey scores were 3 (neutral) or higher on all questions and 8 of the 11 post-intervention survey questions were answered only with "strongly agree" or "agree" to questions regarding program effectiveness, pain relief and improvement in riding performance.

CONCLUSIONS: Impairments in body structure and function that impact a rider's performance were identified following baseline measures and a tailored exercise program yielded meaningful performance changes. Qualitatively, subjects felt the exercise program was reasonable to carry out and beneficial to decrease pain and improve performance.

P123 CHANGES IN BODY COMPOSITION AND PERFORMANCE MEASURES THROUGHOUT THE ACADEMIC YEAR IN FEMALE LACROSSE PLAYERS

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BACKGROUND: In order to promote peak performance in collegiate athletes, training programs should monitor the conditioning effects that a season imposes on the athletes that may lead to declines in physical functioning and poor performance. The purpose of this study was to evaluate changes in body composition and performance measures throughout a yearlong collegiate training cycle in women's lacrosse athletes.

METHODS: Division I female lacrosse players (N=18) were evaluated at the beginning of the fall off-season (T1), prior to the start of pre-season (T2), and immediately post-season (T3). Performance testing included body composition measures (%BF, FFM) assessed via air-displacement plethysmography, vertical jump (VJ), and VO_{2max}. RM-MANOVAs with univariate follow-ups were conducted to determine changes in performance and body composition variables over time with significance set at P<0.05.

RESULTS: Time main effects were seen for all body composition and performance measures (P<0.05). Decreases in %BF and VJ and an increase in FFM were seen from T1 to T2 ($\Delta\%BF=-1.5\pm 0.4\%$, $\Delta VJ=-1.7\pm 0.5\text{cm}$, $\Delta FFM=1.1\pm 0.2\text{kg}$; P<0.05), with a non-significant increase in VO_{2max} (P>0.05). There was a significant decrease in VO_{2max}, with a significant increase in VJ from T2 to T3 ($\Delta VO_{2max}=-2.2\pm 0.6\text{mlO}_2/\text{kg}/\text{min}$, $\Delta VJ=1.5\pm 0.7\text{cm}$; P<0.05). There were no changes in FFM or %BF from T2 to T3 (P>0.05).

CONCLUSIONS: The improvements in body composition measures with declines in VJ from T1 to T2 may be reflective of the type of off-season conditioning program. The power-endurance trade off noted from T2 to T3 may require further analysis of in-season training loads to provide insight as to whether the decrements in aerobic fitness and enhanced lower-body power could be reflective of the on field demands of the sport. Thus, athlete monitoring may be beneficial to coaches and training staff for maintaining athlete readiness during the off-season in order to strengthen player development in preparation for the upcoming season and to mitigate negative in-season performance changes.

P124 ASSOCIATION BETWEEN PITCHING A SIMULATED GAME AND PITCHING PERFORMANCE IN YOUTH SOFTBALL PITCHERS.

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BACKGROUND: The influence of fatigue, pitch types, and pitching mechanics in baseball has been correlated with increased injury risk. However, in softball, the effect of those variables on injury and performance has only recently been investigated. Understanding the potential consequences of fatigue, pitch types, and mechanics is equally important due to the lack of pitch count and rest regulations in softball. Therefore, the purpose of this study was to analyze the effects of a simulated game on fastball (FB) and drop-ball (DB) pitching performance in youth softball pitchers.

METHODS: Nine youth softball pitchers participated (13.33 ± 1.66 yrs, 166.80 ± 5.52 cm, 61.48 ± 17.87 kg). Pitching performance was analyzed using spin rate, true spin, and spin efficiency via the Rapsodo Pte Ltd pitching device. The first 50% of all FBs and DBs pitched in the simulated game were compared to the last 50%. A repeated measure multiple analysis of variance (MANOVA) was used to investigate differences in pitching performance between the first and last 50% of FBs and DBs.

RESULTS: Statistical analysis revealed an overall significant difference between the first and last 50% of pitches, $F_{1,8}= 25.882$, p = .011. Post-hoc analysis revealed a significant decrease in DB spin efficiency (p = .030) from the first and last 50% of DBs pitched in the simulated game.

CONCLUSIONS: The simulated game resulted in a decrease in DB pitching performance, but there were no significant changes in FB pitching performance. This may be in part due to pitchers typically learning a standard fastball prior to a more specialized pitch such as a DB. Within baseball literature, pitching while fatigued is associated with not only decreased performance but also injury susceptibility. Based on the results of the current study there is evidence of similar trends in performance in softball, but future research is still required to determine mechanical changes.

P125 2.4 KG OF PROXIMAL EXTERNAL LOADING IMPAIRS 5-KM RUNNING PERFORMANCE

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BACKGROUND: This study examined the effects of modest torso external loading using a soft and malleable weighted compression garment to simulate a gain in non-contractile muscle mass of ~2.4 kg (4.3 ± 1.0% of body mass) on overground running performance.

METHODS: Former and current collegiate cross country runners (5 female and 6 male) completed two outdoor, road course runs 7 days apart. During the first run (CON) participants ran as closely as possible to their goal pace for a "hard speed day" workout based on pre-determined paces according to current training level and high familiarity with the course. During a subsequent run participants attempted to match their pace while receiving splits from GPS watches and investigators on the course while wearing the weighted compression garment (LOAD). Metabolic data was later assessed during 5 min running bouts on a treadmill with CON or LOAD conditions at participant's CON run pace.

RESULTS: LOAD was slower ($p < 0.01$) at the 1.6-km mark (6:03 ± 0:37 vs. 6:13 ± 0:40) and finish (18:29 ± 2:06 vs 19:15 ± 2:16). There was no differentiation ($p > 0.05$) between VO_2 (CON 3.47 ± 0.86; LOAD 3.56 ± 0.77 L/min) or respiratory exchange ratio (CON 1.05 ± 0.06; LOAD 1.06 ± 0.04). There was an inverse ($r = -0.42$) but non-significant ($p = 0.22$) relationship between percent change in body mass and percent change in performance.

CONCLUSIONS: Metabolic variable differentiation was not detectable at race pace, but 2.4 kg of proximal loading resulted in an approximately 4% acute performance impairment.

P126 LOWER BODY STRENGTH, POWER, AND AGILITY COMPARED TO BODY COMPOSITION IN RESISTANCE TRAINED MALES

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BACKGROUND: Lower body strength, power, and agility are important determinants of success in trained individuals. Understanding these values compared to fat free mass (FFM) and body fat percentage (BF%) may provide better differentiation of ability in individuals of different sizes.

METHODS: Eighteen participants (20.8 ± 2.3yr, 178.2 ± 6.9cm, 81.6 ± 12.8kg) completed a test battery consisting of: body composition (via Bod Pod); one-repetition maximum leg press (1RMLP); reactive shuttle run (RSR); and countermovement jump (CMJ). Performance of each test was normalized to FFM and BF%. Pearson correlations were calculated to determine the relationship between FFM and BF% to 1RMLP, CMJ, and RSR.

RESULTS: A significant, moderate, positive correlation ($r = 0.52$, $p = 0.03$) was found between FFM and 1RMLP. No significant relationship was found between FFM and either CMJ ($r = -0.13$, $p = 0.63$) or RSR ($r = -0.03$, $p = 0.93$). A significant, moderate, negative correlation ($r = -0.66$, $p < 0.01$) was found between BF% and CMJ. No significant relationship existed between either 1RMLP ($r = 0.04$, $p = 0.91$) or RSR ($r = 0.43$, $p = 0.08$).

CONCLUSIONS: Results indicate a relationship between FFM and BF% and lower body strength and power. Analyzing relative strength and power may provide a better understanding of differences than raw scores in trained males.

P127 EFFECT OF EXPERIENCE ON STRENGTH AND POWER IN MALE BRAZILIAN JIU JITSU ATHLETES - A PILOT STUDY.

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BACKGROUND: Brazilian Jiu Jitsu (BJJ) is a grappling-based martial art that is largely predicated on technical prowess and strategy. Like many forms of martial arts, the progression of technical prowess can be demonstrated with belt rank advancement. Aside from clear differences in skill, little is known about the differences in the physical capabilities of athletes of differing belt ranks or whether they influence success in the sport.

METHODS: Athletes reported to the Human Performance Laboratory (HPL) to complete body composition testing via dual energy x-ray absorptiometry, familiarization and 3 - 5 RM assessment of performance tests (bench press [BP], barbell glute bridge [BGB], prone bench pull [PBP]), and a maximal isometric hand grip strength test (MIHS). Athletes returned to HPL to complete power testing in BP, BGB, and PBP.

RESULTS: No significant group differences were found for age, height, body mass, body composition (body fat percentage) or any performance measures except for left hand MIHS; advanced athletes ($n = 3$) possessed higher left hand MIHS (59.1kg ± 2.1 kg, $p = 0.049$, $d = 1.25$) than novice athletes ($n = 6$, 45.8 kg ± 12.7 kg).

CONCLUSIONS: Although differences exist in select strength parameters between advanced and novice BJJ athletes, our findings suggest that success in BJJ may be more specific to technical skill than strength and power.

P128 COMPARISON OF WEARABLE PERFORMANCE MONITORING SYSTEMS IN PROFESSIONAL SOCCER PLAYERS

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BACKGROUND: Increasingly, teams are using bioharnesses, with global positioning (GPS) and heart rate (HR) capabilities, to measure athleticism, monitor load, and determine playing time for athletes. There is limited consensus on the most realistic and reliable bioharness system. **PURPOSE:** To examine the differences in performance metrics between two bioharness systems on professional soccer players.

METHODS: Daily physiological measures were collected on a team ($n = 16$) during a 34-week season. Each athlete wore a compression shirt based (CS) system for 17 weeks, and switched to a sports bra (SB) system after. Each system recorded distance ran (D), max speed (S), average HR (HR_{avg}), peak HR (HR_{peak}), and calories burned (EE) during training. Because athletes did not wear CS and SB concurrently, independent samples t-tests were run on each variable of interest ($\alpha = 0.05$).

RESULTS: Significant differences were noted between systems for D (CS: 4.47 ± 1.4km, SB: 4.02 ± 1.24km; $p < 0.01$), S (CS: 23.8 ± 4.4km, SB: 24.7 ± 4.4km; $p < 0.01$), and EE (CS: 1033.1 ± 314.4kcal, SB: 608.8 ± 193.3kcal; $p < 0.01$). No difference was noted for HR_{avg} ($p = 0.88$) or HR_{peak} ($p = 0.94$).

CONCLUSIONS: The lack of difference in HR suggests that training intensity was similar during each 17 week period. EE saw the largest difference, which may indicate a notably different calculation. Coaches and sport scientists should be mindful of the algorithms of individual systems, as these may misestimate performance which could impact player ability or recovery.

P129 THE RELATIONSHIP BETWEEN CHANGES IN SLEEP, INFLAMMATORY BIOMARKERS, AND ENERGY EXPENDITURE IN FEMALE SOCCER PLAYERS

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BACKGROUND: The chronic stress of training and frequent travel during the competitive soccer season may adversely affect sleep and thus, recovery in collegiate athletes. The purpose of this study was to examine the relationship between changes in sleep, inflammatory biomarkers, and exercise energy expenditure (EEE) throughout the season.

METHODS: DI female soccer players (N=24) were monitored throughout the competitive season. During all training and games, EEE (kcal/kg) was evaluated using the Polar TeamPro system, which was individualized based on pre-season performance testing. Pittsburgh Sleep Quality Index (PSQI) questionnaires, body weight assessments, and blood draws were completed prior to pre-season and at weeks 2, 4, 8, & 12 of the season. Total cortisol (TCORT), free cortisol (FCORT), c-reactive protein (CRP), IL-6, and TNF α were analyzed. Change scores were calculated between timepoints for each biomarker, GlobalPSQI, Sleep Duration (SD), and Sleep Quality (SQ) scores. Pearson product correlations were conducted between change scores as well as EEE_{AVG} between timepoints with significance set at p<.05.

RESULTS: Δ GlobalPSQI was not related to any measures, except Δ SD and Δ SQ (r=.39, r=.51; p<.05). Δ SD and Δ SQ were both significantly correlated to Δ IL-6 (r=-.21, r=-.23; p<.05). Δ IL-6 was positively correlated to Δ CRP (r=.32, p<.05), Δ TNF α (r=.43, p<.05) and Δ FCORT (r=.26, p<.05). Δ CRP was also positively related to Δ TCORT (r=.24, p<.05). EEE_{AVG} was not associated with any measures (p>.05).

CONCLUSIONS: There appears to be a relationship, albeit weak, between sleep measures and IL-6, with increased SD and SQ (i.e. decreased PSQI score) related to increases in IL-6. Additionally, increased IL-6 was associated with increases in other proinflammatory and stress markers, potentially indicative of fuel mobilization and physiological repair responses. The cumulative load of the competitive season could indicate an increased need for recovery, thus yielding compensatory increases in SD and perceived SQ. Further research is warranted using objective sleep measures to examine the observed relationship in soccer players.

Funding provided by Quest Diagnostics

P130 AEROBIC TRAINING-MEDIATED DOWNREGULATION OF PENTRAXIN 3 AND PENTRAXIN 3/TOLL-LIKE RECEPTOR 4 RATIO IN PERIPHERAL BLOOD MONONUCLEAR CELLS OF ELDERLY SUBJECTS, IRRESPECTIVE OF CHANGES IN OXIDATIVE STRESS

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BACKGROUND: The consequence of reactive oxygen species (ROS)-mediated cellular aging has been linked to various diseases, such as atherothrombosis and cancer. Pentraxin 3 (PTX3) is a soluble pattern recognition receptor mainly released from endothelial cells and immune cells and utilizes its counter-regulatory function in promoting the anti-inflammatory response via the inhibition of toll-like receptor 4 (TLR4). Although increased level of PTX3 has been shown following stimulation of oxidative stress and is also associated with aging-related diseases, the relationship between PTX3 and oxidative stress in aging remains to be elucidated. However, exercise has been proposed as the key intervention for the maintenance of health in the elderly. Therefore, this study was to examine whether or not the level of PTX3 on TLR4-dependent inflammation would be associated with changes in oxidative stress in both plasma and peripheral blood mononuclear cells (PBMCs) following 8 weeks of aerobic training in the elderly.

METHODS: Fourteen elderly subjects (9 trained and 5 controls) were recruited to participate in an 8-week aerobic training. The ELISA and western blot analyses were used to determine the levels of PTX3 and biomarkers of oxidative stress in both plasma and PBMCs prior to and following training.

RESULTS: No changes in plasma levels of PTX3 and oxidative stress markers (GSH, TEAC, and ROS/RNS) were observed in trained vs. control groups. However, our analyses showed a downregulation of PTX3 expression in PBMCs (P = 0.017) following aerobic training, along with decreased ratio of PTX3/TLR4 (P = 0.047). Furthermore, the tendency of oxidative stress response in PBMCs remained unchanged as shown in plasma levels. Finally, no correlation was observed between PTX3 and any oxidative stress biomarkers following training protocol.

CONCLUSIONS: These findings demonstrate the downregulation of PTX3 and PTX3/TLR4 ratio in PBMCs of elderly subjects, irrespective of changes in oxidative stress following 8 weeks of aerobic training.

P131 ACUTE EFFECTS OF MAXIMAL EXERCISE ON INFLAMMATORY MARKERS AND HEART RATE VARIABILITY

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BACKGROUND: It has been suggested that vagal input may influence inflammatory responses on a millisecond timescale akin to heart rate. This study aimed to investigate the relations between vagally mediated markers of heart rate variability (HRV) and inflammatory profiles in response to maximal aerobic exercise.

METHODS: Eight recreationally active males (26 \pm 3 yrs, 9.7 \pm 3.2 %BF) completed two trials separated by a minimum of eight weeks. Resting HRV was assessed during a 5-min seated period at both trials; the root mean square of successive differences (rMSSD) was used to assess vagal input. Maximal oxygen uptake (VO_{2max}) was assessed via a ramp protocol on the cycle ergometer (100W + 25W per minute) until volitional fatigue. A blood draw was collected immediately pre-, and immediately post-maximal oxygen uptake testing. Inflammatory markers were quantified in serum using a high sensitivity T-Cell multiplex (IFN γ , IL-10, IL-2, IL-4, IL-6, and TNF- α). Principal component analysis (PCA) was used to form three components and a repeated measures multivariate analysis of covariance (MANCOVA) was used to examine differences in these components between the two trials and across time (pre vs post).

RESULTS: After controlling for the difference in baseline rMSSD, inflammation between the two trials approached significance (p=.095). However, none of the 3 components were significantly different in response to maximal exercise (p=.824).

CONCLUSIONS: Vagal input was assessed by seated resting HRV (rMSSD) which influenced baseline resting inflammatory status but did not influence the exercise-induced inflammatory response. This data suggests that when investigating inflammatory responses, resting vagal input should be considered.

P132 EFFECTS OF DIET ALTERATIONS, WITH OR WITHOUT FECAL MICROBIAL TRANSPLANTS, ON BONE INTEGRITY

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BACKGROUND: High fat feeding exerts a negative impact on bone quality and strength. Gut microbiota have been strongly linked to bone outcomes in several models. A clear mechanism linking alterations in gut microbiota, diet composition, and bone has not yet been elucidated.

METHODS: 6-wk old male C57Bl/6 mice (n=10/group) were randomized to a low-fat (LF) or high fat, high sugar (HFS) diet *ad libitum* for 13 wks. HFS mice were randomized to one of three groups for 4 wks: LF diet with fecal microbial transplants (FMT) from the LF mice (HFS/LF+), LF diet with sham FMT using PBS (HFS/LF), or HFS diet with FMT from the LF mice (HFS/HFS+) to simulate the impact of combined diet alteration and addition of "healthy" microbes, diet alterations only, and addition of "healthy" microbes only, respectively. Animals had free access to a running wheel until terminated at 23 wks of age. Statistical analyses were performed using a two-way ANOVA and Tukey's *post-hoc* test.

RESULTS: HFS/HFS+ mice showed greater absolute femoral neck (FN) strength versus HFS/LF and HFS/LF+ mice (p<0.003), while LF/LF mice had the greatest relative FN strength versus all groups (p<0.016). Whole femur bone mineral density (BMD, g/cm²) was greater in HFS/HFS+ versus all groups (p<0.023); LF/LF mice had the highest BMD when normalized to body weight (p<0.029). Immunostaining for tumor necrosis factor alpha, sclerostin, insulin-like growth factor 1, and interferon gamma in cortical and cancellous bone revealed no differences between groups. Despite no difference in marrow adipocyte number (#/mm²) between groups, HFS/HFS+ mice had greater marrow adipocyte size (μ m²) versus LF/LF mice; diet alteration, with and without transplanted "healthy" microbes, was able to partially attenuate increased marrow adipocyte size.

CONCLUSIONS: A change in diet from HFS to LF led to reduced absolute FN strength compared to HFS/HFS+ and LF/LF mice, with no apparent effect from transplanted "healthy" gut microbes. LF/LF mice had greater relative femoral neck strength. Altering diet, with and without FMT's, was sufficient to partially rescue the detrimental impacts of high fat, high sugar feeding on bone integrity.

P133 ACUTE RESISTANCE EXERCISE ELICITS BDNF BUT NOT CATHEPSIN B IN WELL-TRAINED MEN

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BACKGROUND: The aim of this study was to examine if multi-joint RE exercises (back squat, bench press, and deadlift) to volitional failure elicited a circulating response of biomarkers associated with neuroprotection and if differences in biomarker changes existed between exercises. Further, we examined if the pre- to post-exercise changes in BDNF and IL-6 were related.

METHODS: Thirteen males (age: 24.5±3.8yrs, body mass: 84.01±15.44kg, height: 173.43±8.57cm, training age: 7.1±4.2yrs) performed 4 sets to failure at 80% of a one-repetition maximum (1RM) on the squat, bench press, and deadlift in successive weeks. The bench press was always performed second and the order of the squat and deadlift was counterbalanced. The measured biomarkers are brain derived neurotrophic factor (BDNF), insulin-like growth factor 1 (IGF-1), cathepsin B (CatB), and interleukin 6 (IL-6). Biomarkers were assessed immediately pre- and post-exercise.

RESULTS: There was a main time effect ($p<0.01$) for BDNF. In the deadlift ($p=0.01$) and bench press ($p=0.01$) conditions BDNF significantly increased, however, no significant change was observed the squat condition ($p=0.21$). There was a main time effect ($p<0.01$) for IL-6 with a significant increase in the squat ($p<0.01$), but not the bench press ($p=0.88$) and deadlift conditions ($p=0.24$). No main time effect was observed for either CatB ($p=0.62$) or IGF-1 ($p=0.56$). No significant correlations were observed between the acute change in BDNF and IL-6 ($p>0.05$), however, this relationship was nearly significant in the deadlift condition ($p=0.058$).

CONCLUSIONS: In summary, acute multi-joint RE elicits a significant increase in circulating BDNF. This investigation is the first to report the lack of a transient change of CatB to an acute RE protocol.

P134 CHANGES IN MONOCYTE FUNCTION IN RESPONSE TO ACUTE EXERCISE IN BREAST CANCER SURVIVORS

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BACKGROUND: The effects of acute exercise on immunity following breast cancer therapy are not well understood. **PURPOSE:** To determine the response of monocyte function following acute exercise in breast cancer survivors.

METHODS: 9 breast cancer survivors [Age: 58±8y, BMI: 27.9±6.7] completed a cardiopulmonary exercise test (CPET). In a subsequent trial, 45 minutes of intermittent cycling at 60% of CPET peak wattage was performed. Blood was taken at rest, immediately post (0h), and 1h post-exercise. Phagocytosis and oxidative burst were assessed following *E. coli* exposure. Toll-like receptor 2 (TLR2) and 4 (TLR4) expression was determined on CD14⁺CD16⁻ and CD14⁺CD16⁺ monocytes. All assays were analyzed using flow cytometry and are presented as mean fluorescence intensity (MFI) ± SD.

RESULTS: Phagocytosis increased by 13.4% 1 hour after completion of exercise (0h: 3257±772, 1h: 3692±824, $p=0.035$), while oxidative burst was unchanged. TLR2 expression progressively decreased from rest on both subsets of monocytes (rest: 345±48, 0h: 317±69, 1h: 283±41, all $p<0.01$). TLR4 expression on CD16⁻ monocytes decreased by 12.5% from rest to 1 hour post-exercise (rest: 98±14, 1h: 86±11, $p=0.009$), while TLR4 expression on CD16⁺ monocytes decreased across all time points (rest: 142±20, 0h: 134±16, 1h: 125±17, all $p<0.05$).

CONCLUSIONS: In breast cancer survivors, monocyte phagocytic capacity of bacteria increased following acute exercise, while expression of TLR2 and TLR4 was progressively reduced. The reduction of TLR2 and TLR4 on monocytes may represent an anti-inflammatory response of acute exercise which promotes enhanced elimination of bacteria. Supported by the Breast Cancer Research Foundation of New York.

P135 EFFECTS OF AEROBIC EXERCISE ON MCP-1 AND TNF- α IN OLDER WOMEN

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BACKGROUND: Monocyte chemoattractant protein-1 (MCP-1) and tumor necrosis factor alpha (TNF- α) are inflammatory markers that have been found to be elevated in older adults. In previous research, aerobic exercise decreased MCP-1 and TNF- α in obese younger adults, who also tend to have higher inflammatory markers. However, there is limited knowledge on the effects of exercise on age-related elevated MCP-1 and TNF- α levels. The purpose of this study was to examine the effects of aerobic exercise on MCP-1 and TNF- α levels in older, but non-obese, women.

METHODS: Physically inactive, non-obese, older women were randomly assigned to one of two 4-month exercise groups ($n=65$). Either a low dose of 8 kcal·kg⁻¹ body weight weekly ($n=35$) or moderate dose of 14 kcal·kg⁻¹ body weight weekly ($n=30$). Fasting venous blood samples were collected pre and post exercise intervention. MCP-1 and TNF- α concentrations were quantified using a multiplex immunoassay. A general linear model was performed to test if there were significant changes within groups and differential changes between the groups.

RESULTS: When testing for group by time interaction there was no significant interaction for either inflammatory markers (MCP-1 $p=0.11$, TNF- α $p=0.68$). MCP-1 significantly increased post-exercise intervention in the moderate dose group ($p=0.012$), but not in the low dose group ($p=0.35$). There was no change in TNF- α in either the moderate or low dose exercise group ($p=0.11$, $p=0.46$ respectively).

CONCLUSIONS: Our data indicate MCP-1 may be influenced by exercise dose. It was unexpected that a moderate dose of exercise led to an increase in MCP-1. Further investigation of the relationship between MCP-1, TNF- α , and aerobic exercise in older adults is needed.

P136 ENDOCRINOLOGICAL CHANGES ASSOCIATED WITH PROTEIN INTAKE IN DIVISION I MALE SOCCER PLAYERS

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BACKGROUND: The condensed preseason and match fixture in collegiate soccer impacts hormonal status, though the role of diet on this response is less studied. The purpose of this study was to assess athlete adherence to diet logs and determine relationships between diet and hormonal changes in collegiate soccer players.

METHODS: Male collegiate soccer players ($N=22$) participated in preseason testing to assess body composition (%BF, FFM) and VO_{2max} . Energy expenditure (EEE) was measured during all on-field activities via heart rate monitoring. Blood draws were conducted during preseason and 45 d later for analysis of leptin (LEP), thyroid hormones (TSH, T₃, T₄), free cortisol (CORT), free testosterone (TEST), and IGF-1. Two 3-day diet logs were completed 21 d apart. Pearson product correlations and hierarchical regression were used to assess relationships between performance, diet, and biomarkers at $\alpha=0.05$.

RESULTS: Four (18.2%) participants completed all six days of diet logs. As such, individuals who completed ≥ 3 d were included in dietary analyses ($n=9$). %BF negatively correlated with Δ TSH ($r=-0.47$, $P=0.04$). Protein intake correlated positively with FFM ($r=0.75$, $P=0.02$) and negatively with Δ LEP ($r=-0.74$, $P=0.02$) and Δ TSH ($r=-0.74$). Moderate correlations were seen between Δ LEP and Δ IGF-1 ($r=0.41$, $P=0.04$) and Δ CORT and Δ TEST ($r=0.41$, $P=0.03$). When controlling for EEE, protein intake accounted for variance in Δ LEP ($R^2=0.51$; $P=0.04$) and Δ TSH ($R^2=0.60$; $P=0.02$), and FFM accounted for variance in TSH ($R^2=0.20$; $P=0.06$). No relationships were found with VO_{2max} , T₃, T₄, and other measures.

CONCLUSIONS: These findings show the limited utility of implementing diet logs in this population. The correlations between different hormones show the inherent associations between metabolic status, stress, and anabolism. Overall, the roles of body composition and protein intake on LEP and TSH, hormones associated with energy availability, suggests that protein may be a unique and understated factor in this equation. Funding provided by Quest Diagnostics

P137 MEASURED VERSUS HEART RATE-DERIVED CORE TEMPERATURE DURING OUTDOOR WORK IN THE SOUTHEASTERN UNITED STATES

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BACKGROUND: Climate change is increasing the number of hot days to which outdoor workers are exposed, thereby increasing their risk of heat illness. Currently, continuous monitoring of core temperature (T_c) is expensive, invasive, and impractical. The BioModule is a non-invasive physiological monitor that uses heart rate to provide an estimation of T_c , but its accuracy is unknown. The purpose of this study was to test the association between measured gastrointestinal temperature (T_{GI}) and estimated core temperature (T_{c-est}) from the BioModule device during outdoor work in a hot environment.

METHODS: Twenty groundskeepers (18 men; mean \pm SD age = 38 \pm 8 y, body mass index = 31.5 \pm 7.5 kg/m²) swallowed an ingestible temperature sensor and strapped on a BioModule before work. T_{GI} was collected every 15 minutes during the workday; T_{c-est} was determined by a 1-min average from the same time of day. Data collection occurred in Alabama during July and August (31.4 \pm 3.1 °C WBGT). Relationship between T_{GI} and T_{c-est} was quantified using the repeated measures correlation coefficient (r_{rm}). Agreement (bias \pm 1.96 SD) between T_{GI} and T_{c-est} was evaluated using the Bland-Altman method for repeated observations.

RESULTS: There was a moderate, positive relationship between T_{GI} and T_{c-est} ($r_{rm} = 0.56$, $p < 0.001$). Agreement analysis indicated that T_{c-est} overestimated T_{GI} (0.28 \pm 0.58 °C). The error between T_{c-est} and T_{GI} was larger at lower temperatures, as indicated by a strong negative trend (Pearson's $r = -0.73$).

CONCLUSIONS: The BioModule provides an estimation of T_c that may be helpful as a guide during outdoor work in hot environments but should not be used for safety considerations or measurement of T_c . Funded by the Deep South Center for Occupational Safety and Health, a National Institute for Occupational Safety and Health Education and Research Center.

P138 URINARY HYDRATION MEASURES DURING PRESEASON HIGH SCHOOL FOOTBALL PRACTICES IN THE HEAT

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BACKGROUND: Assessment of hydration is an important measure to help reduce heat illness and has not been evaluated during high school football practice in a hot environment. The purpose of this study was to examine the relationship between urinary markers (i.e. urine color and urine specific gravity), and percent body mass loss (%BML) during football practices in the heat.

METHODS: Thirty-one male high school football players (Age: 16 \pm 1 y; Ht: 181.2 \pm 12.0 cm; Wt: 68.1 \pm 5.4 kg; BMI: 20.8 \pm 1.8) volunteered to participate in this study. Before and after each practice, players provided a urine sample and were weighed wearing shorts. Urine was assessed for urine color (Ucol) and urine specific gravity (USG). All analyses were performed by the same person. Correlations and t-tests assessed relationship and pre-post differences. P value was significant at <0.05.

RESULTS: Mean wet-bulb globe temperature across 8 practices was 30.6 \pm 2.5°C. There were significant correlations between post-Ucol and post-USG ($r = .66$, $p = 0.00$, $n = 209$) and pre-Ucol and pre-USG ($r = .73$, $p = 0.00$, $n = 209$). Post-Ucol (5 \pm 1) was significantly greater than pre-Ucol (4 \pm 2; $p = 0.00$). Post-USG (1.022 \pm .008) was significantly greater than pre-USG (1.020 \pm .008; $p = 0.00$). Post body mass measures were significantly lower than pre-body mass resulting in %BML of 0.93 \pm 1.1%.

CONCLUSIONS: Overall, these football players began practice in a hypohydrated state, which may explain their low %BML. We found a strong relationship between Ucol and USG. In field settings where USG is not feasible, Ucol is an acceptable hydration measure. However, due to individual variability in these measures, clinicians should provide individualized hydration recommendations.

P139 THE EFFECTS OF A STRUCTURED FIRE EXERCISE ON PHYSIOLOGICAL RESPONSES IN PROFESSIONAL FIREFIGHTERS

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BACKGROUND: Firefighters are exposed to extreme environments when performing their job. These environments can cause different physiological responses than most typical work environments. The purpose of this study was to assess the effects of a victim search and rescue, with heat and without heat, in firefighters regarding markers of hydration, subjective measurements, and heart rate responses.

METHODS: Professional male firefighters (n = 10) reported to a local fire station between 0500 and 0800 on two separate trials. Upon arrival, firefighters presented the investigators with urine, subjective measurements, blood samples, and had body mass assessed. Each trial consisted of a victim search and rescue and a simulated fire suppression, but Trial 1 was performed with no heat and Trial 2 was performed with heat. Each trial lasted 20 min with variables collected again after training.

RESULTS: There were no differences in sweat rates, plasma volume shifts, sodium losses, or urine specific gravity (USG) and color between trials. However, when added heat was present, rating of perceived exertion (4.9 \pm 1.1 vs. 3.6 \pm 0.8), thermal sensation (2.4 \pm 0.97 vs. 1.2 \pm 0.63), and perceived thirst (5.0 \pm 0.26 vs. 4.0 \pm 0.35) were all significantly higher ($p < 0.05$). Further, body mass significantly decreased (0.29 \pm 0.6 vs. 0.09 \pm 0.07 kg) and heart rate increased (172 \pm 9 vs. 150 \pm 28 bpm) when heat was present compared to no heat. The most important finding was that regardless if heat was present or not, firefighters reported to both trials in a hypohydrated state (> 1.020 USG).

CONCLUSIONS: Future research should develop measurements and guidelines specific to firefighters to quickly assess hydration status and corrective procedures.

P140 HEART RATE RECOVERY AND CELLULAR RESPONSES TO CINDY IN DIFFERENT ENVIRONMENTAL CONDITIONS

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BACKGROUND: Exercise in cold atmospheric conditions has been shown to increase immune cell responses, growth of new blood vessels, and metabolism. Regular interval training can reduce risk of cardiovascular disease, increase cardiorespiratory endurance, and stimulate muscle hypertrophy. However, much thermoregulatory research has focused on effects of heat exposure during exercise, with little on cold effects. The purpose of this study was to examine physiological responses of heart rate (HR) and systemic markers of muscular damage/repair to determine if there is a synergistic benefit of exercising in the cold.

METHODS: Five recreationally-trained males (22.20 \pm 4.97 yrs, 25.64 \pm 2.8 kg/m²) participated in four sessions in a repeated measures design. Following baseline VO_{2MAX} , participants completed a popular CrossFit protocol, CINDY: 20 min of 15 air squats, 10 push-ups, and 5 pull-ups, for as many rounds as possible. Exercise sessions were performed in three settings: cold (7°C), room temperature (20°C), and hot (30°C). HR was assessed during exercise and for 15 minutes of recovery in the session's conditions. Pre- and 1 hr post-exercise blood samples were taken. The blood samples will be used for TBARS and IL-6 assays and reported on later. Repeated-measures ANOVA with Bonferroni correction was used to assess effect of thermal conditions.

RESULTS: No significant differences in exercise HR were observed, but average post-exercise HR recovery (HRR) was significantly lower during cold exposure compared to heat ($p = 0.036$).

CONCLUSIONS: Preliminary results suggest that cold exposure can aide in immediate post-exercise HRR.

P141 PHYSIOLOGICAL RESPONSES TO HEAT STRESS IN GROUNDSKEEPERS

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BACKGROUND: The extent to which groundskeepers experience heat strain, dehydration, and accompanying declines in kidney function during work in hot-humid conditions is unknown.

METHODS: Hydration, cardiovascular, and internal body temperature measures were assessed in 20 groundskeepers (18 men; mean±SD age=38±8 y, body mass index=32±8 kg/m²) during work on 2 summer days. Before (PRE) and after (POST) the work shift, resting blood pressure (BP) and heart rate (HR) were measured and urine and blood samples were collected. At POST, fluid intake was recalled for the previous 24 h. Gastrointestinal temperature (T_{GI}) was recorded every 5 min via ingestible telemetric sensor.

RESULTS: Average highest daily wet bulb globe temperature=39.1±3.5 °C. In 45% of subjects, PRE BP>130/80 mm Hg on Day 1 (D1) and Day 2 (D2). Highest HR and T_{GI} achieved across both days were 143±15 bpm and 37.7±0.3 °C, respectively. On D1 and D2, urine specific gravity (U_{SG}; 1.021±0.01) and urine color (U_{COL}; 6±1) did not change PRE to POST (all P>0.28), but subjects began the workday “underhydrated” (concentrated urine but normal serum osmolality (S_{osm}))—62% had U_{SG}≥1.020 and 95% had U_{COL}≥4 despite S_{osm}=292±5. Fluid intake=2.3±1.6 L during work and consisted of 70% water and 25% sugar sweetened beverages. No subject lost ≥2% of body mass on D1 or D2. For 6 subjects, estimated glomerular filtration rate at PRE was ≤60 mL/min/1.73m² averaged across D1 and D2. Although serum creatinine did not change statistically from PRE to POST across days (all P>0.18), 5 subjects had increases ≥0.3 mg/dL, signifying an acute kidney injury (AKI).

CONCLUSIONS: While hyperthermia was not prevalent, subjects began and ended the workday underhydrated. Hypertension, obesity, and low water intake may have contributed to the overall low kidney function and AKIs observed. Using urine color as a self-assessment tool could be a beneficial intervention to improve hydration status and kidney function.

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P142 DIABETES RISK STATUS AND PHYSICAL ACTIVITY PARTICIPATION IN WOMEN OF CHILDBEARING AGE: U.S. BRFSS

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BACKGROUND: Women of childbearing age with prediabetes (PD) or gestational diabetes (GD) can reduce their odds of diabetes by engaging in physical activity (PA). This study examined the odds of meeting the current United States aerobic activity (AA), muscle strengthening activity (MSA), both, or neither recommendation(s), according to diabetes risk status (DRS).

METHODS: Women (N=282,302) ages 18-44 who participated the 2011, 2013, 2015, or 2017 Behavioral Risk Factor Surveillance System survey were categorized by DRS: no diabetes (ND), diabetes (DM), or high risk for diabetes (HRD). Logistic regression models stratified by body mass index (underweight [<18.5], desirable weight [18.5-24.9], overweight [25.0-29.9], and obese [≥ 30.0]) were fitted, controlling for potential confounders.

RESULTS: Compared to a ND referent group, overweight women with DM had significantly ($p\leq 0.05$) lower odds of meeting the AA recommendation (OR 0.83, CI 0.67-1.00). Overweight women considered HRD were less likely to meet the MSA recommendation (OR 0.81, CI 0.68-0.97) and more likely to not meet either recommendation (OR 1.20, CI 1.03-1.40). Among women in the desirable weight group, those considered HRD had lower odds of meeting MSA only (OR 0.72, CI 0.61-0.85) or both recommendations (OR 0.77, CI 0.64-0.93). Desirable weight women with DM had greater odds of not meeting either recommendation (OR 1.43, CI 1.12-1.82).

CONCLUSIONS: Increased AA and MSA in women at risk for diabetes may benefit maternal outcomes. Strategies targeting the determinants of PA should be considered to increase participation.

P143 SLEEP DURATION AND OBESITY INDICES IN ADOLESCENTS

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BACKGROUND: Adolescent prevalence of obesity and at-risk waist circumference (WC) has continued to rise worldwide. Sleep duration has been hypothesized as a contributing factor to this increase. This study aimed to examine the sleep-obesity relation in adolescents.

METHODS: National Health and Nutrition Examination Survey ($n=454$; ages 16-18 years), the effect of sleep duration on body mass index (BMI) and WC by gender was analyzed via ANCOVA, linear regression, and logistic regression. Sleep hours were categorized as Under Recommended (under 7 hours), Recommended (8-10 hours), and Over Recommended (over 10 hours).

RESULTS: The proportion of participants who were overweight or obese was approximately 21%. Over half of participants met the recommendations for sleep duration (53.3%). A significant main effect across sleep duration categories was observed via linear regression in the total sample for WC. Longer sleep duration was associated with increased BMI in males, but not females ($\beta=0.136-0.113$, $p<0.05$) and with increased WC in both males ($p=0.030$) and females ($\beta=0.143-0.148$, $p<0.05$). Logistic regression analyses yielded no significant influence of sleep category assignment on overweight BMI classification.

CONCLUSIONS: For both males and females, WC was impacted by excessive sleep. Similarly, excessive sleep only impacted BMI in males. The greater number of females achieving the recommended amount of sleep, and thus, smaller proportion getting insufficient or more than the recommended amount, contributes to the absence of influence on BMI in females. Likewise, the cut points used to classify Under Recommended, Recommended, and Over Recommended may not be sensitive enough to adequately identify risk differences weight-related maladies in females.

P144 STRESS EFFECTS ON UNIVERSITY POLICE HEALTH AND SLEEP

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BACKGROUND: Occupational stress is associated with negative health outcomes such as increased blood pressure and impaired sleep. Police officers experience stressors unique to their job. The Operational Police Stress Questionnaire (PSQ-Op) was designed to measure operational stressors specific to policing such as working alone at night, risk of injury, and occupational-related health issues. The purpose of this study was to examine how operational stress affects systolic (SBP) and diastolic (DBP) blood pressure, body mass index (BMI), and sleep in police officers.

METHODS: 10 university police officers (37.7±6.4 yrs; women=2) completed the PSQ-Op and were divided into two groups on the basis of their PSQ-Op scores: high stress (HS: 3.65±0.52) and low stress (LS: 2.09±0.37). Participants wore wrist actigraphy watches (GT3X+) for 7 days to obtain activity and sleep measurements. HS and LS were compared using independent t-tests. Significance was accepted at $p<0.05$.

RESULTS: Although there were no significant differences in any variables, police officers in the HS had higher BP (SBP: 130±18; DBP: 83±10 mmHg) compared to LS (SBP: 121±15; DBP: 70±10 mmHg) and BMI (HS: 33.2±5.6; 30.4±3.4 kg/m²). HS group had somewhat higher moderate to vigorous activity (HS: 188±55; LS: 166±55 min) and steps/day (HS: 11,881±3,580; LS: 10,599±3,437). Both groups slept less than the recommended 420 minutes per night (HS: 376±27; LS: 362±32 min).

CONCLUSIONS: Our findings suggest that police-related operational stress may have a clinical impact on BP and BMI. University police officers are not meeting sleep recommendations, which may further impact health-related outcomes.

P145 BLOOD BIOMARKERS LINKED WITH CONCUSSION DIAGNOSIS IN ACTIVE, SEDENTARY, AND CONCUSSED INDIVIDUALS

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BACKGROUND: According to the American Medical Society of Sports Medicine, concussion diagnosis is complicated by a lack of validated, objective diagnostic tests. Adding blood-based biomarkers to the armamentarium of tools used to diagnose concussion will add objectivity and likely improve diagnostic accuracy. To determine if serum levels of fatty acid binding protein 7 (FABP7), microtubule-associated protein tau (MAPT), ubiquitin carboxy-terminal hydrolase L1 (UCHL1), glial fibrillary acidic protein (GFAP), and S100 calcium-binding protein B (S100B) may be used to diagnose concussion.

METHODS: Blood was drawn from rugby players within one-hour post-match (n=14), within one-hour of sustaining a concussion (n=9), or after one-hour but within 8 hours of sustaining a concussion (n=5). Inactive controls were recruited as baseline comparisons (n=12). After collection, the blood was allowed to clot and then centrifuged to separate the serum. Serum was stored at -80°C until biomarker analysis. A One-Way analysis of variance was run to compare means among the four groups. If the assumption of normality or homogeneity of variance were not met a Kruskal-Wallis non-parametric test was utilized.

RESULTS: UCHL1 (p=0.116) and S100B (p=0.057) were not significantly different among groups. MAPT and GFAP were not detectable in any samples. FABP7 was significantly different in the inactive group (1.53 ng/mL±5.772) compared to the group of non-concussed rugby players (4.14 ng/mL±3.737, p=0.004), and to the group of rugby players concussed after 1 hour (5.77 ng/mL±5.130, p=0.014). However, FABP was not significantly different in the group of rugby players concussed within one-hour compared to the inactive group (p=0.058), the group of non-concussed rugby players (p=1.000), or the group of rugby players concussed after 1 hour (p=1.000).

CONCLUSIONS: These biomarkers have been considered potential indicators of brain injury, but may not be useful in the diagnosis of sports-related concussion.

P147 EXERCISE AND LITERARY READING COMPREHENSION: AN ALTERNATIVE TO SEDENTARY STUDYING

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BACKGROUND: The positive health effects of physical activity (i.e. decreases in obesity, diabetes, cardiovascular disease, LDL cholesterol, and blood pressure) are commonly known, yet many individuals engage in less than recommended amounts of physical activity per week, and a great deal of sedentary behavior. Of particular interest is the prevalence of sedentary behavior among college students, who have outlets for physical activity (i.e. gyms, trails etc.), but spend many hours sitting in class, studying and doing homework. To therefore, improve health and academic performance alternative ways of engaging in these behaviors may be necessary. The purpose of the current study was to identify whether riding a stationary bike while reading positively or negatively impacted reading comprehension and if dynamic visual acuity (DVA) factored into results.

METHODS: Twenty-four female (n=18) and male (n= 6) college students participated in the study. Seventeen self-reported being active or very active. Participants completed a demographic survey and a DVA test prior to testing. An experimental design was used to assess differences in reading comprehension while reading on a stationary bike and sitting in a chair. Participants completed each trial and then answered open-ended questions. The test of comprehension was created to assess literary interpretation, not just basic understanding to more effective match requirements of collegiate English courses. Scores were generated using a 70-point grading rubric. Further analysis included a mixed-models ANOVA, examining the effect of activity, athletic status, age, DVA, literary excerpt, and exercise vs. non-exercise on reading comprehension (total scores from the reading tests).

RESULTS: Participants who were already highly active scored slightly higher on the non-exercise condition, but no statistically-significant differences were noted as a result of DVA score or trial type.

CONCLUSIONS: Findings showed that riding a stationary bike while reading a literary excerpt did not negatively impact reading comprehension among this group of participants and thus may be a good solution for decreasing sedentary behavior among non-active college students.

P148 IMPACT OF MOVEMENT INCORPORATION ON MIDDLE SCHOOL CLASSROOM PHYSICAL ACTIVITY LEVELS

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BACKGROUND: Physical inactivity is linked with several chronic diseases and intervention strategies have had minimal effect on children's long-term exercise participation. Incorporating physical activity into school day instruction time is a feasible solution to increase physical activity throughout the day in children. The purpose of this study was to examine the effect bouncing feet on an under-the-desk apparatus had on middle school students' physical activity levels.

METHODS: Two middle-school English classrooms from a rural southeastern town participated in the study (N=26). Students were given an under-the-desk band to allow students to freely fidget with their feet and legs. Physical activity was assessed with an accelerometer worn on their ankle during control and intervention periods. During the control period, students maintained normal class routine and wore provided accelerometers for six weeks. Researchers added an under-the-desk band to desks for students to freely fidget at their desks for the intervention. Wilcoxon signed rank tests determined differences in activity levels between control and intervention periods for overall time and percentage of time in each activity level.

RESULTS: Due to poor wear adherence, final analysis included 19 participants. During the intervention, students wore the monitors an average of 12.5 days out of 30 days. Significant increase in sedentary time (z = -2.85, p < 0.05) and percentage of class spent in sedentary were found (z = -2.42, p < 0.05). As well as significant decreases in light time (z = -3.16, p < 0.05), percentage of light (z = -2.17, p < 0.05), percentage of moderate (z = -3.34, p < 0.05), percentage of vigorous (z = -2.58, p < 0.05).

CONCLUSIONS: Results indicate an under-the-desk band did not improve physical activity levels. However, results may be skewed due to poor wear adherence.

P149 CONTINUOUS METABOLIC SYNDROME SCORE AND PHYSICAL ACTIVITY AMONG METABOLIC SYNDROME POSITIVE INDIVIDUALS

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BACKGROUND: Metabolic syndrome (MetS) is a clustering of cardiometabolic factors increasing risk of morbidity and mortality. Traditionally, MetS is assessed dichotomously; however, new techniques allow for consideration of the severity of MetS using gender- and race-specific, continuous z-scores. **PURPOSE:** This study aimed to identify how self-reported daily minutes of physical activity (PA) by intensity (sedentary, moderate, and vigorous) predicted degree of severity of MetS among MetS positive individuals (12 to 80-years-old).

METHODS: Using 2015-2016 National Health and Nutritional Examination Surveys data, individuals with no missing cardiometabolic data were classified as MetS positive using ATP III criteria (obesity, dyslipidemia, dysglycemia, and hypertension). Subsequently, MetS z-scores were derived for each individual (n=662). Due to limited variability of the MetS z-score, tertials (Lower: -1.95 to 0.76, Middle: 0.77 to 1.38, and Upper: 1.39 to 7.32) were created to increase predictive ability of PA. Differences in daily minutes of PA between MetS tertials were determined with an ANOVA and linear regression was utilized to predict the severity of MetS with PA.

RESULTS: The middle tertial (n=234) reported the most sedentary time (381.41±212.18 minutes; p<0.287) and vigorous PA (11.04±35.03 minutes; p<0.985). The lower tertial (n=237) reported the greatest amounts of moderate PA (26.71±52.69 minutes; p<0.128). However, no significant differences between tertials were observed. The linear regression revealed PA intensity was not a significant predictor of MetS z-score tertial.

CONCLUSIONS: Overall, PA, as reported in total daily minutes, did not differ between MetS z-score tertials nor did it predict severity of MetS. This may be due to PA being self-reported and/or the exclusion of non-MetS individuals. Future research may be able to elucidate a relation using a more sensitive, objective measure of PA to better understand its relation with MetS.

P150 A SIT AND RESISTANCE TRAINING INTERVENTION ON SEDENTARY WOMEN WITH METABOLIC SYNDROME RISK FACTORS

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BACKGROUND: Metabolic syndrome affects 35% of the United States population, with a higher prevalence among women. The purpose of this study was to determine the effects of a 10-week sprint interval training (SIT) and resistance training (RT) intervention on waist circumference (WC), blood pressure (BP), fasting plasma glucose (FPG), high triglycerides (TG), and low high-density lipoproteins (HDL) in sedentary women 25-55 years old.

METHODS: 38 sedentary females (Age = 38 ± 8 years old, BMI = 33.33 ± 7.68 kg/m²) completed a 10-week, 30 session SIT and RT intervention. At pre and post- intervention, BP, FPG, TG, and HDL were conducted to screen for MetS risk factors. WC was collected at pre, week 5 and post intervention. A paired samples T-test compared pre- and post- variables with a Bonferroni corrected significance level of $p < .01$. A repeated-measures ANOVA examined differences in the three WC measures.

RESULTS: BP showed significant decreases in systolic ($t(37) = 2.877, p = .007$) from pre- (129 ± 18 mm/Hg) to post- (125 ± 12 mm/Hg), diastolic ($t(37) = 2.999, p = .005$) from pre- (81 ± 7 mm/Hg) to post- (79 ± 6 mm/Hg), and mean arterial pressure ($t(37) = 4.197, p < .001$) from pre- (81 ± 7 mm/Hg) to post- (79 ± 6 mm/Hg). A significant effect of time was found in WC ($F_{1,66} = 3.872, p < .034$). Post-hoc analysis revealed a significant decrease ($p = .007$) in WC from pre- (111.43 ± 18.05 cm) to post- (107.34 ± 16.22 cm). No significant changes were found in FPG, TG, and HDL from pre- to post- intervention.

CONCLUSIONS: The current study revealed that a 10-week SIT and RT intervention can significantly decrease BP and WC in sedentary women. These data reveal that further investigation is warranted into timeframe and optimal modality of exercise to decrease risk factors for metabolic syndrome.

P151 DISCORDANCE BETWEEN LDL CHOLESTEROL VERSUS PARTICLE CONCENTRATION AND THE CARDIOVASCULAR RISK FACTOR PROFILE

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BACKGROUND: Although low-density lipoprotein cholesterol (LDL-C) levels have been associated with cardiovascular disease (CVD) risk, subjects with well controlled LDL-C are still at considerable residual risk for CVD. Alternative measures such as particle concentration of LDL (LDL-P) may be clinically useful for fully characterizing LDL associated risk. The purpose of this study was to compare CVD risk factor profiles among groups of people with discordant levels of LDL-C versus LDL-P concentration in the HERITAGE Family Study.

METHODS: Standard lipid panels and lipoprotein subclass profiles via nuclear magnetic resonance (NMR) spectroscopy were measured among 715 participants (34% Black, 55% Female). LDL-C and LDL-P values ≥ the median value were considered high and values < median were considered low. Four exclusive LDL-C/LDL-P groups were identified for LDL from these base categories: 1) low/low (<median for both LDL-C and LDL-P), 2) low/high (<median for LDL-C, ≥ median for LDL-P), 3) high/low, and 4) high/high. Cross-sectional associations between baseline LDL discordance group and CVD risk factors were assessed via multivariable linear regression. All models were adjusted for age, race, and sex.

RESULTS: Sixty four (9.0%) participants were discordant with high LDL-C/low LDL-P, while 61 (8.5%) were discordant with low LDL-C/high LDL-P. Main effects ($p < .05$) of LDL discordant group were found for the following outcomes: triglycerides, HDL-C, HDL-P size and small and large HDL-P concentration, percent body fat, maximal oxygen uptake, fasting insulin, lipoprotein lipase activity, testosterone, GlycA, and C-reactive protein. In general, groups with lower LDL-P had more favorable CVD risk factor profiles relative to high LDL-P groups.

CONCLUSIONS: In general, low LDL-P levels were associated with favorable CVD risk factor profiles regardless of LDL-C levels.

P152 EFFECTS OF AEROBIC AND RESISTANCE TRAINING ON THE LIPOPROTEIN SUBCLASS PROFILE IN TYPE 2 DIABETICS

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BACKGROUND: Type 2 diabetes (T2D) is associated with dysfunctional lipid metabolism in addition to impaired glucose metabolism. Exercise is widely prescribed in the treatment of T2D; however, the effects of exercise on complex lipoprotein traits in T2D are not fully understood.

METHODS: Change in lipoprotein subclass profile was examined in 214 patients with T2D from the HART-D cohort. Patients were randomized to 9 months of either control (n=33), aerobic training (AT, n=62), resistance training (RT, n=55), or combination of aerobic and resistance training (AT/RT, n=64). NMR spectroscopy was used to quantify lipoprotein size, total and subclass concentrations of triglyceride rich lipoproteins, low-density lipoproteins, and high-density lipoproteins (TRL-P, LDL-P, and HDL-P respectively). Paired t-tests were used to assess the effects of exercise within each intervention, and general linear models (GLMs) adjusting for group, sex, race, age, baseline BMI, and baseline trait value were used to compare changes in lipoprotein subfractions in exercise groups to changes in control.

RESULTS: AT resulted in nominal ($p < .05$) changes in small HDL-P (H2 (7.8nm): -0.69 μmol/L $p = 0.032$, H1 (7.4nm): 0.44 μmol/L, $p = 0.03$), and RT increased medium LDL-P (43.89 nmol/L, $p = 0.002$), while AT/RT failed to produce changes in any lipoprotein subclass. Adjusted GLMs revealed the change in H2 HDL-P was less in AT compared control ($p = 0.01$). Additionally, despite no training response in large LDL-P subclass concentration following AT, change in large LDL-P was less in the AT group compared to control ($p = 0.01$).

CONCLUSIONS: Overall, exercise training resulted in minimal changes in the lipoprotein subclass profile in patients with T2D. Further studies are needed to elucidate the potential effects of exercise dose on lipoprotein subfractions to improve upon the clinical utility of exercise prescription in the treatment of T2D.

P153 RELATIONSHIP OF KIDNEY TRANSPLANTATION BIOPSY MARKERS WITH GRAFT LOSS AND MORTALITY

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BACKGROUND: The best treatment for end-stage renal disease is kidney transplantation. Deleterious effects of poor lifestyle choices have consequences on donor kidneys that may affect prospective graft health and lifespan. The purpose of this study was to assess kidney health after kidney/kidney-pancreas transplantation and explore associations between routine kidney biopsy and follow-up graft loss/death of patients in South Carolina.

METHODS: A total of 1702 transplant records were analyzed from electronic medical records between January, 2011 and May, 2019. A subgroup of 178 kidney biopsy records were used as a proxy for healthy living. Thirteen biopsy indicators (i.e., glomerulitis, tubule inflammation, peritubular capillaritis, etc.) were rated 0 (best) to 5 (worst) to assess inflammation. Pearson's correlations (r) and one-way ANOVA testing using Bonferroni adjustments were used to describe the associations using IBM SPSS v.25.

RESULTS: Kidney alone constituted 92.4% of the transplants. Combined, kidney/pancreas transplants averaged 199.7/year. The average age of kidney transplants (mean: 52.5 years (stdev: 13.7)) was significantly higher than the kidney/pancreas group (mean: 44.6 years (stdev: 9.8)) ($p < 0.001$). Pearson correlations showed no relationships or significance between biopsy indicators and graft loss/death ($-0.21 < r < 0.12$): all p 's $> .14$) with interstitial inflammation almost reaching significance ($r = 0.15, p = .052$).

CONCLUSIONS: This study implies that initial kidney transplant biopsy markers are not strongly associated with future graft status, thus a focus on change of kidney indicators may provide stronger value to predict future health status of transplant patients. This project was funded by College of Charleston.

P154 ACUTE HEART RATE AND ENJOYMENT RESPONSES OF MODERATE-INTENSITY INTERMITTENT INTERVAL WALKING IN MIDDLE-AGED WOMEN

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BACKGROUND: Middle-aged and older women are less likely to adhere to physical activity guidelines for aerobic activity than their younger female and similar-aged male counterparts. The purpose of this study was to investigate heart rate (HR) and exercise enjoyment during and following three walking protocols in middle-aged women.

METHODS: Ten women (55 ± 4 years) completed three walking protocols of the same work volume (90 MET·min) in a randomized, counter-balanced order. The protocols consisted of one 30-min bout of low-moderate continuous walking (CW) (3 METs; ~ 4.8 km/h), three 10-min bouts of low-moderate intermittent walking (IW) min, and three 8-min 40-s bouts of intermittent interval walking (IIW) with cycles of 30 s:120 s of high-moderate (5 METs; ~ 6.4 km/h): low-moderate intensities. HR and enjoyment were assessed at six evenly distributed increments during exercise and post-exercise.

RESULTS: IIW (112.0 ± 16.0) elicited higher during exercise HR than IW (105.0 ± 14.0; $p = 0.01$). Immediately following exercise, both CW (108.0 ± 14.0; $p = 0.004$) and IIW (109.0 ± 16.0; $p = 0.03$) elicited higher HR than IW (102.0 ± 14.0). Despite during and post-exercise HR differences, exercise enjoyment during and following exercise were similar amongst protocols (all $p > 0.05$).

CONCLUSIONS: The shorter more intense, IIW, may be an exercise prescription suitable for middle-aged women to progress to higher exercise intensities and address the barrier of time.

P155 THE PHYSIOLOGICAL EFFECTS OF FLIP-FLOPS

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BACKGROUND: While many podiatrists claim that walking in flip flops can be harmful, there is limited research to support these claims. The purpose of this study was to investigate if flip-flops place increased strain on the body by analyzing the differences in oxygen consumption, respiratory exchange ratio, calories, muscle activation of the lower limb, and heel strike and toe-off angles between three footwear conditions over an extended walking period.

METHODS: Thirteen college students walked on a treadmill for 20 minutes at a constant speed of 3 mph and a grade of 1% under three footwear conditions: barefoot, flip-flops, and exercise shoe of choice. Oxygen consumption (VO₂) and respiratory exchange ratio (RER) were measured during the entire walking period, and calories were calculated from VO₂ and RER. At the beginning and end of the walking period, electromyography (EMG) was used on the tibialis anterior and lateral gastrocnemius, and heel strike and toe-off angles were measured using the Hudl Technique application.

RESULTS: A one-way repeated measures ANOVA showed that the overall model was significant at a univariate comparison ($p < .01$). Flip-flops and shoes both had significantly higher VO₂ and calorie values than barefoot. There were no significant differences in muscle activation between the three conditions. There were significant differences in heel strike and toe-off angles between all three conditions, and flip-flops had a larger heel strike and a smaller toe-off than barefoot.

CONCLUSIONS: Based on the results of this study, walking in flip-flops is not recommended. Walking in flip-flops decreases economy, as demonstrated by the increased VO₂ and calories compared to barefoot, and it alters heel strike and toe-off angles, which could change the body's natural gait pattern.

P156 HEART RATE RESPONSE IN WOMEN WITH GESTATIONAL DIABETES MELLITUS ASSESSED BY FITBIT CHARGE 3

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BACKGROUND: The impact of walking versus stepping in place on heart rate (HR) response in women with gestational diabetes mellitus (GDM) is unknown. The purpose of this study was to compare HR response assessed by Fitbit Charge 3 while walking and stepping in place at three different cadences to inform the development of a physical activity intervention for women with GDM.

METHODS: Women with GDM (N=14) were recruited during the third trimester. Participants were fitted with a Fitbit Charge 3. Resting HR was assessed after 5 minutes of sitting and resting. Participants completed six 2-minute bouts that differed by mode (walking or stepping in place) and cadence (67, 84, or 100 steps/minute). Bout sequence was randomized. The percentage increase above resting HR (i.e., HR response) was calculated for each bout. Two-way ANOVA was used to examine potential differences in HR response by mode and cadence.

RESULTS: Neither mode nor cadence was statistically significantly associated with HR response (mode $p = .81$, cadence $p = .39$). The addition of an interaction term for mode and cadence also did not attain statistical significance ($p = .48$).

CONCLUSIONS: No difference in HR response assessed by Fitbit Charge 3 was detected across the cadences examined in this study. These cadences are roughly equivalent to walking at 2, 2.5, and 3 miles/hour and differences may exist for faster cadences. Findings suggest that HR from the Fitbit Charge 3 should not be used as a proxy for intensity of walking/stepping in place in a behavioral physical activity intervention for women with GDM.

P157 MUSCLE CROSS-SECTIONAL AREA IMPROVES WITH HOME-BASED TRAINING DURING METASTATIC CASTRATION-RESISTANT PROSTATE CANCER

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BACKGROUND: Exercise training improves regional body composition in localized prostate cancer, but it is unknown if training has similar effects in advanced disease. **PURPOSE:** 1) To determine changes in leg muscle cross-sectional area (CSA) and quality (MQ) values following home-based exercise training during metastatic castration-resistant prostate cancer (mCRPC) and 2) to compare CSA values to healthy controls (CON).

METHODS: Sedentary mCRPC patients undergoing androgen deprivation therapy (ADT; $n = 17$, age = 71y ± 8, BMI = 32.0kg/m² ± 6.5) underwent CSA and MQ analyses using B-mode ultrasound for the vastus lateralis (VL) muscle before and after a 12-week home-based exercise protocol. Age- and BMI-matched CON ($n = 17$, age = 69y ± 2, BMI = 32.8kg/m² ± 6.5) completed baseline scans only.

RESULTS: At baseline, VL CSA was lower in mCRPC (9.12cm² ± 3.15) relative to CON (36.55cm² ± 7.04, $p < 0.001$, $d = 4.95$). For mCRPC patients, the 12-week intervention did not change VL MQ, but increased CSA by 15.2% following the intervention (pre: 8.28cm² ± 2.85, post: 9.54 ± 3.56, $p < 0.001$, $d = 0.39$) with no change in MQ.

CONCLUSIONS: Patients undergoing ADT exhibit lower muscle size compared to CON; however preliminary results suggest that home-based exercise training induces a moderate degree of regional muscle hypertrophy. The finding of regional hypertrophy is consistent with work conducted in patients with localized disease on ADT and may be an important outcome to monitor if increases in muscle CSA translate into improvements in physical function and quality of life. Supported by Physical Activity and Cancer Survivorship Pilot Funding.

P158 BODY COMPOSITION AND PHYSICAL FUNCTION WORSEN ACROSS DIFFERENT STAGES OF PROSTATE CANCER: A CROSS-SECTIONAL ANALYSIS

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BACKGROUND: Androgen deprivation therapy (ADT) has detrimental side effects but changes between localized and advanced prostate cancer are unclear. The purpose is to determine body composition, physical function, and quality of life (QoL) differences across progressive stages of prostate cancer on ADT.

METHODS: Men with localized (PC, n=43, age 67±6y) or metastatic castration-resistant prostate cancer (mPC, n=21, age 72±8y) and non-cancer controls (CON, n=37, age 69±6y) completed total body DXA scans (% fat, lean and fat mass), physical function (6m walk, chair stands, timed up and go (TUG), stair climb), and QoL questionnaires (FACT-P).

RESULTS: % fat was different between all groups (CON: 26.1±5.6%; PC: 29.9±8.9%; mPC: 34.5±5.6%; p<0.05), along with greater fat mass in mPC vs. CON (CON: 22.2±7.8kg; mPC: 32.2±11.7kg; p<0.05). Both stair climb (CON: 4.7±1.0s; PC: 4.8±1.0s; mPC: 6.1±2.4s; p<0.05) and TUG (CON: 6.1±1.3s; PC: 6.1±1.5s; mPC: 10.4±9.0s; p<0.05) were slower in mPC compared to CON and PC, as were chair stands (CON: 9.3±2.2s; PC: 10.6±3.1s; mPC: 12.8±4.9s; p<0.05) and 6m walk (CON: 3.9±0.7s; PC: 3.9±0.4s; mPC: 4.7±1.5s; p<0.05). There were trends for lower QoL scores in mPC and PC vs. CON for overall FACT-P (CON: 138.6±13.3; PC: 121.8±20.7, p=0.055; mPC: 120.0±18.5; p=0.064), Social Well-Being (CON: 27.0±5.1; PC: 21.8±4.4, p=0.004; mPC: 22.9±3.4, p=0.051) and Trial Outcome Index (CON: 91.8±6.9; PC: 80.2±14.8, p=0.066; mPC: 77.6±3.7, p=0.043) vs. CON.

CONCLUSIONS: Body composition and physical function appear worse in advanced prostate but do not translate into lower quality of life. Exercise interventions targeting these outcomes are warranted to minimize the side effects of anti-cancer therapy.

P159 EFFECTS OF WEIGHT LOSS ON METABOLIC SYNDROME Z-SCORE

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BACKGROUND: Metabolic syndrome (MetS) z-score is the combined extent of MetS risk factors on a continuous scale. The present study investigates the effect of weight loss on MetS z-scores.

METHODS: Overweight and obese adults (n=18, 34.2±3.9 BMI) participated in a 10-week weight loss program (OPTIFAST) and supervised aerobic exercise program (50-75% VO₂ max 3xwk). Blood pressure, waist circumference, HDL cholesterol, glucose, and triglycerides were assessed at baseline and follow-up. Categorical determination of MetS was determined using the Adult Treatment Panel III guidelines. Continuous z-score was calculated using the mean and standard deviations of the entire cohort.

RESULTS: Glucose(-13.2mg/dL, p<0.001), diastolic blood pressure(-7.5 mmHg, p<0.001), waist circumference(-6.6 cm, p<0.001), and triglycerides(-21.1 mg/dL, p=0.032) all significantly improved. However HDL(3.9 mg/dL) and systolic blood pressure (-10.9 mmHg) (all p>0.05) did not. There were significant changes in both MetS prevalence (-0.8, p=0.001) and continuous z-score (p<0.001). The mean MetS prevalence score was 2.12±1.36 with a mean change of -0.823±0.88 (p<0.001). The mean continuous z-score was -1.63±3.4 at baseline with a mean change of 2.82±1.59 (p<0.001), which was associated with the change in weight (p=0.029), but not BMI, fat mass, or fitness (p>0.05).

CONCLUSIONS: Weight loss, through diet and exercise, reduces the risk factors associated with MetS.

P160 THE EFFECTS OF EXERCISE AND WEIGHT LOSS ON ASCVD RISK

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BACKGROUND: Current clinical guidelines recommend screening patients for atherosclerotic cardiovascular disease (ASCVD). However, little data has evaluated the change in ASCVD after a lifestyle intervention. The purpose of this study was to determine the change of ASCVD risk score in overweight and obese adults after weight management.

METHODS: Fifteen overweight and obese adults participated in a 10-week hypocaloric weight loss program combined with supervised aerobic training (50-75% VO₂max) to attain clinically significant weight loss (≥7%). Systolic blood pressure (SBP), diastolic blood pressure (DPB), medical history (e.g. smoking status, medications) and clinical data from blood samples (HDL, LDL, total cholesterol) were used to compute 10-year ASCVD risk using the JACC risk estimator at baseline and follow-up.

RESULTS: In participants with clinically significant weight loss (n=11), there was a reduction in 10-year ASCVD score (-0.6%, p=0.006). There was a negative correlation between the change in 10-year ASCVD risk and change in body fat percentage (r=0.6, p=0.041). However, no change was observed for lifetime ASCVD risk (-5.9%, p=0.123). Change in fasting insulin was negatively associated with 10-year ASCVD (r=-0.77, p=0.003), but not lifetime ASCVD risk (p=0.098). There was no significance for change in fitness and body weight (p>0.05) with either ASCVD risk score.

CONCLUSIONS: Although significant, aerobic exercise and weight loss resulted in minimal risk reduction (0.6%) in 10-year ASCVD risk, but not lifetime ASCVD risk score in overweight and obese individuals.

P161 THE ENDURANCE INDEX RELIABILITY FOR THE BICEPS FEMORIS

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BACKGROUND: The Endurance Index (EI) is a relatively new technique to assess the resistance to local muscular fatigue. A technique is useful if it is both reliable and valid. This study sought to determine the reliability of the EI for the bicep femoris (BF).

METHODS: The dominant leg (14R/2L) of 16 apparently healthy participants (8M/8F), weight (75.0±21.4 kg) height (170.9±10.1cm), BMI (25.3±5.5 kg/m²) completed accelerometer-based mechanomyography (aMMG) and strength testing three times on nonconsecutive days within a 15-day period. Data was collected via accelerometer, compiled and calculated as a percent change. Participants performed maximal voluntary leg extensions (60 degrees/sec) at each visit via isokinetic dynamometer. aMMG uses low frequency (4hz) and low amperage (25-35mA) for three 5-minute periods separated by 30 seconds of rest. The EI was calculated from aMMG data as a percent change from peak acceleration for each period. Data were analyzed using 2-way repeated measures ANOVA with preplanned comparisons, and reliability coefficients were computed for EI%.

RESULTS: The EI was not different between Trails 1, 2 and 3 (p>0.05), however EI% changed significantly over time. Post hoc analysis revealed T0 was different from T1, T2, and T3 (100±0.0, 61.3±3.1, 61.8±3.1 60.3±3.1; p<0.001) but no other differences were found. Reliability coefficients were calculated for both EI and Strength. Moderate reliability coefficients were computed for T1 (.445), T2 (.410), and T3 (.534) across trials for the EI% while strong reliability coefficients were computed for the strength data (0.96).

CONCLUSIONS: Taken together these data suggest that the EI% is a potentially useful tool to investigate local muscular fatigue but may require larger sample sizes to compensate for moderate reliability.

P162 CAN THE ENDURANCE INDEX ASSESS FATIGUE?

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BACKGROUND: The Endurance Index (EI%) is a method to objectively assess a muscles ability to resist muscle fatigue. The purpose of this study was to determine the influence of muscular fatigue on the endurance index.

METHODS: Thirteen apparently healthy volunteers between the ages of 18 and 30 years of age (female =7; male = 6, body weight (69.3±10.9 kg), body height (173.7±9.3 cm), body mass index (22.9±2.4 kg/m²), and 12 right leg dominant) performed 3 bouts of 5-minute electrical muscle stimulations (EMS) of the vastus lateralis at 4 hz on both limbs simultaneously. An accelerometer was to the measured movements in 3 dimensions. Acceleration (g) was converted to the EI% by normalizing values to baseline acceleration for the exercise and control limbs, respectively. Participants then performed 50 maximal isokinetic (60 degree/sec) concentric flexion and extensions on an isokinetic dynamometer with one limb. Peak torque was assessed for both limbs prior to and immediately following maximal contractions. The second limb served as a non-exercise control. The EMS protocol was repeated immediately following the second peak torque assessment.

RESULTS: A significant Treatment by Trial interaction for peak torque (p=0.0003) followed by post hoc analysis revealed that peak torque was not different between control and exercised limb at baseline but peak torque was significantly lower only in the exercised limb after 50 maximal contractions (p<0.0001) (Ex Pre 109.8±9.2, Ex Post 67.6±4.4, Con pre 105.9±11.5, Con Post 104.7±10.7 Nm). Treatment by Trial interaction followed by post-hoc analysis revealed that the EI% was significantly lower in the exercised limb after 50 contractions compared to the control limb (Ex Pre 80.4±4.9%, Ex Post 52.9±4.9%, Con Pre 81.7±4.9 %, Con Post 73.9±4.9%; p=0.0025).

CONCLUSIONS: Fifty maximal contractions produced measurable muscular fatigue, and the EI% was able to detect the muscular fatigue.

P163 CASE STUDY:PHYSIOLOGICAL RESPONSES OF A RUCK MARCH IN A MALE CORP OF CADET

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BACKGROUND: There is limited research on loaded marches, however, they have been apart of the military since the 18th century. Soldiers must be capable of carrying equipment and supplies over mixed terrain for a prolonged duration as part of military training and combat operations. Each load can include the uniform (1.4lbs), boots (7.5lbs), MOLLE FLC Vest with pouches (4 lbs), two full canteens (2 lbs), ruck sack (35 lbs), camel back with 3 Liters of water (6.6 lbs), Kevlar helmet (3.6 lbs), M16A2 plastic rifle (8.8 lbs) and a chest strap (1 lb). The average total weight of the equipment is 65.2 lbs. The 6-mile ruck march must be completed in 90 minutes or less to meet the qualifying standard. Objective points are awarded if the 6-mile is completed in 70 minutes or less.

METHODS: This case study was on a single subject who participated in a paced 6-mile ruck march wearing the described loaded gear. The K4b2 portable metabolic system (CosMed) was used to collect oxygen consumption (VO₂), carbon dioxide production, minute ventilation (respiratory rate) and respiratory exchange ratio (RQ) during the 6-mile ruck march. Heart rate was collected using a Polar heart rate strap. Rate of perceived exertion (RPE) was measured at the conclusion of the ruck march using the 6-20 RPE scale.

RESULTS: The cadet completed the 6-mile ruck march in 85 minutes and 30 seconds. His pace was constant at slightly under 15 minutes per mile with only slight variation of pace over the 6-miles. The VO₂ during the ruck march was 27.2 +/- 6.6 mls/kg/min or 7.8 Mets. The average heart rate was 145.3 +/- 9.8. The respiratory quotient (RQ) average was 1.0 +/- .08 and the average respiratory rate (RR) was 42.5 +/- 9.0. The RPE at the end of the ruck march was scored as a 15, "hard" according to Borg scale of RPE.

CONCLUSIONS: The cadet was able to accomplish a 6-mile ruck march within the prescribed 90 minute time frame. During the ruck march, the cadet was wearing multiple monitors that were able to track his cardiac capabilities. The results indicate that his average heart rate response (145 beats/min) was 72.8% of his maximal heart rate (200 beats/min), his average VO₂ response (27.2 mls/kg/min) was ~51% of his maximal VO₂ (55.6% mls/kg/min) and his average RR was 42.5 (77% of maximal RR of 55). The physiological responses encountered were all normal and allowed our subject to complete the ruck march below the 90 minute time limit. Pacing was an important aspect needed to accomplish the time goal and our subject was able to maintain a consistent pace that allowed him to finish under the prescribed time.

P164 LONGITUDINAL-RETRROSPECTIVE 8-WEEKS NON-PERIODIZED, NON-INDIVIDUALIZED TRAINING PROGRAM EFFECTIVENESS OF HIALEAH FIRE DEPARTMENT

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BACKGROUND: Firefighting requires high fitness. Fire academies assess cadets' fitness. Hialeah Fire Department (HFD) academy utilizes a non-periodized, non-individualized training program to assess its recruits' fitness. **PURPOSE:** Evaluate HFD's program effectiveness across 4 years. We hypothesized a) each class-years' fitness will be improved; b) there will be no difference in gain across years, after accounting for intra- and inter-individual differences.

METHODS: HFD cadets (age 26 ± 5 SD) from class-years 2016 (N=6), 2017 (N=7), 2018 (N=16), and 2019 (N=15) included in the study. All class-years participated in the same 8-week program. Cadets assessed at week-1 and week-8 on 1.5-mile run time, maximum pull-ups, push-ups, and sit-ups. Delta gain percentage ($\Delta G < i > \%$) calculated as $[(\text{post-pre/pre}) * 100]$. Analysis of covariance (ANCOVA) by class-year and controlled for the pre-test scores was performed for each dependent variable. Significance was set at $p < 0.05$. All analyses were performed using SPSS.

RESULTS: Significant effect of $\Delta G < i > \%$ on class-year 1.5-mile ($F_{3,39} = 20.693, p = .000, \eta^2 < /sup > = .614$); no significant effect of $\Delta G < i > \%$ on class-year pull-ups ($F_{3,38} = 2.722, p = .058, \eta^2 < /sup > = .177$); significant effect of $\Delta G < i > \%$ on class-year push-ups ($F_{3,39} = 3.338, p = .029, \eta^2 < /sup > = .204$); no significant effect of $\Delta G < i > \%$ on class-year sit-ups ($F_{3,39} = 1.828, p = .158, \eta^2 < /sup > = .123$).

CONCLUSIONS: HFD's program improved cadets' fitness levels across 4 year-classes but failed to account for intra- and inter-individual differences. This program may under- or over-estimate cadets' fitness training capabilities. This program is not appropriate to account for between class-years and within cadets' differences and maximize the reported benefits as dictated by the training principles. Specific individualized fitness programs that meet the needs of a broad range of individuals within the Fire Service are needed. Such tailored programs may serve better the firefighters' job-related fitness.

P165 ASSOCIATION BETWEEN AEROBIC FITNESS, TOTAL REPETITIONS AND VOLUME LOAD PERFORMED DURING INTENSE RESISTANCE TRAINING

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BACKGROUND: Acute resistance training (RT) performance relies heavily on anaerobic metabolism, but inter-set recovery is facilitated by aerobic processes. Thus, resistance-trained individuals with greater aerobic fitness may accumulate more volume during a standardized RT session relative to less-fit individuals. We aimed to investigate potential associations between markers of aerobic fitness, total repetitions and total volume load performed during an intense bout of RT.

METHODS: Twelve males (25 ± 5 years; 178 ± 5 cm; 89 ± 12 kg) with at least 1 year of RT experience (10 repetition maximum barbell squat = 94.7 ± 12.7 kg) performed a graded maximal exercise test on a treadmill for the determination of maximal oxygen consumption (VO_{2max}) and time-to-exhaustion (TTE). On a separate occasion, subjects performed 6 sets to muscular failure in the barbell back squat, bench press and latissimus dorsi pull-down with loads corresponding to 90% of their 10 repetition maximum. Inter-set and inter-exercise rest periods were 90 s and 120 s, respectively. Number of repetitions were recorded during each exercise and summed to determine total repetitions. Volume load was calculated for each exercise (volume load = repetitions × resistance) and summed to determine total volume load. Associations between variables were quantified with Pearson's correlations.

RESULTS: Mean and standard deviation for VO_{2max} and TTE were 42.1 ± 7.6 ml·kg⁻¹·min⁻¹ and 660.6 ± 252.8 s, respectively. Subjects performed 226.2 ± 24.7 repetitions and accumulated 11172.9 ± 1440.8 kg of total volume load. VO_{2max} was not associated with total repetitions (r = -0.10, p = 0.75) or total volume load (r = 0.01, p = 0.97). Similarly, TTE was not associated with total repetitions (r = -0.14, p = 0.67) or total volume load (r = -0.01, p = 0.98).

CONCLUSIONS: Contrary to our hypothesis, resistance-trained individuals with greater aerobic fitness did not perform more volume than less-fit individuals during a standardized RT protocol.

P166 EXERCISE RELATION TO S-KLOTHO AND THE EFFECT ON ENDOTHELIAL DYSFUNCTION A REVIEW

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BACKGROUND: Arterial stiffens describes the inflexibility of the arterial wall occurring with aging and arteriosclerosis. Endothelial dysfunction is characterized by reduced vascular nitric oxide levels leading to some irregularities in blood artery function. These functional irregularities result in atherosclerosis, causing vasoconstriction of small arteries, a major factor in producing hypertension and possibly, left ventricle diastolic dysfunction. There are two forms of klotho membrane and secreted, the membrane klotho acts as a necessary coreceptor for fibroblast growth factor 23, while secreted klotho regulates nitric oxide production in the endothelium.

METHODS: A literature search was conducted using the ISI Web of Knowledge, MEDLINE (PubMed), Google Scholar, and the references of retrieved articles. The search included articles written in English published in conventional and online journals.

RESULTS: It has been suggested secreted Klotho affect nitric oxide which in turn benefits endothelial function. Recent years have shown an increase in studies examining the effect of aerobic exercise on blood circulating secreted Klotho. It has been demonstrated responses of secreted klotho depends on aerobic fitness level. Values of secreted Klotho were significantly higher in trained individuals compared to untrained suggesting long-lasting aerobic training may be an appropriate model for mechanistically probing the role of physical activity on secreted Klotho expression.

CONCLUSIONS: There are two factors associated with the endothelial function improvement increased secreted klotho levels following aerobic exercise training. Both alleviate and attenuate the endothelial dysfunction process. It is believed that this review will inspire more deliberation on the relationship between aerobic exercise training and circulating secreted Klotho, as potential effectors on cardiovascular arterial stiffens due to endothelial dysfunction.

P167 THE EFFECTS OF BEETROOT JUICE SUPPLEMENTATION ON MODERATE INTENSITY CYCLING IN OBESE MALES

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BACKGROUND: Obese adults exhibit increased whole body oxygen consumption (VO₂) and ratings of perceived breathlessness (RPB) when compared to normal weight adults during moderate intensity exercise. Nitrate rich beetroot juice (BRJ) has been shown to reduce whole body VO₂ during moderate intensity exercise in normal weight adult males. Purpose: The purpose of this study was to evaluate VO₂ and RPB during moderate intensity, constant work rate cycling in obese males following BRJ supplementation.

METHODS: Six (n=6) recreationally-active obese (30 < BMI < 40 kg/m²) males performed spirometry measures and a VO₂peak test on a cycle ergometer during the initial visit. Utilizing a randomized, cross-over design, subjects then returned for two subsequent visits following a ten day supplementation of BRJ or a placebo (tomato juice (TJ)). During the aforementioned subsequent visits, subjects cycled at a moderate intensity for 6 minutes. The intensity of cycling was calculated as 90% of their gas exchange threshold obtained from the initial VO₂peak test. A 10-day washout separated the two supplementation periods. Data was compared between BRJ and TJ using paired sample t-tests.

RESULTS: Breathing pattern during exercise was altered: Tidal volume was significantly lower in BRJ (Beetroot juice) compared to TJ (tomato juice) placebo (t(5)=3.438, p=0.018); however, VE was unaltered between supplements (t(5)=0.442, p=0.677). Thus being there were no significant differences for any perceptual, ventilatory, mechanic, and metabolic data between supplements.

CONCLUSIONS: In conclusion, during moderate intensity exercise, VT was reduced following BRJ conditions and V̇CO₂ was reduced as well but the reduction in V̇CO₂ was not significant (p = 0.07). Using a larger sample possibly would have changed the results of this experiment making the values more significant. The CO₂ production would have decreased in moderate to intensive exercise in young obese males.

P168 PHYSIOLOGICAL RESPONSES TO CYCLE ERGOMETRY WITH AND WITHOUT A FAN

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BACKGROUND: The effects of convective (i.e., fan) cooling are often ignored in laboratory and indoor environments where exercise evaluation and training are frequently performed. We sought to comprehensively compare physiological responses to submaximal cycle ergometry with and without a fan.

METHODS: Eleven recreationally active young adults (5 females, age = 24.2±3.3 yrs, body fat = 15.9±7.2 %, aerobic power = 41.2±12.1 ml/kg/min) participated in the study. The study consisted of two 40-min cycle ergometer training sessions at an identical relative workload (70% heart rate reserve) either with or without a fan, the order of which was randomized. Workload, oxygen cost, and respiratory exchange ratio were monitored throughout the test and rating of perceived exertion (RPE) and thermal sensation (scale: 0-8) were recorded every 5-min. Total energy expenditure of each training session was quantified. Blood lactate was recorded prior to, halfway through, and immediately following each training session and nude body mass was obtained pre-post.

RESULTS: Greater (P<0.05) workload (+17%) and oxygen consumption (+6%) yielded significantly greater (P<0.01) energy expenditure with fan cooling (340±138 kcals) compared to without (294±113 kcals). Thermal sensation, but not RPE, was lower (P<0.05) with fan cooling (3.7±0.8) compared to without (5.6±0.9) and body mass loss was attenuated with fan cooling (-0.4±0.2 kg) compared to the non-fan trial (-0.6±0.4 kg). Significantly higher blood lactate levels were observed post fan trial (P<0.05; 3.0±1.5 vs. 2.1±0.7 mmol/l).

CONCLUSIONS: These data highlight the utility of fan cooling as a means to improve work capacity and increase caloric expenditure if prescribing submaximal exercise using heart rate values.

P169 PRE-SEASON PERFORMANCE RELATED VARIABLES IN FEMALE NCAA DIVISION III SOCCER PLAYERS

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BACKGROUND: Over the years, several studies have examined the physiological profile of elite male and female soccer players. However, normative anthropometric and performance data for NCAA Division III female soccer players are limited. Therefore, the purpose of this study was to examine anthropometric and performance related variables in this population.

METHODS: Twenty-four members of a NCAA Division III women's soccer team (mean ± SD): age (19 ± 1.0 yrs); body weight (64.7 ± 7.9 kg); height (1.7 ± 0.1 m); BMI (23.6 ± 2.5 kg·m²); body fat (29.1 ± 4.3%) volunteered to participate in the study. Performance testing included aerobic capacity (VO_{2max} performed on a treadmill), Wingate anaerobic test, vertical jump, and 20 and 40 yard sprints. All performance testing occurred prior to the start of the regular season.

RESULTS: The results of this study suggest that compared to elite female soccer players, NCAA Division III female soccer players performed at a lower level of aerobic capacity (42.3 ± 6.2 ml·kg⁻¹·min⁻¹), peak power (6.8 ± 1.0 W·kg⁻¹), and mean power (5.0 ± 1.0 W·kg⁻¹). In addition, they exhibit lesser vertical jump heights (40.4 ± 5.4 cm), slower 20 yard sprint (3.3 ± 0.3 s) and 40 yard sprint times (6.0 ± 0.4 s) than elite female soccer players.

CONCLUSIONS: This study provides normative data for selected group of NCAA Division III female soccer players. In comparison to published descriptive data in the literature, the athletic ability of the athletes observed in this study appears to be lower than the more elite female soccer players.

P170 ANECDOTE MEETS SCIENCE- BODY COMPOSITION CHANGES ASSOCIATED WITH A 30-DAY PUSH-UP CHALLENGE

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BACKGROUND: Body composition may undergo changes when participating in the 30-day pushup challenge. **Purpose:** The purpose of the study was to examine any changes in lean muscle mass, muscle endurance, and muscle strength.

METHODS: A convenience sample of twenty-four (n=24) college-age students volunteered for the study and fourteen (n=14) completed the challenge. Participants of the study performed 100 push-ups a day in a specified time-period (45 minutes for females and 30 minutes for males) for 30 days. Eleven participants withdrew from the study. The study was approved by the Institutional Review Board at Truett McConnell University. Body composition analysis (BCA) was assessed using the InBody 770 (Seoul, Korea) and MuscleSound (Denver, CO). Both units measured the amount of lean muscle mass and percent body fat. A baseline measurement of muscle strength was performed by the 1-repetition maximum (1-RM) bench press on a York half-rack (York, PA). A baseline measurement of muscle endurance was evaluated by 1-minute push-up test. Participants underwent a familiarization session of proper bench press and push-up form.

RESULTS: Initial measurements revealed a mean \pm SD for push-up endurance (34.79 ± 15.37); post-test measurement revealed a mean \pm SD (49.14 ± 13.81). Initial 1-RM group measurements revealed a mean \pm SD ($64.13 \text{ kg} \pm 21.11 \text{ kg}$); post 1-RM group mean \pm SD ($70.13 \text{ kg} \pm 21.99 \text{ kg}$). The initial measurement of pre- %BF revealed a mean \pm SD (20.84 ± 9.21); the post- %BF mean \pm SD (20.46 ± 9.67). A paired t-test was run for data analysis. There was a significant difference between the pre- and post-pushup at 0.002. There was a significant difference between the pre- and post-1-RM at 0.000. There was not a significant difference in %BF found between before and after completing the 30-day push-up challenge.

CONCLUSIONS: These results suggest that the 30-day pushup challenge may improve muscle endurance and muscle strength but may not increase lean muscle mass.

P171 BIOMECHANICAL ANALYSIS OF THE CLOSED KINETIC CHAIN UPPER EXTREMITY STABILITY TEST

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BACKGROUND: The closed kinetic chain upper extremity stability test (CKCUEST) involves counting alternate touches of each hand to the contralateral hand while maintaining a push-up position. The purpose of this study was to compare kinematic and ground reaction force (GRF) patterns between the dominant (DOM) and nondominant (NDOM) limbs.

METHODS: Healthy college-aged males (n=9) and females (n=5) completed three 15s trials of the CKCUEST test with 45s rest between trials. DOM and NDOM GRF and hand kinematics were captured using an electromagnetic tracking system and two forceplates. Contact and flight times were computed separately for each limb. For both the medial-lateral (ML) and 3-dimensional (3D) composite vectors, the average hand travel distance, hand velocity, and peak and average GRF per touch were computed and statistically compared between limbs.

RESULTS: There was no significant limb differences for contact (DOM= 95 ± 21 s, NDOM= 96 ± 21 s, P=.394) and flight (DOM= 64 ± 16 s, NDOM= 64 ± 15 s, P=.679) times. While ML distance was significantly (P=.014) greater for the NDOM (1.57 ± 15 m) limb compared to DOM (1.52 ± 15 m), there was no differences for 3D distance (DOM= 1.48 ± 16 m, NDOM= 1.51 ± 14 m, P=.115). There was no significant differences for either ML (DOM= 2.41 ± 42 m/s, NDOM= 2.45 ± 41 m/s, P=.116) or 3D (DOM= 2.61 ± 46 m/s, NDOM= 2.67 ± 43 m/s, P=.096) velocities. Peak ML GRF was significantly (P=.001) greater for the NDOM (203.5 ± 78.4 N) limb compared to DOM (176.3 ± 62.2 N). Average ML GRF was significantly (P<.001) greater for NDOM (141.9 ± 48.1 N) limb compared to DOM (119.8 ± 40.4 N). There were no significant limb differences for either peak 3D GRF (DOM= 517.8 ± 166.6 N, NDOM= 527.0 ± 169.7 N, P=.233) or average 3D GRF (DOM= 397.1 ± 124.8 N, NDOM= 403.6 ± 124.8 N, P=.210).

CONCLUSIONS: Although there were significant findings with ML GRF, the differences may not be clinically meaningful. Future research will consider the symmetry of shoulder patients released from rehabilitation.

P172 AN INVESTIGATION OF EXERCISE ADHERENCE ON FITNESS OUTCOMES AMONG RURAL FIREFIGHTERS

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BACKGROUND: Firefighters (FF) require a great amount of physical strength and endurance to perform tasks successfully and safely. Initiatives have been put in place to encourage FF to be more physically active while on shift. **PURPOSE:** To investigate the impact of on-duty FF gym adherence to fitness outcomes.

METHODS: Forty FF performed a test battery of: 3-repetition maximum for bench (3RM-BP) and leg press (3RM-LP), vertical jump (VJ), push-ups (PU), and plank to failure (P). Onsite gym attendance was recorded for 10 months. FF were categorized based off of their attendance: High (H) (> 44 sessions, n = 9); Moderate (M) (31-44 sessions, n = 11); Low (L) (17-30, n = 10); Minimal (MIN) (0-16 sessions, n = 10). Differences in fitness outcomes and adherence were analyzed using an ANOVA, with post-hoc LSD analysis ($\alpha = 0.05$).

RESULTS: A significant main effect was found for 3RM-LP (F = 3.003, p = 0.05), 3RM-BP (F = 4.853, p < 0.01), and PU (F = 3.188, p = 0.04). H outperformed all groups in 3RM-LP (M: 150.1 ± 67.6 lb [mean difference], p = 0.04; L: 185.3 ± 69.1 lb, p = 0.01; MIN: 170.7 ± 69.1 lb, p = 0.02). H outperformed L (59.5 ± 21.6 lb, p = 0.01) and MIN (73.9 ± 21.6 lb, p < 0.01) in 3RM-BP. MIN underperformed M (-10.3 ± 4.2 rep, p = 0.02) and H (-12.3 ± 4.4 rep, p = 0.01) in PU.

CONCLUSIONS: FF who did not adhere to exercise recommendations underperformed their peers, which could lead to an increase risk of injury. Enforcing fitness initiatives may help FF perform their occupational tasks more successfully and safely.

P173 RELIABILITY OF THE DETERMINATION OF CRITICAL HEART RATE

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BACKGROUND: Theoretically, the critical heart rate (CHR) reflects the highest heart rate that can be maintained without fatigue. This study quantified the test-retest reliability of the CHR, average heart rate (HR_{avg}), and time to exhaustion (T_{Lim}) for constant power output (P) cycle ergometry.

METHODS: Eleven subjects completed a graded exercise test to exhaustion to determine the P associated with VO_{2peak} (pVO_{2peak}). The HR_{avg} and T_{Lim} were recorded during two sets of four (P_{1-P4}), randomly ordered, constant P rides to exhaustion at 80%-100% pVO_{2peak}. The CHR was derived from the linear regression of the total number of heart beats (HB_{Lim}) versus T_{Lim} for each set of four rides. Analyses included one-way repeated-measures ANOVAs (p < 0.05), intra-class correlation coefficients (ICC_{2,1}), standard errors of the measurement (SEM), minimal differences (MD), and coefficients of variation (CoV).

RESULTS: There were no differences in CHR (p = 0.11), P_{1-P4} HR_{avg} (p = 0.23-0.64), or P_{1-P3} T_{Lim} (p = 0.20-0.59) between test 1 and test 2. However, test 1 P₄ T_{Lim} was shorter than test 2 (p = 0.02). The CHR (ICC = 0.699; SEM = 7.9 b·min⁻¹; MD = 22 b·min⁻¹; CoV = 4.9%) and HR_{avg} (ICC = 0.749-0.934; SEM = 2.4-5.6 b·min⁻¹; MD = 6.7-15.5 b·min⁻¹; CoV = 1.5-3.5%) demonstrated "good" and "excellent" relative reliabilities, respectively, while T_{Lim} (ICC = 0.201-0.823; SEM = 0.3-1.9 min; MD = 0.9-5.2 min; CoV = 7.7-23.0%) demonstrated "poor" to "good" relative reliability.

CONCLUSIONS: The CHR was a reliable measure despite variability in T_{Lim} from the first to the second trial, due to consistency of the HR_{avg} across trials. Therefore, the CHR may provide a useful tool for prescribing cardiorespiratory endurance exercise.

P174 STEP COUNTING VALIDITY OF WRIST-WORN ACTIVITY MONITORS DURING ACTIVITIES WITH FIXED UPPER EXTREMITIES

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BACKGROUND: Little is known about validity of wrist-worn physical activity monitors during activities when an arm-swing is not present. The purpose of this study was to compare the step-counting validity of wrist-worn activity monitors (Fitbit Charge HR Series 2, Actigraph GT9X Link, Apple Watch Series 4) during functional physical activities with fixed upper extremities.

METHODS: Tasks included treadmill walking at 3 mph and five free-living tasks (walking with a baby doll on the left hip and the right hip, holding groceries, and pushing a stroller while walking and while jogging). Device step counts were compared to hand-counted steps from GoPro video footage.

RESULTS: Fitbit Charge had less error when compared to the left Actigraph in both stroller walking and jogging, treadmill walking, and grocery walking tasks ($p < 0.001$ to 0.020). For grocery walking, walking with a baby on the right, and walking with a baby on the left, device percentage errors ranged from $0 \pm 0.5\%$ to $-7.6 \pm 15.8\%$. For stroller jogging, stroller walking, and treadmill walking, device percentage errors ranged from $-8.3 \pm 7.3\%$ to $-94.3 \pm 17.9\%$. Fitbit was the most valid step counting device and Actigraph least valid. Tasks with the hands fixed to an item that also had contact with the floor (stroller and treadmill) had more error than when participants held an item that was not in contact with the floor (doll and groceries).

CONCLUSIONS: Consumers should be aware that their devices may undercount steps during activities with the hands fixed; this may be especially true with items in contact with the floor.

P175 THE EFFECT OF LOW-INTENSITY VIBRATION ON MUSCLE ACTIVATION IN TRAINED ADULTS

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BACKGROUND: Low-intensity vibration (LIV) has been shown to increase muscle activation. The purpose of this study was to investigate whether or not low-intensity vibration would be a more effective warm-up than a traditional warm-up on a cycle ergometer. It was hypothesized that the vibration warm-up would produce higher muscle activation than the cycle warm-up.

METHODS: Day 1 of testing included a one repetition maximum (1RM) in back squat and bench press to determine 85% of 1RM. The method of warm-up for days 2 and 3 of testing were randomized prior to the sessions. Warm-up was LIV (standing 10 min at 35 Hz) or cycle ergometry (10 min cycling at 50 watts). Muscle activation was recorded with use of an electromyography system during three repetitions of 85% 1RM, then 100% 1RM back squat and bench press following the prescribed warm-up over the course of three days.

RESULTS: The participants ($N = 8$) had a mean age of $22.9 (\pm 7.0)$ years and participated in regular weekly exercise (353.1 ± 180.6 min/week). There were no significant differences ($p < .2$) in mean EMG values for the lower body muscles during 100% 1RM lifts, but the mean EMG values differed. Gluteus Maximus produced greater outputs after vibration ($M = 0.6$, $SD = 0.3$) than after cycle ergometer ($M = 0.5$, $SD = 0.2$). Vastus Medialis produced greater outputs after vibration ($M = 2.2$, $SD = 0.8$) than after cycle ergometer ($M = 1.6$, $SD = 0.6$). Rectus Femoris produced greater outputs after vibration ($M = 1.7$, $SD = 0.4$) than after cycle ergometer ($M = 1.5$, $SD = 0.5$). Semitendinosus produced greater outputs after vibration ($M = 1.5$, $SD = 1.4$) than after cycle ergometer ($M = 0.8$, $SD = 0.3$). There was not a significant difference in mean EMG values for the lower body muscles during 85% 1RM lifts. Biceps Brachii produced greater outputs after cycle ergometer ($M = 1.1$, $SD = 0.5$) than after vibration ($M = 0.8$, $SD = 0.5$). Triceps Brachii produced greater outputs after cycle ergometer ($M = 3.4$, $SD = 1.1$) than after vibration ($M = 3.0$, $SD = 1.5$). There was not a statistically significant difference in mean EMG values for the upper body muscles.

CONCLUSIONS: Standing on a vibration platform as a warm-up could increase muscle activation and produce greater results during a maximal strength workout.

P176 EFFECTS OF TIME OF DAY EXERCISE PREFERENCE ON POWER, VELOCITY, AND RESISTANCE EXERCISE PERFORMANCE

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BACKGROUND: Previous evidence has suggested that power and velocity of free-weight resistance exercise are lower at times in the afternoon compared to morning. However, no studies have controlled for time of day preference or described how time of day exercise preference influences resistance exercise performance. The purpose of this study was to examine the effects of time of day exercise preference on power, velocity, repetitions to failure (RTF), and rate of perceived exertion (RPE).

METHODS: Resistance-trained male participants were recruited for this study. Participants were categorized into: 1) AM preference, 2) PM preference. In a counterbalanced manner, each participant completed one exercise session at 8 am and one at 4 pm. During each exercise session, participants began by completing 2 sets \times 2 reps of bench press at 70% 1-RM with maximum explosive intent. Power and velocity of barbell movement was measured using a linear position transducer. Participants then completed 1 set \times RTF of bench press at 70% 1-RM. Power, velocity, RTF, and RPE were analyzed.

RESULTS: Velocity ($p = 0.35$), power ($p = 0.42$), and RTF ($p = 0.20$) were not significantly different between preferred and non-preferred times. RPE was significantly higher in the non-preferred session ($p = 0.04$).

CONCLUSIONS: Results suggest time of day exercise preference does not affect resistance exercise performance but alters RPE, which may have implications for training regimens.

P177 VALIDITY OF SKINFOLD-BASED EQUATIONS FOR ESTIMATING BODY COMPOSITION IN FEMALE ATHLETES

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BACKGROUND: Traditional skinfold (SF) body composition algorithms are validated within the general population and may demonstrate decreased accuracy for individuals possessing greater fat-free mass (i.e., athletes). **PURPOSE:** The purpose was to determine the validity of athlete-specific (ASF) and traditional skinfold (TSF) body composition measures against a criterion of air displacement plethysmography (ADP) in collegiate female athletes.

METHODS: Eighty-eight Division-I female athletes performed two body composition tests (i.e., SF and ADP). Body density, based on a three site SF, was used to predict body fat percentage (BF%) using two equations (i.e., ASF & TSF). Agreement between ASF, TSF, and ADP was based on r -values, standard error of estimate (SEE), constant error (CE), and 95% limits of agreement (LOA).

RESULTS: ADP (22.82 ± 6.27) displayed significantly greater BF% values as compared to ASF (23.96 ± 5.23 ; $p = 0.03$; $d = 0.20$; $SEE = 4.06\%$) and TSF (23.99 ± 5.22 ; $p = 0.02$; $d = 0.20$; $SEE = 4.14$). ASF displayed ± 10.25 LOA's around a CE of 1.14%. For TSF, 95% LOA's were ± 10.23 with a CE of 1.17%.

CONCLUSIONS: While statistical differences exist between both SF measures and ADP, an acceptable SEE and CE may promote the use of SF methods for determining BF% in female athletes.

P178 EVALUATING THE IMPACT OF COMPETITION ON VERTICAL JUMP PERFORMANCE

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BACKGROUND: The vertical jump (VJ) test is used in athletic populations to assess lower body power and this value can be utilized as a predictor for sports performance. Incidentally, athletes have often elevated their level of play in competitive environments. However, competition during assessment tests has not been widely examined. It is logical to assume that conducting the VJ test where subjects compete against each other may contribute to higher jumps. Therefore, the purpose of this study was to determine if a competitive environment would have an impact on VJ performance in females.

METHODS: Twenty-six no less than averagely fit, college females (age = 21 ± 1.86 years, ht. = 166.53 ± 7.30 cm, wt. = 64.47 ± 11.84 kg, BF% = $23.55 \pm 6.22\%$) completed a dynamic warm up followed by four minutes of passive recovery (PR). After the completion of familiarization jumps and a four-minute PR period, subjects completed two jump series (in a counterbalanced order, solo and competitive) consisting of six jumps per series. The competitive series consisted of two subjects jumping side by side against one another simultaneously. The first highest jump, second highest jump, and average jump heights of the solo (SFHJ, SSHJ, SAJ) and competitive (CFHJ, CSHJ, CAJ) jumps were compared and analyzed using a paired-samples T-test ($p \leq 0.05$).

RESULTS: Significant differences occurred between: CFHJ (54.61 ± 1.31 cm) and SFHJ (53.34 ± 1.27 cm) ($p=0.001$); CSHJ (53.68 ± 1.32 cm) and SSHJ (52.27 ± 1.34 cm) ($p<0.001$); and CAJ (52.97 ± 1.31 cm) and SAJ (51.45 ± 1.33 cm) ($p<0.001$).

CONCLUSIONS: The results of this study suggest that a competitive environment for the VJ test does have an impact on VJ performance. Future research may need to assess the impact of a competitive environment on the VJ test utilizing athletes from sports where jumping actions are of extreme importance. Furthermore, an evaluation of the competitive environment on other power tests such as the broad jump should occur.

P179 THE EFFECT OF PHYSICAL ACTIVITY LEVEL ON COGNITIVE FUNCTION WHILE WALKING ON A TREADMILL DESK

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BACKGROUND: There is conflicting information on treadmill desks in the workplace when it comes to productivity. One possible theory for these reported differences is the theory of a U-shaped relationship on physical activity and cognitive scores. The theory proposes that sedentary and highly physically active individuals will score poorly on cognitive tests, but moderately active individuals will have high cognitive scores. Therefore, the purpose of this study is to compare the cognitive performance of participants who are sedentary, moderately active, and highly active while walking on a treadmill desk and seated at a traditional desk.

METHODS: Thirty participants between the ages of 18-24 were recruited and separated into three different activity levels using the International Physical Activity Questionnaire (IPAQ): the sedentary group ($n=8$), the moderate physically active group ($n=12$), and the high physically active group ($n=10$). In a randomized crossover counterbalanced study design, participants completed the Digit Symbol Substitution Test (DSST) in three different conditions: sitting, walking on a treadmill desk at 1.2 mph, and at 1.6 mph.

RESULTS: The moderate physically active group had significantly higher accuracy on the DSST seated compared to sedentary ($p=0.02$) and high physically active groups ($p=0.01$). Additionally, the moderate physically active group's accuracy was significantly greater than both sedentary and high physically active at treadmill desk walking of 1.2 mph ($p=0.04$ and $p=0.01$, respectively) and 1.6 mph ($p=0.01$ and $p=0.03$, respectively).

CONCLUSIONS: Data from this study supports a U-shaped relationship between physical activity levels and cognitive function. This indicates that people who engage in moderate amounts of physical activity may benefit more than sedentary or highly active individuals when it comes to workplace productivity when walking on a treadmill desk.

P180 DIFFERENCES IN RELATIVE LOWER BODY STRENGTH, POWER, AND AGILITY IN RESISTANCE TRAINED FEMALES

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BACKGROUND: Physical fitness capacity can be determined by measuring lower body strength, power, and agility. While raw scores are beneficial, finding the relationship between the values relative to fat free mass (FFM), and body fat percentage (BF%) is an important consideration, especially among women. **PURPOSE:** To examine the relationship between lower body strength, power, and agility, when normalized to FFM and BF%, in resistance trained females.

METHODS: 21 participants (Age: 21.4 ± 2.1 yr, Ht: 162.8 ± 10.1 cm, Wt: 66.8 ± 11.1 kg) completed the study. Body composition was assessed via air displacement plethysmography. A test battery of 1RM leg press (1RMLP), countermovement jump (CMJ), and reactive shuttle run test (RSR) was completed. The best score of two trials was included for analysis. Pearson correlations were calculated to determine relationships between FFM and BF% to 1RMLP, CMJ, and RSR.

RESULTS: A significant, moderate, positive correlation ($r = 0.50$, $p = 0.03$) was found between FFM and 1RMLP. No relationship existed between FFM and CMJ ($r = -0.05$, $p = 0.85$) or RSR ($r = -0.24$, $p = 0.31$). A significant, moderate, positive correlation was found between BF% and 1RMLP ($r = 0.50$, $p = 0.03$) and RSR ($r = 0.51$, $p = 0.02$). No relationship existed between BF% and CMJ ($r = -0.39$, $p = 0.09$).

CONCLUSIONS: Stronger individuals had more FFM and BF%. However, increased BF% negatively impacted agility. Normalizing performance values may provide a more accurate representation of strength and agility in trained females.

P181 SPORT COMPARISONS OF ANTHROPOMETRICS BETWEEN DIVISION-I FEMALE COLLEGIATE ATHLETES

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BACKGROUND: The potential recruitment and success of an athlete at the collegiate-level can often be based upon anthropometrics, muscular strength, and power, dependent upon the given sport. However, information in regard to between-sport differences is lacking within female athletic populations. The purpose of this investigation was to determine the differences in anthropometrics, handgrip strength (HG), and lower-body power between division-I female athletes of various sports.

METHODS: Seventy-seven ($n = 77$) female athletes from multiple sports (Cheer: $n = 10$; Basketball: $n = 8$; Volleyball: $n = 13$; Softball: $n = 17$; Swimming: $n = 11$; and Soccer: $n = 18$) were tested for height, weight, body fat percentage (BF%), HG, and countermovement jump height (CMJ). Multiple one-way analyses of variance were used to determine differences in anthropometric and performance variables. Tukey post-hoc analyses, with an a priori alpha level of 0.05, were used for follow-up procedures.

RESULTS: No statistical differences were observed between the various sports in regard to BF%, CMJ, or HG. For height, basketball, volleyball, and swimming athletes were significantly taller than cheerleaders (all $p < 0.01$). Additionally, cheerleading displayed a significantly lower weight (58.9 ± 9.1 kg) compared to basketball (75.3 ± 23.6 kg) ($p = 0.04$).

CONCLUSIONS: While female athletes may possess particular traits in regards to a given sport, results of the current study indicate no differences in body composition, lower body power, or upper body strength. Thus, further research is warranted into a greater development of athletic profiles based on sport-specific measures.

P182 LINEAR AND NONLINEAR MODELING OF CRITICAL RESISTANCE

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BACKGROUND: Critical resistance (CR) is the highest sustainable resistance that can be completed for an extended number of repetitions, while strength' (S') may reflect variability in muscle properties that allow for the completion of repetitions above CR. The purpose of this study was to examine the estimates of CR and S' for the deadlift from 4 different mathematical models (Linear-TW, Linear-Res, Nonlinear-2, and Nonlinear-3).

METHODS: Eleven subjects completed one-repetition maximum (1RM) testing and repetitions to failure at 50%, 60%, 70%, and 80% of 1RM for the deadlift on separate days. Resistance used, repetitions completed, and total work (resistance [kg] x repetitions) were recorded to determine the CR and S' from the 4 mathematical models. Coefficient of determination (r^2) and standard error (SE) values were used to determine goodness of fit, and separate one-way repeated measures ANOVAs were used to determine differences in CR and S' among the 4 models ($p \leq 0.05$).

RESULTS: All 4 models provided r^2 values ranging from 0.843 to 0.971 and SE values ranging from 5.62 kg·m to 38.59 kg·m. There were significant differences in the CR ($p=0.001$) and S' ($p=0.001$) estimates among the 4 models. The Linear-Res model provided the highest estimate of CR (66.46±19.44 kg) while Nonlinear-2 (53.08±14.55 kg) model provided the lowest estimate of CR. For S', the Linear-Res model provided the lowest estimate (499.02±163.35 kg·rep), while the Nonlinear-3 model provided the highest (744.26±166.59 kg·rep).

CONCLUSIONS: Despite the mathematical equivalence of the 4 models, they produced different estimates of both the CR and S' parameters.

P183 EVALUATING THE VALIDITY OF THE INTEGRATIVE BODY COMPOSITION ASSESSMENT TECHNIQUE VS. DUAL-ENERGY X-RAY ABSORPTIOMETRY

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BACKGROUND: The novel technique for this study is known as the Integrative Body Composition (IBC) method. IBC is non-invasive and requires only a person's height, weight, waist circumference, left wrist circumference and diameter, and right wrist circumference and diameter. This method is quick to administer, low cost, and very portable. Thus, if valid, it could be an excellent alternative to skinfold assessment or other laborious, high-cost techniques of assessing body composition. Therefore, the purpose of this study is to evaluate the validity of IBC as a novel technique for assessing body composition.

METHODS: A cross-section of 60 participants (36 female & 24 male; mean age for all participants: 28.9 ± 14.9 yrs) reported to the lab one time, where IBC and DXA assessment were taken for each participant. Bland-Altman analyses were employed to determine agreement between IBC and DXA.

RESULTS: The analyses revealed minimal bias, but large 95% limits of agreement (LOA) for all participants (bias ± 95% LOA = -2.76 ± 9.86), for females (-2.42 ± 9.51), and for males (-3.26 ± 10.48). Graphs also indicated homogeneous data, particularly for all participants and for females.

CONCLUSIONS: While mean bias between DXA and IBC is low, large individual variability in bias between the two devices suggest that errors in IBC derived body composition are too large to be used with any degree of certainty.

P184 EFFECTS OF PICKLE JUICE ON CORE TEMPERATURE, HEART RATE, & MOVEMENT ECONOMY IN FEMALE SOCCER PLAYERS

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BACKGROUND: Pickle juice (PJ) is widely used by high performance athletes in recovery and sport performance. The purpose of this study was to evaluate the effects of PJ on core temperature (CT), heart rate (HR), and movement economy in female soccer players.

METHODS: In this study, 11 female soccer players (Age=21.4±3.95y, Body Fat Percentage=24.3±6.50%, VO2 Max=44.2±6.44 ml/kg/min) completed 3 exercise sessions. The first session included a BodPod for body fat percentage and a VO2max test. Subjects then completed two identical sessions, one with water (W) only, and one with the addition of PJ. These sessions were counterbalanced. For PJ trials, subjects consumed 1 mL of PJ per kilogram of body mass, twice during the session. Both sessions were conducted on a treadmill in a heat chamber at a WBGT of 31.2 degrees Celsius and 80% humidity. The workout consisted of 45 minutes of intervals (fast walk, jog, sprint, slow walk), followed by a 15 minute halftime break, then followed by 25 minutes of alternating walk/jog. During the last 25 minutes, VO2 was measured using a ParvoMedics metabolic cart. HR was measured using a FT160, Polar Electro band. CT was measured using a CorTemp 2000 sensor swallowed by subjects 6 hours prior to exercise. Sessions were separated by at least 72 hours each. Repeated measure ANOVA were conducted to detect any differences.

RESULTS: On average, CT was lower by 0.42±0.04 degrees Celcius ($p=0.675$) in W trials as compared to the pickle juice session. Water consumption was higher by an average of almost 100ml for the W only trial. HR remained the same for both sessions for the first 45 minutes, but was lower for both running intervals at 65 and 75 mins for pickle juice trials (PJ=162±22 bpm vs. W=172±15 bpm ($p=0.391$)). Movement economy, measured via sub-maximal oxygen consumption was not different (PJ=23.64±2.75 ml/kg/min, W=23.68±2.22 ml/kg/min, $p=0.468$) for both W and PJ trials.

CONCLUSIONS: Pickle juice may reduce HR in female soccer players, but not improve movement economy. However, PJ may not promote higher water intake, which may in turn affect core temperature.

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P185 THE EFFECTS OF PICKLE JUICE ON COGNITION IN FEMALE SOCCER PLAYERS

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BACKGROUND: Pickle juice (PJ) has been used as an ergogenic aid in sport performance. It may also improve hydration and cognition during competition in hot and humid environments. The purpose of this study was to examine the effect of PJ on cognitive processing speed.

METHODS: 10 female soccer players completed a simulated soccer match on a treadmill in a heat chamber controlled at a WBGT of 31.2 degrees Celsius and 80% relative humidity. The subjects were tested twice where the PJ and water-only (H2O) trials were counterbalanced and separated by a minimum of 72 hours. A dose of PJ at 1 ml/kg body mass was consumed prior to and 45 minutes into the PJ trial with water consumed ad libitum. At the end of each trial, the participants performed five math addition problems using sets of playing cards, and they were also asked to perform the Stroop test. Their answers and testing times were recorded for both trials. Dependent T-test were performed to detect any differences.

RESULTS: On average, the timing of the Stroop test was faster when PJ was consumed vs. H2O (PJ = 9.2 ± 1.19 sec vs. H2O = 10.01 ± 2.5 sec, $p=0.285$). The speed of the math test was also faster with consumption of PJ (18.48 ± 5.5 sec) vs. H2O (21.49 ± 6.8 sec), ($p=0.239$).

CONCLUSIONS: Though not statistically significant these differences show that pickle juice may improve cognitive speed. These differences may have real world implications in competitive sports, such as soccer, which require decisions to be made quickly. Supported by The Pickle Juice Company and The Orr Endowed Research Grant and The Southeastern Kinesiology Foundation.

P186 RELATIONSHIP BETWEEN FORCE PRODUCTION CHARACTERISTICS IN THE COUNTERMOVEMENT VERTICAL JUMP AND STANDING LONG JUMP

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BACKGROUND: The countermovement vertical jump (CMJ) is a reliable, non-invasive, and relatively non-fatiguing test commonly used to assess lower-body “explosiveness”. Although the CMJ is the most popular, additional jumping tests such as the standing long jump (SLJ) are included in many monitoring and performance testing programs. To avoid redundancy in testing, it is important to determine if these tests reflect similar qualities. The purpose of this study was to determine the relationship between vertical force production characteristics in the countermovement jump and standing long jump.

METHODS: Participants of this study were forty-seven cadets ($N=47$, 43 male, 4 female; age: 20.5 ± 0.88 y; height: 1.76 ± 0.75 m; mass: 79.32 ± 9.87 kg) recruited from a U. S. Army ROTC unit at a senior military college. Participants performed a total of five CMJs and five SLJs following a standardized warm-up. All jumps were performed on dual force plates sampling at 1,000 Hz. In addition to jump height (JH) and jump distance (JD), the following force production characteristics were calculated from the force-time data for both jumps: peak force (PF_a), mean concentric force (MF_a), impulse (Imp_a), and contraction time (CT). All force variables were allometrically scaled (normalized to body mass to the power of 0.67). Pearson's product zero-order correlations were used to examine the relationship between CMJ and SLJ performance variables. **RESULTS:** A very strong relationship was observed between CMJ JH and SLJ JD ($r = 0.822$, $p < 0.001$). Strong relationships were observed for PF_a ($r = 0.538$, $p < 0.001$) and MF_a ($r = 0.540$, $p < 0.001$) and small and trivial relationships for Imp_a ($r = 0.202$, $p > 0.05$), and CT ($r = 0.034$, $p > 0.05$) when comparing the two jumps.

CONCLUSIONS: Relative force production characteristics were found to be strongly related between jumps. Small and trivial relationships observed between Imp_a and CT may suggest that jumpers employ different movement strategies in each jump.

P187 PEAK RESPONSES TO GRADED EXERCISE PROTOCOLS IN YOUNG CHILDREN

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BACKGROUND: The Bruce protocol (Bruce) is a progressive treadmill test with an aggressive initial grade that was developed for the use in adults, and often used to assess cardiac patients. Due to the steep grade, young children may terminate the Bruce prematurely. The University of Kentucky Pediatric Exercise Physiology Lab has developed a protocol (PEP Lab) with lower grades which we hypothesized would be better tolerated and potentially elicit greater peak VO₂ and cardiovascular responses. **Purpose:** To compare peak oxygen uptake (pVO₂; ml·kg⁻¹·min⁻¹), heart rate (pHR; bpm), systolic blood pressure (pSBP; mmHg), and respiratory exchange ratio (pRER) responses to the Bruce versus the PEP Lab in 46 (21 boys) young (7-11 yr old) children. We also evaluated each subject's perception of difficulty between the two protocols.

METHODS: Subjects completed the Bruce and the PEP Lab protocols in a random order 1 week apart. pVO₂ and pHR were determined with an integrated metabolic system, and pSBP was determined by manual auscultation. Verbal encouragement was provided during both testing sessions and test completion based on volitional fatigue. Results are expressed as mean ± SE and significance $p < 0.05$.

RESULTS: The Bruce versus PEP Lab pVO₂ (44.0 ± 1.4 vs 43.1 ± 1.5) and pHR (187.0 ± 1.8 vs 185.9 ± 2.4) did not significantly differ. However, pSBP during the Bruce was significantly lower (136.6 ± 1.3 vs 140.3 ± 1.2) and the Bruce pRER was significantly higher (1.065 ± 0.018 vs 1.013 ± 0.014) than the PEP Lab. Bruce and PEP Lab protocol pVO₂, pHR, pSBP, pRER were significantly correlated ($r=0.62$, 0.63 , 0.50 and 0.42 , respectively). The majority (93%) of the children perceived the Bruce to be more difficult.

CONCLUSIONS: A less steep protocol can elicit similar cardiopulmonary results as the Bruce. Protocols that are perceived as less difficult may help guarantee that children do not terminate their exercise tests prematurely prior to reaching their true pVO₂.

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P188 THE EFFICACY OF A VERIFICATION PHASE IN VO₂ MAX TESTING AND THE IMPACT OF SAMPLING TIME

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BACKGROUND: Verification phases may improve the validity of maximal oxygen uptake (VO_{2max}) measurements during maximal graded exercise testing (GXT). It is not known whether VO₂ sampling times influence the necessity of a verification phase.

METHODS: 15 female and 18 male test subjects (18 - 25 y) completed a treadmill incremental GXT. Speed was increased from 3.0 mph by 0.5 mph every minute until 6.0 mph was reached. Elevation was then increased by 3% every minute until volitional fatigue. Subjects then walked for five minutes at 3.0 mph and 0% grade; after which time the verification phase began at the stage preceding the last stage achieved and continued until volitional fatigue. VO₂ and RER were determined continuously during the test using breath x breath measurements. Heart rate was obtained at the end of each stage from a Polar (Lake Success, NY) monitor. VO_{2max} from the incremental GXT (iVO_{2max}) and VO_{2max} from the verification phase (verVO_{2max}) were determined using 10 s, 30 s and 60 s averages from the breath x breath measurements. For all sampling times, iVO_{2max} verVO_{2max} were compared using paired t-tests. Sensitivity and specificity were calculated for the following criteria from the iVO_{2max} portion of the protocol: plateau (< 150 ml/min increase in VO₂ over the final 2 stages), and HR/RER (achievement of at least 90% of age-predicted maximal heart rate RER ≥ 1.10).

RESULTS: There were no differences between iVO_{2max} and verVO_{2max} for 10s (47.9 ± 8.31 ml/kg/min vs 48.85 ± 7.97 ml/kg/min, $P = 0.09$), 30s (46.94 ± 8.62 ml/kg/min vs 47.28 ± 7.97 ml/kg/min, $P = 0.50$), and 60s (46.17 ± 8.62 ml/kg/min vs 46.00 ± 8.00 ml/kg/min, $P = 0.81$) sampling times. verVO_{2max} was at least 2% higher for 62%, 41%, and 31% of the tests for the 10s, 30s and 60s sampling times respectively. Both sensitivity and specificity for the plateau criteria was under 45% for all sampling times. Sensitivity of using HR/RER was above 80% for all sampling times and specificity was under 30%.

CONCLUSIONS: A verification phase yields a higher VO_{2max} in a large proportion of tests and the effectiveness of the verification phase may be more important with shorter sampling times. A plateau for determining the achievement of VO_{2max} during an incremental test has poor sensitivity and specificity and the use of HR and RER criteria exhibits poor specificity.

P189 COMPARISON OF VERTICAL JUMP TESTING TO MOTION CAPTURE

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BACKGROUND: The Sargent vertical jump with countermovement (VJCM) is one of the most common methods utilized to test the explosive power of the lower body and multiple devices are available to assess it. Recently a new markerless motion capture (Physimax) was developed, which includes an assessment of vertical jump maximum; it measures the distance from the floor to the bottom of one's feet instead of the difference between initial reach and final reach. The purpose of this experiment was to compare the measurement of VJCM obtained from the jump and reach board to the Physimax.

METHODS: Eighteen female D2 college softball athletes completed three maximal VJCM using the jump and reach board while simultaneously capturing jump height with the Physimax. Each jump height was recorded in centimeters (cm). Out of the three trials, the maximum value was obtained for both and compared. The statistical analysis utilized was a dependent t-test.

RESULTS: The participants average scores were 35.2 ± 6.9 cm on the board and 38.8 ± 7.1 cm on the Physimax ($t=0.0005$; $p=0.8835$).

CONCLUSIONS: The results indicated no significant difference between the maximum vertical heights found with either the jump and reach board and the Physimax when the vertical jump is performed as the Sargent VJCM. In addition, Physimax improves time efficiency with trials due to height measurements being recorded immediately upon completion of each jump. Future studies could include concentrating on lower extremity when performing a maximal vertical jump with the removal of focus on upper extremity reaching. Furthermore, joint angles from sagittal and front planes of the lower extremities can be assessed by Physimax and in turn, be utilized in clinical settings as well as strength and conditioning to improve vertical jump maximums. Supported by funding from Southern Wesleyan Honors program

P190 UTILIZING HEART RATE RESPONSE TO PREDICT STAGE COMPLETION ON THE MANCHESTER UNITED FITNESS TEST

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BACKGROUND: The Manchester United (ManU) Fitness Test is a type of Yo-Yo intermittent recovery test that is often used to assess the cardiovascular fitness of soccer athletes. This fitness test is a series of one-minute stages that include intensive 100-yard sprints followed by 100-yard recovery runs. This field test can last up to 40 minutes. In response to the time burden of this field test, the purpose of this study was to examine heart rate (HR) as a variable that may be used to predict stage completion of the ManU Fitness Test.

METHODS: Twenty-one female soccer athletes from a Division II college participated in this study. Data collected during the ManU fitness test included: HRmax, HR during each stage, %HRmax at stage level, blood lactate, and estimated $\dot{V}O_{2\max}$.

RESULTS: The average number of stages completed for the ManU Fitness Test was 16.9 ± 3.2 , with the lowest stage completion at 11 and the highest at 23. Heart rates progressively increased throughout each stage of the test. At termination of the test, the average HR was within 99.7% of the athletes' age-predicted HRmax. There was a significant increase in heart rate from stage one (172 ± 12 bpm) to each athletes' final stage (199 ± 7 bpm) ($p < 0.01$). The strongest correlation between heart rate response and stage completion was after stage one ($r = -0.54$; $r^2 = 0.29$; $SEE = 10.3$ stages). With each subsequent stage, correlations between HR and stage completion decreased as heart rates approached maximal levels.

CONCLUSIONS: There was a non-significant ($p = 0.13$), moderate correlation between stage one HR and stage completion on the ManU Fitness Test. The correlation was negative, indicating that lower heart rates after stage one of the ManU Fitness Test were associated with higher stage completions. Because the correlation was non-significant, further research is warranted to examine physiological variables that may be used to better predict ManU performance in order to alleviate the time burden of this field test.

P191 EFFECTIVENESS OF A PHYSICAL READINESS OFFICER ON PERCEPTIONS OF MILITARY PHYSICAL TRAINING AMONG MILITARY CADETS

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BACKGROUND: Military and paramilitary training units have begun incorporating scientifically based principles of strength and conditioning into military physical training (PT). Recently, The Citadel began the Physical Readiness Officer (PRO) Program, which aims to develop cadets with specialized academic and experiential training in strength and conditioning. The purpose of this pilot study was to evaluate differences in perceptions and attitudes of military PT between a cadet company led by a physical readiness officer and cadet companies following traditional Army PT over three years at a senior military college.

METHODS: In 2016, The Citadel implemented a PRO to lead a single cadet company through strength and conditioning-based PT, which served as the experimental group (PRO). Military PT among the remaining cadet companies over the next three years followed traditional Army PT led by a traditional Army PT cadet, which served as the control group (APT). At the end of the academic year, all cadets received a survey assessing their perceptions and attitudes toward both military PT and non-military PT exercise along six psychosocial constructs. Level of agreement for each survey item was assessed using a 5-point Likert scale. Mann-Whitney U tests were used to compare differences among the six psychosocial constructs between PRO and APT.

RESULTS: No significant differences ($p > 0.05$) were found among the six psychosocial constructs between the PRO group and APT group. The psychosocial constructs assessing perceptions and attitudes specifically towards military PT between the PRO and APT were found to be similar for Value of Military PT for Current Fitness (PRO: 2.38 ± 0.93 ; APT: 2.23 ± 0.88), Enjoyment of Military PT (PRO: 2.43 ± 0.63 ; APT: 2.40 ± 0.68), and Value of Military PT for Lifelong Fitness (PRO: 2.14 ± 0.93 ; APT: 2.03 ± 0.88).

CONCLUSIONS: Further research is needed to determine how to best implement strength and conditioning principles to increase the effectiveness of military PT.

P192 CORRELATION BETWEEN OXYGEN UPTAKE EFFICIENCY PLATEAU AND THE MAXIMAL HR TO RF RATIO

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BACKGROUND: The oxygen uptake efficiency plateau (OUEP) measures the maximal oxygen extraction from ventilated air during a cardiopulmonary exercise test (CPET). Previous studies reported that both the OUEP and the breakpoint of respiratory frequency (Rf) occur at the first ventilatory threshold (VT1). We hypothesized that the breakpoint of respiratory frequency is the point at which longest inspiratory time is matched with a high tidal volume (Vt) and heart rate (HR). The aim of this study is to determine if the point of maximal oxygen extraction, OUEP, is correlated to the point at which the HR-to-Rf ratio is maximum (maxHR/Rf).

METHODS: 61 adolescent boys and girls (BMI 21.85 ± 5 kg/m²), 45 adolescents (15.81 ± 4 years) and 16 preadolescents (10.11 ± 7 years), participated in the study. Participants performed a CPET (COSMED K5) to measure OUEP, HR/Rf, and the Vt at VT1 (Vt-VT1). VT1 was identified using the ventilatory equivalent and the V-slope methods. A 1-min average was used to identify the highest HR/Rf during the CPET. Pearson's coefficient of determination R² was computed between OUEP, maxHR/Rf, and Vt-VT1. Participants were divided into quartiles based on Vt-VT1 and OUEP and an independent-samples t-test was applied to screen for differences between quartiles.

RESULTS: Pearson's coefficient reported moderate correlations between maxHR/Rf and Vt-VT1 model (R² = 0.59), OUEP and Vt-VT1 (R² = 0.32) and maxHR/Rf and OUEP (R² = 0.34). The maxHR/Rf was higher in the 4th (9.1 ± 2.9 bpm) Vt-VT1 quartile compared to the 1st (4.5 ± 0.8 bpm) and 2nd (5.0 ± 0.9 bpm) quartiles ($P \leq 0.01$). The OUEP was higher in the 4th (42.7 ± 4.5) Vt-VT1 quartile compared to the 1st (35.1 ± 3.2) and 2nd (36.1 ± 4.6) quartiles ($P \leq 0.01$). The maxHR/Rf was higher in the 4th (8.6 ± 3.5 bpm) OUEP quartile compared to the 1st (4.8 ± 1.1 bpm) and 2nd (5.4 ± 1.3 bpm) quartiles ($P \leq 0.01$).

CONCLUSIONS: The OUEP and the Vt at VT1 only moderately predicts the maxHR/Rf. However, adolescents with the highest OUEP and the Vt at VT1 also reports the highest maxHR/Rf.

P193 INFLUENCE OF AGILITY ON A 20 M SHUTTLE RUN AEROBIC FITNESS TEST

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BACKGROUND: The 20 m shuttle run aerobic fitness test, the PACER test (PT), is a field test of aerobic fitness which consists of repeatedly running between two cones set 20 m apart at increasing speed. However, the PT also involves three aspects of agility: acceleration, deceleration and change of direction. The purpose of this study is to examine the relationship between agility performance and PT performance.

METHODS: 17 adult subjects were recruited (age = 21.82 ± 4.05 , BMI = 25.19 ± 3.75). On day 1, subjects completed a modified T-test of agility (TA) which involved forward running for a total of 36.58 m with two 90° turns and two 180° turns. The best of 3 trials was used for analysis. Subjects then completed a standard submaximal YMCA cycle ergometer aerobic test (YMCA) which concluded when heart rate (HR) exceeded 85% of estimated maximal heart rate at the end of a 3 minute stage. The HR and workloads during the last two stages were used to estimate maximal oxygen consumption. On day 2, subjects completed a PT. A CD recording was used with beeps set at times representing a running speed starting at 8 k·h⁻¹ increasing 0.5 k·h⁻¹ each minute. The test ended when subjects were twice unable to reach the cone before the beep. Standard equations were used to estimate $\dot{V}O_{2\max}$ in each test. Pearson correlations coefficients were calculated to determine the correlation between PT, TA and YMCA and a linear regression analysis was used to determine the relationships between variables.

RESULTS: $\dot{V}O_{2\max}$ estimates were: YMCA: 37.51 ± 9.503 ml·kg⁻¹·min⁻¹ and PT: 49.70 ± 12.131 ml·kg⁻¹·min⁻¹. Mean TA time = 9.488 ± 1.212 s. There was a significant correlation between YMCA $\dot{V}O_{2\max}$ and TA time ($r = -.0560$, $p = 0.024$), between PT $\dot{V}O_{2\max}$ and TA time ($r = -0.772$, $p < 0.001$) and between YMCA $\dot{V}O_{2\max}$ and PT $\dot{V}O_{2\max}$ ($r = 0.631$, $p = 0.009$). In the regression analysis, TA was found to be significantly correlated to PT ($\beta = -0.609$, $p = 0.009$) while the addition of YMCA $\dot{V}O_{2\max}$ did not significantly improve the prediction ($\beta = 0.290$, $p = 0.165$).

CONCLUSIONS: Agility may play a significant role in PT performance. Caution should be used when interpreting PT $\dot{V}O_{2\max}$ assessments especially for individuals with either low or high agility skills.

P194 EFFECTS OF PREFERRED AND NON-PREFERRED WARM-UP MUSIC ON ROWING PERFORMANCE

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BACKGROUND: Ergogenic effects of music have been widely studied showing improvements in aerobic, sprint, and resistance exercise performance. Previous evidence has shown that listening to music during warm-ups increases subsequent exercise performance. However, the effect music preference has on the efficacy of warm-up music is unknown. Given that previous investigations have shown listening to preferred music during exercise shows greater benefits, the purpose of this study was to examine the effects of preferred versus non-preferred warm-up music on power output, trial time performance, rate of perceived exertion (RPE), and motivation during rowing exercise.

METHODS: College-aged male and female participants participated. In a crossover counterbalanced design, participants complete three trials: 1) No music, 2) Preferred music, and 3) Non-preferred music. Participants began warming up to by rowing at 50% of HRmax for 5 minutes while listening to corresponding music/no music. Following the warm-up, participants completed a maximal 2000 m rowing time trial. Power output, trial time, RPE, and motivation were analyzed.

RESULTS: There were no significant differences between any conditions for power output, trial time, and RPE ($p > 0.05$). Compared to no music, preferred music increased motivation ($p = 0.021$) while non-preferred music did not elicit a change ($p = 0.47$).

CONCLUSIONS: Findings indicate that warm-up music preference influences motivation to exercise but does not alter rowing performance.

P195 THE EFFECTS OF CORE STABILITY TRAINING ON ATHLETIC PERFORMANCE IN NCAA DIII COLLEGIATE WOMEN ATHLETES

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BACKGROUND: Core strengthening exercises are regularly added into training programs of all sports but very rarely is core stability. The main difference between core strengthening and core stability is that strengthening focuses on resistance of fatigue while stability focuses on maintaining balance. **PURPOSE:** To examine the effects of core stability training on sports performance.

METHODS: 20 subjects total participated from the Meredith College Softball and Volleyball teams underwent pre-testing of sport specific movements, followed by a 6 week core stability training program, and finally a post-test that examined the same variables as the pre-test. The volleyball team's sport performance was measured by passing accuracy, setting accuracy, and arm swing speed when hitting. The softball team's sport performance was measured by throwing accuracy, arm speed when throwing, and run time from home plate to first base.

RESULTS: There was no significant difference for both teams with respect to accuracy ($p = .521$ for volleyball athletes passing, $p = .619$ for volleyball athletes setting, and $p = .131$ for softball athletes throwing). However, there were significant findings for both teams in arm speed and run time for softball athletes. Arm swing when hitting for volleyball athletes $p = .001$, arm speed when throwing for softball athletes $p = .015$, and run time from home plate to first base $p = .014$.

CONCLUSIONS: Core stability training made a positive impact on sports performance by increasing arm speed when swinging for volleyball athletes, arm speed when throwing for softball athletes, and also decreasing run time from home to first base in softball athletes. Future research is necessary in order to fully validate the hypothesis that core stability training does positively affect sports performance.

P196 AN ASSESSMENT OF OFFSEASON SKILL TRAINING AMONG 14-18 YEAR OLD BASKETBALL PLAYERS

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BACKGROUND: The purpose of this research study was to establish the benefits of offseason training among teenage basketball players. The goal of every basketball team is to achieve the best outcomes possible among its athletes; hence, the study intends to investigate the possible outcomes that offseason training can have on a junior level basketball team. 40 participants between 14 and 18 years were selected from their respective school basketball teams to voluntarily take part in the offseason training program. A quantitative research design was used in which 20 participants were assigned to the control group and 20 remaining participants assigned to the test group. The focus was to establish the development of athlete's rebounding, passing, scoring, and dribbling skills at the end of the offseason training period. The descriptive statistics of the study entailing the mean, standard deviation, sample variance, skewness, and confidence interval indicated that there was a significant improvement in the dribbling, scoring, passing, and rebounding skills in the test group while there was a significant drop in the same skills observed in the control group. The correlation analysis in the pre-test assessment had values of ($r = 0.17$), ($r = 0.5$), ($r = -0.5$), and ($r = 0.28$) and post-test assessment had values of ($r = -0.76$), ($r = -0.58$), ($r = -0.47$), and ($r = -0.99$) in dribbling, scoring, passing, and rebounding respectively. This indicated that offseason training is a positive predictor of increased performance among teenage basketball players.

P197 CHARACTERIZATION OF PHYSICAL ACTIVITY AND SEDENTARY TIME ACROSS COLLEGE YEARS

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BACKGROUND: Sedentary behavior and physical activity (PA) are important habits that influence body composition and lifelong health. The purpose of this study was to characterize sedentary time (ST) and PA across class year (freshman, sophomore, junior, or senior year) and sex in collegiate young adults, and to explore the relationship between PA and body composition.

METHODS: 179 normal weight college students (68% female; Age: 19.5 ± 1.3 yrs; BMI: 22.0 ± 1.8 kg/m²) were assessed during a Fall semester for body composition from a four-compartment (4C) model to estimate fat mass (FM), percent body fat (%BF), and fat free mass (FFM). Physical activity levels in metabolic equivalent (PA; MET/min/wk), and weekday ST (min/wk day) were characterized using the 27-item International Physical Activity Questionnaire (IPAQ). One-way ANOVAs and Pearson correlations were used for analyses.

RESULTS: In females, there was no significant difference for total PA (3687.44 ± 2020.25 min/wk; $p = 0.710$) or ST (383.15 ± 175.77 min/wk day; $p = 0.613$) across class year. For males, there was a significant difference for total PA (3645.5 ± 2277.40 min/wk; $p = 0.033$) and ST (340.0 ± 136.6 min/wk day; $p = 0.017$) across class year. Sophomores had the highest PA compared to all other years (2814.96 ± 1104.79 min/wk, $p = 0.057$). Freshman and juniors had significantly less ST compared to seniors (Mean Difference \pm Standard Error: $-163.97 - 186.26 \pm 54.59 - 59.85$ min/day, $p < 0.024$). In the total sample, total walking METS was related to %BF ($r = 0.151$, $p = 0.044$) and FFM ($r = -0.183$, $p = 0.015$). Only total vigorous METS was related to %BF ($r = -0.294$; $p < 0.001$) and FM ($r = -0.320$, $p < 0.001$) and FFM ($r = 0.161$, $p = 0.049$). ST was related to %BF ($r = 0.151$, $p = 0.046$).

CONCLUSIONS: Sophomore males appear to be the most active, and senior males the least active. Females appear to have similar PA throughout college. Vigorous activity may be an important component for body composition. A PA intervention targeting senior males may positively influence lifelong health.

P198 MUSCULAR FITNESS AND BODY COMPOSITION COMPARISON BETWEEN RURAL, SOUTHEAST GEORGIA FIREFIGHTERS AND POLICE OFFICERS

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BACKGROUND: While both firefighters (FF) and police officers (PO) are subjected to on-duty physical stressors, there may be differences in the down time nature of the jobs. Additionally, FF are often allotted time on-shift to exercise, while PO are not. This could lead to body composition and muscular strength and endurance differences. **PURPOSE:** To compare the body composition and muscular fitness measures of FF and PO in rural, southeast Georgia.

METHODS: 40 FF and 45 PO participated in the study. All participants were tested on percent body fat (%BF) via air displacement plethysmography, 3-repetition maximum bench press (3RM-BP) and leg press (3RM-LP), push-ups (PU) and plank to fatigue (P). 3RM-BP and 3RM-LP results were normalized to bodyweight for analyses. Independent sample t-tests were used to compare differences ($\alpha=0.05$) in each measured variable.

RESULTS: PO had significantly greater 3RM-LP compared to FF (PO = 2.88 ± 0.93 , FF = 2.48 ± 0.69 ; $p = 0.03$). No differences were noted for %BF ($p = 0.45$), 3RM-BP ($p = 0.64$), PU ($p = 0.14$), or P ($p = 0.22$).

CONCLUSIONS: While PO are often considered more sedentary than FF on-duty, PO had greater relative lower body strength compared to FF and had similar body composition and other muscular fitness values. Determining differences in cardiovascular endurance may provide a better understanding of the performance and training needs in FF and PO.

P199 IS SELF-REPORTED PHYSICAL ACTIVITY INTENSITY ASSOCIATED WITH SIT TO STAND MUSCULAR POWER IN YOUNG ADULTS?

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BACKGROUND: Meeting the physical activity guidelines is linked to functional performance in most populations. However, it is unclear if meeting moderate (MOD) and vigorous (VIG) physical activity guidelines influences lower limb power in young adults.

METHODS: Participants were not included in this study if current musculoskeletal injury, illness, or recent surgery changed their physical activity pattern or leg power. A completed physical activity questionnaire determined which participants met the 2018 guidelines for MOD and VIG physical activity. A Tendo power analyzer was used to measure relative mean power (MP) and relative peak power (PP) during a body weight sit-to-stand test. A univariate analysis of variance compared leg power differences between individuals meeting MOD and VIG physical activity guidelines to those not meeting guidelines with total resistance time as a covariate. Significance was set at $p \leq 0.05$.

RESULTS: MP and PP were significantly different between 15 participants who met the physical activity guidelines for MOD intensity activity (MP, 9.13 ± 1.40 W/kg; PP, 17.44 ± 3.89 W/kg) compared to the 6 participants who did not meet this guideline (MP, $7.09.13 \pm 1.88$ W/kg; PP, 12.40 ± 3.90 W/kg). Peak power for the 9 participants meeting the VIG activity guidelines (PP, 18.52 ± 4.06 W/Kg) was significantly different than the 12 participants who did not meet this guideline (PP, 14.10 ± 3.86 W/Kg) while MP differences approached significance ($p = 0.053$).

CONCLUSIONS: Meeting the physical activity guidelines for MOD and VIG activity can have an effect on mean and peak lower leg power. Future studies need to assess this relationship in older adults.

P200 RELATIONSHIP BETWEEN SEATED SINGLE ARM SHOT PUT AND ISOKINETIC SHOULDER FLEXION AND ELBOW EXTENSION STRENGTH

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BACKGROUND: Previous studies have demonstrated a strong correlation between isokinetic pushing force and seated single-arm shot-put (SSASP) test performance. However, there is limited research on the contribution of shoulder flexion and elbow extension strength on SSASP test outcomes. Therefore, the purpose of this study was to examine the relationship between isokinetic shoulder flexion and elbow extension strength and SSASP test performance and compare limb symmetry indexes (LSI) between the two tests.

METHODS: Healthy, physically active men ($n=9$, ages=22-34 yrs) and women ($n=4$, age=21-25 yrs) performed dominant (DOM) and nondominant (NDOM) shoulder flexion and elbow extension isokinetic tests (System 4, Biodex, Shirley, NY) at $60^\circ/s$ (5 repetitions) and $180^\circ/s$ (10 repetitions) to determine peak torque production. The average horizontal range from three SSASP (2.0kg ball) trials were computed separately for each limb. In addition to conducting correlational analyses between the peak torques and SSASP distances, the differences in LSI computed between each of the peak torques and SSASP distances were statistically compared at each velocity by joint analysis of variance.

RESULTS: Significant ($P<.004$) relationships were revealed between DOM and NDOM SSASP performance and shoulder ($r=.732$ to $.789$) and elbow ($r=.773$ to $.829$) peak torques at both velocities. LSI for the SSASP ($101.8 \pm 5.8\%$) were similar to the isokinetic LSI at both $60^\circ/s$ (Elbow: $98.0 \pm 9.1\%$, Shoulder: $102.6 \pm 18.9\%$) and $180^\circ/s$ (Elbow: $97.7 \pm 7.5\%$, Shoulder: $102.5 \pm 15.9\%$), with no statistically significant differences ($P=.452$ to $.919$, $\eta^2=.001$ to $.048$).

CONCLUSIONS: Results demonstrate shoulder and elbow isokinetic torques are correlated with SSASP distances. Moreover, LSI for both tests were not significantly different from each other, thereby supporting the utilization of the SSASP for making bilateral comparisons in healthy individuals.

P201 ASSOCIATION BETWEEN BONE MINERAL DENSITY AND COUNTERMOVEMENT JUMP IN COLLEGIATE ATHLETES

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BACKGROUND: Increases in bone mineral density (BMD) rely on various factors, particularly repetitive loading tasks, such as jumping. Thus, it can be assumed that athletes who engage in sports that require repetitive jumping are more likely to possess a greater BMD than athletes whose sports do not require repeated landing efforts. **PURPOSE:** The purpose of this study was to determine the relationship between countermovement jump (CMJ) and BMD in division-I male and female collegiate athletes.

METHODS: Fifty-three Division-I collegiate athletes (females $n = 34$; males $n = 19$) agreed to participate in this study. Each athlete performed three barefoot CMJ's, with the hands on the hips, and the best trial was used for data analysis. Additionally, participants completed a dual-energy x-ray scan to assess BMD. Pearson's product moment correlations were used to determine significant relationships between the variables with an alpha level of 0.05.

RESULTS: Pearson's product correlation revealed a non-significant association between BMD and CMJ for the group ($r=0.067$, $p=0.63$). Additionally, when factored by gender, there were no significant relationships between BMD and CMJ (females: $r=-0.09$, $p=0.58$; males: $r=0.04$, $p=0.88$).

CONCLUSIONS: Based upon the current results, there was no relationship between BMD and CMJ. Thus, in a collegiate athlete population that traditionally has increased levels of activity and resistance training experience, BMD values may not differ between various sports. Thus, further investigation is required into between sport comparisons of BMD and CMJ.

P202 LONG TERM PARTICIPATION IN FOUR DIFFERENT SPORTS--A COMPARISON OF FITNESS MEASURES

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BACKGROUND: It is well-known that long-term participation in sports is beneficial for physical fitness, especially for older adults. However, little is known about potential differences in fitness effects with long-term participation in different common sports. This study investigated the fitness effects of long-term participation in four popular sports (Aerobics, Tai-chi, Diabolo, and Track and Field) in middle-aged females.

METHODS: One hundred and fifteen female subjects (aged 45-54 years old), who were selected to be National Sports Instructors (NSI) in China (2016 and 2017), participated in this study. All of them had been performing their specific sports specialty for at least nine years, which was also the basic requirement to become a NSI. Sports included Aerobics (N=30), Tai-chi (N=28), Diabolo (N=29), and Track and Field (N=28). Measures included height, weight, body composition, waist-hip ratio, resting heart rate, blood pressure, vital capacity, grip strength, flexibility (sit and reach), reaction time, and balance (time on one-leg standing with eyes closed). Data were analyzed using a one-way analysis of variance (ANOVA), and Fisher's LSD test was used for post hoc comparisons of significant differences.

RESULTS: Vital capacity and flexibility were greater ($P < 0.05$) in the Aerobics group versus other groups. Lean body mass was greater in the Tai-chi group versus other groups. No significant differences between groups existed for the other variables.

CONCLUSIONS: Several different fitness outcomes differed by sports participation in female participants. Those participating in aerobics had the greatest vital capacity and flexibility, while those participating in Tai-chi had the greater lean body mass. Future research should continue to explore fitness outcomes in these sports. This is especially true for diabolo, in which there is limited research compared to the other sports.

P203 THE EFFECTS OF LOWER EXTREMITY BLOOD FLOW RESTRICTION TRAINING ON POWER AND MUSCLE SIZE

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BACKGROUND: Blood flow restriction (BFR) is an intervention that when combined with exercise of lower intensities, can trigger hypertrophic pathways to improve strength and power, similar to that seen in high intensity exercise without BFR. This study was designed to determine if BFR training 30-40% of maximum will produce similar muscle hypertrophy and power improvements seen in training at 60-80% of maximum.

METHODS: Thirteen participants (30.2 ± 7.7 yr, 69.6 ± 15.0 kg, 166.8 ± 7.3 cm) were randomized to a control (n=7) or BFR group (n=6). Participants completed baseline and post-testing 4 weeks apart. Testing sessions included: bilateral thigh circumference, cross-sectional area (CSA) of vastus lateralis (VL) and biceps femoris (BF) via ultrasound imaging, graded exercise test on a rower to determine maximum oxygen consumption ($\text{VO}_{2\text{max}}$) and power output, and estimated one-rep maximum (1-RM) deadlift. Training occurred twice a week for four weeks consisting of rowing and deadlifts, with or without BFR applied to thigh bilaterally at 80% occlusion. Both groups began with a dynamic warm up, one bout of rowing for 2 minutes and three bouts of rowing for 1 minute, with 30 seconds of rest between bouts. BFR group rowed at 40% of their maximum power output and control group rowed at 80%. After a three minute rest, participants completed four sets of deadlifts with 30 seconds of rest between sets. BFR group lifted 30% of 1-RM for one set of 20 reps and three sets of 10 reps. Control group lifted 60% of 1-RM for one set of 10 reps and three sets of 5 reps. If RPE was less than 6/10 at the end of a session, intensity was increased 10% at the subsequent session.

RESULTS: A repeated measures ANOVA indicated a time difference ($p = .006$) for power ($p = .001$), deadlift 1-RM ($p = .001$), and CSA of VL and BF bilaterally ($p < .007$) indicating that both groups improved over time. There was also a difference in power for group x time ($p = .035$), with a higher increase in maximum rowing power for the BFR group. Group x time differences were non-significant for all other variables.

CONCLUSIONS: The results suggest training with BFR is as effective as high intensity training without BFR, with a higher output in maximum power. BFR training can be a feasible option for individuals unable to train at 60-80% of maximum allowing for progressive rehabilitation with lower intensity.

P204 CERTIFICATIONS: THE KEY TO PROFESSIONAL DEVELOPMENT AND WORKPLACE PREPARATION FOR UNIVERSITY STUDENTS

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BACKGROUND: The purpose of this presentation is to detail the importance of exploring with students the opportunities of experiential learning in preparation for their future careers. All too often students begin to contemplate employment in the last year of their program, having missed out on years of learning skills for professional development. This presentation will focus on three main areas of development: 1) customer service and networking, 2) social media with departmental/university programs, and 3) professional certifications. Blending these methods in a university setting shows great efficiency. This model has been implemented in the Health and Community Wellness (CMWL) program at the University of West Georgia (UWG) with success. The presenter will share the key to developing today's next leaders in fitness and wellness, while providing success stories of current university students.

METHODS: The CMWL program is aligned with the National Wellness Institute (NWI) Wellness Promotion Competency Model. This model aids in providing a resource for curriculum development, recruitment and hiring, continuing professional development, and certification in the wellness field. The undergraduate program coordinator was involved with the creation and implementation of this model in the wellness community. The curriculum for many of the CMWL major courses has been designed and structured with supporting material from professional health and fitness organizations. NWI, ACSM and ACE are just a few organizations promoted to students within the major. After successful completion of the course, students have the option to sit for a national certification. Current major courses aligned with certifications are: Exercise Wellness and Programming for Special Populations, Exercise Leadership, Advanced Concepts of Personal Training, Wellness Coaching and Worksite Wellness.

RESULTS: A number of CMWL have passed a national certification and obtained current employment. Currently, after receiving their certification, three university students are working in the Wolf Wellness Lab on campus with fitness testing, assessments, and health coaching.

CONCLUSIONS: Workplace preparation is an integral phase of a student's career. The presentation will demonstrate how integrating professional certifications into course curriculum, enhances the skills of students in professional development making them more marketable for hire now and in the future.

P205 THE EFFECT OF AGE ON THE TRADEOFF BETWEEN COGNITIVE AND PHYSICAL PERFORMANCE WHEN DUAL TASKING

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BACKGROUND: The completion of two tasks simultaneously, termed dual tasking, results in a decline in performance on one or both tasks. The ability to dual task decreases with age, though the extent to which physical versus cognitive tasks are affected is unclear. The purpose of this study was to examine the tradeoff between a cognitive and a physical task while dual tasking in young compared to older adults.

METHODS: Younger adult male and female participants ages 20-35 years (n= 12) and older adult participants ages 45-70 years (n=15) were recruited to participate. All participants completed three trials on the same day; the order of trial completion was counterbalanced and all participants rested for 15 minutes between each trial. In one single task trial, participants completed a word recall test where they were given 3 minutes to examine a word list and 5 minutes following to recall as many words as possible from memory. The second single task trial consisted of a maximum effort rowing test where participants were instructed to give maximum effort for a 3 minute period and to produce as much power as possible, and the third dual task trial consisted of completion of the recall test and maximal rowing test completed simultaneously. Power output from the row ergometer was the measure of the physical task and words recalled was the measure of the cognitive task.

RESULTS: There was a 56.0 and 69.3% decline in words recalled when dual tasking compared to single tasking in the younger and older adults, respectively ($p > 0.05$), and a 16.9% and 24.5% decline in power output when dual tasking compared to single tasking ($p > 0.05$). A paired t-test revealed no significant difference in decline in cognitive versus physical task decline in the younger group ($p > 0.05$), but the older group did significantly worse in the recall task compared to power output decline ($p = 0.034$).

CONCLUSIONS: The results indicate that both younger adults and older adults prioritize the physical task of rowing over the cognitive task. The results also indicate that older adults must give a greater amount of attentional resources to the physical task in comparison to the younger adults.

P206 CLASSIFICATION OF ACTIGRAPH WGT3X BT DEVICE NON-WEAR IN INFANTS

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BACKGROUND: Analyzing free-living physical activity monitor data requires identification of periods of non-wear. Traditionally, non-wear is determined by examining periods of consecutive zero counts, however, zero counts may also indicate periods of non-movement. In infants, evaluating non-wear is challenging due to their sporadic nature of movement, frequency of sleep, and caregiver-generated movement. Thus, an infant-specific method to identify device non-wear time is necessary. **Purpose:** To use hip- and ankle-worn ActiGraph wGT3X-BT data to identify non-wear periods in infants.

METHODS: Fifteen infants (mean±SD; age, 8.7±1.7 wk; 5.1±0.8 kg, 56.2±2.1 cm) wore a wGT3X-BT on the hip and ankle. Criterion data (minutes of wear and non-wear) were collected during two, 2-hour periods of direct observation. Using raw 30 Hz triaxial acceleration data a vector magnitude and the inclination angle of each individual axis were calculated. Data were then averaged into 1-min epochs and a 4-min rolling coefficient of variation of each axis was calculated for each minute. Three decision trees models were developed using data from the 1) hip, 2) ankle, and 3) hip and ankle combined. Leave-one-out cross-validation was used to assess model performance as classification accuracy (correctly identified minutes of wear and non-wear) and F1 Score (harmonic mean of precision and recall).

RESULTS: The hip model correctly classified 87% of wear and non-wear minutes with an F1 score of 0.75 compared to the ankle only model which classified 90% of minutes correctly with an F1 score of 0.82. The combined site model also correctly classified 90% of minutes and had an F1 score of 0.81 which is similar to the performance of the ankle only model.

CONCLUSIONS: Overall, a single site model using ankle data performs best during structured lab visits. This approach provides an advancement in identification of device wear status using wearable sensor data in infants. Supported by NIH P30DK072476-10.

P207 NOTCH1 KNOCKDOWN INCREASES MYOD AND FIBROSIS IN SKELETAL MUSCLE FOLLOWING EXERCISE

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BACKGROUND: Notch is a cell signaling pathway that directs muscle regeneration. The aging process results in poor muscle repair partly due to accelerated fibrosis and decreased Notch signaling. However, it is not known if Notch contributes the increased presence of fibrosis in repairing aged muscle. The goal of this project was to investigate if inhibited Notch expression results in increased fibrosis in repairing muscle.

METHODS: The gastrocnemius of young (~ 3mo) C57Bl/J mice were injected with either Notch1 shRNA (Notch1KD) or control Lentiviral particles (CT) for five days in left or right gastrocnemius. The animals were then exposed to an acute bout of downhill running. Muscle injury was quantified using H and E staining, muscle repair was quantified using western blot analysis on MyoD and collagen expression was quantified using the Sirius Red staining.

RESULTS: The DHR protocol did not induce significant muscle injury however the 1D post-DHR Notch1 KD trended down compare to CT (p=0.07). MyoD was significantly elevated in Notch1KD relative to CT (p ≤ 0.05). Collagen expression was significantly greater in Notch1 KD relative to CT (p = 0.04).

CONCLUSIONS: The results show that Notch signaling inhibits the later stages of muscle repair and collagen expression. This information could be crucial to the therapeutic developments in prevention and treatment of age-associated muscle wasting. *This project was funded in part by UNC Charlotte's Faculty Research Grant.*

P208 RATE OF FORCE DEVELOPMENT PARAMETERS IN YOUNG AND OLDER MALES DURING A CHAIR RISE

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BACKGROUND: Assessing vertical ground reaction forces (VGRF) during a chair rise may yield insight regarding age-related differences in physical function, but a comprehensive assessment of rate of force development (RFD) during this task is lacking. The purpose of this study was to compare RFD parameters during a chair rise in young (YM) and older (OM) males.

METHODS: YM (n=15, age =20.7±2.2 yrs) and OM (n=15, age=71.6±3.9yrs) performed a single chair rise as quickly as possible on a force plate. Peak VGRF (PF), as well as peak (highest 100 ms rolling average), early (minimum VGRF to 50% PF), late (50% PF to PF), and overall (minimum VGRF to PF) RFD were calculated. Chair rise time was also obtained. Independent samples t-tests were used for group comparisons, and Pearson correlation coefficients were calculated for each group to examine select relationships.

RESULTS: Chair rise time was similar between groups (p=0.256). PF (-15%; p<0.001) and all RFD measures (-20-39%; p<0.001), except for early RFD (p=0.051), were lower in the OM. For OM, only PF (r=-0.875; p<0.001) and peak RFD (r=-0.783; p=0.001) were correlated with chair rise time, while no correlations were present for the YMs.

CONCLUSIONS: PF and RFD, especially late RFD, were dramatically diminished in OM. PF and peak RFD demonstrated a strong inverse relationship with chair rise time in OM.

P209 EVALUATION OF PERCEIVED FATIGUE VERSUS MUSCLE FATIGUE IN A COMPARISON OF OLDER AND YOUNGER ADULTS

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BACKGROUND: Fatigue is a common clinically reported symptom that leads to reduced activity levels and quality of life. Perceived fatigue is found especially in older adults. This study compared muscle fatigue and perceived fatigue in older and younger adults.

METHODS: Calf muscles of healthy adults ages 18-35yrs (n=16) and 55-80yrs (n=14) were tested. Participants completed a profile of mood states (POMS) questionnaire followed by a muscle specific endurance test. Participants completed the POMS questionnaire based on how they were feeling in that moment. The fatigue category from the POMS results was used as a person's perceived fatigue. Muscle specific endurance test consisted of a 9-minute protocol. Electrodes were placed on the lateral gastrocnemius with a tri-axial accelerometer in between. The current was adjusted to get a vigorous contraction. The test consisted of 3 minutes of stimulation each at 2Hz, 4Hz, and 6Hz. The endurance index (EI) was calculated by dividing the end twitch acceleration by the start twitch acceleration and multiplying times 100.

RESULTS: EI values in the older population were 74.3%±15.6% and 84.5%±11.1% in the younger population (p=0.046). The fatigue POMS score (0-20) for the older population were 2.3%±3.3% and in the younger population were 3.6%±3.0% (p=0.18). The correlation between perceived fatigue and muscle fatigue was R²=0.15 in the older population and R²=0.004 in the younger population.

CONCLUSIONS: Older subjects did not have greater perceived fatigue on the POMS, but they did have less muscle specific endurance. We did not find a relationship between muscle endurance and perceived fatigue in older adults.

P210 AGE-RELATED DIFFERENCES IN RAPID NEUROMUSCULAR PARAMETERS OF THE PLANTARFLEXORS AND CORRELATIONS WITH PHYSICAL FUNCTION

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BACKGROUND: Few studies have concurrently examined multiple rapid neuromuscular characteristics of the plantarflexors (PFs) in middle-aged (MM) and older (OM) males. Thus, our purpose was to compare rapid neuromuscular parameters of the PFs in MM and OM, and examine correlates of physical functioning. **METHODS:** Twenty-nine healthy, MM (n=14; 45.3±2.6 yrs) and OM (n=15; 65.3±3.2 yrs) performed unloaded isotonic (IT) and isokinetic (IK; 60 deg/sec) concentric contractions of the PFs using a dynamometer. Peak velocity (PV), rate of velocity development (RVD_{IT}), and rate of electromyography rise (RER) were obtained from IT trials. During the IK trials, time to peak torque (TPT) and rate of velocity development (RVD_{IK}) were acquired. Maximal walking velocity (MWV) and time to complete 5 chair rises (5CR) were also recorded. Group comparisons were made with independent samples t-tests, while Pearson correlation coefficients were calculated to examine select relationships. **RESULTS:** RVD_{IT} was lower (-11%; p=0.037), and 5CR time greater (16%; p=0.022) in OM. RER was only correlated (r=0.431; p=0.026) with RVD_{IT}. Only PV (r=0.396; p=0.033) and RVD_{IT} (r=0.480; p=0.008) were correlated with MWV, while only TPT was correlated with 5CR time (r=0.451; p=0.014). **CONCLUSIONS:** Our findings suggest that rapid neuromuscular measures may be differentially influenced by age, and only particular parameters are associated with physical function.

P211 EARLY AND LATE RAPID NEUROMUSCULAR PARAMETERS OF THE PLANTAR FLEXORS IN MIDDLE-AGED AND OLDER MALES

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BACKGROUND: Rapid torque production is negatively affected by aging, but few comparisons exist between middle-aged and older adults for early and late rapid torque measures. Thus, our aim was to compare early and late rapid torque measures of the plantar flexors (PFs) in middle-aged (MM) and older males (OM). **METHODS:** Twenty-nine MM (n=14; 45.3±2.6 yrs) and OM (n=15; 65.3±3.2 yrs) performed maximal isometric contractions of the PFs using a dynamometer. Peak torque (PT), as well as rate of torque development and impulse during the early (0-50 ms; RTD₀₋₅₀, IMP₀₋₅₀) and late (100-200 ms; RTD₁₀₀₋₂₀₀, IMP₁₀₀₋₂₀₀) contraction phases were calculated. Torque at 50 (TQ₅₀), 100 (TQ₁₀₀), and 200 ms (TQ₂₀₀) was also obtained. Additionally, RTD and TQ variables were normalized to PT. Rate of electromyography rise (RER) was calculated at 30, 50, and 75 ms as the linear slope of the normalized signal. **RESULTS:** PT (p=0.105), TQ₅₀ (p=0.156), early (p=0.162), and late (p=0.074) RTD were similar between groups. TQ₁₀₀ (-20%; p=0.046), TQ₂₀₀ (-20%; p=0.031), and IMP₁₀₀₋₂₀₀ (-20%; p=0.032) were lower in OM. Normalized variables showed no differences. RER (p=0.057-0.072) was similar between groups. **CONCLUSIONS:** Our data indicate that later rapid torque parameters of the PFs were preferentially influenced by age, yet PT appeared to mediate this result. Although not significant, the effect sizes for RER (d=0.69-0.74) may suggest that rapid muscle activation was influential as well.

P212 EFFECTS OF A COUPLES-BASED EXERCISE INTERVENTION ON PHYSICAL FUNCTION AND PHYSICAL ACTIVITY IN OLDER ADULTS

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BACKGROUND: The inverse relationship between age, physical activity (PA) and exercise (EX), and physical function (PFx) is well-established; however, interventions that effectively maintain PA/EX behavior for the majority of older adults are lacking. Close intimate partnerships can influence daily activities and patterns, including PA/EX, in both positive and negative ways. However, minimal research intentionally incorporates romantic partnerships into the PA/EX behavioral intervention. This study aimed to examine the effects of a 9-week EX (resistance, flexibility, balance training) and PA/EX behavioral change intervention on PA/EX behaviors and Pfx in older adult couples. **METHODS:** Heterosexual couples (n=9 or 18 total; 60-79 & 69.4±4.9 yo) were assessed for Pfx via 6-Minute Walk Test (WALK), Timed Up and Go (UPGO), Transfer Task (TRANSFER), and Community Balance and Mobility Scale (CBMS); PA via CHAMPS questionnaire; and relationship quality (RQ) via Couple Satisfaction Index-32. **RESULTS:** Paired samples t-tests revealed improvement in WALK, TRANSFER, CBMS, and PA (all p<.05) and a decline in RQ (p<.05). Bivariate correlational analysis indicated that baseline RQ was not related to change in any measure of Pfx or PA (all p>.05). However, improvement in RQ was related to better performance in both UPGO and TRANSFER (r=-.68 and -.54, respectively, both p<.05). **CONCLUSIONS:** Our results suggest that whereas initial RQ may not influence EX intervention effects on Pfx and PA in older couples, changes in RQ may be an important influential factor. Research exploring the utility of the romantic partner as a PA/EX behavior change and maintenance agent to enhance Pfx in older adults is warranted. Funded by UGA Owens Institute for Behavioral Research

P213 JOINT-, CONTRACTION-TYPE, AND CONTRACTION-VELOCITY SPECIFIC DIFFERENCES IN MUSCLE STRENGTH OF LOWER EXTREMITY IN CHILDREN

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BACKGROUND: Concentric and eccentric muscle contractions produce dynamic movements requisite for activities of daily living (e.g. walking, running, and jumping). While distinct yet overlapping neural and mechanical processes dictate these contractions, little is known regarding the influence of body-site, contraction velocity, and contraction-type on muscle strength in children. Thus, the aim of our study was to examine joint-, contraction-type, and contraction-velocity specific differences as a function of lower extremity muscle strength in children. **METHODS:** Thirteen typically developing children (male = 5, female = 8; age = 11.2 ± 1.1 years) participated in our study. After a familiarization session, participants performed randomized unilateral isometric (ISO), concentric (CON) and eccentric (ECC) muscle strength testing of the non-dominant knee extensors and ankle plantarflexors in a seated position at 120°/s and 180°/s on Biodex. Obtained peak torques were normalized to body mass. Differential muscle strengths were also calculated [D1 = (ECC120-CON120)_{knee}; D2 = (ECC120-CON120)_{ankle}; D3 = (ECC180-CON180)_{knee}; D4 = (ECC180-CON180)_{ankle}]. We used separate within repeated measures ANOVA to calculate muscle strength differences for different types of contractions for the two sites. Paired t-tests were used to compare the differential muscle strength (D1 vs D2; D3 vs D4). **RESULTS:** No difference was noted between ISO and CON. However, ISO and CON were lower than ECC muscle strength at 120°/s and 180°/s (F > 27.8; all P < 0.01) at the knee and ankle. No difference was noted between D1 and D2 but D4 was significantly lower than D3 (P = 0.009). **CONCLUSIONS:** Irrespective of contraction velocity and the body sites, children display greatest muscle strength for ECC relative to CON or ISO. Interestingly, differential muscle strength is site-dependent. Whether this is dictated by maturation associated site-specific neuromuscular inhibition remains to be investigated.

P214 SKELETAL MUSCLE ECHO INTENSITY: INDICATIVE OF VOLUNTARY OR INVOLUNTARY STRENGTH?

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BACKGROUND: Echo intensity is a novel and attractive measure of muscle tissue composition that is associated with measures of muscle function, particularly in older adults. It is unclear, however, if these relationships are influenced by neural drive. Thus, we sought to examine correlations between echo intensity versus voluntary and involuntary strength.

METHODS: Eighteen healthy females (age = 21 ± 2 years, BMI = 22.7 ± 2.3) participated. Assessments included B-mode ultrasound imaging of the dominant vastus lateralis and rectus femoris muscles. ImageJ software was used to quantify echo intensity (arbitrary units) and cross-sectional area (cm²). All strength testing was performed with an isokinetic dynamometer. Peak evoked twitch force was assessed via the interpolated twitch technique. Isometric maximal voluntary contractions (MVC) of the knee extensors were performed at a joint angle of 110°. Concentric isokinetic muscle actions were performed at 180°/s and 360°/s. The highest peak torque value (Nm) from each testing condition was used for analysis. Pearson correlation coefficients (*r*) were used to assess the association between echo intensity of the rectus femoris and vastus lateralis versus peak evoked twitch force, cross-sectional area, peak MVC torque, and concentric isokinetic peak torque at 180°/s and 360°/s.

RESULTS: Echo intensity of the rectus femoris was not significantly correlated with peak evoked twitch force ($r = -0.238, p = 0.341$), MVC ($r = -0.200, p = 0.427$), concentric isokinetic peak torque at 180°/s ($r = 0.105, p = 0.678$), and 360°/s ($r = 0.088, p = 0.729$), or cross-sectional area of the rectus femoris ($r = 0.262, p = 0.290$). Echo intensity of the vastus lateralis was not significantly correlated with peak evoked twitch force ($r = -0.050, p = 0.845$), MVC ($r = -0.014, p = 0.956$), concentric isokinetic peak torque at 180°/s ($r = 0.099, p = 0.697$), peak isokinetic torque at 360°/s ($r = 0.061, p = 0.810$), or cross-sectional area of the vastus lateralis ($r = -0.069, p = 0.786$).

CONCLUSIONS: Our findings indicate there was no relationship between echo intensity and both voluntary and involuntary strength. As many previous echo intensity studies have focused attention on differences among age groups, it seems that the relationship between echo intensity and muscle function may be limited to older adults.

P215 CHANGES IN MOTOR UNIT RECRUITMENT THRESHOLDS AS A COMPENSATORY STRATEGY DURING NEUROMUSCULAR FATIGUE

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BACKGROUND: During fatigue, skeletal muscle fibers display a decrease in twitch force. To maintain a given absolute force level, compensatory adjustments in motor unit control are thought to occur. The force level at which a motor unit is recruited, known as its recruitment threshold (RT), has been shown to increase, decrease, and not change in previous studies. To reconcile differences in the literature, we set out to examine changes in the relationship between motor unit RT and action potential amplitude.

METHODS: Eleven men (mean \pm SD age = 24 ± 5 years) completed maximal voluntary contractions (MVCs) of the dominant knee extensors followed by an isometric fatiguing protocol. After determination of MVC, participants performed repeated isometric contractions at 30% MVC force until exhaustion. For each contraction, force was increased from 0% to 30% over three seconds, held constant for 33 seconds, and decreased from 30% to 0% over three seconds. Bipolar surface electromyographic (EMG) signals were detected from the vastus lateralis. A surface EMG signal decomposition algorithm was used to determine RT and the shapes of individual motor unit action potentials (MUAPs). A custom LabVIEW program was used to quantify each MUAP's peak-to-peak amplitude. RT (%MVC) and MUAP amplitude (mV) were quantified for each motor unit from contractions at the beginning, middle, and end of the fatiguing protocol. The slope (%MVC/mV) and y-intercepts (%MVC) for each RT versus MUAP relationship were compared across time (beginning, middle, and end) using repeated measures analyses of variance (ANOVAs).

RESULTS: The repeated measures ANOVA for the slopes was significant ($p = 0.003, \eta^2 = 0.448$), and Bonferroni post-hoc comparisons revealed significant difference from the beginning (214.1 ± 138.3 %MVC/mV) to the end (131.5 ± 114.6 %MVC/mV) of the protocol. The y-intercept was not affected by fatigue ($p = 0.219, \eta^2 = 0.141$; beginning = -1.8 ± 5.8 %, middle 1.8 ± 10.2 %, end = 2.4 ± 8.2 %).

CONCLUSIONS: These data suggest that during a fatiguing protocol at 30% MVC, the moderate to high threshold motor units within a contraction are recruited at lower forces. Therefore, it is reasonable to suspect that throughout a low force fatiguing task, motor units typically recruited during high force actions may be more readily activated.

P216 SEX-RELATED DIFFERENCES IN NEUROMUSCULAR RESPONSES PERFORMED ABOVE AND BELOW CRITICAL RESISTANCE

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BACKGROUND: This study examined sex-related differences in electromyographic (EMG) and mechanomyographic (MMG) amplitude (AMP) and mean power frequency (MPF) during leg extension (LE) repetitions (reps) performed to failure above (CR_{+15%}) and below (CR_{-15%}) critical resistance (CR).

METHODS: Eleven men and ten women completed one-repetition maximum (1RM) testing and reps to failure at 50%, 60%, 70%, and 80% 1RM (to derive CR), and at CR_{+15%} and CR_{-15%}, on separate days. During all visits, EMG and MMG signals were measured from the vastus lateralis of the dominant limb. Separate 2 (sex: men and women) x 2 (intensity: CR_{+15%} and CR_{-15%}) x 5 (time: 5%, 25%, 50%, 75%, and 100% of total repetitions) mixed factorial ANOVAs ($p \leq 0.05$) were used to examine the neuromuscular responses.

RESULTS: There were no sex differences in relative strength or reps to failure and no 3-way interactions for any parameter. There were time x sex interactions for EMG AMP ($p = 0.024$), EMG MPF ($p = 0.036$), and MMG MPF ($p = 0.002$) that indicated an earlier onset of fatigue-induced changes for the women compared to the men for EMG AMP (W: 25% vs. M: 75% of total reps) and EMG MPF (W: 25% vs. M: 100% of total reps), but a later onset for MMG MPF (W: 100% vs M: 75% of total reps). There were no 3-way or 2-way interactions for MMG AMP, but there was a main effect for time ($p = 0.013$) that indicated fatigue-induced changes began at 25% of total reps.

CONCLUSIONS: These findings indicated there were sex-dependent motor control strategies during fatiguing LE exercise.

P217 EFFECTS OF BLOOD FLOW RESTRICTION ON FORCE PRODUCTION AND EMG ACTIVITY DURING ISOKINETIC LEG EXTENSIONS

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BACKGROUND: Previous studies have reported that low-intensity ($\leq 50\%$ of 1 of repetition max) resistance training with blood flow restriction (BFR) elicits increases both in muscle hypertrophy and strength to a similar, or even greater, extent than traditional exercise performed at higher intensities ($\geq 65\%$). However, the impact of high-intensity relative levels of BFR on the acute neuromuscular response to resistance exercise is not fully understood. The purpose of this study was to determine if BFR application during an acute bout of heavy resistance exercise has any impact on maximal force production and muscle activation.

METHODS: Eight resistance-trained individuals (25.75 ± 5.8 yrs, 178.68 ± 8.8 cm, 82.80 ± 6.9 kg, and $15.99 \pm 4.4\%$) performed 5 sets of 5 maximal knee extensions on an isokinetic dynamometer under two conditions: Control and BFR (w/ 80% of personal occlusion pressure). Electromyographic (EMG) data was collected and analyzed using a BIOPAC MP150 system and Acqknowledge 4.4 software (BIOPAC System, Inc., Goleta, CA). Peak torque was normalized as percent of maximal voluntary isometric contraction (%MVIC). Paired-samples *t*-tests were used to determine if %MVIC and root mean square (RMS) values were significantly different between conditions. Cohen's *d* statistic was calculated to determine the effect size of the differences.

RESULTS: Non-significant differences were observed between trials for %MVIC, $3.9 \pm 9.3\%$, $p = .111$, and RMS, $-0.89 \pm .432$ mV, $p = .425$, respectively. Effect sizes for %MVIC and RMS were both small ($ES = 0.59$ and 0.29 , respectively).

CONCLUSIONS: The preliminary results demonstrate that peak torque and EMG activity are similar during traditional and high-intensity BFR isokinetic leg extensions. Data collection is on-going.

P218 UNILATERAL BIAS IN PROXIMAL LEG ELECTROMYOGRAPHY DURING RECUMBENT STEPPING IN COLLEGE AGED PARTICIPANTS

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BACKGROUND: Previous findings illustrated that stepping against resistance and stepping at a higher frequency increased mean electromyography (mEMG) while on the NuStep Cross Trainer (NS). However, it is not well understood if exercise on the NS is symmetrical. Therefore, our purpose was to compare contralateral leg mEMG in healthy college-aged adults.

METHODS: Twenty-three healthy males and females (aged 23.52 years \pm 4.23) participated. Participants determined self-selected (SS) cadence during a 10 min pretest on the NS at an RPE between 12-16. Participants then performed five separate left-only protocols on the NS in a randomized order. During each protocol, mEMG of the rectus femoris (RF), vastus medialis oblique (VMO), semitendinosus (ST), tibialis anterior (TA), medial gastrocnemius (MG) and soleus (SOL) were recorded bilaterally. mEMG amplitudes (uV) were converted to a percentage of isometric maximum voluntary contraction (%mvc). Data were examined for parametric assumptions and, consequently, were compared using five separate 5 x 2 repeated-measures ANOVA. Post-hoc data are reported with mean (M) and 95% confidence intervals (CI).

RESULTS: No bilateral difference was observed in knee extensor or flexor strength; $p > .05$. There was a statistically significant two-way interaction between protocol and limbs for RF, $F(1.53, 24.48) = 9.50, p = .002$. Post hoc analysis with a Bonferroni adjustment found right RF mEMG to be higher in all protocols; $p < .05$. VMO demonstrated a main effect for limb, $F(1.00, 17) = 6.94, p = .017$. Furthermore, LVMO mEMG was significantly greater ($M = 11.65\% \text{ mvc} \pm 4.97\%$; 95% CI = 9.36% to 13.92% vs. $M = 8.61\% \text{ mvc} \pm 4.97\%$; 95% CI = 6.36% to 10.86%); $p = .017$. ST also demonstrated a main effect for limb, $F(1.00, 15) = 7.79, p = .014$. LST mEMG was significantly greater ($M = 5.13\% \text{ mvc}$; 95% CI = 3.62% to 6.64%) than RST ($M = 3.41\% \text{ mvc}$; 95% CI = 2.42% to 4.41%); $p = .014$. No interaction or main effect of limb existed for the distal musculature (i.e. MG, SOL or TA); $p > .05$.

CONCLUSIONS: The proximal VMO and ST demonstrated higher mEMG on the participant's left leg. Whereas, the degree to which the RF demonstrated higher mEMG was dependent on the protocol. Seemly, participants demonstrated muscle-specific unilateral bias in the proximal musculature. Future research should examine the effect of leg preference on the NS exercise.

P219 COMMERCIALY AVAILABLE CAPSAICIN SUPPLEMENT FAILS TO ENHANCE TIME-TO-EXHAUSTION DURING CYCLING EXERCISE

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BACKGROUND: Capsaicin (8-methyl-N-vanillyl-trans-6-nonenamide), the active ingredient in chili peppers, agonizes transient receptor potential vanilloid receptor-1 (TRPV1) ion channels throughout the body, influencing a multitude of physiological systems. While acute capsaicin supplementation (≥ 12 mg) has proven to enhance exercise performance, the minimum effective dose that is least likely to elicit gastrointestinal distress has yet to be determined. This study examined whether a commercially available low-dose (1.2 mg) chewable capsaicin supplement could enhance endurance cycling performance.

METHODS: Thirteen young recreationally active males and females (5 females; 24.2 \pm 2.9 yrs; 21.2 \pm 6.1 % body fat) participated in the study. The study consisted of three visits, beginning with an initial evaluation of cardiorespiratory fitness (37.1 \pm 5.5 ml/kg/min). During the second and third study visits, participants completed time-to-exhaustion (TTE) tests on a cycle ergometer at a workload eliciting $\sim 90\%$ $\text{VO}_{2\text{max}}$, 45 minutes after ingesting either a 139 kcal capsaicin fruit gummy or eucaloric placebo, the order of which was randomized. Heart rate and rating of perceived exertion (RPE) were recorded every two minutes throughout the TTE sessions.

RESULTS: Time-to-exhaustion was not significantly different ($P > 0.05$; $d = 0.13$) between placebo (487.8 \pm 187.7 sec) and capsaicin (517.5 \pm 258.4 sec) trials. Average heart rate (148.3 \pm 11.8 vs. 146.2 \pm 8.1 bpm) and session RPE (18.6 \pm 1.1 vs. 18.6 \pm 1.3) were also similar ($P > 0.05$) between placebo and capsaicin trials, respectively.

CONCLUSIONS: These findings suggest that pre-exercise ingestion of a commercially available low-dose (1.2 mg) chewable capsaicin supplement fails to provide ergogenic benefits for time-to-exhaustion during cycling exercise. More research is needed to delineate the minimum effective dose of pre-exercise capsaicin supplementation to enhance exercise performance.

P220 EFFECTS OF A COMMERCIALY AVAILABLE CAPSAICIN SUPPLEMENT ON KNEE EXTENSOR CONTRACTILE FUNCTION

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BACKGROUND: Capsaicin, the pungent ingredient in chili peppers, has recently been explored by a variety of pharmacological studies due to its unique ability to influence an array of bodily systems. In skeletal muscle, capsaicin mediated activation of transient receptor potential vanilloid receptor-1 (TRPV1) cation channels on the sarcoplasmic reticulum is proposed to potentiate intracellular calcium release and possibly intensify force production. The present study evaluated the effects of a commercially available capsaicin supplement (1.2 mg) on isokinetic knee extensor contractile performance.

METHODS: Nine young recreationally active males and females (5 females; 23.6 \pm 1.5 yrs; 24.2 \pm 3.3 kg/m²) participated in this randomized, single-blind, crossover study. After an initial familiarization session, participants completed two isokinetic knee extensor contractile function assessments, 45 minutes after ingesting either a capsaicin fruit gummy or eucaloric placebo, the order of which was randomized. Knee extensor peak torque (strength), summed torque (endurance) and fatigue index (fatigue) were compared between trials.

RESULTS: Knee extensor peak torque was significantly greater ($P < 0.05$; $d = 0.80$) in the capsaicin (126.0 \pm 40.4 N·m) than the placebo (118.8 \pm 41.3 N·m) trial. No significant differences ($P > 0.05$) were found for summed torque (8012 \pm 2771 vs. 7823 \pm 2611 N·m; $d = 0.45$) or fatigue index (56.0 \pm 17.1 vs. 48.7 \pm 21.0 %; $d = 0.46$) between capsaicin and placebo trials, respectively.

CONCLUSIONS: These findings, in a relatively modest and mixed-gender sample, suggest that pre-exercise capsaicin ingestion may benefit knee extensor muscle strength but does not appear to affect parameters of skeletal muscle endurance or fatigue.

P221 ACETIC ACID SUPPLEMENTATION: EFFECT ON RESTING AND EXERCISE ENERGY EXPENDITURE AND SUBSTRATE UTILIZATION

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BACKGROUND: Evidence suggests that acetic acid (vinegar) supplementation promotes weight loss; however, the mechanism has not been elucidated. The purpose of this study was to investigate the influence of acetic acid supplementation on resting and exercise energy expenditure, and substrate utilization.

METHODS: Using a randomized, double blind, crossover design 11 healthy subjects were supplemented with either an acetic acid or a placebo solution. The acetic acid treatment (ACV) consisted of 30 ml/day of acetic acid mixed in 1 L of a lemon-flavored non-nutritive drink (Crystal Light™) whereas the placebo treatment (PLA) consist of 1 L the same drink without acetic acid. 500 ml of the respective drinks was consumed each morning and evening for 3 d. On day 4 another 500 mL was consumed 1 h before undergoing indirect calorimetry for the assessment of resting energy expenditure (REE) and substrate utilization. This was immediately followed by an assessment of exercise energy expenditure during 20 min of cycling, 10 min at 40W (EEE-40) and 10 min at 80W (EEE-80).

RESULTS: Neither REE (ACV 1647 \pm 286, PLA 1620 \pm 207 kcal/d), nor substrate utilization (CHO: ACV 0.09 \pm 0.05, PLA 0.08 \pm 0.05 g/min; Fat: ACV 0.08 \pm 0.03, PLA 0.08 \pm 0.02 g/min) were significantly different between groups ($p > .05$). During exercise at both 40W and 80W, there were no significant differences observed between groups for energy expenditure (EEE-40: ACV 3.97 \pm 0.79, PLA 4.14 \pm 0.55 kcal/min; EEE-80: ACV 5.94 \pm 0.96, PLA 5.95 \pm 0.60 kcal/min) or substrate utilization (40W CHO: ACV 0.61 \pm 0.14, PLA 0.68 \pm 0.12 g/min; Fat: ACV 0.16 \pm 0.07, PLA 0.15 \pm 0.07 g/min), (80W CHO: ACV 1.12 \pm 0.27, PLA 1.14 \pm 0.28 g/min; Fat: ACV 0.15 \pm 0.09, PLA 0.14 \pm 0.10 g/min) ($p > .05$).

CONCLUSIONS: Our findings indicate that acetic acid supplementation does not stimulate either resting or exercise metabolism, thereby suggesting that the mechanism by which acetic acid supplementation impacts weight loss is likely due to its effect on satiety.

P222 EFFECTS OF MAGNESIUM SUPPLEMENTATION ON MUSCLE SORENESS AND PERFORMANCE

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BACKGROUND: Magnesium (Mg) supplementation is proposed as an ergogenic aid. However, few studies have examined effects of Mg supplementation on muscle soreness and performance. This double-blind, between groups study, examined effects of Magnesium (Mg) supplementation (350 mg/day, 10 days) vs. matched placebo (PI) on muscle soreness and performance.

METHODS: A 7-day dietary recall determined individual Mg intake. Recreationally active males ($n = 9$) and females ($n = 13$) completed baseline and post-treatment eccentric bench press lifting sessions to induce fatigue/soreness. These trials were followed 48 h later by bench press performance sessions (total volume (TV) and reps to failure (RTF) (65%, 75%, and 85% of 1RM) including collection of perceptual responses (acute and session RPE, perceived recovery). Results were considered significant at $p \leq 0.05$.

RESULTS: Mg resulted in a significant reduction (6 cm line) in muscle soreness from baseline eccentric to post-intervention trial 24 (-1.8 ± 1.2) 36 (-2.0 ± 2.1) and 48h (-2.1 ± 1.6). There were no significant changes for Pla 24 (-0.3 ± 1.8) 36 (-0.5 ± 1.9) and 48h (-0.6 ± 2.0). Total RTF approached significance ($p = 0.06$) vs. baseline for Mg (28.0 ± 7.0 to 30.6 ± 7.0). Total RTF did not change significantly for PI (31.7 ± 9.0 to 32.0 ± 8.0). Mg resulted in a significant reduction in both session RPE and acute RPE (~1 unit on a 10 pt scale) indicating participants felt the work was easier following Mg supplementation. No significant RPE differences were observed for PI. Perceived recovery post-supplementation was improved (feelings of greater pre-exercise recovery) vs. baseline for Mg (5.4 ± 2.2 to 7.5 ± 2.3), but not for PI (6.2 ± 2.4 to 7.2 ± 3.3).

CONCLUSIONS: Mg supplementation may be beneficial for those starting a new exercise regimen as well as active individuals experiencing chronic soreness.

P223 EFFECTS OF CURCUMIN AND FENUGREEK SOLUBLE FIBER ON THE VENTILATORY THRESHOLD IN UNTRAINED COLLEGE STUDENTS

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BACKGROUND: Submaximal exercise performance is, in part, limited by the accumulation of metabolic byproducts and energy system capacities. Curcumin and the combination of curcumin and fenugreek soluble fiber (CurQfen[®]) have been shown to increase endogenous antioxidants and metabolic byproduct clearance as well as reduce inflammation and lipid peroxidation, and therefore, may enhance submaximal aerobic thresholds. This study examined the effects of a CurQfen[®] and fenugreek (FEN) supplement on the ventilatory threshold (VT).

METHODS: Forty-five untrained, college-aged subjects (mean age ± SD: 21.2 ± 2.5) were randomly assigned to one of three supplementation groups; placebo (PLA, $n=13$), CurQfen[®] (500 mg/day, $n=14$), or FEN (60 mg/day, $n=18$). All subjects completed a maximal graded exercise test on a cycle ergometer to determine the VT before (PRE) and after (POST) 28 days of daily supplementation. The VT was determined from the V-slope method for the ventilation (\dot{V}_E) vs. volumetric oxygen consumption ($\dot{V}O_2$). A one-way ANCOVA was used to examine between group differences for adjusted POST $\dot{V}T-\dot{V}O_2$ values, with the PRE $\dot{V}T-\dot{V}O_2$ as the covariate.

RESULTS: The adjusted POST $\dot{V}T-\dot{V}O_2$ for the CurQfen[®] (mean ± SD= 1.593 ± 0.157L·min⁻¹) and FEN (1.597 ± 0.157L·min⁻¹) groups were greater than ($p= 0.04$ and $p= 0.03$, respectively) the PLA (1.465 ± 0.155L·min⁻¹) group, but the FEN and CurQfen[®] groups were not different ($p = 0.94$).

CONCLUSIONS: These findings suggested that CurQfen[®] and/or fenugreek may improve submaximal aerobic performance in untrained subjects.

P224 EFFECTS OF VARYING CARBOHYDRATE MOUTH RINSE CONCENTRATION ON VERTICAL JUMP PERFORMANCE

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BACKGROUND: Previous evidence has shown that carbohydrate (CHO) mouth rinse stimulates brain activity. CHO mouth rinse has been reported to increase power output and work during exercise. There is a wide range of CHO concentrations utilized in previous literature and no investigations have directly compared the efficacy of varying concentrations on explosive exercise performance. Accordingly, the purpose of this study was to investigate the effects of varying CHO mouth rinse concentrations on explosive vertical jump performance.

METHODS: In a crossover counterbalanced design, physically active college-aged males completed three separate trials/conditions: 1) Placebo, 2) 6% Maltodextrin, 3) 18% Maltodextrin. Participants swished the solutions in their mouths for ten seconds and rested for an additional ten seconds before exercise. During the exercise bout, participants completed ten vertical jumps with maximum explosive intent separated by five seconds of rest between each jump. A linear position transducer was used to assess jump height, power, and velocity measures. Average peak power, peak velocity, and jump height over the ten jumps were analyzed.

RESULTS: Compared to placebo, no significant differences were found for peak power, peak velocity, or jump height between the 6% or 18% CHO conditions ($p>0.05$). Additionally, no differences were found for any performance measures when comparing 6% to 18% CHO ($p>0.05$).

CONCLUSIONS: Findings do not support the use of CHO mouth rinse for improving explosive exercise performance and varying CHO mouth rinse concentrations appear not to change efficacy.

P225 EFFECTS OF CURCUMIN AND FENUGREEK ON THE PHYSICAL WORKING CAPACITY AT THE FATIGUE THRESHOLD

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BACKGROUND: Curcumin, a polyphenol, has been suggested to improve metabolic byproduct clearance and increase nitric oxide production in working muscle. These purported effects may delay neuromuscular fatigue. This study examined the effects of a curcumin and fenugreek soluble fiber supplement (CurQfen[®]) on the physical working capacity at the fatigue threshold (PWC_{FT}), an electromyographic (EMG) technique that estimates the highest power output that can be maintained without evidence of neuromuscular fatigue.

METHODS: Forty-seven untrained, college aged subjects were randomly assigned to one of three supplementation groups; placebo (PLA, $n=15$), CurQfen[®] (500 mg/day, $n=18$), or fenugreek soluble fiber (60 mg/day, FEN, $n=14$). All subjects completed a maximal graded exercise test on a cycle ergometer to determine the PWC_{FT} before (PRE) and after (POST) 28 days of daily supplementation. Surface EMG signals were recorded from a bipolar electrode arrangement on the vastus lateralis of the right leg during each test. A one-way ANCOVA was used to determine if there were between group differences for adjusted POST PWC_{FT} values, with the PRE PWC_{FT} as the covariate.

RESULTS: The adjusted POST PWC_{FT} for the CurQfen[®] group (mean ±SD: 195.95 ±58.41W) was greater than ($p= 0.016$) the PLA (168.154 ±49.25W) group, but the FEN (184.68 ±31.53W) was not different than the CurQfen[®] or PLA ($p>0.05$).

CONCLUSIONS: These findings suggested curcumin and fenugreek may work synergistically to delay neuromuscular fatigue in untrained subjects.

P226 HYDRATION STATUS OF FEMALE SOCCER PLAYERS

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BACKGROUND: Hydration plays a pivotal role in sports and inadequate hydration can impart detrimental effects on performance. Soccer is a team sport in which the integrity of all players is vital for success; thus, individual player hydration is important. Most studies however monitor only acute hydration status, few monitor more realistic, extended periods (>7days). The purpose of this study was to monitor the hydration status of female soccer players over consecutive training/match days, and to identify any relationship between pre-training hydration and fluid intake.

METHODS: Sixteen female players (20.4 ± 0.8 years) provided urine samples over 9 days, and hydration was determined by urine specific gravity (U_{sg}) upon waking (AM) and pre-practice/game (PM). Players also completed a beverage consumption questionnaire (BEVQ) to determine fluid intake. General linear mixed model and Pearson correlation coefficient were used for statistical analysis. Significance was accepted at $p < 0.05$.

RESULTS: On 5 out of the 9 days, 100% of players were at least minimally hypohydrated ($U_{sg} > 1.010$) in the AM. The highest incidence of significant or severe hypohydration in the AM and PM was 87% and 63%, respectively. Players had significantly higher U_{sg} values in the morning (AM) vs. the afternoon (PM) ($p < 0.05$). There was a negative relationship between BEVQ total fluid and mean U_{sg} ($r = -0.60$, $p < 0.05$).

CONCLUSIONS: Data show a high prevalence of hypohydration in this specific population. This sub-optimal hydration status could be a cause for concern in terms of player health and performance.

P227 ASSOCIATIONS BETWEEN PHYSICAL ACTIVITY AND URINE OSMOLALITY IN THE UNITED STATES POPULATION

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BACKGROUND: The purpose of this study was to analyze the associations between physical activity (PA) categories and urine osmolality, which is often used as a practical assessment of hydration status in large populations.

METHODS: The data of 7,421 adults from the 2009-2012 National Health and Nutrition Examination Survey (NHANES) were analyzed. Freezing-point depression osmometry was used to determine urine osmolality and individuals were classified as having high or low urine osmolality based on an age-specific equation. Participants were also categorized into PA variables based on whether they reported to perform vigorous activity (yes vs. no) and by total MET-minute tertile (low, medium, high). Logistic regressions were used to assess the associations between PA and urine osmolality category. The models were adjusted for confounders including age, gender, race/ethnicity, education, body mass index, alcohol consumption, and intakes of moisture, protein, sodium, and potassium.

RESULTS: Participants in the high total MET-minute tertile were more likely to be in the high urine osmolality category compared to the low activity tertile (odds ratio [OR]: 1.27; 95% confidence interval [CI]: 1.06-1.53), and the OR changed to 1.31 (95% CI: 1.07, 1.60) after adjustment. There was no significant difference in likelihood of high urine osmolality when comparing the low and medium tertiles. Additionally, participants who performed vigorous activity were more likely to have high urine osmolality compared than those who did not perform vigorous PA (OR: 1.21; 95% CI: 1.04, 1.41), and the OR remained essentially the same after adjustment (1.20; 95% CI: 1.02, 1.41).

CONCLUSIONS: Participants that reported performing vigorous intensity or large quantities of PA were more likely to have high urine osmolality, which is associated with hypohydration. However, the ORs were small, suggesting that physical activity is only a weak predictor of high urine osmolality in the general population.

P228 ASSOCIATION BETWEEN FREE-LIVING WEEKDAY 24-HOUR URINARY HYDRATION MARKERS AND WEEKEND SLEEP MEASURES

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BACKGROUND: Inadequate sleep and underhydration have been independently associated with adverse health outcomes. However, the relation between hydration status and sleep has yet to be investigated over the course of several days in young adults. Thus, the purpose of this study was to assess the association between 24h urinary hydration markers and both perceived and objective sleep quality.

METHODS: Eighteen participants (female, n=7; age, 23±3; height, 174.6±15.3cm; body mass, 73.5±15.9kg; body fat, 19.4± 9.4%) provided a 24h urine sample on seven consecutive days for measures of urine volume (U_{VOL}), urine osmolality (U_{OSMO}), urine specific gravity (U_{SG}) and urine color (U_{COL}). Objective sleep metrics (wrist-worn actigraphy) and subjective sleep assessments (Karolinska Sleep Diary) were recorded each day. Actigraph measures included periods of wakefulness after defined sleep onset (WASO), sleep time, wake time, and sleep efficiency. The Karolinska Sleep Diary included nine questions used to assess perceived sleep quality from the previous night. Mean values were calculated for each participant for all variables on weekdays (Monday-Friday) and weekend days (Saturday/Sunday).

RESULTS: Higher weekday U_{SG} and darker U_{COL} were both associated with greater weekend time spent sleeping (U_{SG} , adj $R^2 = 0.203$, $p = 0.024$; U_{COL} , adj $R^2 = 0.274$, $p = 0.015$). Decreased weekday U_{VOL} was associated with increased weekend time spent sleeping (adj $R^2 = 0.220$, $p = 0.028$). Higher weekday U_{OSMO} was associated with greater weekend WASO actigraph measures (adj $R^2 = 0.205$, $p = 0.045$).

CONCLUSIONS: Mean 24-hour urinary hydration markers depicting a state of underhydration (elevated U_{SG} and reduced U_{VOL}) across weekdays were associated with an increased number of awakenings during the weekend nights, albeit, having a longer sleep time. Determining how day-to-day variations in hydration status and other general health behaviors influence sleep has yet to be explained.

P229 AVERAGE PHYSICAL ACTIVITY LEVEL OF PRESCHOOLERS PARTICIPATING IN ALL-DAY CAMPS

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BACKGROUND: National surveys report that total physical activity (PA) has decreased in children as young as preschool-age. The purpose of this study was to investigate the (PA) and energy expenditure of 3-4 year old children participating in four 6-hour long day camps at the Diet and Nutrition (DAN) laboratory with free play and structured PA periods.

METHODS: The DAN laboratory is a research facility specifically designed to measure children's diets and activity in a highly controlled laboratory setting. For this study, 25 children were recruited from the local community to participate in four all-day camps, which included at least 120 minutes of free play and two 30-minute sessions of directed PA games per day. Only approximately 5 minutes of screen time were scheduled (to settle before lunch); no TV, tablets or other devices encouraging sedentary time were present. *ActiGraph GT3x+* placed on children's left hip to collect PA data. Average time spent in sedentary, light, moderate, and vigorous activity levels were calculated using *ActiLife* software; PA kilocalories (kcal) were obtained. Children were classified based on the amount of time spent in MVPA (60+ min, 30-60min, and less than 30min.) according to guidelines by the National Association for Sport and Physical Education.

RESULTS: Only 22 children (mean age 48 months, 60% male) completed at least two camp days, wore their accelerometer for the entire camp day (45 full camp days were recorded from n=19 children), and were included in this analysis. Results showed that, on average, PA related energy expended was 103.8 kcal/d and children spent 61.5±0.1% in sedentary, 28.5±0.1% in light, 6.7±0.1% in moderate, and 3.4±0.01% in vigorous activity levels; only 9% of the children met the minimum PA guideline of 60 minutes/d.

CONCLUSIONS: This study shows that preschool-age children spent only a small proportion of time being physically active, even when in an environment that promotes PA and includes directed active time. Our findings indicate a need to explore the underlying factors of preferring sedentary time at a very early age and how behavior change can be implemented to achieve higher average PA levels.

P230 THE INFLUENCE OF BODY COMPOSITION AND DIETARY INTAKE ON BIOMARKERS IN FEMALE BALLET DANCERS

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BACKGROUND: Low body fat percentage (%BF) and caloric intake may be associated with hormonal disruptions and adverse health effects in athletes. The purpose of this study was to assess relationships between body composition (BC), dietary intake, and hormonal disruptions in female ballet dancers with self-reported oligomenorrhea.

METHODS: Female ballet dancers (N=7; M_{age}=15.8±1.4y; M_{BMI}=18.8±1.5kg/m²) underwent BC testing to determine %BF and fat-free mass (FFM). Blood was drawn and analyzed for lipids (total cholesterol [TC], LDL, HDL, triglycerides [TG]), thyroid markers (thyroid-stimulating hormone [TSH], T3, T4), and adipokines (leptin [LEP], adiponectin [APN]). Five-day diet logs were recorded to determine energy (kcal) and macronutrient (CHO, PRO, fat) intake relative to body mass (kg). Pearson product correlations (r) were used to determine relationships between BC, biomarkers, and diet. Significance was set at P<0.05.

RESULTS: While BC did not significantly correlate with lipid markers, FFM correlated with T₃ (r=-0.85; P<0.05), and the relationship with APN trended towards significance (r=0.93; P=0.07). Kcal/kg was positively correlated with TC (r=0.82), and CHO/kg positively correlated with TG (r=0.91) (P<0.05). Correlations between CHO/kg and both LEP (r=0.83) and APN (r=-0.93) approached significance (P<0.10), while PRO/kg negatively correlated with TSH (r=-0.91; P<0.01). Fat/kg correlated positively with TC (r=0.76; P<0.05), and correlations with LDL (r=0.59) and T₄ (r=-0.67) approached significance (P<0.10).

CONCLUSIONS: Energy and macronutrient intake, rather than BC measures, appear to have greater associations to blood lipids levels, indicating dietary intake may play a larger role in augmenting lipid status and metabolism in this population. Additionally, increased PRO intake may play a unique role in overall metabolic status, suggested by the negative correlations with TSH. However, more research is needed to determine the influences of both energy intake and BC on menstrual status in this population. These findings warrant future investigations into dietary interventions designed to improve overall metabolism and health in ballerinas.

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P231 CAFFEINE INFLUENCES VOLUNTARY ACTIVATION BUT NOT TWITCH PROPERTIES

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BACKGROUND: Caffeine has been reported to have both central and peripheral effects. However, it is unclear whether this response is influenced by genetics. The purpose of this study was to examine the influences of CYP1A2 genotype on acute responses to caffeine.

METHODS: Thirty-nine recreationally active males (Age: 23±3 yrs; Height: 177.9±6.2 cm; Weight: 89.1±13.5 kg; Caffeine Intake: 280.3±274.3 mg/day) were genotyped for C>A-183 polymorphisms of CYP1A2 as either AA (n=23) or AC/CC (n=16) via saliva sample. Percent voluntary activation (%VA) and evoked doublet twitch torque (PTT) of right knee extensors were measured pre- and 1-hour post-consumption of either caffeine (CAF; 6 mg/kg/bw) or placebo (PLA). For all testing, subjects were seated in an isokinetic dynamometer. PTT and %VA were assessed via the interpolated twitch technique (ITT), where a maximal doublet stimulus was delivered prior to, during, and 3-5 seconds after a maximal isometric contraction. Two separate 2 (CAF vs. PLA) X 2 (Pre vs. Post) X 2 (AA vs. AC/CC) repeated measures ANOVAs were utilized to examine potential differences in %VA and PTT. Paired samples t-tests were utilized to examine any interaction or main effects.

RESULTS: No significant 3-way interaction were found for %VA (p=0.580) or PTT (p=0.939). Post-hoc t-tests revealed a significant Condition X Time interaction for %VA (p=0.019). Post-hoc analyses revealed significantly lower %VA Post PLA when compared to Post CAF (p=0.030; Post PLA: 93.2 ± 5.7%; Post CAF: 95.4 ± 2.8%). There was a significant main effect for Condition (p=0.034) and Time (p<0.001) for PTT. Post-hoc analyses revealed significantly greater PTT during CAF, when compared to PLA (p=0.008; CAF: 54.0 ± 12.6 N·m; PLA: 50.2 ± 10.8 N·m), as well as significantly greater PTT at POST when compared to PRE (p=<0.001; Pre: 53.4 ± 11.6 N·m; Post: 48.6 ± 12.4 N·m). No other significant interaction or main effects were found for %VA (p=0.290-0.844) or PTT (p=0.087-0.886).

CONCLUSIONS: The results of the present investigation suggest that caffeine may influence central but not peripheral factors. Additionally, the influence of CYP1A2 polymorphism remains unclear.

P232 IMPROVED CYCLING EFFICIENCY FOLLOWING BEETROOT JUICE INTAKE NOT DUE TO CHANGES IN MUSCLE OXYGEN SATURATION

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BACKGROUND: Beetroot Juice (BRJ) has consistently shown to lower oxygen uptake (VO₂) during submaximal exercise. While the precise mechanisms responsible for these improvements remain to be determined, it is often presumed that dietary nitrate found within BRJ increases nitric oxide (NO) mediated regulation of blood flow and oxygen delivery. However, a number of studies have also demonstrated that NO may mediate oxygen utilization within skeletal muscle. The purpose of this study was to determine if acute BRJ intake would reduce the VO₂ during submaximal cycling, and assess if these changes were due to changes in muscle oxygenation.

METHODS: 16 sedentary individuals with obesity were recruited for this randomized crossover study where participants were assigned to each of the following conditions Placebo, BRJ, NaNO₃, and Control separated by at least 72 hours. Near Infrared Spectroscopy (NIRS) was used to assess oxygen saturation in the gastrocnemius during a five-minute bout of submaximal cycling at 90% of the gas exchange thresholds (GET).

RESULTS: A significant main effect was observed for submaximal exercise VO₂ (P=0.021). Post hoc analyses demonstrated a lower VO₂ during submaximal exercise in BRJ compared to placebo (P=0.009) and nitrate alone (P=0.024). No significant changes were observed between conditions for skeletal muscle tissue oxygen saturation.

CONCLUSIONS: In this analysis, individuals who had consumed BRJ improved efficiency by reducing VO₂ during submaximal cycling, however, this was not due to any changes in oxygen utilization within skeletal muscle.

P233 MORINGA OLEIFERA AS A POTENTIAL ERGOGENIC AID IN SKELETAL MUSCLE

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BACKGROUND: Recent estimates suggest that 7% of Americans use plant-derived nutritional supplements to treat a variety of complications and/or to improve athletic performance. For example, *Moringa oleifera* (MO) is a subtropical plant cultivated primarily in Africa, Southeast Asia, the Caribbean Islands, and South America and is routinely used to treat inflammation, diabetes, obesity, cancer, and HIV. The mechanism of action of MO has not been fully elucidated, but existing data suggest it may improve oxidative capacity. Thus, the purpose of this study was to evaluate the role of MO as a novel ergogenic aid to improve exercise performance by driving peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC-1α)-dependent signaling pathways implicated in mitochondrial biogenesis and oxidative metabolism in skeletal muscle tissue.

METHODS: Adult male C57BL/6 mice were treated with 1.0 g of MO (N = 20) or vehicle control (N = 20) for a total of 5 weeks. Following 3 weeks of supplementation, half of each group was given access to running wheels every night for 2 weeks, distances ran were recorded daily. After treatment protocols were complete, the gastrocnemius muscles were excised and assayed for known markers of mitochondrial biogenesis, angiogenesis, endurance capacity, and capillary density using immunohistochemistry and RT-PCR.

RESULTS: Our results showed a significant increase in average distance run in the MO and MO + running groups. Furthermore, there was an increase in vascular endothelial growth factor (VEGF), phosphorylatable myosin light chain (MYLPP), and phosphoglycerate mutase 1 (PGAM-1) in the MO treated groups compared to control.

CONCLUSIONS: This data suggests that MO has the potential to be an ergogenic aid via increasing energy metabolism in adult skeletal muscle by increasing markers of glycolysis, mitochondrial biogenesis, and angiogenesis.

P234 TOO BUSY TO EXERCISE: EXAMINING PREGNANT WOMEN'S EXERCISE PREFERENCES

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BACKGROUND: Gestational diabetes mellitus (GDM) is diagnosed between 24 and 28 weeks of pregnancy and can usually be managed by healthy diet and exercise. There is currently a *lack* of clinical consensus regarding exercise prescription for GDM management. The current study aimed to elicit thoughts and feelings about exercise in women with GDM to inform the development of behavioral exercise intervention.

METHODS: The research team conducted 20-minute semi-structured interviews with 15 participants. Interview questions were on the description of a typical day, opportunities to engage in exercise, challenges to exercising during pregnancy, exercise preferences during pregnancy, and thoughts about the use of a FitBit to track steps. Interviews were audio-recorded and transcribed using InqScribe v. 2.2.4. (Inquirium, 202). Transcripts were analyzed using descriptive and interpretive coding to identify themes, including analysis of similarities and differences between the women.

RESULTS: The participants varied by marital status, employment status, and family size (i.e., having one or more children in their care). Most of the participants reflected on the complexity of their lives, especially if they were employed and had other children to care for, making exercise difficult. Some of the women suggested that they were already active due to all they did throughout the day though not necessarily engaging in structured exercise. Most expressed motivation for better health and the health of their unborn child.

CONCLUSIONS: Anything that simplifies exercise, is convenient, or imparts flexibility is key in the development of an exercise intervention for women with GDM.

P235 EFFECT OF DYNAMINE WITH AND WITHOUT TEACRINE SUPPLEMENTATION OVER FOUR WEEKS ON BLOOD BIOMARKERS

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BACKGROUND: Methylxanthine (Dynamine; DYM) and theacrine (Teacrine; TCR) are purine alkaloids. Previous research on TCR reported increases in feelings of energy, focus, and concentration, and decreases in fatigue. The purpose of this study was to examine the effect of four weeks of DYM with and without TCR on blood biomarkers.

METHODS: One-hundred twenty-five men (n=60) and women (n=65) were assigned to one of five groups: 100 mg DYM, 150mg DYM, 100mg DYM + 50mg TCR, 150mg DYM + 25mg TCR, and 125mg maltodextrin. Participants visited the laboratory fasted on two occasions (V1 and V2), separated by four weeks of supplementation, for a blood draw. Blood was analyzed by an independent third-party (i.e. LabCorp). Three-way repeated measure analyses of variance were performed for all blood biomarkers.

RESULTS: Group x sex x time interactions ($p < 0.05$) with post-hoc analyses revealed differences for mean corpuscular hemoglobin (MCH) concentration. Group x time interactions ($p < 0.05$) with post-hoc analyses revealed differences for platelets, blood urea nitrogen, total globulins, alanine transaminase, total proteins, triglycerides, and high-density lipoproteins. Significant main effects for time were also observed. Specifically, increases in mean corpuscular volume, MCH, basophils, absolute eosinophils, creatinine, and high-density lipoproteins from V1 to V2, while decreases in glomerular filtration rate, chloride, carbon dioxide, bilirubin, and alanine transaminase were seen. While small changes were found for some biomarkers, values remained within normal clinical limits.

CONCLUSIONS: This suggests that DYM alone or in combination with TCR consumed at the dosages used in this study does not appear to negatively impact blood biomarkers associated with health. Compound Solutions, Inc. grant

P236 IMPACT OF CAMARADERIE BASED EXERCISE ON ANXIETY, DEPRESSION AND PAIN AMONG COMBAT VETERANS

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BACKGROUND: Suicide was the 9th-leading cause of death in the U.S. in 2017. Veterans are 22 percent more likely to commit suicide than those in the general population. Reducing veteran suicide is a top priority for the Department of Veterans Affairs. Anxiety, depression and chronic pain are predictive of suicide among veterans. Exercise has been shown to reduce these symptoms. Camaraderie has also been shown to be an important factor in mitigating suicidal tendencies among veterans. The purpose of this study was to pilot test a camaraderie-based exercise intervention aimed at reducing anxiety, depression, and pain among combat veterans.

METHODS: A small sample of combat veterans (n=5) were recruited and met the study's inclusion criteria. A single-group, pre-post, quasi-experimental design was used to measure acute impact of a Camaraderie Based Exercise Event (CBEE) on symptoms of anxiety, depression and pain. Previously validated scales were used to measure the three outcome variables. Anxiety was measured using the 7-item, (GAD-7). Depression was measured using the Patient Health 9-item questionnaire, (PHQ-9). Pain was measured using the Universal Pain Assessment Tool (UPAT). The CBEE was a 5-kilometer, multi-obstacle mud run. Descriptive statistics were used to compare pre-post mean values across the three mental health scales.

RESULTS: Mean depression scores were reduced from 7.8 (SD 6.71) to 1.8 (SD 2.49) from pre-post, respectively. Mean anxiety scores were reduced from 9.0 (SD 8.31) to 2.8 (SD 2.2) pre-post, respectively. Mean pain scores remained largely unchanged at 2.4 (SD 1.82) pre-intervention, and 2.6 (SD 1.52) post-intervention.

CONCLUSIONS: Results from this pilot study show that CBEE may be a promising means for acutely reducing symptoms of anxiety and depression among combat veterans. Follow up studies with larger sample sizes are needed to further investigate the relationship between CBEE and acute and chronic symptoms of anxiety and depression, and subsequently, veteran suicide.

P237 DO RACE, PHYSICAL ACTIVITY, BODY MASS INDEX, AND SLEEP QUALITY AFFECT MENTAL TOUGHNESS

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BACKGROUND: Physical activity (PA) has been linked to health and quality of life benefits. Differences in race and body mass index (BMI) may contribute to health-related disparities. Sleep quality (SQ) has been associated with both PA and health, influencing each other in a two-way interaction. Variations in PA are linked to differences in mental toughness (MT). MT is linked to lower SQ and increased PA, but the influence of race and BMI on MT is still under investigation. The purpose of this study was to characterize the association and the effects of PA, race, BMI, and SQ on MT.

METHODS: Sixty-two participants (age 25.4 ± 6.0 SD) completed surveys related to PA, race, BMI, SQ, and MT. Main and interaction effects of the responses analyzed using factorial ANOVA. Significance was set at $p < 0.05$. All analyses were performed using SPSS[®].

RESULTS: PA was positive correlated ($r = .246, p = .027$) and SQ was negatively associated with MT ($r = -.470, p = .000$). Race was negatively associated with MT ($r = -.234, p = .033$). SQ had a main effect on MT ($F_{31,1} = 18.568, p = .000, \eta^2 = .382$). PA and BMI interaction had an effect on MT ($F_{31,2} = 5.572, p = .009, \eta^2 = .271$). The interaction of race and BMI had an effect on MT ($F_{31,4} = 2.805, p = .043, \eta^2 = .272$).

CONCLUSIONS: As previously reported, poor quality sleepers are mentally tougher compared to good quality sleepers. When PA and BMI are combined, PA and overweight individuals are mentally tougher, followed by the non-PA and underweight ones. When race and BMI are combined, White-overweight and other-normal BMI individuals are the mentally toughest. Followed by Hispanic-overweight, and Asian underweight and obese I, II, III, with African Americans underweight and overweight having similar values. Health care professionals may find this information valuable when they are trying to address health-related issues that pertain to race, PA, BMI, SQ, and MT.

P238 LAW ENFORCEMENT AND FIREFIGHTERS PHYSICAL ACTIVITY STUDY

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BACKGROUND: Law enforcement and firefighters serve a vital role in maintaining the safety and order in our communities. The stressful nature of their jobs can have a negative effect on their physical, mental, and occupational health. Therefore, the purpose of this study was to examine the correlational relationships between physical activity levels and measures of physical, mental, and occupational health in firefighters and law enforcement officers.

METHODS: Law enforcement officers and firefighters ($n = 22$) were assessed for physical activity via the Fitbit Flex activity tracker over a 7-day period and the International Physical Activity Questionnaire Long-Form (IPAQ). Physical, mental, and occupational measures of health were assessed via online questionnaires. Pearson correlations were used to determine the relationship between these measures of health.

RESULTS: Total number of steps among both occupations had a weak negative correlation with compassion fatigue ($r = -.18$), burnout ($r = -.28$), depersonalization ($r = -.09$) and PSQI ($r = -.14$). MVPA (IPAQ) had a weak negative correlation with compassion fatigue ($r = -.08$), depersonalization ($r = -.04$), SF-12 ($r = -.18$) but moderate, negative correlation with fatigue ($r = -.48$).

CONCLUSIONS: Although weak non-significant correlations, this provides evidence that there is an association between steps and MVPA with different mental and occupational health measures, notably fatigue. The stressors that come along with both occupations can have a negative impact on their physical, mental and occupational health which makes it critical to examine solutions to help alleviate stressors.

P239 PHYSICAL ACTIVITY IN YOUNG ADULTS PREDICTS INTERNALIZING, BUT NOT EXTERNALIZING, BEHAVIORS

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BACKGROUND: Previous work demonstrates a small-to-moderate cross-sectional association between physical activity and internalizing disorders, such as depression and anxiety. However, few studies have examined the association between physical activity and externalizing disorders. The goal of the current study was to evaluate whether self-reported internalizing and/or externalizing behaviors are predictive of self-reported physical activity in young adults.

METHODS: A total of 969 participants (519 women), ages 18 - 25, completed the International Physical Activity Questionnaire (IPAQ) short form and the Achenbach Adult Self Report (ASR). We calculated total physical activity (MET-minutes/week) and ASR t-scores for internalizing and externalizing behaviors. We used hierarchical regression to determine whether internalizing and externalizing contribute to the prediction of physical activity.

RESULTS: Internalizing was entered at Stage one and Externalizing was entered at Stage two. The results revealed that at Stage one, internalizing contributed significantly to the regression model, and accounted for 10% of the variance in self-reported physical activity. Adding externalizing to the model explained less than 1% of the variance and the R^2 change was not significant. Next, we reversed the order of the predictors in the model. The regression revealed that at Stage one, externalizing did not contribute to the regression model and accounted for 1% of the variability in physical activity. Adding internalizing to the model explained an additional 10% of the variance and the R^2 change was significant.

CONCLUSIONS: The current work suggests that internalizing, but not externalizing, predicts physical activity. Notably however, internalizing only explained a small percent of the variance, which suggests that other health and lifestyle factors influence total physical activity.

P240 IF YOU OFFER IT, WILL THEY EXERCISE? INVESTIGATING THE IMPACT OF ATLANTA BELTLINE FITNESS CLASSES

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BACKGROUND: The Atlanta BeltLine consists of 22 miles of multi-use trails that connects 7 parks around the city. In 2018, the BeltLine Partnership offered over 2,350 free health and fitness classes. The purpose of this cross-sectional study was to investigate the relationship between fitness class attendance and self-reported exercise behavior based on residential proximity to the trail.

METHODS: Eligible participants were sent a link to the informed consent and survey through the BeltLine listserv ($N = 12,659$) and on social media. The survey consisted of demographic questions, and the Godin Leisure-Time Exercise Questionnaire that measured participation in moderate and vigorous exercise before and after fitness class attendance.

RESULTS: Although 391 adults consented (3.1% = response rate), only 148 provided adequate data. Participants were 41.1 years old (± 11.9) and were mostly Non-Hispanic (70.3%), White (34.5%) and Non-White (39.9%), females (62.8%). They traveled 5.7 miles (± 7.6) to attend a fitness class. Participants were grouped by trail proximity (Median = 3.0), and compared on exercise behavior before and after fitness class attendance. Groups did not differ on age, gender, or ethnicity, but White adults were more likely to live near the BeltLine than Non-White adults, $\chi^2(1, N = 95) = 11.9, p = .001$. Independent samples t -tests revealed significant group differences for exercise behavior before, $t(94) = 2.7, p = .008, 95\% CI(4.8, 32.2), d = 0.55$, and after fitness class attendance, $t(94) = 2.5, p = .013, 95\% CI(3.8, 31.4), d = 0.51$. Participants who lived near the trail (Range = 0.0-3.0 miles) reported greater exercise behavior before and after fitness class attendance (before = 50.7 METs/week ± 38.0 ; after = 57.4 METs/week ± 38.5) than those who lived further away (Range = 4.0-45.0 miles; before = 32.2 MET/week ± 27.6 ; after = 39.7 MET/week ± 28.0).

CONCLUSIONS: Despite offering free fitness classes to promote exercise behavior, reach was limited to participants with convenient access to the trail, which included a greater proportion of White adults. Although generalizability of these findings to all BeltLine users may be limited, future research should investigate how experiences differ based on trail proximity and how programming can rectify those differences.

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P241 BUMP SET SPIKE RECREATIONAL VOLLEYBALL TO LIFT AFFECT AND ENJOYMENT

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BACKGROUND: Current literature has highlighted an overwhelming number of Americans receiving little to no planned physical activity, and obesity rates have been increasing exponentially over recent years. The most common reasons for failure to adopt/adhere to exercise programs include lack of time and enjoyment. While recent literature has highlighted the beneficial effects of high-intensity interval training to reduce exercise time, less emphasis has been given to enjoyment; specifically alternative exercise modes besides traditional cardio and weight training. Examine the acute effects of playing three sets of recreational volleyball on affective valence and enjoyment.

METHODS: Participants [$N = 24, 6$ females; age ($M \pm SD$); 29.0 ± 6.8 yrs; BMI ($M \pm SD$); 24.0 ± 4.1] played three sets of recreational volleyball (i.e., 3 games to 21pts, rally scoring). Affective valence (Feeling Scale: FS) and perceived exertion (RPE) were assessed before, immediately and 10-min after, while enjoyment (PACES) was assessed immediately after completion of three sets. Data was analyzed with SPSS 24.0.0, utilizing repeated measures analysis of differences for main outcome measures.

RESULTS: Participants reported significantly more exertion immediately following exercise ($M_{diff} \pm SE$); 8.0 ± 0.38 [Cohen's $d = 5.15$], that remained elevated after 10 minutes of rest [Cohen's $d = 2.24$]. FS was significantly increased immediately following exercise ($M_{diff} \pm SE$); 1.29 ± 0.43 [Cohen's $d = .93$], and remained elevated after 10 minutes of rest [Cohen's $d = .60$]. Finally, PACES scores range from 18-126, with present scores ranging from 92-126 ($M \pm SD$); 113.0 ± 10.6 .

CONCLUSIONS: Playing 3 sets of recreational volleyball was sufficient to significantly increase RPE while also increasing FS values. Importantly, FS did not decrease immediately after exercise and at no point did participants report negative affect. Additionally, enjoyment levels were very high. This study provides evidence to support the use of sport/alternative modes of exercise to increase exercise enjoyment and post exercise affective valence. Future work needs to focus on the physiological adaptations of recreational sport under the umbrella of maximizing physiological and psychological benefits of exercise.

P242 RANDOMIZED CROSSOVER TRIAL EXAMINING THE EFFECTS OF NATURAL FREQUENCY TECHNOLOGY ON SLEEP

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BACKGROUND: Insomnia is the most common sleep disorder affecting about 50% of adults, and it is associated with sleep disturbances resulted in decreased mood and overall health. Natural Frequency Technology (NFT) that uses electromagnetic frequencies may provide a healthier alternative to improve insomnia symptoms than over-the-counter and prescription sleep aids. The study purpose was to conduct a four-week randomized double-blind placebo-controlled crossover trial on adults with insomnia symptoms to examine the efficacy of NFT on sleep quality, anxiety/stress levels, and mood.

METHODS: Adults ($N = 44$, M age = 41.9 years) with insomnia symptoms (i.e., scores of < 7 on the Insomnia Severity Index) were randomized to the Placebo Bracelet (PB) or Philip Stein Sleep Bracelet (SB) for two weeks and then the alternative bracelet for two weeks. The bracelets were identical except that the SB contained the NFT that is not recognizable. Participants wore the bracelet during their nighttime sleep. EMFIT Sleep trackers were used nightly to monitor physiological sleep quality. Self-reported mood (Profile of Mood States), anxiety (Trait Anxiety Inventory), stress (Perceived Stress Scale) and sleep quality (Pittsburgh Sleep Quality Index) were completed at Day 0 and following each condition. Tracker data were analyzed using RStudio. Change scores for the self-report assessments were compared using SPSS (Version 24) to determine condition differences via paired t-tests (p 's $< .05$).

RESULTS: When the participants wore the SB, compared to the PB, they had significantly improved sleep quality (e.g., REM, recovery sleep), anxiety, stress, and mood, p 's $< .05$. No adverse events were reported.

CONCLUSIONS: The SB was well-tolerated and may be a simple, noninvasive, and non-pharmacological intervention to improve sleep and mood. Future research should examine how NFT longitudinally impacts the physiology and pathways associated with sleep in a variety of populations and environments.

P243 SELECTIVE ATTENTION IS RESISTANT TO HIGH INTENSITY EXERCISE AND MUSICAL DISTRACTION.

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BACKGROUND: The effects of high-intensity exercise on cognitive performance are not fully understood. Music can affect physiological responses to exercise which may also affect cognitive performance. The aim of this study was to determine if music could impact cognitive performance after a bout of high-intensity interval exercise.

METHODS: Twelve subjects ($n = 7$ males, $n = 5$ females, 20.3 ± 1.7 y; 72.2 ± 14.9 kg; 1.70 ± 0.09 m) completed the Stroop test after a short (14 min) bout of high-intensity interval exercise while listening to either Classical, Rock, or No Music conditions. Subjects completed the Brunel Music Rating Inventory after listening to Classical or Rock music during a control (no exercise) session. The order of testing was randomized.

RESULTS: There was no significant difference in Stroop effect between musical conditions without exercise (No Music 166.6 ± 118.17 ms; Classical 138.42 ± 86 ms; Rock 139.67 ± 74.47 ms). There was no significant difference in Stroop effect between musical conditions with exercise (No Music 132.39 ± 88.93 ms; Classical 137.05 ± 61.74 ms; Rock 102.6 ± 83.1 ms). There was no significant difference in Stroop effect between control and exercise for the different music conditions. There was, however, a significant interaction effect of music and exercise on heart rate response ($p < 0.01$), with exercise HR being significantly lower during either musical condition (Classical [146.41 ± 12.59 ms], Rock [148.92 ± 12.30 ms]) than without music (151 ± 16.66 ms).

CONCLUSIONS: The results of the present study suggest that selective attention is resistant to the effects of a short high-intensity interval exercise bout and the distraction of either classical or rock music. The results also suggest that music may lower the average heart rate during high-intensity interval exercise.

P244 EXPLORING DIVISION I ATHLETES' AND ATHLETIC TRAINERS' EXPERIENCES WITH PSYCHOSOCIAL ASPECTS OF INJURY REHABILITATION

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BACKGROUND: One unique relationship that exists in athletics is between injured athletes and their athletic trainers (ATs). Athletes trust that ATs will help them recover as efficiently as possible so they can return to their sport safely. Due to this level of trust, athletes are likely to open up about their struggles, emotional challenges, and goals, which are important elements embedded within the field of sport psychology. Despite the prevalence of these elements, most ATs do not have the proper training to help athletes with the psychosocial aspect of their injuries, which may prevent them from treating athletes holistically. Therefore, the purpose of this study is to investigate the relationship between injured athletes and ATs to better understand how psychological factors might play a role in building the relationship and enhancing the rehabilitation process.

METHODS: A phenomenological qualitative approach was used to conduct this study. ATs ($n=8$) were recruited and then interviewed in a semi-structured format. The interviews were transcribed verbatim and then coded in order to find themes in the data.

RESULTS: Four higher order themes emerged, including wearing different hats, building relationships, psychological strategies for rehabilitation, and perceptions of sport psychology. The four higher order themes contained twelve lower order themes and twenty-four sub-themes.

CONCLUSIONS: While all participating ATs use sport psychology skills during rehabilitation, some were unaware. All participants were interested in further training in sport psychology because most believed it would benefit their athletes. Future research will explore the athlete perspective.

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P245 PATIENT-REPORTED OUTCOME USE IN A PHYSICAL FITNESS CHALLENGE TO EXPLORE HEALTH COMPONENTS

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BACKGROUND: Performing push-ups daily for 30-days may improve mental and physical health.

Purpose: The purpose of the study was to compare the mental and physical health components of the health-related quality of life (HRQoL) assessment tool before and after completing a rigorous physical fitness challenge (30-day pushup challenge).

METHODS: Participants of the study performed 100 push-ups a day in a specified time-period (45 minutes for females and 30 minutes for males) for 30 days. Twenty-four ($n=24$) college age students volunteered for the study. Participants underwent proper push-up form familiarization before starting the study. The study was approved by the Institutional Review Board at Treutt McConnell University. The Patient-Reported Outcomes Measurement Information System (PROMIS), known as the PROMIS Global-10, was used to measure both mental and physical health in response to the intervention. A baseline measure was recorded prior to initiating the fitness challenge. After 30 days, thirteen ($n=13$) participants completed the PROMIS Global-10 post-test.

RESULTS: A paired t-test was used for data analysis. Baseline measurements ($n=23$) reveal a mean \pm SD for PROMIS-Physical (54.7 ± 6.63) and PROMIS-Mental (55.5 ± 6.45) scores. Post-test results ($n=13$) reveal scores for the PROMIS-Physical (57.4 ± 5.54) and PROMIS-Mental (56.3 ± 8.26) after the intervention. No significant difference was found between before and after completing the 30-day push-up challenge in either mental or physical health. Mental health did not improve more than physical health during the intervention.

CONCLUSIONS: Anecdotal evidence suggesting drastic improvements in body composition may overestimate physical improvements. The 30-day pushup challenge did not significantly improve physical or mental health over the course of the study.

P246 INTEGRATING A PATIENT REPORTED OUTCOME INTO AN EXERCISE TRAINING PROGRAM DURING AN EMPLOYEE WELLNESS PROGRAM

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BACKGROUND: Mental and physical wellbeing may change during an 8-week exercise training program. **Purpose:** The purpose of this study is to examine if health components change during an 8-week intervention/exercise program in adult males and females as part of an employee wellness program. **METHODS:** A convenience sample of nine faculty/staff members (n=9) at Treutt McConnell University and community members of Cleveland, Georgia volunteered for the study. The study was approved by the Institutional Review Board at Treutt McConnell University. Mental and physical health was assessed before, during, and after the exercise program using the 12-Item Short Form Survey (SF-12) patient reported outcome. Participants met twice a week for an hour each session for 8 weeks with an exercise science major-student. Participants followed an exercise program that followed ACSM exercise prescription guidelines. **RESULTS:** Age of the participants mean SD during the study was (54.7 years 13.8 years). A higher score for mental or physical health represents better health. The mental health score at pre-test revealed a mean SD (57.5 3.64). The mental health at post-test revealed a mean SD (58.7 2.51). The mental health score at 8 weeks post-test revealed mean SD (57.9 3.32). The physical health at pre-test revealed a mean SD (48.4 8.66). The physical health at post-test revealed a mean SD (51.4 5.22). The physical health at 8 weeks post-test revealed a mean SD (51.2 3.43). A one-way ANOVA with Tukey's Honest Significant Difference (HSD) was used for data analysis. There were significant differences for both physical and mental scores. The scores were significant from pre- to post-test (mental score at 0.001 and physical score at 0.007). Mental health scores were significantly different from pre-test to 8-weeks post-test (0.004). **CONCLUSIONS:** The SF-12 results suggest that mental and physical health can improve during the course of an exercise program. There are residual effects found in physical and mental health scores up to 8 weeks after completing an exercise program.

P247 IMPACT OF A CONCEPTUALLY BASED PHYSICAL ACTIVITY COURSE ON COLLEGE STUDENTS' MENTAL HEALTH

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BACKGROUND: Mental health issues are significant in the college population and may impact students' overall quality of life and wellbeing. Physical activity has been demonstrated to improve mental health in a variety of populations, including college students. Therefore, the purpose was to examine the impact of a conceptually based physical activity course on college students' mental health. **METHODS:** Students enrolled in the 16-week course completed a pre and post survey which examined subjective physical activity levels, anxiety, depression, perceived stress, and quality of life. **RESULTS:** The undergraduate participants included (N = 142; 65.1% female; 73% Caucasian; 19.6 ± 1.2 years) 40% sophomores, 28% juniors, 16% freshman, and 14.8% seniors. The average BMI was 24.3 ± 5.5 kg/m². Participants scored towards the higher end of the Perceived Stress Scale (M = 30.0 ± 4.7; out of a total score of 40) and the Keyes' Mental Health Continuum (M = 62 ± 19.9; out of a total score of 70) while meeting the vigorous physical activity recommendations of 75 minutes per week (M = 79.4 ± 68.4 minutes). **CONCLUSIONS:** Results suggest undergraduates are reporting high levels of stress, anxiety, and depression occurrences despite meeting a component of the physical activity recommendations. Further examination, with a larger sample size, of the effect of a physical activity course on mental health is warranted.

P248 ENJOYMENT ASSESSMENT IN WOMEN WITH METABOLIC DISEASE AFTER AEROBIC AND RESISTANCE TRAINING PROGRAM

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BACKGROUND: Although exercise is associated with a host of health benefits, a majority of adult women fail to meet exercise guidelines. Adherence to exercise is associated with multiple factors, however enjoyment is consistently reported as barriers to exercise. The purpose of this study was to assess changes in exercise enjoyment for women with metabolic disease during a sprint interval training (SIT) and resistance training (RT) intervention. **METHODS:** 36 women (M = 40.41 ± 9.05 yrs) who had at least two factors for metabolic disease completed a SIT and RT intervention. The intervention was three times per week for 10 weeks for a total of 30 sessions. Enjoyment was assessed with the Physical Activity Enjoyment Scale once per week after SIT and RT separately. Potential scores for this questionnaire range from 18 to 126. **RESULTS:** A paired samples T-Test indicated that on average over the 10-weeks RT (100.1 ± 12.71) was significantly more enjoyable compared to SIT (92.78 ± 17.42; t = -2.790, p = 0.008). A RMANOVA examined differences in enjoyment for both RT and SIT at week 1, 5 and 10 by age and weight status (normal, overweight or obese). The results showed that there was no significant changes in enjoyment over the course of the 10-week intervention and enjoyment did not differ by weight status. There was a significant difference between age groups at week 5 for SIT with participants aged 20-30 (80.5 ± 8.62) reporting significantly lower enjoyment than the 41-50 (97.00 ± 20.07, p = 0.042), and 50+ group (101.1 ± 20.81, p = 0.034). A significant difference was found between the 20-30 (90.8 ± 14.48) year old group and the 31-40 (111.0 ± 16.48) year old group at week 10 for RT (p = 0.013). **CONCLUSIONS:** Identifying age appropriate exercises may be an important aspect to consider when designing exercise programs for an individual with metabolic disease. In the future it may be warranted to determine to what extent the factors for metabolic disease influence enjoyment.

P249 FRONTAL ASYMMETRY: A POTENTIALLY NOVEL BIOMARKER FOR SEDENTARY BEHAVIOR

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BACKGROUND: Consistent with other human behaviors, sedentary behavior appears to be modulated, at least in part, by emotional and motivational processes. Past research has found that various emotion and motivation interactions show different patterns of asymmetric frontal cortical activity (FCA). It is possible that the decision, motivation, or the intention to engage in sedentary behavior may depend on the FCA. However, FCA has yet to be investigated as a potential neurobiological marker to predict sedentary behavior. Therefore, the purpose of this study was to examine the relationship between sedentary behavior and resting frontal asymmetry using electroencephalography (EEG). **METHODS:** Forty-five college students participated in this study in exchange for partial course credit. A modified short version of the International Physical Activity Questionnaire was administered to determine habitual level of physical activity and sedentary time. Standard processing of EEG data was performed using BrainVision Analyzer software. Univariate correlation analyses were used to examine the relationship between frontal asymmetry and sedentary time. **RESULTS:** Average number of minutes spent sitting on a weekday (r(22) = -0.45, p = 0.027) and on a weekend day (r(22) = -0.55, p = 0.005) correlated with relative left frontal activity. **CONCLUSIONS:** To our knowledge, our data are the first to find a link between neurobiological markers of approach/avoidance motivation and sedentary activity, suggesting that reduced left frontal activity might be a novel neurophysiological marker for sedentary behavior.

P250 EXERCISE IS MEDICINE ON CAMPUS: A PILOT STUDY

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BACKGROUND: The primary objective of the project was to: a) test the effectiveness of the validated Exercise is Medicine® (EIM) program in a university setting and b) evaluate the treatment effectiveness of the EIM program by comparing the baseline levels of physical activity, mental health, and physical health with post-EIM levels of physical activity, mental health, and physical health.

METHODS: Referred and consenting students (n = 4) participated in a 12-week EIM program including bi-weekly exercise informational and training sessions. At pre- and post-program, participants completed measures of current health behaviors, obstacles to physical activity, health goals, physical activity history, biometric screening (resting heart rate, blood pressure, waist-to-hip ratio, body composition percentage via bioelectrical impedance, cardiovascular and muscular endurance baseline, and flexibility), perceived stress, and self-compassion.

RESULTS: All of the participants adhered to 100% of the program. Participants experienced a decrease in resting heart rate, body composition, and blood pressure, and an increase in sleep, physical activity, and self-compassion.

CONCLUSIONS: The Exercise is Medicine® program helped create a network of health promotion across campus through exercise prescription. The program will be implemented with a larger sample of referred students with the goal of reducing risk or prevalence of chronic disease.

P251 COMPARISON OF DUAL TASK COST DURING OVERGROUND WALKING IN PREGNANT WOMEN AND NON-PREGNANT CONTROLS

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BACKGROUND: Eighty-one percent of pregnant women report that their memory is impaired compared to non-pregnancy, but results of studies of cognitive abilities are mixed, with some showing worsened memory and others showing no difference in pregnant women and non-pregnant controls. Fall risk is also elevated during pregnancy due to an altered center of gravity. No research has examined the effect of pregnancy on a woman's ability to dual task, or perform a cognitive task with a motor task at the same time. Thus the purpose of this study was to examine the effect of walking over ground at a self-selected speed while also performing a thinking task on gait and cognitive performance during pregnancy.

METHODS: A total of n=14 women in their second trimester of pregnancy (mean 20.8±4.0 weeks pregnant, age 32.6±3.4 years old) and n=8 non-pregnant controls (age 31.3±4.1 years) were recruited to participate in this study. Participants performed a baseline walking gait analysis on a GaitRite gait analysis system and then performed four cognitive tests while walking: serial 1, 3, and 7 subtraction tests and a phoneme monitoring test where participants listened to a story and answered questions related to the content and also counted the frequency that two words appeared in the story. Each assessment lasted two minutes each, and participants completed the same four assessments while seated. The order of the testing was counterbalanced. Dual task cost (DTC) was calculated using the formula (Single task score - Dual task score)/Single task score*100. T-tests were used to compare the two groups.

RESULTS: Pregnant and control participants performed significantly better (p<0.05) while seated versus walking for serial 1 subtractions, but there were no other differences between seated and walking in either group. Both pregnant women and controls walked at slower velocity during phoneme monitoring and serial 7 subtractions compared to baseline (p<0.05).

CONCLUSIONS: There were no differences between pregnant women and controls in the dual task cost of walking or performing the cognitive tests, suggesting that pregnant women are not worse at dual tasking than non-pregnant controls. Further research should use a longitudinal design to examine changes in dual tasking ability across pregnancy and postpartum.

P252 MITOCHONDRIAL NETWORK DYNAMICS: BENEFITS OF A HIGH METABOLIC DEMAND (LACTATION) CONDITION IN RATS

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BACKGROUND: Mitochondria are dynamic, interconnected organelles that form a complex network that is regulated by processes such as fusion (merging of mitochondria), fission (splitting of mitochondria), and autophagy (removal of damaged mitochondria). Exercise increases calorie expenditure and imposes a metabolic challenge to the mitochondrial network that results in positive adaptations. Lactation/breastfeeding also imposes a high metabolic demand (~500 kcal/day) on the mother. Therefore, the purpose of this study was to investigate the short and long-term effects of lactation on markers of mitochondrial dynamics in the mother.

METHODS: Female rats (10 weeks old) were assigned to 1) nonreproductive, 2) reproductive without lactation (did not suckle their pups after birth), and 3) reproductive with lactation (suckled their pups for 21 days) groups. Half of the animals from each group were sacrificed at seven days post weaning and the other half were sacrificed twelve weeks post weaning; six groups of n=8/group. Markers of mitochondrial fusion and fission, and autophagy were measured in the liver via Western blots. A two-way ANOVA followed by a Tukey's post-hoc test (when significance was present) was performed. Statistical significance was established at $\alpha < 0.05$.

RESULTS: There were interactions for the two markers of mitochondrial fusion (Mfn2 (p=0.0011) and OPA1 (p=0.0260)). No changes (p>0.05) were observed for the mitochondrial fission marker Drp1. We also observed interactions for two markers of autophagy (LC3BII/LC3BI (p=0.0133) and Beclin1 (p=0.0002)).

CONCLUSIONS: Dysregulation of mitochondrial dynamics (e.g., reduced fusion and autophagy) have been reported in diseases, including type 2 diabetes. Our data indicate that lactation has rapid and persistent (seven days and twelve weeks post weaning; respectively) beneficial effects. In closing, our data provide additional support of the Stuebe and Rich-Edwards "reset hypothesis" which posits that lactation plays a central role in resetting maternal metabolism after pregnancy. Specifically, we show, for the first time, that the mitochondrial network is favorably adapted via the fusion and autophagy pathways. These data provide support for breastfeeding (high energy expenditure) in female reproductive health in a manner like exercise.

P253 CHALLENGES IN ALL-DAY PA MEASUREMENT IN PRESCHOOLERS: QUESTIONS TO ASK AND LESSONS LEARNED

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BACKGROUND: Objective measurement of physical activity (PA) is necessary to support appropriately designed crucially needed interventions to increase PA in very young children. To date, limited knowledge is available on how to increase preschooler's compliance of wearing PA measurement devices for prolonged periods of time. The purpose of this study was to explore this challenge in a sample of n=22 3-4 year olds participating in day camps.

METHODS: The Diet and Nutrition (DAN) laboratory is a research facility specifically designed to measure children's diets and activity in a highly controlled laboratory setting. For this study, 25 children were recruited to participate in four all-day camps (9:00 am to 3:00 pm). Upon arrival at the lab, *ActiGraph GT3x+* were secured to a flexible, colorful belt and placed to sit on the children's left hip to collect their PA data.

RESULTS: Only 22 children (mean age 48 months, 60% male) wore the accelerometer for the entire camp day, thus, due to additional missed study days, we were only able to collect total PA data on 71 camp-days from n=19 children. Overall, 86.4% of this group wore the accelerometers at least one full camp day, providing 63% of possible daily PA totals (22x4=88 days). The most common cause for non-compliance was refusal to wear the belt due to fear and discomfort. Of the children that did wear the accelerometer, many took them off periodically and played with them. Making up "hero stories" (where the belt gave the child special powers) and assistance from parents was successful in some, but not all children. Based on *ActiGraph* data, n=4 (9%) children met the guideline of at least 60 minutes in MVPA, n=25 (56%) were between 30 and 60 minutes, and n=16 (36%) were active less than 30 minutes.

CONCLUSIONS: Research in young children is challenging, especially objectively measuring PA, which seems to be limited to using methods that are associated with high levels of resistance. However, our results showed that most children did not meet PA recommendations, indicating the pivotal need to develop strategies to increase PA to support good health behaviors and prevent chronic diseases. In conclusion, while this work in young children is critical to help public health efforts, successful strategies to overcome the barriers of wearing measurement devices are needed.

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P254 INFLUENCE OF WINDOWING ON SHOULDER ISOKINETIC PEAK TORQUE, WORK AND RANGE OF MOTION

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BACKGROUND: Valid isokinetic measures requires attaining target test velocity. Windowing test data within certain percentages of the target velocity is one approach to avoid measurement artifacts when acceleration occurs; however, little objective rationale for the optimal window threshold exists. **PURPOSE:** To examine the effects of differing window thresholds on shoulder internal (IR) and external (ER) rotation isokinetic testing.

METHODS: Sixteen healthy, young adults (18 to 30 yrs) completed dominant shoulder IR and ER rotation isokinetic testing at 180°/s (Biodex, Shirley, NY) in both the traditional (90°abduction-90°elbow flexion) and modified positions (30°abduction-30°scaption-30°diagonal motion). Raw torque, angle and velocity data were processed using a custom program that computed average peak torque (PT), work, and range of motion (ROM) at 8 window thresholds: no window (NW), 70%, 75%, 80%, 85%, 90%, 95%, and 99% of target velocity. Using the values obtained with the 99% window as a reference, percent differences (PD) were computed for each window. As PD did not follow normal distributions, inferential statistics were not conducted. The average PD across all participants greater than 2% were considered clinically significant.

RESULTS: For ER in the modified position, both the 70% (2.2±4.3%) and NW (10.9±13.4%) had PT PD greater than 2%, whereas in the traditional position, only NW (6.2±8.8%) had PT PD greater than 2%. Except for NW (1.7±6.1%), the remainder of the windows for IR PT PD in both positions were less than 2%. PD for ER work were all greater than 2% for both the traditional (Range: 2.2 to 25.3%) and modified (Range: 4.5 to 50.4%) positions. In the traditional position, except for 90% (1.4±.5%), PD for IR work were all greater than 2% (Range: 2.75 to 14.1%). In the modified position, all PD for IR were greater than 2% (Range: 2.4 to 21.7%). For both positions, ROM PD were all greater than 2% (Range: 2.2 to 50%).

CONCLUSIONS: Windowing had less effects on average PT compared to work. As work is computed from torque and angular displacement, the potent window effects on ROM explains the work results. These results suggest using a 70% window when considering PT whereas a 99% window is recommended when assessing work.

P255 METABOLIC AND VENTILATORY RESPONSES DURING EXERCISE FOLLOWING ACUTE ELECTRONIC CIGARETTE USE

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BACKGROUND: Electronic cigarette (EC) use has been demonstrated to increase airway resistance, which may be detrimental to maximal expiratory flow. These parameters have important implications to cardiorespiratory function during exercise, where large expiratory air flow rates are required to meet the ventilatory and metabolic demands. Therefore, the purpose of this study was to investigate the acute effects of EC use on exercise tolerance and exertional dyspnea in young adults.

METHODS: Male participants (N=10; 21 ± 2 yr, 180.4 ± 8.1 cm, 84.9 ± 13.3 kg) visited the laboratory on three occasions to perform testing procedures. Subjects completed pulmonary function testing for screening and familiarization purposes during the initial visit. During the subsequent two visits, subjects inhaled from an EC with (EC+) or without (EC-; i.e., placebo) the nicotine cartridge in random order. Following the EC intervention, subjects completed an incremental exercise test to volitional exhaustion on a cycle ergometer. Metabolic, ventilatory, and perceptual parameters at maximal exercise were compared between EC+ and EC-.

RESULTS: Upon study entry, all subjects displayed pulmonary function above the lower limit of normal. Maximal oxygen consumption was not different between trials (EC+: 3.25 ± 0.39 L·min⁻¹; EC-: 3.22 ± 0.58 L·min⁻¹; p > 0.05). Minute ventilation and ratings of perceived breathlessness and exertion were unaffected due to acute EC use (p > 0.05). However, the ventilatory equivalent for CO₂ was significantly greater (EC+: 35.8 ± 1.9; EC-: 33.9 ± 2.5; p < 0.05) and the ventilatory equivalent for O₂ tended to be greater (EC+: 44.5 ± 3.3; EC-: 42.2 ± 3.9; p = 0.063) during EC+ compared with EC-.

CONCLUSIONS: It appears acute EC use does not alter cardiovascular responses at maximal exercise. Yet, acute EC use may serve as a ventilatory stimulant and increase the work of breathing during subsequent exercise.

P256 FUNCTIONAL CAPACITY OF PATIENTS ONE-YEAR POST CARDIAC REHABILITATION

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BACKGROUND: Cardiac rehabilitation (CR) improves functional capacity (FC), quality of life (QoL), psychosocial well-being, and reduces cardiovascular risk factors using lifestyle management strategies. Despite well known benefits, little is known about the long-term effects of CR on risk factor management and changes in FC following discharge. Therefore, the purpose of this retrospective cross-sectional investigation was to examine changes in 6-minute walk distance (6MWD) 11-15 months following CR.

METHODS: Patients referred to the UAB Cardiac Rehabilitation Program from 2016-2019 who completed 24-36 sessions and 6-minute walk tests (6MWT) at intake, discharge, and post-discharge were included in this pilot investigation. Twenty-two patients were included with the following CVD diagnoses: myocardial infarction, angina, PCI, CABS, or valve replacement. Repeated measures analysis of variance (ANOVA) was used to examine differences over time for 6MWD with least significance difference (LSD) post-hoc testing (SPSS, v25).

RESULTS: 6MWD increased by 30% from intake to discharge (388 ± 96 m to 504 ± 123 m, P < 0.0001). Post-discharge walking distance (519 ± 118 m) remained higher than intake (P < 0.0001) but was similar to discharge (P = 0.091). Body weight, waist circumference, systolic blood pressure (SBP), and diastolic blood pressure (DBP) all returned to baseline intake values post-discharge.

CONCLUSIONS: The results of this study suggest that CR may produce lifestyle and behavioral changes that promote long-term maintenance of FC. While an extensive examination of other risk factors was not performed, increases in body weight and blood pressure observed 11-15 months post-discharge are discouraging. A thorough examination of the long-term consequences of these findings with preserved FC will be needed to explore the interaction between FC and other risk factors as it relates to secondary prevention of CVD. **Sponsor:** UAB Departments of Human Studies and Cardiopulmonary Rehabilitation

TP1 STANDING BALANCE MUSCLE ACTIVATION AT THE ANKLE JOINT IS NOT ASSOCIATED WITH SLIP OUTCOMES

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BACKGROUND: Increased fall risk has been associated with declines in sensory system integrity. Previous research has suggested that decreased clinical balance scores were associated with more hazardous slips. However, muscle activity during standing balance has yet to be examined between individuals who fall or recover after a slip. Thus, the purpose of this study was to examine lower extremity muscle activity during quiet standing between individuals who fall, and recover, after an induced slip perturbation.

METHODS: One hundred participants completed this study. Standing postural control measures were recorded under six sensory conditions [eyes open, eyes closed, eyes open with sway referenced vision, eyes open with sway referenced support, eyes closed with sway referenced support, and eyes open with sway referenced vision and support. Surface EMG was recorded during balance testing from left leg musculature: tibialis anterior, and medial gastrocnemius. Raw EMG data were collected at 1,500 Hz, Band-pass filtered (20-250Hz) and rectified prior to analysis. Variables of interest were the mean muscle activity, and mean muscle activity normalized to maximal voluntary contractions. After postural control testing, participants completed slip testing including normal gait and an unexpected slip trial. The slip was classified as either a fall or recovery and muscle activity was examined between groups using independent t-tests, with an alpha level of 0.05.

RESULTS: After exclusions, the final analysis sample included 73 participants, with 48 trials classified as recoveries, and 25 trials classified as falls. Independent t-tests revealed no significant differences in mean muscle activity, or percent activation between falls, and recoveries for all muscles, and balance conditions (all $p > 0.05$).

CONCLUSIONS: The current findings suggest that muscle activation about the ankle joint during quiet standing is not associated with slip outcomes. Future research should examine temporal patterns of muscle activity, such as contraction to further understand the relationship between standing balance and slip recovery.

TP2 THE EFFECT OF TREADMILL DESK WALKING ON CREATIVE THINKING

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BACKGROUND: Most research on treadmill desks in the workplace report no significant change in productivity. However, most of these studies focused on cognitive performance measured by tests in attention, memory or reasoning. While aerobic exercise has been linked to producing a positive effect on creative potential, few studies have tested workplace creativity thinking. The purpose of this study was to examine the effect of treadmill desk walking on convergent and divergent creative thinking.

METHODS: Male and female college-age students were recruited and completed three tests of creative function: the verbal Guilford's Alternate Uses Task (VGAT) of divergent thinking, written Guilford's Alternative Uses Task (WGAT), and the Remote Associations Task (RAT) of convergent thinking. Participants completed all tests while seated at a traditional desk and while walking on a treadmill desk at 1.5 mph. Step length, stride length, and gait cycle were assessed by the OptoGait gait analysis system. A paired samples t-test was used to compare creative test scores and gait variables.

RESULTS: There were no significant differences between any test scores while seated and walking ($p > 0.05$). There was no significant difference between baseline gait and divergent thinking (VGAT, WGAT) task gait in any variable ($p > 0.05$). There was a significant increase in step length ($p = 0.049$), stride length ($p = 0.046$), and gait cycle ($p = 0.039$) between the walking only condition and the treadmill desk walking during the RAT.

CONCLUSIONS: Results of this study suggest neither convergent nor divergent creative thinking are improved when walking on a treadmill desk. While gait patterns are not changed during divergent thinking, this study suggests gait during convergent thinking may be altered.

TP3 INFLUENCE OF BALANCE SHOES ON PLANTAR PRESSURE IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY

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BACKGROUND: Individuals with chronic ankle instability (CAI) walk with increased lateral plantar pressure, predisposing them to future ankle sprains. Gait retraining to medially shift plantar pressure may be beneficial to these patients. This study sought to determine if walking in balance shoes can redistribute plantar pressure in patients with CAI.

METHODS: Twelve adults with CAI (age: 20.83 ± 1.7 yrs; body mass index: 26.7 ± 4.6 kg/m²) participated. Individuals with CAI were screened according to International Ankle Consortium criteria. A Pedar-X® insole plantar pressure system was used to measure contact time and peak plantar pressure during treadmill walking. A 30s baseline trial was collected. Next, balance shoes were fitted over the shoes and a 30s baseline trial with balance shoes was recorded. Following 20-minutes of walking, a 30s follow-up trial was recorded without the balance shoes. The middle 10 steps of each trial were extracted and contact time and peak pressure under the total foot and 9 sub-regions (medial and lateral heel; medial and lateral midfoot; medial, central, and lateral forefoot; hallux, and lesser toes) of the foot were determined. Data were averaged across steps for each participant and repeated measures analyses of variance determined differences in contact time and peak pressure under each region of the foot between baseline, baseline with balance shoes, and follow-up ($P < 0.05$).

RESULTS: Peak pressure was lower while wearing the balance shoes compared to baseline under the medial heel (117.8 ± 19.6 kPa vs 135.0 ± 32.1 kPa, $P = 0.033$), lateral heel (107.1 ± 21.6 kPa vs 126.8 ± 28.3 kPa, $P = 0.012$), lateral midfoot (80.7 ± 22.1 kPa vs 106.2 ± 17.9 kPa, $P = 0.016$), lateral forefoot (118.6 ± 28.6 kPa vs 150.3 ± 22.1 kPa, $P = 0.003$), and hallux (147.6 ± 29.3 kPa vs 184.9 ± 48.6 kPa, $P = 0.035$) regions. Peak pressure was similarly lower than follow-up under the lateral midfoot (80.7 ± 22.1 kPa vs 101.1 ± 22.8 kPa, $P = 0.036$) and lateral forefoot (118.6 ± 28.6 kPa vs 149.2 ± 28.2 kPa, $P = 0.006$). Total foot contact time was shorter with balance shoes (781.3 ± 99.0 ms) compared to baseline (822.5 ± 110.4 ms, $P = 0.011$) and post-walking (824.99 ± 124.3 ms, $P = 0.049$), while baseline medial midfoot contact time (747.42 ± 116.9 ms) was lower than follow-up (777.7 ± 133.9 ms, $P = 0.019$).

CONCLUSIONS: Balance shoes changed plantar pressure distribution while walking; therefore, balance shoes may be a beneficial adjunct to gait retraining in patients with CAI.

TP4 HYDROTHERAPY VS. LAND BASED EXERCISES ON DUAL TASK DYNAMIC BALANCE IN A GERIATRIC POPULATION

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BACKGROUND: The Centers for Disease Control and Prevention (2017) reported 2.8 million senior adults were treated in emergency room hospitals for fall-related injuries within the last year. Therefore, falls are now considered a leading public health issue among the elderly population. The disruption of postural control is one factor that can lead to falls for the geriatric population. Moreover, the elderly population experience falls while performing two activities simultaneously; in other words, dual tasking, which involves the performance of one task (postural control task) that demands the majority of the individual's concentration while also completing a second task (cognitive task). Finding effective ways to lower falls in the geriatric population may increase quality of life, such as, hydrotherapy which is a safe, low-impact therapeutic option to increase balance performance.

METHODS: Eleven elderly adults completed a 14-Point Berg Balance Scale (BBS) with a Stroop Color and Word Test dual task (SCWTDT) before (pre) and after (post), six weeks of dual-tasking balance training either in a land-based (LB) or hydrotherapy (HYDRO) group. BBS scores and SCWTDT response correctness were analyzed using a between subject 2×2 [2 (Hydrotherapy x Land-Based Exercises) x 2 (Pre-test x Post-test)] repeated measures ANOVA at $p \leq 0.05$.

RESULTS: Significant time main effect differences were found. Both groups reported increased BBS scores during single as well as dual task conditions and increased SCWTDT response correctness. However, no significant differences were found between groups.

CONCLUSIONS: Both LB and HYDRO may show improvements in dynamic balance while under a dual tasking condition.

TP5 HIP AND KNEE MUSCLE ACTIVITY DURING STANDING BALANCE ARE NOT ASSOCIATED WITH SLIP SEVERITY

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BACKGROUND: During a slip, sensory systems must detect that the slip is occurring in order to trigger recovery responses. Previous work has associated declines in sensory system function measured through standing balance, with increased slip severity and fall risk. However, it is unknown if muscle activity of the lower extremity during standing balance is associated with slip severity. Thus, the purpose of this study was to examine lower extremity muscle activity during quiet standing between individuals who experience a hazardous, and non-hazardous slip, after an induced slip perturbation

METHODS: Standing balance measures were recorded under six different sensory conditions: eyes open, eyes closed, eyes open with sway referenced vision, eyes open with sway referenced support, eyes closed with sway referenced support, and eyes open with sway referenced vision and support. Surface EMG was recorded during balance testing from the left leg vastus medialis, and semitendinosus. Raw EMG data were collected at 1,500 Hz, Band-pass filtered (20-250Hz) and rectified prior to analysis. Variables of interest were the mean muscle activity, and mean muscle activity normalized to maximal voluntary contractions. Following balance testing, participants completed slip testing including normal gait and an unexpected slip trial. The slip was classified as either hazardous or non-hazardous based on heel slip distance, and velocity and muscle activity was examined between groups using independent t-tests, with an alpha level of 0.05.

RESULTS: After exclusions, the final analysis sample included 73 participants, with 46 trials classified as non-hazardous, and 27 classified as hazardous slips. Results indicated no significant differences in mean muscle activity or percent activation between hazardous and non-hazardous slips for all muscles and balance conditions (all $p > 0.05$).

CONCLUSIONS: These findings suggest that muscle activation at the hip and knee during quiet standing is not associated with slip severity. Future research should examine timing aspects of EMG such as muscle response times to further elucidate how standing balance may be associated with slip severity.

TP6 BIOMECHANICS DURING LOWER EXTREMITY FUNCTIONAL TESTS IN FEMALE COLLEGIATE ATHLETES RELATED TO KNEE VALGUS

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BACKGROUND: Measuring landing kinematics, kinetics and muscle activation during the single hop test provides valuable injury information on the anterior cruciate ligament (ACL). The chair to single leg box landing is not a common lower extremity test that is studied. However, this test eliminates the stretch shortening factor, which may alter the peak force found in the knee along with rotation. A forward jump with a single leg landing motion targets the stabilizer muscles to activate along the tibiofemoral joint in order to decrease valgus. The purpose of this study was to compare lower extremity biomechanics during different functional landing tasks in division 3 female collegiate athletes.

METHODS: 4 division 3 female (age: 19.75 ± 0.96) collegiate soccer players (BMI of 22.9 ± 2.54), with no history of ACL injury, performed five different functional jumps. A 3D motion capture system was used (Vicon, Centennial, CO) to collect kinematic, kinetic and EMG data.

RESULTS: Preliminary results found no significant differences between variables of interest between the tasks. However, the following results are trending towards significance. Average knee rotation during the forward single leg landing jump was 29.4° compared to the chair to box single leg landing which was 37.3°. Average vertical ground reaction force (vGRF) was higher in the Box (849 N) than the Forward (780 N). Knee valgus angle exhibited a strong positive correlation ($p = .75$) with vGRF in the Box but exhibited a weak positive correlation in the forward ($p = .31$).

CONCLUSIONS: The preliminary results of this study show interesting results regarding the differences in vGRF, and knee valgus angle between landing tasks that are not commonly studied in the literature. Studying these alternate landing task may help further our understanding of ACL injury risk in female athletes.

TP7 THE IMPACT OF PREGNANCY ON BLOOD FLOW FOLLOWING GLUCOSE INGESTION

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BACKGROUND: Pregnancy elicits drastic changes in cardiometabolic health, which appear to be independent of pre-pregnancy health status. Placental derived hormones have been proposed to contribute to insulin resistance; however, changes in these hormones during pregnancy do not necessarily correlate with alterations in insulin resistance. Thus, it is likely that placental hormones are acting in synergy with other factors impacting insulin resistance. The vasculature within skeletal muscle is insulin responsive and insulin mediated vasodilatation of these vessels has been shown to account for up to 40% of glucose uptake. However, whether or not this response is blunted in pregnant women, which may contribute to insulin resistance, is not known. The purpose of this study was to examine if the blood flow response following glucose ingestion was reduced in pregnant women compared to non-pregnant women.

METHODS: Non-pregnant (Age: 27.5±5.5 years, BMI: 22.3±2.9 kg/m², n=4) and pregnant (Age: 26.3±3.5 years, Pre-Pregnancy BMI: 21.7±65 kg/m², Gestational Age: 31.33±2.85 weeks, n=6) women underwent a 2 hour, 50g oral glucose tolerance test (OGTT) with concurrent measures of femoral artery blood flow assessed every 30 minutes via Duplex Doppler Ultrasound.

RESULTS: Percent change in blood flow in the pregnant women (21.60±11.48) was significantly reduced compared to the non-pregnant women (71.13±18.91) ($p < 0.05$). Peak femoral artery blood flow during the OGTT in the non-pregnant women was significantly increased above baseline (BL: 195.65±74.75 Peak: 303.50±103.30 ml/min)($p < 0.05$); however, this was not shown in the pregnant women (BL: 193.39±52.00 Peak: 228.30±61.24 ml/min) ($p > 0.05$).

CONCLUSIONS: These data suggest that insulin stimulated blood flow is reduced during pregnancy. Future studies aim to examine if increasing physical activity levels will improve this response. This work was supported by funds from the Department of Human Movement Sciences at Old Dominion University.

TP8 THE INFLUENCE OF EXERCISE BEFORE AND DURING PREGNANCY ON OFFSPRING HEART FUNCTION AND DEVELOPMENT

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BACKGROUND: Research shows that aerobic exercise during pregnancy is associated with infant cardiac benefits; however, it is not known if exercise before pregnancy influences infant cardiac function. Therefore, the purpose of this study is to determine the effects of exercise before and during pregnancy on infant cardiac heart rate (HR) and heart rate variability (HRV) at 1 and 6 months of age.

METHODS: Participants completed a Questionnaire to determine Physical Activity before pregnancy and did supervised aerobic (n=12) or stretching (n=13) from 16 weeks gestation until delivery. Supervised exercise occurred three, 50 minute moderate intensity exercise sessions per week. After birth, one month and 6 month infant HR and HRV measurements were obtained. A one way ANOVA was performed to compare means between the exercise and control groups before and during pregnancy.

RESULTS: There were no significant differences between groups for before or during pregnancy exercise regarding mean HR($p = .81$; $p = .07$) and HRV($p = .62$; $p = .06$) at 1 month and 6 months, respectively.

CONCLUSIONS: Aerobic exercise during pregnancy and pre-pregnancy exercise showed no differences in infant HR and HRV, at both 1 and 6 months of age. Larger studies with other measures of cardiac function are recommended.

TP9 EXERCISE BEHAVIORS AND BELIEFS AMONG PREGNANT WOMEN IN RURAL COMMUNITIES

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BACKGROUND: To determine beliefs about exercise during pregnancy in pregnant women living in rural areas of North Carolina. By obtaining a deeper understanding of women's beliefs, we can more effectively promote safe exercise, and educate on the prevention of preeclampsia, gestational diabetes, and extensive bedrest through exercise.

METHODS: Electronic and paper surveys were distributed in professional healthcare settings to pregnant women living in rural areas of western North Carolina. Participation was voluntary and anonymous.

RESULTS: 50 women (age 27.9 ± 7.4 yrs) completed the survey. Nearly all women (87%) believe it is safe to perform light intensity exercise during pregnancy, while fewer agree moderate (64%) or vigorous (18%) intensity exercise is safe. Most women believe exercise increases the risk of falling during pregnancy (85%). Relatively few women believe it is unsafe to perform activities that involve abdominal twist (13%) or physical contact (28%). Only 45% believe that women should continue their exercise regimen, and 11% believe that previously inactive women can begin exercise training while pregnant. Less than one-third of women do moderate-intensity exercise ≥ 2 days per week. Additionally, the majority (62%) of pregnant women do not ever engage in vigorous exercise, and most (73%) do not participate in resistance exercise.

CONCLUSIONS: Based on our findings, pregnant women are participating in light intensity exercise, but are not meeting ACSM guidelines for aerobic exercise. In addition, resistance exercise is not popular in this community, and knowledge related to safe exercises during pregnancy is limited. Targeted education is needed in this population on the FITT principle for pregnant women, including examples of safe aerobic and resistance exercises.

TP10 PATIENT AND PROVIDER COMMUNICATION REGARDING EXERCISE DURING PREGNANCY IN A RURAL SETTING

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BACKGROUND: Women in rural settings are at increased risk for adverse pregnancy outcomes. One potential way to improve pregnancy outcomes in rural settings is through physical activity promotion. However, given the disparities in prenatal care, women in rural areas may not receive information from their health care providers regarding physical activity during pregnancy. Therefore, the purpose of this study was to examine patient and provider communication in a rural setting (from both patients' and providers' perspectives) regarding physical activity during pregnancy.

METHODS: A mixed methods study was performed in a rural, multi-specialty obstetrical practice in the southeastern United States. During early pregnancy, patients were asked questions about their current physical activity levels and intentions for physical activity during their pregnancy. During late pregnancy, patients completed a survey regarding communication from their obstetric provider about exercise during pregnancy. Providers responsible for the patients' prenatal care then took the provider version of the survey.

RESULTS: Seventy-one pregnant women and 5 providers participated. 58.2% of patients reported their provider did not discuss physical activity during pregnancy with them at all. Meanwhile, all providers (100%) reported discussing physical activity with all of their patients. Similarly, only 21.8% of patients reported their provider discussed the benefits of exercise during pregnancy, while 100% of providers reported telling their patients about the benefits of exercise during pregnancy.

CONCLUSIONS: Our study suggests ineffective patient/provider communication regarding physical activity during pregnancy in rural settings. Improved communication strategies could reduce disparities in health outcomes among pregnant women in rural settings.

TP11 OBESITY AND PHYSICAL ACTIVITY DURING PREGNANCY HAVE IMPLICATIONS FOR NEONATAL GROWTH AND INFLAMMATION

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BACKGROUND: Maternal obesity has also been intricately connected to metabolic dysfunction in both mother and neonate. The purpose of this study was to explore the potential impact that maternal obesity and maternal physical activity and sedentary time has on neonatal outcomes.

METHODS: Participants (N=39; lean n=23, pre-pregnancy BMI=21.4 \pm 1.1 and obese n=16, pre-pregnancy BMI= 36.2 \pm 4.4) were recruited in late pregnancy. Maternal physical activity and sedentary time was objectively assessed by an Actigraph GT9X Link Accelerometer. The wrist-worn device was worn for 24 hours/day for 7 days. At parturition, neonatal anthropometrics were assessed and cord blood was collected. Neonatal C-reactive protein (CRP) was measured by immunoturbidimetric assay. Using SPSS, t-tests compared neonatal outcomes between groups and correlation coefficients assessed the degree of the relationship between neonatal outcomes and maternal activity.

RESULTS: Neonatal outcomes between infants born to lean and obese women were compared. Several outcome measures were significantly different including neonatal adiposity (triceps and subscapular skinfolds, $p < 0.03$), birthweight ($p = 0.03$), and CRP ($p = 0.05$). CRP levels were positively correlated with maternal sedentary time ($r = 0.88$, $p < 0.01$) and negatively correlated with maternal moderate physical activity ($r = -0.77$, $p < 0.01$).

CONCLUSIONS: Conclusion: These data are consistent with previous studies suggesting maternal obesity contributes to neonatal overgrowth and inflammation, which may mediate adverse outcomes common among obese women such as shoulder dystocia. Fortunately, potential mechanisms to combat neonatal inflammation, and possibly improve other maternal and neonatal outcomes, include moderate physical activity and reduced sedentary time during pregnancy. Funding: NIH NIGMS 5P20GM103436, WKU RCAP 17-8011.

TP12 CHANGES IN DUAL TASKING FROM SECOND TO THIRD TRIMESTER OF PREGNANCY

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BACKGROUND: Pregnant women anecdotally report 'pregnancy brain,' or decrements in memory and cognitive functioning during pregnancy but results of studies on the topic are mixed. No studies have examined the ability of pregnant women to simultaneously perform two tasks (i.e. dual tasking) and whether this ability changes across pregnancy. The purpose of this study was to examine changes in dual tasking from the 2nd to 3rd trimester in pregnant women.

METHODS: A total of n=17 pregnant women completed a baseline walking gait analysis on a GaitRite gait analysis system and then performed four cognitive tests while walking: serial 1, 3, and 7 subtraction tests and a phoneme monitoring test where participants listened to a story and answered questions related to the content and also counted the frequency that two words appeared in the story. Each assessment lasted two minutes, and participants completed the same four assessments while seated. The order of the testing was counterbalanced, and participants completed all assessments during the 2nd trimester (21.8 \pm 3.8 weeks pregnant) and 3rd trimester (33.7 \pm 4.0 weeks pregnant) time points. Dual task cost (DTC) was calculated using the formula (Single task score - Dual task score)/Single task score*100. Paired t-tests were used to compare the two time points.

RESULTS: Women performed significantly more serial 7, 3, and 1 subtractions while walking in the 3rd trimester compared to the 2nd ($p < 0.05$ for all comparisons), and also said more correct serial 7 subtractions numbers while seated in the 3rd compared to 2nd trimester ($p = 0.02$). However, there were no differences in gait velocity, cadence, step time, or step time CV between trimesters for any of the cognitive tests ($p > 0.05$). Further, DTC was not significantly different between trimesters for any gait or cognitive parameters ($p > 0.05$).

CONCLUSIONS: These data suggest that pregnant women may improve at cognitive tests involving subtraction from the 2nd to 3rd trimester, but that the cost of performing cognitive tests relative to gait does not change across pregnancy.

TP13 GENERATIONAL DIFFERENCES OF CONSUMER WEARABLE DEVICES FOR ESTIMATING PHYSICAL ACTIVITY OUTCOMES

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BACKGROUND: Consumer activity monitors (CAMs) are commonly validated for estimated physical activity outcomes (e.g. energy expenditure (EE)) when a new model is released. It is unclear if this is a needed practice and if prediction algorithms change when a new device generation is released. **PURPOSE:** To compare different generations of wrist-worn CAMs from the same manufacturer [Apple Watch Series 2 (AW2) and 4 (AW4), Fitbit Charge 2 (FC2) and 3 (FC3), and Garmin Vivofit (VF) and Vivofit 4 (VF4)] for estimating EE and steps.

METHODS: Nineteen participants (mean±SD; age, 25.1±5.0 years) completed seven structured activities (6 min each) that ranged from sedentary to vigorous intensities. Each participant wore four CAMs (two different models from the same brand on each wrist) and a Cosmed K5 portable metabolic system for measured EE. The devices were randomized by combination (e.g. Fitbit-Garmin), placement (proximal vs. distal), and side (left vs. right). Estimates of EE were obtained for the entire activity protocol including transitions (48 min on average). Paired t-tests were used to compare steps between different generations within a brand. Repeated measures ANOVAs were used to compare estimated gross EE from devices and measured K5 EE.

RESULTS: For EE, the FC2 and FC3 were not significantly different between generations or from measured EE (mean errors <19.4 kcal (<7%); all p>0.05). The other CAMs had mean errors that ranged from 19.0-142 kcals (9-47%); all p<0.05). For steps, the AW2 and AW4 were not significantly different (mean error 73 steps (2.4%) p=0.550). The mean differences between the FC2 and FC3 [126±126 steps (3.6%)] and VF and VF4 [144±154 steps (4.5%)] were significantly different (p<0.05).

CONCLUSIONS: It is not recommended to interchange EE estimates from different CAM generations within a brand. As the step estimates were within 5%, they could be interchanged across CAM generations. Future investigations should explore if the difference is due to changes in hardware or software.

TP14 THE INFLUENCE OF DEMOGRAPHIC FACTORS ON BEHAVIOR CHANGES AFTER CONSUMER ACTIVITY MONITOR USE

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BACKGROUND: Physical activity (PA) self-monitoring has been shown to increase physical activity and decrease sedentary behavior (SED) in adults, although the magnitude of these changes has varied substantially across studies. The reasons for the observed variability across studies remain unclear. The purpose of this study was to examine if changes in SED and PA behaviors after initiating wear of a consumer activity monitor vary according to participant age, education, or body composition.

METHODS: 25 university employees aged 26 to 60 years, and without a history of consumer activity monitor wear volunteered to wear a Fitbit Alta HR for 12 days. Changes in SED and PA behaviors were assessed using an activPAL worn for 5 days at baseline and 5 days at follow-up. Days with at least 14 hours of activPAL wear were included in the analysis. Changes in activPAL prolonged sitting (>30 min bouts) and steps were adjusted for baseline values and examined across self-reported categories of age (<45 / ≥45 yr), education (< 4-yr degree/ 4-yr degree/graduate degree), and BMI (<25 / ≥25 kg/m²).

RESULTS: Prolonged sitting time (Mean±SD change:15.5±110.0 min, p=0.85) and steps (772±2454, p=0.053) increased after participants commenced wearing the Fitbit. Changes in prolonged sitting time did not significantly differ by age (<45: +35.0, ≥45: -5.6; p=0.45), education (< 4-yr degree: -43.9, 4-yr degree: +12.6, graduate degree: +71.0; p=0.27), or BMI (<25: +14.3, ≥25: +16.3; p=0.81). Changes in steps significantly differed by education (< 4-yr degree: +2658, 4-yr degree: +699 graduate degree: -787; p=0.01) but did not significantly differ by age (<45: +523, ≥45: +1042, p=0.55) or BMI (<25: +594, ≥25: +890; p=0.37).

CONCLUSIONS: Changes in steps and prolonged sitting behaviors did not significantly differ by age or BMI. However, education level may influence the behavioral changes associated with consumer activity monitor wear.

TP15 DEVELOPMENT AND TESTING OF AN OBJECTIVE INSTRUMENT FOR ASSESSING MILITARY PHYSICAL TRAINING

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BACKGROUND: Physical fitness (PF) has been shown to be the strongest predictor of injuries among military personnel, after gender. The US military continues to evaluate physical training (PT) methods to improve performance on military physical fitness tests (PFT), in military occupations, and in combat. Similarly, many military branches are evaluating PFT standards to determine their ability to predict readiness for military service. However, evidence on the efficacy and effectiveness of military PT, and of different military PFT, remains equivocal. The purpose of the current study was to develop and test the psychometric properties of an objective instrument for assessing attitudes towards military PT as it relates to current PF, lifelong PF, and ability to pass a military PFT.

METHODS: Data were collected on 892 cadets from a senior military college who participate in military PT at least two d/wk. The sample was split into two sub samples for the purpose of establishing and confirming the psychometric properties of the scale. In sample one, coefficient alpha was calculated for six a priori subscales and a confirmatory factor analysis was conducted using maximum likelihood estimation with missing variables. Modification indices were consulted following estimation. Analyses were repeated with sample two. All analyses were conducted in Stata 15.1.

RESULTS: In sample one, all six subscales indicated acceptable internal consistency (alpha = .69-.89) and the initial measurement model was a good fit for the data (Chi-square=558.15 (215), RMSE=0.060, CFI=0.947, TLI=0.937). Modification indices suggested adding two additional covariances, which resulted in a superior fit to the data (Chi-square=445.63 (213), RMSE=0.050, CFI=0.964, TLI=0.957). In sample two, all subscales indicated acceptable internal consistency (alpha = .69-.86) and the final measurement model was a good fit for the data (Chi-square= 395.83 (213), RMSE=0.044, CFI=0.968, TLI=0.962).

CONCLUSIONS: The current data provide support for the factorial validity and internal consistency of the instrument. Thus, this instrument can be employed as an objective assessment of PT programs within military settings and can be used to conduct impact evaluations in the presence or absence of formal military and paramilitary PFT.

TP16 VALIDATION OF THE WITHINGS ACTIVITE STEEL AND COACHCARE ACTIVITY MONITORS DURING TREADMILL WALKING

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BACKGROUND: In the last decade, we have seen an exponential increase in the number of wearable devices. Since consumers are utilizing these devices to enhance their levels of physical activity, these devices must be validated against other gold-standard devices such as the ActiGraph®. The purpose of this study was to validate the Withings Activite Steel (WAS), CoachCare (CC) devices, and their ability to track step counts compared to an ActiGraph® GT3X (A) accelerometer during 10 minutes of treadmill walking.

METHODS: Thirty-One participants (Age 23.0 ± 7.0 yrs, Height = 173.6 ± 9.4 cm, Weight = 78.6 ± 7.0 kg) participated in this study. Participants wore WAS and CC activity monitors on their dominant wrist, and an ActiGraph® accelerometer was placed around the left side of their waist. Participants walked on a treadmill for 10 minutes at 3.0 mph. Repeated measures of analysis of variance (ANOVA) was used to evaluate the mean difference in steps counts between the WAS, CC, and A. All statistical analyses were conducted using SPSS v23.0.0. Significance was set to p<0.05.

RESULTS: The data indicate no significant differences between WAS 1092.2 ± 68.1, CC (1056.8 ± 117.8), and A (1101.2 ± 115.4).

CONCLUSIONS: Our findings indicate that the WAS and CC are valid devices for measuring step counts when compared to the ActiGraph®. However, further investigation is warranted to investigate agreement between these devices at various walking speeds.

TP17 EFFECTIVENESS OF CONSUMER WEARABLE PHYSICAL ACTIVITY PROMPTS IN UNIVERSITY EMPLOYEES

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BACKGROUND: Physical activity (PA) prompts are a feature of most consumer wearable devices. Whether these prompts alter PA behaviors is unclear. The purpose of this study was to evaluate the effectiveness of consumer wearable PA prompts in full-time university employees.

METHODS: 31 employees without a prior history of consumer wearable device use were randomly assigned to wear a Fitbit Alta HR monitor with PA prompts (Prompt group) or without PA prompts (Non-Prompt group). They were instructed to wear the device during all waking hours for 12 consecutive days. Hourly PA prompts were scheduled from 6am to 8pm each day and occurred when <250 steps were achieved in the first 50 min of an hour. Average step values were calculated during the first 50 min and last 10 min of each hour and compared between hours when a prompt was given (Prompt) or would have been given (Non-Prompt). The percentage of hours when 250+ total steps were achieved was also calculated for hours when a prompt was given (Prompt) or would have been given (Non-Prompt) and compared between groups both overall and by the time of day.

RESULTS: During hours when <250 steps were achieved in the first 50 min, the average steps taken in the last 10 minutes of these hours were significantly lower ($p < 0.01$) when a prompt was given (49 steps) compared to the Non-Prompt control group (91 steps). Further, no significant difference ($p = 0.31$) was observed between the Prompt (16%) and Non-Prompt (20%) groups in the percentage of hours when a prompt was given (Prompt) or would have been given (Non-Prompt) that subsequently accumulated 250+ steps.

CONCLUSIONS: Consumer wearable PA prompts did not alter PA behaviors in university employees. Future studies should evaluate if PA prompts are effective in other employee settings and evaluate PA prompts provided by other consumer device brands.

TP18 VALIDATION OF THE FITBIT CHARGE 3 IN WOMEN WITH GESTATIONAL DIABETES MELLITUS

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BACKGROUND: There is a paucity of studies examining the accuracy of commercial step counters in late pregnancy. In preparation for a behavioral physical activity intervention promoting walking and stepping in place in women diagnosed with gestational diabetes mellitus (GDM), this study sought to assess the accuracy of the Fitbit Charge 3 in recording steps during walking and stepping in place at three cadences.

METHODS: Women (N=15) diagnosed with GDM were recruited in the third trimester. Participants wore a Fitbit Charge 3 on the non-dominant wrist and completed a total of six 2-minute bouts that varied according to mode (walking vs. stepping in place) and cadence (67, 84, or 100 steps/minute). Bout sequence was randomized. Actual steps were determined by hand-tally, the criterion, in duplicate. One-way and two-way ANOVA were used to examine differences in the mean percentage of steps recorded, by mode and cadence.

RESULTS: There was a statistically significant difference in the percentage of steps recorded by cadence ($p < .01$), but not by mode ($p = .23$); no interaction was detected between mode and cadence ($p = .17$). Analyses of cadence only suggested that 67 steps/minutes (the lowest cadence) may significantly differ from the other cadences (67 steps/minute = 113%, 84 steps/minute 97%, 100 steps/minute = 95%; $p = .05$).

CONCLUSIONS: The Fitbit Charge 3 may overestimate step count at lower cadences. However, step count did not differ with respect to mode at the cadences examined. Results suggest that the Fitbit Charge 3 is suitable for an intervention promoting walking/stepping in place in this population.

TP19 EFFECTS OF HEART RATE BIOFEEDBACK AND SLEEP, ON MARKSMANSHIP DURING A LIVE FIRE STRESS SHOOT

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BACKGROUND: Discharging a weapon (e.g. pistol) is sometimes required in law enforcement. Doing so requires attention to detail, decision making and marksmanship accuracy (MA) which can be impaired by sleep loss, increased high heart rate (HR) or breathing rate (BR). These impairments may be mitigated by practicing controlled-breathing (i.e. HR biofeedback (emWave, EW)) prior to engagement. The purpose of this study was to determine the impact of EW on MA, stress shoot time-to-completion (TTC), HR and BR versus placebo (PLA).

METHODS: Eleven police officers volunteered for this study. Sleep measurements began five days before testing and continued until three days after the final trial. Officers completed a familiarization trial followed by the EW and PLA trials (counter-balanced). Trials were completed on a 25-m gun range, by engaging three steel targets. MA was determined by a “hit, no-hit” system. HR and BR were monitored for 10 minutes before, immediately after and for 20 minutes after each trial. Dependent *t*-tests were conducted for MA and TTC. A 2x3 repeated measures ANOVA was conducted for HR, BR, before, during, and after each trial. A Pearson correlation was conducted for sleep and alertness. The alpha level was $p < 0.05$.

RESULTS: HR (128 ± 23 vs. 136 ± 14) and BR (19 ± 2 vs. 21 ± 2) was not statistically different between trials ($p = 0.30$ and $p = 0.31$). TTC ($108.4 \pm 11.2s$ vs. $111.6 \pm 20.2s$) was not statistically different between trials ($p = 0.94$). MA (81.4 ± 10.2 vs. $85.9 \pm 12.9\%$) was not statistically different between trials ($p = 0.95$). Sleep duration ($7.4 \pm 2.9h$ vs. $5.4 \pm 1.7h$) was not significantly different ($p = 0.13$). There was a “fairly low” correlation ($r = 0.32$) between sleep and alertness during the EW trial and a “very high” correlation ($r = 0.98$) during the PLA trial.

CONCLUSIONS: Controlled-breathing did not affect the physiological and tactical performance of officers during a 25-m live-fire stress shoot based on HR, BR, TTC and MA while considering sleep quantity.

TP20 NEUROMUSCULAR FACTORS ASSOCIATED WITH STAIR CLIMB PERFORMANCE IN FIREFIGHTERS

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BACKGROUND: The weighted stair climb is a critical and essential occupational task for career firefighters. However, limited data is available investigating the influence of neuromuscular function on stair climb performance (SCP). The purpose of this study was to examine the influence of lower extremity strength, power, fatigability, and steadiness on SCP.

METHODS: Forty-one firefighters (32.34 ± 8.20 yrs) completed one laboratory visit where they completed peak torque (PT) testing of the leg extensors of the dominant leg on an isokinetic dynamometer. Participants then completed two separate steadiness trials at 10% (Stead₁₀) and 50% (Stead₅₀) of PT for 30 seconds. Fatigability was determined from the reduction in PT following 30 consecutive isotonic contractions (80% of range of motion) at 40% of their PT. Peak power (PP) was determined from the highest value during the first five isotonic contractions. PT and PP were normalized to body mass (BM) prior to analysis (PT/BM and PP/BM). Following a 20-minute rest, participants then completed a weighted (22.73 kg vest) stair climb by ascending and descending 26 steps, four times. Pearson’s product-moment correlations were used to examine the associations between each neuromuscular variable and SCP. A stepwise multiple regression analysis was then completed to determine the relative contributions of all neuromuscular variables on SCP. An *a priori* alpha level of ≤ 0.05 was used to determine statistical significance.

RESULTS: Faster SCP was associated with greater PP/BM ($r = -0.530$; $P = 0.001$), PT/BM ($r = -0.421$; $P = 0.007$), and lower fatigability ($r = 0.389$; $P = 0.014$). The stepwise multiple regression analyses determined that PP/BM and Stead₅₀ were the only significant predictors of SCP ($R^2 = 0.442$; $P = 0.013$).

CONCLUSIONS: Our findings suggest that lower extremity power output and motor control are the strongest neuromuscular predictors of SCP. These findings are impactful considering these variables can be improved with exercise.

TP21 DESCRIPTIVE EPIDEMIOLOGY OF INJURIES AND ILLNESSES REPORTED BY SOLDIERS IN ARMY BASIC COMBAT TRAINING

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BACKGROUND: Thousands of men and women enter Army basic combat training (BCT) each year, a large proportion of whom experience injury and seek medical attention. However, women have been shown to have an increased risk of injury, incur higher medical costs and are more frequently discharged than men. The purpose of the study was to describe and compare injuries reported during sick call at BCT between men and women.

METHODS: Soldier and injury descriptors (i.e. gender, age, injury location, provider impression, visit reason) were collected for all Soldiers who reported for sick call during the study period at the Fort Jackson Army Training Center. Frequencies and proportions were calculated for all variables. Cross-tabulations were performed to compare injury location and provider impression between men and women. Missing data were excluded from analysis.

RESULTS: There were 14,304 documented sick call visits. Most Soldiers reporting to sick call were females (n=7650, 53.5%), under 22 years-old (n=8499, 59.1%), and White (n=8433, 59.0%). Musculoskeletal injuries were the most common reason to seek care (n=7926, 55.4%). A higher proportion of women reported injuries of the foot (12.9% vs 9.6%), ankle (17.1% vs 11.8%), and hip/pelvis (10.0% vs 5.7%) compared to men (p<0.05). Men reported more illness (16.9% vs 11.8%) and injuries affecting the knee (23.5% vs 21.7%), wrist/hand (3.2% vs 1.9%), elbow/forearm (1.4% vs 0.6%), and neck/spine (11.3% vs 8.9%) than women (p<0.05). Men were more frequently diagnosed with heat injury (0.1% vs 0.0%) and illness or infection (9.0% vs 5.6%) than women (p<0.05). Women were more frequently diagnosed with chronic/overuse injury (19.1% vs 17.5%) and stress reaction/fractures (3.7% vs 2.3%) than men (p<0.05).

CONCLUSIONS: During this study, women represented less than 40% of Soldiers, but accounted for over 50% of sick call visits. Our findings confirm increased injuries among women in BCT, particularly of the lower extremity and overuse in nature. Strategies to reduce injury risk, improve injury management, and reduce financial burden are needed, particularly for women. Funded by the United States Department of Defense

TP22 PHYSICAL FITNESS MAINTENANCE IN MEMBERS OF A SOUTHEASTERN UNITED STATES CITY PROFESSIONAL FIREFIGHTING DEPARTMENT

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BACKGROUND: Previous studies report that firefighters lacking an adequate level of physical fitness, even those classified as experts, can experience a severe physiological challenge in unpredictable environmental conditions. The purpose of this study was to assess and track the annual physical fitness performance of the members of a professional firefighting department.

METHODS: As part of the annual health and fitness testing (data from 2002-2017) performed by the Bowling Green Fire Department (BGFDP) in Bowling Green, KY, 154 firefighters had their physical fitness evaluated using standardized and recommended protocols published by the International Association of Fire Fighters. A mixed methods analysis was employed to examine differences over time for each of the dependent variables (push-ups, plank hold, handgrip strength, static arm pull, and static leg pull) using SPSS (v25).

RESULTS: Handgrip strength performance significantly improved in the first 4 years after baseline ($p < .05$) followed by a steady, significant decline each following year ($p < .05$), with the exception of year 15 ($p = .430$). Push-up performance significantly declined from baseline ($p < .05$). The plank hold performance was maintained over the first 3 years of testing ($p > .05$) before showing marked improvement in the two most recent years ($p < .05$). Although small, flexibility significantly improved from year 1 to year 2 ($p < .05$), but then was maintained over each subsequent year of testing ($p > .05$). Static arm pull and static leg pull both significantly improved for the first 5 years ($p < .05$), but then showed a steady decline thereafter ($p < .05$).

CONCLUSIONS: Based on these results, physical fitness showed a consistent improvement in the first several years tested; however, several of the muscular strength-related variables showed a consistent decline thereafter. It will be important to continue to monitor and adjust the physical training regimen to attempt to alleviate any physical fitness decline. **Sponsor: National Institute for Occupational Safety and Health (NIOSH) through the PRP of the University of Cincinnati Education and Research Center Grant #T42OH008432.**

TP23 A COMPARISON OF FUNCTIONAL MOVEMENT SCREEN SCORES OF RURAL, GEORGIA FIREFIGHTERS AND POLICE OFFICERS

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BACKGROUND: Firefighters (FF) and police officers (PO) often find themselves in positions and gear that place them at physical disadvantages. Poor performance on the functional movement screen (FMS) may lead to increased injury risk, though research is limited in tactical populations. **PURPOSE:** To compare the differences in individual and composite FMS scores of rural FF and PO.

METHODS: FMS testing was performed on 40 FF and 44 PO. The composite score (cFMS) and individual scores of each test [deep squat (DS), left (L) and right (R) hurdle step (HS), L and R inline lung (IL), L and R shoulder mobility (SM), L and R active straight leg raise (ASLR), trunk stability push-up (TSPU), and L and R rotary stability (RS)], were analyzed using independent sample *t*-tests ($\alpha = 0.05$).

RESULTS: No significant difference was found for cFMS between groups (PO: 13.8 ± 2.5 , FF: 13.6 ± 2.4 , $p = 0.75$). Among individual tests, only RHS (PO: 2.1 ± 0.4 , FF: 2.2 ± 0.5 ; $p = 0.03$) was different between groups. No other differences existed for DS ($p = 0.20$), LIL ($p = 0.89$), LSM ($p = 0.38$), RSM ($p = 0.23$), LASLR ($p = 0.31$), RASLR ($p = 0.33$), TSPU ($p = 0.65$), LRS ($p = 0.39$), and RRS ($p = 0.24$).

CONCLUSIONS: While few differences existed between groups, average cFMS score fell below the FMS "At Risk" range (>14). FF and PO appear to be at an increased risk of injury due to their lack of mobility, stability, and symmetry. Exercise programs should focus on improving core stability and symmetrical hip and ankle mobility in this population.

TP24 PHYSIOLOGICAL PROFILE OF RURAL LAW ENFORCEMENT OFFICERS IN SOUTHEAST GEORGIA

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BACKGROUND: Police officers (PO) in rural, underserved areas often have limited resources and funding. The impact of these factors may have an overall effect on their physiological profile. **PURPOSE:** To provide an extensive physiological profile of rural POs in southeast Georgia.

METHODS: 44 male PO underwent testing for anthropometrics (i.e., body mass index (BMI), waist and hip circumference (WH)), cardiovascular fitness (VO₂max), vertical jump (VJ), handgrip strength (HGS), estimated 1-repetition maximum bench press (1RM-BP) and leg press (1RM-LP), maximum push-ups (PU) and plank (P), and flexibility via sit and reach. Additionally, blood pressure (BP) measures were obtained. Data was reported as means and standard deviations. The group means were compared to ACSM norms and previously published literature.

RESULTS: When compared to ACSM guideline, 50% were considered obese based on BMI (31.17 ± 6.13), 73.3% were low risk based on WH (0.92 ± 0.07), and 40.5% were hypertensive. When compared to age-matched groups in previous literature, 57.7% had greater 1RM-BP (94.31 ± 31.15 kg), 93.3% had greater 1RM-LP (278.22 ± 87.01 kg), 100% had lower PU (19.40 ± 10.58) and HGS (38.03 ± 6.39 kg), 17.8% had lower P (90.23 ± 46.44 sec), 35.6% had lower VJ (45.95 ± 11.21 cm), and 55.6% had lower VO₂max (27.45 ± 5.55 mL/kg/min).

CONCLUSIONS: While PO in this study showed good muscular strength, the poor muscular and cardiovascular endurance, and high rate of obesity should be given more focus when working with this population, due to increased stress and risk of sudden cardiac events.

TP25 THE RELATIONSHIP BETWEEN TIME-LAGGED ACUTE:CHRONIC WORK RATIOS AND PHYSICAL PERFORMANCE IN COLLEGIATE SOCCER PLAYERS

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BACKGROUND: Acute-to-chronic work ratios (ACWR) reflect the balance between fitness and fatigue in athletes. The ACWR has been related to injury risk in elite athletes, but the relation with physical performance is less understood. Therefore the purpose of this study was to assess the relation between ACWR on the three days prior to a competitive match and game-related physical performance.

METHODS: Male (n=26) collegiate soccer players (Mean±SD; 20±1y; 75.83±5.90kg; 178.6±6.8cm) wore GPS enabled heart rate monitors during training and match days over two collegiate seasons. Exponentially weighted moving averages were calculated from a training load metric where acute (7 d), chronic (28 d), and ACWR (7/28 d) parameters were computed. ACWR was time-lagged by -1 (ACWR₁), -2 (ACWR₂), and -3 (ACWR₃) days relative to each match. Physical performance was assessed by total distance (TD), and number of sprints (SP), maximal accelerations (AC), and maximal decelerations (DC). Conditional growth models assessed the relations between match performance and ACWR at each lag.

RESULTS: One SD above a given player's mean ACWR₃ resulted in increased performance in the match relative to their mean within-match performance, with an additional 948m (p<0.001) of total distance, 2.27 (p<0.01) additional sprints, and 1.77 (p<0.01) more accelerations.

CONCLUSIONS: The ACWR appears to be associated with additional within-match external load and thus it may provide a useful method of assessing and reducing injury risk. This study was funded in part by the National Collegiate Athletics Association.

TP26 HIGH-SPEED RUNNING DENSITY IN COLLEGIATE WOMEN'S LACROSSE

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BACKGROUND: The purpose of this study was to examine the metric known as high-speed running (HSR) density in collegiate women's lacrosse. HSR density is defined a ratio between HSR efforts and volume (distance covered). This study will seek to better identify the metric, its' correlation to overall workload and intensity, and differences by position and between practices and games.

METHODS: Data were collected during the 2018/2019 season practices (n = 162) and games (n = 14) through players (n = 25) wearing a sports vest containing GPS and heart rate monitors. HSR density was calculated each day and compared to other daily metrics from a practice/game, including: total distance, maximum speed achieved, average heart rate, and the number of high intensity accelerations and decelerations. Differences in HSR density between positions and between a training session and game were also evaluated.

RESULTS: Overall HSR density had low to moderate correlations with distance ($\rho = -0.168$, $p < .001$), max speed ($\rho = -.425$, $p < .001$), and decelerations ($\rho = -.120$, $p < .001$). No significant correlation between HSR density and average heart rate and accelerations was found. There was a significant difference between positions for HSR density ($p < .001$) with defenders (19.9 ± 40%) registering higher HSR density than attackers (15.8 ± 25.8%, $p = .028$) and midfielders (13.9 ± 22.2%, $p < .001$). There was also a significant difference between training and games for HSR density ($p < .001$; training 16.2 ± 30%, game 17.5 ± 29%).

CONCLUSIONS: We observed that HSR density is a key factor in evaluating player workload during both training and a game. Defenders, having the highest average HSR density, are asked to perform many quick and intense bursts of running, whereas midfielders and attackers have the tendency to perform longer bouts of running, making their overall workload less dense compared to a defender. Results show that games require a higher HSR density than practice, likely because of the overall increased intensity and workload generated throughout the course of a game. These results will assist coaches in better determining the intensity of a training session or a match.

TP27 ASSOCIATION BETWEEN COMPETITIVE EXPERIENCE & HEART RATE VARIABILITY IN COLLEGIATE SWIMMERS

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BACKGROUND: Resting heart rate (RHR) and HR variability (HRV) are used as objective, physiological markers of training adaptation in swimmers. Further investigation into potential determinants of RHR and HRV is needed to facilitate interpretation of individual responses. The purpose of this study was to quantify associations between years of competitive experience and RHR and HRV parameters among collegiate swimmers.

METHODS: Twenty-eight short-distance swimmers (17 males, 181 ± 10 cm, 78 ± 9 kg; 11 females, 178 ± 15 cm, 73 ± 12 kg) performed post-waking HRV measures (60 s) in the seated position with a validated mobile device throughout a 4-week preparatory phase. The 4-week mean and coefficient of variation (CV, a marker of daily fluctuation) were calculated for RHR and the natural logarithm of the root mean square of successive differences (LnRMSSD, a parasympathetic HRV index). Years of competitive swimming experience was documented for each individual. Independent t-tests were used to compare RHR and LnRMSSD parameters between sexes. Pearson and partial correlations were used to quantify associations between variables.

RESULTS: Mean RHR (males vs. females, 64.4 ± 6.6 vs. 59.4 ± 6.6 b·min⁻¹), LnRMSSD (4.2 ± 0.3 vs. 4.4 ± 0.4) and CV for RHR (10.1 ± 3.1 vs. 8.0 ± 2.3%) and LnRMSSD (7.2 ± 2.0 vs. 6.9 ± 3.3%) were not different between sexes (all P>0.05). Associations were therefore quantified as one group (n=28). Competitive experience (11.6 ± 4.1 yrs) was associated with mean LnRMSSD ($r=0.60$, $P<0.001$) and LnRMSSD CV ($r=-0.52$, $P<0.01$), but not with mean RHR or RHR CV ($P=0.08-0.45$). Accounting for multicollinearity between mean LnRMSSD and LnRMSSD CV ($r=-0.55$, $P<0.01$), partial correlation analysis showed that competitive experience remained associated with mean LnRMSSD ($r=0.44$, $P=0.02$) but not LnRMSSD CV ($r=-0.28$, $P=0.15$).

CONCLUSIONS: Swimmers with a longer history of competitive experience maintained higher vagally-mediated HRV throughout preparatory training.

TP28 KINETIC ASYMMETRY OF CROSSFIT ATHLETES DURING HANG POWER CLEANS AT VARIOUS LOADS - A PILOT STUDY

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BACKGROUND: Research suggests that lower limb asymmetry may be detrimental to performance on various power specific anaerobic tasks. However, the effect of lower limb asymmetry on performance of barbell hang power cleans is not well-understood. The purpose of this pilot study was to examine lower limb kinetic asymmetry in CrossFit athletes during hang power cleans at various loads.

METHODS: Six competitive and experienced CrossFit athletes (3M, 3F; age: 28±3 y; height: 170.1±8.8 cm; mass: 71.7±9.1 kg; 1-rep max (1RM): 82.2±14.2 kg) completed hang power cleans at loads of 60%, 70%, and 80% of their 1RM. Ground reaction forces were recorded from each limb using 2 force platforms and vertical barbell position was recorded using a 3D motion analysis system. Peak vertical force, average and instantaneous rate of force development, and time to peak force on each limb was calculated from the force platforms. Peak barbell velocity was also calculated for each load. Symmetry index (SI) scores were computed for each kinetic variable and compared across loads using a one-way ANOVA ($p<0.05$).

RESULTS: No significant differences were found for any of the kinetic SI scores across loads ($p>0.05$). Peak barbell velocity significantly decreased as the load increased to 70% 1RM ($p=0.001$; 2.0±0.2 m/s) and 80% 1RM ($p<0.001$; 1.9±0.1 m/s) when compared to 60% 1RM (2.2±0.1 m/s).

CONCLUSIONS: Our results likely indicate that experienced athletes may not shift reliance to the stronger limb to achieve the same movement goal as load increases. More research is warranted to determine the impact of lower limb kinetic asymmetry on weightlifting performance.

TP29 CORRELATION OF PHYSIOLOGICAL AND PSYCHOLOGICAL MEASURES DURING COMPETITION IN COLLEGIATE SOCCER PLAYERS - A PILOT STUDY

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BACKGROUND: Use of physiological measures to track sport performance is essential. Recently, psychological measures of well-being and perceptual response to training have been of interest, especially their practicality and correlation to physiological measures. However, research has focused on data collection during practice. **PURPOSE:** To determine the correlation of selected physiological and psychological variables during competition in collegiate soccer players.

METHODS: Eleven female collegiate soccer players (age 20.09±0.83yr, height 168.79±7.65cm, weight 67.44±10.07kg, body fat 25.29±3.04%) competed in two exhibition competitions during preseason training. Using Zephyr OmniSense 5.0 accelerometers, heart rate (HR), HR recovery (HRR), HR variability (HRV), training load (TL), step impulse (SI), and rate force development (RFD) were recorded. Overall well-being was assessed in five categories by questionnaire. The data were analyzed using SPSS. A Pearson's Correlation assessed the relationship between physiological measures and well-being. Data are presented by magnitude of the correlation (r); significance level p<0.05.

RESULTS: Relationships between physiological measures and well-being differed between competitions. TL was largely correlated to well-being (r = -0.554) in the first competition, but only moderately correlated (r = 0.323) in the second competition. HRR was moderately correlated in both competitions, but varied in direction. SI and FRD showed a small correlation in both competitions (r = -0.284) and (r = 0.262), respectively. Peak HR was moderately correlated to well-being (r = 0.327), but HRV was only trivially correlated.

CONCLUSIONS: These data suggest no clear relationship between measures of sport performance and well-being during competition.

TP30 GROUND REACTION FORCES AND THROWING VELOCITY ARE HIGHER IN SKILLED PITCHERS COMPARED TO NOVICE THROWERS

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BACKGROUND: Stride-leg ground reaction forces (GRFs) have been used to predict throwing velocity in skilled baseball pitchers. However, it is not clear whether the same relationship exists between ground reaction forces and throwing velocity in novice performers. The purpose of this study is to determine peak GRFs of the stride leg and the relationship of those GRFs to throwing velocity in age-matched skilled baseball pitchers and novice throwers.

METHODS: Ten collegiate baseball pitchers and ten recreationally active college-aged novice throwers completed one laboratory testing session in which they were asked to throw a baseball as fast and as accurately as possible after a standardized instruction and warmup. Each subject performed a total of 15 throws, collected as part of a larger study in which stride-length was altered (comfortable ± 10%) on a dimensionally correct pitching mound equipped with a force platform (1200 Hz). Peak GRFs, normalized for body weight (N/BW), were measured in the anterior-posterior (Fxpeak), lateral (Fypeak), and vertical (Fzpeak) directions. Wrist velocity (m/s), tracked with video motion analysis, was measured at ball release.

RESULTS: Skilled pitchers demonstrated larger GRFs (Fxpeak: 0.71± 0.13 vs. 0.47± 0.11; Fypeak: 0.17± 0.07 vs. 0.12± 0.05; Fzpeak: 1.61± 0.19 vs. 1.34± 0.13 N/BW, p<0.01) and higher wrist velocity (16.78± 1.77 vs. 12.86± 1.26 m/s, p<0.01) compared to novice throwers. Fzpeak and wrist velocity were correlated, but only for skilled pitchers (r=0.39, p<0.05).

CONCLUSIONS: Skilled pitchers are more effective than novice throwers at generating ground reaction forces and transferring those forces through the kinetic chain in order to maximize wrist velocity.

TP31 IMPACT OF VIBRATION ON RECTUS FEMORIS DURING BODYWEIGHT SQUATS IN FEMALE COLLEGIATE TRACK ATHLETES

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BACKGROUND: Whole-body vibration (WBV) exposes the entire body to mechanical oscillations when one is standing on a vibrating platform. In recent years, researchers have studied the extent to which these oscillations effect the body. Previous studies have investigated muscle activity in the general population during static exercises with WBV, but there has been little research that has focused on the effects of WBV during dynamic movements in athletes. Therefore, the purpose of the study was to investigate the effects of WBV on rectus femoris muscle activity during a whole-body squat (WBS) exercise in NCAA Division 1 female track and field athletes.

METHODS: Twelve NCAA Division 1 track and field female athletes (Height = 164.41±6.22 cm; Weight = 59.44±3.97 kg; BF% = 19.28±4.53 %; Age = 19.67±1.72 yr) were assessed for adequate squat form using the FMS deep squat protocol. Subjects then completed a dynamic warm-up before a wired EMG sensor was placed over the rectus femoris muscle belly of the right leg. Subjects completed two trials consisting of 10 repetitions of WBS with and without WBV, in a counterbalanced order. Root mean squared (RMS) values were collected using the EMG sensor during WBS trials. RMS values for WBS during each trial were analyzed using a Dependent t-Test with an alpha level of p ≤ 0.05.

RESULTS: Mean values for RMS were 70.02±16.78 μV for WBV trials, and 47.03±17.98 μV for ground squat trials. The values for RMS were significantly (p < 0.001) greater for the WBV trials.

CONCLUSIONS: Significantly higher RMS values occurred for the WBV trials which may indicate that more motor units were recruited in the rectus femoris when the athlete was performing WBS and experiencing WBV. Future research may be required to determine if the current study's results may apply to collegiate male track and field athletes.

TP32 EFFECT OF CARBOHYDRATE MOUTH RINSING ON RESISTANCE EXERCISE PERFORMANCE

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BACKGROUND: A carbohydrate mouth rinse (CMR) has been shown to enhance short duration, high-intensity endurance performance, and raises the possibility that such a strategy could improve resistance exercise performance. This study was performed to investigate the effect of rinsing a carbohydrate-containing solution during repeated bouts of resistance training.

METHODS: In a crossover, counterbalanced design male (n = 18) and female (n = 16) resistance trained subjects (age: 21.5 ± 1.6 y; height: 1.72 ± 0.09 m, mass: 72.8 ± 13.4 kg; body fat: 16.7 ± 5.8%) performed 3 experimental visits during which 4 sets of bench press resistance exercise (4 x 10 repetitions at 65% of one repetition maximum [1RM] with 120 s recovery) and a 5th set of repetitions to failure at 60% of 1RM were performed. Subjects rinsed 25 mL of a water (WAT), non-caloric placebo (PLA), or 6.4% maltodextrin (CHO) solution for 10s during recovery from each set. Rating of perceived exertion (RPE), pleasure-displeasure (FS), repetitions to failure during the 5th set (REPS), and post-exercise blood glucose (GLU) and lactate (LA) were measured.

RESULTS: Compared to WAT (17.7 ± 0.8), rinsing with PLA (19.0 ± 0.7; p = .025) and CHO (18.7 ± 0.8; p = .039) resulted in higher REPS, with no difference between PLA and CHO treatments (p = .310). RPE progressively increased each set (p < .0001), but was not affected by treatment (p = .897). FS declined during recovery from sets 3 and 4 (p < .05), but was also not affected by treatment (p = .692). Post-exercise GLU (p = .103) and LA (p = .620) were not different between treatments.

CONCLUSIONS: Although a placebo effect was noted for REPS, the present study failed to detect an effect of CMR on REPS, RPE, FS, GLU, or LA during resistance exercise. This suggests that use of a CMR to improve performance or reduce the perception of effort during a bout of upper body resistance exercise is not warranted.

TP33 COMPROMISED ANABOLIC RESPONSE TO MECHANICAL OVERLOAD LEADS TO DECREASED MUSCLE HYPERTROPHY IN TUMOR-IMPLANTED MICE

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BACKGROUND: Mechanical overload is a robust stimulus to induce muscle hypertrophy *in vivo*. Previous studies demonstrated that the intervention could attenuate the muscle mass loss due to tumor inoculation in rats. However, the underlying mechanism by which the overload reduced the magnitude of muscle wasting remains to be elucidated.

Purpose: The purpose of this study was to determine whether 7-day functional overload in plantaris muscle would alter the state of anabolic signaling in tumor-inoculated mice.

METHODS: Male C57BL6 mice at approximately three months of age were used in this study. The mice were divided into two groups: one group was subject to Lewis Lung Carcinoma injection (LLC, n=5) and the other to PBS injection (Con, n=5). Four weeks after injection when tumor growth was visible, synergist ablation (SA) surgery, the removing of a tendon for gastrocnemius and soleus muscles, was performed on the left leg (Overload). The right leg served as an internal control with sham surgery (Sham). Puromycin (0.04 $\mu\text{mol/g}$ body weight, BW) was injected 30 minutes prior to sacrifice, then plantaris muscles (PLAN) were weighed and harvested at day 7 following the surgery. Muscle proteins were extracted, total protein concentration of the homogenates was estimated, then western blotting was performed using 60–100 μg of protein. Paired t-test (Sham vs. Overload) and unpaired t-test (Con vs. LLC) were used for statistical analysis.

RESULTS: At the time of sacrifice, no significant difference was observed in control PLAN mass. However, PLAN weights with SA in LLC mice were smaller by 19% than those with SA in Con mice (27.2 \pm 1.6 mg vs. 22.1 \pm 1.1 mg for Con and LLC, respectively, $p < 0.05$). In coincidence with this, densitometry analysis of western blot showed that LLC mice had lower levels of p70S6K phosphorylation following 7-day functional overload compared to Con mice (4.4-fold vs. 1.6-fold, for Con and LLC, respectively, $p < 0.05$). Furthermore, the muscle protein synthesis rate was smaller in LLC mice regardless of SA compared to Con mice (1.0 \pm 0.1 vs. 0.5 \pm 0.1 for Sham and 2.1 \pm 0.1 vs. 1.1 \pm 0.1 for Overload for Con and LLC, respectively, $p < 0.05$).

CONCLUSIONS: These results suggest that decreased anabolic response to mechanical overload contributes, at least in part, to reduced muscle mass accretion in tumor-implanted mice. Supported by Louisiana Board of Regents Support Fund (LEQSF(2017-20)-RD-A-22) to SS.

TP34 RELATIONSHIP BETWEEN JOINT-SPECIFIC CONTRACTION-TYPE, CONTRACTION-VELOCITY AND POTENTIATED CONCENTRIC FORCE IN YOUNG ADULTS

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BACKGROUND: An enhanced concentric force production after a rapid reversed action of a muscle where the muscle actively lengthens and then shortens quickly (known as stretch shortening cycle) is well-established. This enhanced concentric force output is positively related to muscle strength. Whether this relationship is affected by muscle-site, contraction-type, and contraction-velocity is unknown. Therefore, the purpose of this study was to investigate the relationship between the potentiated concentric force and the isokinetic resistive eccentric and concentric peak torques at the knee and ankle at the following velocities: 120°/s and 180°/s.

METHODS: Eleven healthy non-athlete young adults (4 males and 7 females; age = 24.6 \pm 2.48; body mass = 75.33 \pm 19.95 kg; height = 169.5 \pm 11.07 cm) participated in this study. After familiarization with the types of contractions on the isokinetic dynamometer machine (Biodex system 3), participants performed unilateral concentric (CON) and eccentric (ECC) muscle strength tests. Potentiated concentric strength test (Pot.CON) was performed as maximum concentric preceded by maximum eccentric contraction. All the muscle strength tests were done on the non-dominant knee extensors and ankle plantarflexors at 120°/s and 180°/s. Resultant peak torques were normalized to body mass. Pearson correlation was calculated to determine the relationship between Pot.CON and 1) CON, and 2) ECC for all the conditions. All the relationships were first controlled for age, race, and sex. Then the relationships between the all variables of interest were calculated.

RESULTS: No relationship was observed between Pot.CON_{knee} and ECC_{knee} and CON_{knee} at 180°/s; however, Pot.CON_{knee} was positively related to ECC_{knee} and CON_{knee} at 120°/s ($r_{\text{partial}} = 0.8-0.9$; $P < 0.05$). Pot.CON_{ankle} was positively related to CON_{ankle} and ECC_{ankle} at both the velocities, 120°/s and 180°/s ($r_{\text{partial}} > 0.7$; $P < 0.05$).

CONCLUSIONS: Both, ECC and CON muscle strength, are positively related with the enhancement of the concentric force in SSC at the ankle and the knee; however, velocity of movement can affect this relationship. Our data suggests that muscle strength is not related to potentiated force at the knee at higher velocity. Interplay of range of movement, sex, contraction-velocity, and joint-specific neuromuscular properties on generation of potentiated force remains to be known.

TP35 LOAD-VELOCITY RELATIONSHIP DURING PAUSED AND TOUCH-AND-GO BENCH PRESS REPETITIONS

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BACKGROUND: Velocity-based training is a method of prescribing training loads using the load-velocity relationship. Previous research has examined the load-velocity relationship in traditional free-weight exercises, but little is known about how incorporating a pause between the eccentric and concentric phase will affect the concentric movement velocity. The purpose of this study was to investigate the effects of paused repetitions on the load-velocity relationship in the barbell bench press exercise.

METHODS: Twelve resistance-trained males (age: 21.2 \pm 1.2 y, height: 182.7 \pm 10.5 cm, body mass: 99.3 \pm 26.7 kg) with previous bench press experience, were recruited to participate in this study. In a crossover, counterbalanced design, participants completed two trials: 1) touch-and-go bench press repetitions (TNG) which consisted of no delay between the eccentric and concentric phase of the lift, and 2) bench press repetitions with a 2 s pause following the end of the eccentric phase of the lift (PAUSED). During both trials, participants completed 3 repetitions at 20%, 40%, 60%, and 80% 1RM with 3 min of rest between sets. Mean velocity was recorded for each repetition using a linear position transducer. The coefficient of variation was calculated for each set to determine the intra-set reliability.

RESULTS: TNG mean velocity was significantly higher than PAUSED across each of the relative loads ($p < 0.05$). The coefficient of variation in mean velocity was not different between conditions at 20%, 40%, and 60% ($p > 0.05$). At 80% 1RM, the coefficient of variation was significantly higher during PAUSED compared to TNG ($p < 0.05$).

CONCLUSIONS: Paused repetitions decreased mean bench press velocity at each relative intensity and increased kinematic variability at 80% 1RM.

TP36 SIT TO STAND POWER, FUNCTIONAL PERFORMANCE, AND PHYSICAL ACTIVITY IN OLDER ADULTS

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BACKGROUND: Sit to stand (STS) power is associated with functional performance in community-dwelling older adults. Higher functional performance is also reported to be greater in older adults with higher levels of physical activity (PA). The purpose of the study is to determine relationships among STS power and functional performance measures and PA, respectively in a mixed sample of community-dwelling, independent, and assisted living older adults ($N = 36$; 85.1 \pm 5.5 yrs).

METHODS: A Tendo Power Analyzer was used to measure STS power. Functional performance was measured using the Short Physical Performance Battery (SPPB), timed up and go (TUG), five STS chair stand time (CS), six-minute walk (6MW), and gait speed (GS). The Actigraph GT9x wrist worn monitor was used to assess PA across 5 to 7 consecutive days and PA was estimated using average vector magnitude (VM). Pearson Product-Moment Correlations were used to assess relationships between STS power (peak, average, and relative), functional performance measured, and VM. Effect size was interpreted as: $< 0.3 = \text{small}$, $> 0.3-0.5 = \text{medium}$, $> 0.5-1.0 = \text{large}$. Significance was set at $p \leq .05$.

RESULTS: Mean values were: STS average power (309.3 \pm 142.9 W), STS peak power (534.6 \pm 263.6 W), STS relative peak power (7.2 \pm 2.8 W/kg), SPPB total (8.3 \pm 2.2), TUG (14.6 \pm 4.4 sec), CS (15.2 \pm 4.1 sec), 6MW (947.7 \pm 266.8 ft), GS (0.77 \pm 0.23 m/sec) and VM (1081.74 \pm 300.80). All functional performance measurements were related to STS power with medium to large effect sizes. Average STS power was associated with SPPB ($r = .52$), TUG ($r = -.54$), CS ($r = -.45$), 6MW ($r = .44$), and GS ($r = .42$). Similarly, peak and relative peak power were associated with SPPB ($r = .46$, $r = 0.50$), TUG ($r = -.49$, $r = -.56$), CS ($r = -.37$, $r = -.48$), 6MW ($r = .38$, $r = .42$), and GS ($r = .37$, $r = .43$). However, STS power was not associated with VM ($p > .05$).

CONCLUSIONS: Improving lower-limb power may be a viable intervention to improve a variety of functional performance outcomes in older adults.

01 HUMERAL SEGMENT ENERGY AND ITS RELATIONSHIP TO CLINICAL GLENOHUMERAL MEASURES IN YOUTH BASEBALL PITCHERS

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BACKGROUND: Energy flow (EF) into and out of the humerus during the baseball pitch has been associated with ball speed in youth pitchers. However, less is known about the association between humeral EF and clinical measures of glenohumeral (GH) strength and range of motion (ROM). Investigating the associations between humeral EF and clinical GH measures could help provide insight into the relevance of clinical GH assessments to pitching performance. Therefore, the purpose of this study was to examine the relationships between humeral EF and throwing arm GH strength and ROM in youth baseball pitchers.

METHODS: Throwing arm GH internal rotation (IR) and external rotation (ER) isometric strength, IR ROM, ER ROM, ball speed, and 3D pitching motion capture data were collected on 77 youth baseball pitchers (12.6±1.9yrs; 1.63±0.14m; 57.1±12.7kg). Humeral EF, consisting of energy inflow (IF) and outflow (OF), was calculated by integrating the humeral segment power curve between stride foot contact and ball release. Energy flow and GH strength measures were normalized to body mass. Hierarchical stepwise linear regressions were constructed using ball speed and the clinical GH measures to predict humeral IF and OF with an alpha level of .025 set *a priori*.

RESULTS: After accounting for ball speed and body mass, IR ROM negatively predicted humeral energy IF and OF (IF: $F_{1,74}=6.653$, $\Delta r^2=.071$, $p=.012$; OF: $F_{1,74}=6.379$, $\Delta r^2=.071$, $p=.014$). No other significant relationships were found.

CONCLUSIONS: Internal rotation ROM demonstrated a small but significant inverse relationship with humeral energy IF and OF. Pitchers with reduced IR ROM tended to display increased EF into and out of the humerus, indicating increased work done on and done by throwing arm throughout the pitching motion. If excessive, increased throwing arm EF may indicate an increased risk of pitching-related injury. Therefore, pitchers should maintain adequate IR ROM in an attempt to minimize excessive humeral EF.

02 BIOMECHANICAL DIFFERENCES DURING JUMP SQUATS USING OSCILLATING AND OLYMPIC BARBELLS

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BACKGROUND: Using an oscillating barbell anecdotally changes the training stimulus relative to an Olympic barbell, however little research has objectified the differences. The purpose of this study was to determine differences during jump squats in ground reaction forces (GRFs) between an oscillating and Olympic barbell.

METHODS: Resistance-trained collegiate baseball players ($n = 10$, 1.80 ± .08 m, 87.2 ± 13.4 kg) completed three sessions that began with a standardized warm up. The first session consisted of familiarization with both barbells followed by one repetition maximum (1RM) testing of the jump squat with an Olympic barbell. A second familiarization session was completed 48-72 h later. Following a 72-h rest period, participants completed two sets of six jump squat repetitions at 20% 1RM with both barbells in a between-subjects counterbalanced order. Ground reaction forces under each foot and three-dimensional data from eight body segments were collected. These data were used to divide each repetition into a landing and propulsion phase, after which the average peak force, impulse, average force and phase time across four repetitions was computed.

RESULTS: The vGRF impulse was significantly higher for the Olympic (.73±.12 BW*s) compared to the oscillating barbell (.67±.12 BW*s) ($P<.001$, $d=.56$). While there were no significant differences ($P>.05$) between barbells for phase time (.31±.08s vs. .33±.05s) there was a significant phase by barbell interaction for average force ($P<.001$, $\eta^2_p=.8$). Post hoc analysis revealed when using the oscillating bar, the average land phase force (2.11±.36 BW) was significantly lower ($P<.001$, $d=.41$) than the average propulsion phase force (2.56±.33 BW).

CONCLUSIONS: With the oscillating bar, participants demonstrate less average force during the landing phase, but greater average force during the propulsion phase of the jump squat.

03 DOES PITCH LOCATION AFFECT HITTING MECHANICS IN COLLEGIATE SOFTBALL PLAYERS?

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BACKGROUND: Previous studies on baseball hitters have shown significant differences in pelvis and trunk kinematics when swinging at pitches in different strike zone locations. However, less is known about how softball hitters adapt to different pitch locations. The purpose of this study was to examine differences in the pelvis and trunk kinematics of elite softball hitters when swinging at pitches in different ball locations. It was hypothesized that differing ball locations would result in differences in pelvis and trunk kinematics. **METHODS:** Twenty-seven NCAA Division 1 softball athletes participated (20.4±1.8 years; 167.5±21.3 cm; 75.0±15.3 kg). Kinematic data were measured during three, game-effort swings at each of the following tee locations: middle-inside (MI), middle-middle (MM), and middle-outside (MO). Multivariate analysis of variance (MANOVA) was used to examine differences in peak trunk counter rotation (CR), pelvis CR, pelvis rotation angular velocity, trunk rotation angular velocity, hip-to-shoulder separation angle, and hand velocity between pitch locations.

RESULTS: MANOVA revealed a significant difference between pitch locations for peak trunk counter rotation ($F=4.293$, $p=.01$, Partial Eta Squared=.112). Specifically, hitters demonstrated greater trunk CR during MO pitches compared to MI pitches (mean difference=8.6°, $p=.002$).

CONCLUSIONS: With the exception of peak trunk CR, elite softball hitters did not change pelvis or trunk mechanics when swinging at balls in different strike zone locations. While there was an observed difference in peak trunk CR between MI and MO, we hypothesize this to be because of the known point of contact when hitting off a tee versus live pitching. Further study is needed to determine if this difference persists during live pitching. The lack of pelvis and trunk kinematic differences amongst the differing tee locations may suggest that elite softball hitters adopt similar pelvis and trunk rotational strategies irrespective of pitch location.

04 THE EFFECT OF LOAD MAGNITUDE ON MUSCLE ACTIVATION DURING UNILATERAL FRONT RACKED DUMBBELL CARRIES

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BACKGROUND: Weighted carries may increase strength and stability of the scapular and lumbo-pelvic hip complex (LPHC) musculature; however, load magnitude should be considered since variations may affect muscle activation. The purpose of this study was to quantify the effect of load magnitude on muscle activation during unilateral front racked dumbbell carries.

METHODS: Eight (22.8 ± 2.9yrs, 178.0 ± 4.8cm, 72.8 ± 29.6kg) healthy and resistance trained individuals completed 3 trials of 3 load conditions across a 12 m distance with a dumbbell held in a front racked position on the participant's dominant side. Loading conditions were 25% (light), 30% (moderate), and 35% (heavy) of body weight. Electromyography data were measured on the dominant (1) upper (UT) and (2) lower trapezius (LT), (3) latissimus dorsi (LD), (4) serratus anterior (SA), non-dominant (5) gluteus medius (GM), and bilateral (6-7) external obliques. Maximum voluntary isometric contraction (MVIC) testing established baseline muscle activity to which subsequent trials were normalized. A 3 (load) x 7 (muscle) repeated measures analysis of variance (RM-ANOVA) compared muscle activation (% MVIC) between load conditions.

RESULTS: The RM-ANOVA revealed a significant load by muscle interaction [$F(2.540, 17.783) = 4.154$, $p = 0.026$]. Post hoc analysis revealed a significant difference between light and heavy loads in UT ($p = 0.005$), LT ($p = 0.006$), LD ($p = 0.007$), SA ($p = 0.015$), and non-dominant external oblique ($p = 0.030$), where heavy loads had greater activation. There was also a significant difference between light and moderate loads in the UT ($p = 0.017$) and non-dominant external oblique ($p = 0.024$), where moderate loads had greater activation.

CONCLUSIONS: Increased load magnitude resulted in greater scapular and LPHC activation during unilateral front racked dumbbell carries. Future research should analyze the effect of load magnitude during weighted carries with other load placement variations.

05 IMPACT OF HIP INTERNAL AND EXTERNAL ROTATION ON SHOULDER KINETICS DURING A BASEBALL PITCH

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BACKGROUND: Suboptimal hip rotation positioning during a baseball pitch may reduce the amount of energy transferred up the kinetic chain, forcing compensation at the shoulder. However, there is little research testing this hypothesis. Therefore, the purpose of this study was to examine the associations between hip rotation and shoulder kinetics during a baseball pitch.

METHODS: Sixteen right-handed pitchers (14.1±1.2 years; 175.7±10.3 cm; 66.4±9.1 kg) participated in the study. Kinematic and kinetic data were recorded during three game-effort fastball pitches. Data were analyzed in the phases between the following events: foot contact (FC), maximum external rotation, (MER) ball release, (BR) maximum internal rotation (MIR), and follow-through (FT). Linear regression was used to analyze the associations between bilateral hip rotation throughout the pitch and shoulder kinetics during the phases MER to BR and BR to MIR.

RESULTS: Statistical analysis revealed a significant association between right (R) hip rotation from FC to MER, R hip rotation from MIR to FT, and left (L) hip rotation from FC to MER on average net shoulder torque from MER to BR ($F=8.178$, *adj. r*²=0.347, $p=0.003$). There was also a significant association between R hip rotation from BR to MIR on average normalized net shoulder torque from MER to BR ($F=8.089$, *adj. r*²=0.103, $p=0.013$). Specifically, net shoulder torque from MER to BR was associated with greater bilateral hip ER from FC to MER and greater R hip internal rotation (IR) from MIR to FT. Net shoulder normalized torque from MER to BR was associated with greater R hip internal rotation.

CONCLUSIONS: Increased bilateral hip external rotation from FC to MER potentially indicates an overreaching and less efficient stride; forcing compensation up the kinetic chain. Increased R hip IR from MIR to FT may indicate falling across the mound, which is generally considered detrimental to pitching.

06 ASSOCIATIONS BETWEEN SINGLE LEG SQUAT STABILITY AND OVERHEAD THROWING KINETICS IN YOUTH SOFTBALL ATHLETES

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BACKGROUND: The single leg squat (SLS) is commonly used as an injury prevention assessment, though the value of the SLS assessment in overhead throwing sports is largely unknown. The current study aimed to identify relationships between SLS stability groups and throwing arm kinetics during the overhead throw.

METHODS: Sixty-nine youth softball athletes (12.7±2.3 years; 160.1±11.2 cm; 58.9±14.5 kg) participated. Participants were attached to an electromagnetic motion tracking system and performed an SLS bilaterally and three game-effort overhead throws to a catcher 60 feet away. SLS stability was defined as knee valgus ≤ 15° in the decent of the SLS. Participants were divided into four stability groups 1) Bilateral Stability (BS), 2) Throwing Side Instability (TSI), 3) Non-Throwing Side Instability (NTSI), and 4) Bilateral Instability (BI). Kinetic data (shoulder and elbow anterior/posterior force, medial/lateral force, and compression/distraction force) were averaged across three throws and analyzed with a one-way ANOVA at foot contact (FC), maximum external shoulder rotation (MER), ball release (BR), maximum shoulder internal rotation (MIR), and follow through (FT).

RESULTS: Significant differences between stability groups and kinetics were found and Tukey post hoc tests were run. At FC, the BI group had a greater shoulder medial force than the BS ($p=0.007$), TSI ($p=0.037$), and NTSI ($p=0.015$) groups and greater elbow distraction force than the BS ($p=0.002$) and NTSI groups ($p=0.011$). At MER, the BI group had greater elbow distraction forces than the BS ($p=0.009$) and NTSI ($p=0.020$) groups. At MIR, the BI group had a greater elbow anterior force compared to the NTSI ($p=0.036$) group.

CONCLUSIONS: Athletes with SLS instability displayed greater forces about the elbow and shoulder during the overhead throw. It may be beneficial for youth softball athletes to add stability exercises into their training plan to avoid excessive force at the elbow and shoulder.

07 FORCE PRODUCTION SYMMETRY CARRY-OVER BETWEEN BILATERAL JUMPING TESTS

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BACKGROUND: Measuring and monitoring force production symmetry during jumping tests has become increasingly common in rehabilitation and performance settings. However, it has yet to be determined whether symmetry observed in bilateral tasks is universal or task-specific. The purpose of this study was to determine the carry-over of force production symmetry between two jumping tests and its influence on performance.

METHODS: Participants were twenty-five trained males (age: 20.8 ± 1.0 y; height: 1.79 ± 0.06 m; body mass: 83.3 ± 9.8 kg). Participants performed five maximal countermovement jumps (CMJ) and standing long jumps (SLJ) on dual force plates. For the CMJ, jump height (JH) was estimated from time in air and for the SLJ jump distance (JD) was obtained using a measuring tape. Symmetry index (SI%) values were calculated for the following variables: standing weight distribution (WtD%), peak force (PFSI%), and mean concentric force (MFSI%). The mean of the five trials was used for all analyses. To examine carry-over of symmetry and influence of symmetry on performance, a series of Pearson's product-moment correlations were used.

RESULTS: Small and moderate relationships were observed between WtD% and PFSI% ($r = 0.143$; $r = 0.223$) and MFSI% ($r = 0.344$; $r = 0.368$) for CMJ and SLJ, respectively. When examining the carry-over of symmetry between CMJ and SLJ, strong and moderate statistically significant ($p < 0.05$) relationships were observed for PFSI% ($r = 0.531$) and MFSI% ($r = 0.449$). Only trivial and small negative relationships were observed between SI% values and jump performance (JH and JD).

CONCLUSIONS: These results indicate that symmetry observed during quiet stance has minimal carry-over to peak and average force symmetry during jumps. The strong and moderate relationships observed when comparing peak and average force symmetry indicate that symmetry does carry-over between jumping tests. Interestingly, this analysis found force production symmetry appears to have little influence on overall vertical or horizontal jump performance.

08 COMPARISON OF THE BILATERAL SYMMETRY OF RUNNING KINEMATICS FOR COLLEGIATE SWEEP OARSMEN AND DISTANCE RUNNERS.

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BACKGROUND: Competitive sweep rowers use only one oar and are therefore exposed to high volumes of asymmetric rowing. This has potential to create musculoskeletal asymmetries or asymmetrical movement patterns. In this study, we analyze and compare distance running kinematics of collegiate rowers to distance runners. **PURPOSE:** Analyze symmetry of distance running lower body sagittal plane kinematics for college rowers and college distance runners to determine if there are significant differences. We hypothesized that the rowers would be more asymmetric.

METHODS: Participants were 8 college varsity rowers (20.3±1.2 years) and 8 college distance runners (20.9±2.2 years). For the treadmill gait analysis, 9 mm spherical retro-reflective markers were applied and stride foot contact and toe-off were determined according to Pohl et al., (2010). Six Vicon Bonita cameras collected the kinematic data at 200 frames per second using 3DGAIT software. Participants ran for 3 minutes at their preferred pace and data was collected in the last minute. For each stance and swing, data were normalized to 101 points. To assess symmetry, joint angle waveforms were generated for 10 strides for stance and swing. Then, right and left waveforms were compared and symmetry scores were calculated by determining the average difference score (for the 101 data points). For stance and swing, 2 by 2 repeated measures factorial ANOVAS were used to test for main effects and interaction (group - rowers vs. runners; joint - knee vs. hip) at $p=0.05$.

RESULTS: For stance, there was no significant main effect ($p=0.18$) for runners vs. rowers (runners=2.56°±0.48°; rowers=3.49°±0.48°) For swing, there was no significant main effect ($p=0.25$) for runners vs. rowers (runners=4.81°±0.52°; rowers=3.96°±0.52°). However, the main effect for joint approached significance ($p<0.056$), with the knee (5.10°±0.51°) being greater than the hip (3.67°±0.52°).

CONCLUSIONS: Our preliminary results revealed no significant differences; however, this study should be completed with more participants as rowers may have more asymmetric running biomechanics, especially at the knee.

09 SELF-REPORTED SLEEP HABITS ARE RELATED TO ARTERIAL STIFFNESS IN APPARENTLY HEALTHY INDIVIDUALS

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BACKGROUND: Insufficient sleep is associated with cardiovascular disease. Whether this relationship is mediated through decrements in vascular function has yet to be fully elucidated. This study investigated relationships between self-reported sleep habits and vascular health in apparently healthy individuals.

METHODS: Thirty-one individuals (14 females, 30±10 yrs, 24.7±3.2 kg/m²) free of cardiovascular disease, diabetes, hypercholesterolemia and not using medications were enrolled. Subjective sleep habits were characterized using the Pittsburgh Sleep Quality Index to generate a composite score (PSQI score) ranging from 0 (better) to 21 (worse). Vascular health including brachial and aortic pressures, pulse pressure, and augmentation pressure (a measure of arterial stiffness) was quantified via arterial pressure waveforms.

RESULTS: Mean PSQI score was 4±3, which is generally considered as good sleep quality. Initial regression models for age, gender, body mass index, and PSQI score predicted ($P<0.01$) pulse pressure (31.2±5.9 mmHg) and augmentation pressure (2.4±3.7 mmHg). The final model including only significant predictors for pulse pressure ($P<0.01$, $R^2=0.38$) included PSQI score ($\beta=0.47$, $P<0.01$) and BMI ($\beta=0.38$, $P=0.02$). Meanwhile, the final model for augmentation pressure ($P<0.01$, $R^2=0.31$) included PSQI score ($\beta=0.34$, $P=0.04$), BMI ($\beta=0.36$, $P=0.03$), and gender ($\beta=0.46$, $P=0.01$). PSQI score was not associated ($P>0.05$) with brachial or aortic systolic (123±11 and 108±10 mmHg) or diastolic (76±9 and 77±9 mmHg) pressures.

CONCLUSIONS: These data demonstrate that self-reported sleep habits, quantified via PSQI score, are related to indices of arterial stiffness (i.e., pulse pressure and augmentation pressure) in apparently healthy individuals. Large artery stiffening resulting from sleep deficiency may play a role in the development of hypertension and cardiovascular disease.

010 ECG STRESS CHARACTERISTICS IN DIVISION II COLLEGE ATHLETES

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BACKGROUND: A 12-lead exercise stress test is a screening tool that can detect underlying cardiovascular conditions in young athletes and can prevent sudden cardiac death. The purpose of this study was to evaluate the ECG characteristics of Division II collegiate athletes using the Seattle Criteria.

METHODS: Fifty two athletes (Males = 26; Females = 26) of various ethnicities (Caucasian = 65%, Latino/Hispanic = 20%, and African American = 15%); from soccer (27%), tennis (17%), basketball (15%), softball (14%), cross country (9%), volleyball (6%), football (6%), and swimming (6%) completed cardiovascular screening with resting and exercise 12-lead ECG analysis. ECG abnormalities and anthropometrics were compared across race, gender, and sports using an ANOVA. Chi-square analysis was used to test for differences in the frequency of ECG findings across gender, race, and sports.

RESULTS: Although sport was not a predictor for an abnormal ECG, 73% of the athletes presented with athletes' heart configuration, which was significantly higher in males than females ($p = 0.02$). The highest independent predictor of abnormal ECGs was found in Latino/Hispanic athletes, when compared to Caucasian and African American athletes ($p = 0.03$).

CONCLUSIONS: A majority of Division II athletes presented with 'abnormal' ECGs due to cardiac remodeling. With newer and more sensitive ECG screening criteria, the prevalence of false-positive tests is declining. The increasing incidence of sudden cardiac death in collegiate athletes warrants future research that evaluates the impact of implementing the 12-Lead ECG as a standard screening tool for collegiate athletes

011 UTILITY OF SERIAL SHORT-TIME INDICES OF HRV AND CARDIAC DYNAMICS THROUGHOUT THE DAY

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BACKGROUND: Short-time indices of heart rate variability (HRV) and cardiac regulatory dynamics (CRD) throughout a 24-hr recording may provide an alternative to the collection of a full 24-hr recording, however, methodological approaches need to be further evaluated. The purpose is to examine the robustness of various methodological approaches of short-time indices of HRV and CRD throughout a 24-hr period.

METHODS: Eight healthy males completed two 24-hr visits. R-R intervals were recorded continuously using a heart rate monitor. Measures of HRV include the root mean square of successive R-R intervals (rMSSD) and the standard deviation of R-R intervals (SDNN), while CRD was assessed using sample entropy (SampEn). Each 24-hr recording was separated into 145 epochs to create a new time-series (HRV_{EP}). Length and position of these epochs were varied around every 10th-min: the 3-min before every 10th-min (B3), the 3-min following every 10th-min (A3), the 3-min splitting every 10th-min (S3), and the 5-min splitting every 10th-min (S5). The dimensionality and complexity of each of these epoched profiles were subsequently analyzed. Tests of equivalence (TOST) were used to compare the raw values of rMSSD, SDNN, and SampEn between epoching methods at the individual level while paired TOST tests were used to examine the dynamics of these epoched profiles between epoching methods.

RESULTS: TOST test between epoching methods of the raw values for rMSSD_{EP} and SDNN_{EP} at the individual level were equivocal ($p\geq0.05$), whereas SampEn_{EP} showed equality ($p\leq0.05$). Further analysis of paired TOST test comparing the embedding dimension and complexity of HRV_{EP} showed inequality in the optimal embedding dimension of these time-series and statistical equality ($p\leq0.01$) between the complexity of these time-series.

CONCLUSIONS: Epoch-by-epoch analysis of rMSSD_{EP} and SDNN_{EP} were not equal whereas SampEn_{EP} was equivalent across epoching methods. Although the optimal embedding dimension of these time-series varied between epoching methods, the complexity of these time-series were similar between methods for all indices of HRV_{EP}.

012 A COMPARISON OF NEURAL CARDIOVASCULAR CONTROL IN PHYSICALLY ACTIVE AND SEDENTARY YOUNG WOMEN

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BACKGROUND: Lower risk of cardiovascular disease (CVD) may be attributed to improvements in neural cardiovascular control. The impact of exercise training on neural control, specifically in women, remains unclear. The purpose of this study was to investigate sympathetic activity and reactivity in physically active and sedentary young women.

METHODS: Physically active (PAW, n=7) and sedentary (SED, n=7), yet healthy, young women participated in this study. Exercise history and maximal aerobic capacity were measured in Visit 1. During Visit 2, muscle sympathetic nerve activity (MSNA), heart rate (HR), and systolic (SBP) and diastolic (DBP) blood pressures were measured continuously at rest, and during cold pressor (CPT) and dynamic handgrip (DHG) tests.

RESULTS: PAW and SED were similar in baseline characteristics, but PAW had higher VO₂ max values compared with SED (44.2 ± 3.0 vs 29.7 ± 8.1 ml·kg⁻¹·min⁻¹; $p<0.001$). Beat-by-beat SBP during spontaneous breathing (SB) was lower in PAW than SED (111 ± 8 vs. 126 ± 9 mmHg, $p<0.01$). HR tended to be lower in PAW (59 ± 10 bpm) compared with SED (69 ± 11 bpm) during SB ($p=0.06$). HR, SBP, and DBP were similar between groups during controlled breathing (CB; 12 breaths·min⁻¹). MSNA did not differ between groups during SB; however, MSNA burst frequency was lower in PAW than SED (5 ± 3 vs. 11 ± 5 bursts·min⁻¹, $p=0.04$) during CB. No significant differences were displayed in BP or HR responses to the CPT. A significant group x time interaction was found for total MSNA, with SED exhibiting greater MSNA response to the 2 min CPT ($p=0.036$). During DHG, average SBP tended to be higher in SED than PAW (140 ± 27 vs. 116 ± 17 mmHg, $p=0.10$); however, there were no other group differences.

CONCLUSIONS: Preliminary results indicate high levels of physical activity may alter autonomic and cardiovascular function at rest and in response to a painful stimulus. Further testing will help elucidate the mechanisms by which endurance training lowers the risk of CVD in women.

013 THE IMPACT OF BLOOD FLOW RESTRICTION DURING A DYNAMIC EXERCISE ON PLASMA MARKERS OF ENDOTHELIAL HEALTH

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BACKGROUND: Blood flow restriction (BFR) with low intensity resistance training has been found to elicit similar adaptations in skeletal muscle, strength, and hypertrophy when compared to traditional resistance exercise training. Reduced or disturbed blood flow has been shown to increase cell adhesion molecules, such as Vascular Adhesion Molecule-1 (VCAM-1). However, little research has examined the effects of a traditional BFR exercise, which decreases arterial wall shear stress due to decreased blood flow on VCAM-1. The purpose of this study was to examine the effect of a traditional blood flow restrictive exercise (biceps curl) on plasma VCAM-1.

METHODS: Twenty-five physically active males (Blood Flow Restrictive Exercise (BFRE), $n=13$, 24.5 ± 1.1 years, 27.7 ± 1.0 kg/m²) (Resistance Exercise (RE), $n=12$, 24.7 ± 1.2 years, 27.8 ± 1.1 kg/m²) completed the study. Unilateral biceps curl at 30% 1-Repetition Maximum (RM) with a pneumatic cuff at 80% subject specific arterial occlusion pressure (143.0 ± 3.6 mmHg) was performed for 3 sets to failure in the BFRE group. The RE group performed the biceps curl at 30% of their 1RM without arterial occlusion utilizing the average number of repetitions for each set as the BFRE group. Blood samples were collected before and immediately after exercise for plasma VCAM-1. Further, endothelial function was assessed via flow mediated dilation (FMD) before and immediately post exercise.

RESULTS: No change in VCAM-1 (BFRE: 204.6 ± 5.6 , RE: 203.5 ± 5.6) was found between BFRE and RE. Further no change in %FMD (BFRE: 4.78 ± 1.1 , RE: 5.11 ± 1.9), Shear Area Under the Curve (AUC) (BFRE: 4.58 ± 0.06 , RE: 4.66 ± 0.06), and baseline diameter (BFRE: 4.87 ± 0.4 , RE: 4.14 ± 0.4) was found between groups. However, a significant effect of time on VCAM-1 pre-exercise (BFRE: 202.8 ± 5.6 , RE: 204.2 ± 5.6) and 10-minute post exercise (BFRE: 204.1 ± 5.6 , RE: 204.1 ± 5.6) was found in BFRE and RE. In addition, a similar effect of time was found in baseline diameter from baseline (BFRE: 4.67 ± 0.3 , RE: 4.00 ± 0.3) to 10-minute post exercise (BFRE: 4.96 ± 0.3 , RE: 4.25 ± 0.3) in both groups.

CONCLUSIONS: These data indicate a traditional BFRE utilizing biceps curl has no considerable negative effect on plasma markers of vascular inflammation or function as assessed by VCAM-1 and FMD in healthy males.

014 EFFECT OF EXERCISE ON RESERVE OF REPOLARIZATION AND BLOOD OXIDATIVE STRESS MARKERS IN PTSD INDIVIDUALS

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BACKGROUND: Reserve of repolarization of the heart (RoR) is a non-invasive method to monitor the heart's response to stress. RoR assesses the ability of the cardiac cells to reestablish the membrane potential. Previous studies reported RoR as a useful metric to determine cardiac risk in cardiac patients. In this study, we compared two cohort groups, posttraumatic stress disorder (PTSD), which is reported to have a strong association with CVD risk, and a group of apparently healthy control subjects (CON). **Purpose:** To determine differences in PTSD and CON cohorts in RoR and oxidative stress markers in response to a graded exercise.

METHODS: Sixteen male and female subjects (22.00 ± 3.52 yrs) were recruited [confirmed to have PTSD ($n=8$) or were age and sex-matched controls ($n=8$)]. Subjects arrived between 7-9 am after overnight fast, and rested for 20 minutes. A graded walking test was performed on a treadmill until 85% of estimated maximum heart rate. ECGs (12 lead) were monitored before, during and after exercise to obtain RoR. Blood was obtained at rest and immediately after graded-exercise, and was treated for HPLC determination of glutathione (both oxidized [GSSG] and reduced [GSH] forms). A 2 x 2 repeated measures ANOVA was utilized to analyze the results using SPSS v22 with significance set at $\alpha=0.05$.

RESULTS: There were no significant differences in any demographic or resting measures between groups. Resting RoR showed a significant reduction from $75 \pm 5\%$ pre-test to $26 \pm 10\%$ RoR at the end of exercise ($p < .001$), but no differences were noted between groups. Exercise caused a reduction in blood GSH (Pre 385 ± 206 μ M, Post 210 ± 205 μ M, $p = .002$) and an increase of GSSG (Pre 96 ± 40 μ M, Post 142 ± 78 μ M, $p = .038$), but was not significantly different between PTSD and CON groups.

CONCLUSIONS: These data suggest that a graded submaximal exercise test is sufficient to elicit a significant blood oxidative stress response, as well as reduced RoR value. However, there appears to be no discernible difference between PTSD and CON.

015 VALIDATION OF FLOW-MEDIATED SLOWING AS A MEASURE OF ENDOTHELIAL FUNCTION

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BACKGROUND: Flow-Mediated Slowing (FMS) is a potentially simple, automated and user-objective test for assessing endothelial function. FMS can be defined as the minimum pulse wave velocity (PWV_{min}) during reactive hyperemia. The purpose of this study was to determine the effects of acute endothelial dysfunction on PWV_{min}. It was hypothesized that endothelial dysfunction would increase PWV_{min}.

METHODS: 22 young, healthy adults (23.8 yrs ± 4.1 , 73% F, 22.8 kg/m² ± 2.8) underwent simultaneous assessment of Flow-Mediated Dilation (FMD) and PWV_{min} at baseline and immediately following 30min of an endothelial dysfunction protocol. FMD is the current gold-standard test of endothelial function and was used to confirm endothelial dysfunction. Endothelial dysfunction was induced by increasing retrograde shear stress in the brachial artery via inflation of a pneumatic tourniquet to 75 mm Hg around the forearm. PWV was measured from the upper-arm to the wrist using an oscillometric-based device, and brachial FMD was measured using duplex Doppler ultrasound. FMD (%) was calculated as the mean increase in diameter during reactive hyperemia, and PWV_{min} as the minimum pulse wave velocity during reactive hyperemia. Linear mixed models were used to assess baseline versus endothelial dysfunction changes in PWV_{min} and FMD, controlling for within-subject changes in mean arterial pressure. Inter-individual associations between baseline PWV_{min} and FMD were examined using Pearson's product moment correlation, and intra-individual associations between change (baseline vs. endothelial dysfunction) in PWV and change in FMD using the repeated measures correlation package for R was used.

RESULTS: The endothelial dysfunction protocol resulted in large effect size (ES) decrease in FMD ($\Delta = -3.10$, 95%CI: -4.15 , -2.05 , ES = -1.3), and a moderate significant increase in PWV_{min} ($\Delta = 0.16$, 95%CI: 0.05 , 0.28 , ES = 0.6). There was a moderate inter-individual association between FMD and PWV_{min} ($r = 0.46$), and a large intra-individual association between FMD and PWV_{min} ($r = -0.61$).

CONCLUSIONS: Acute changes in PWV_{min} may be a user-objective, automated, and viable tool for monitoring acute changes in endothelial function.

016 VASCULAR FUNCTION FOLLOWING AN ACUTE MENTAL STRESSOR AMONG FIT VERSUS NON-FIT YOUNG ADULTS

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BACKGROUND: Acute mental stress impairs vascular function. The purpose of this study was to investigate if stress-induced vascular impairment is moderated by physical fitness.

METHODS: Nineteen young, healthy adults (21.6 ± 2.7 y, 23.9 ± 3.1 kg/m², 10 F) were classified as fit ($n=11$) or non-fit according to ACSM physical activity guidelines (75 min vigorous or 150 min moderate-intensity aerobic exercise). Across two randomized visits, subjects underwent an experimental (stress) and control (non-stress) testing session. A five-min mental arithmetic task was given to induce stress in the experimental session following baseline measurements. Measurements were taken throughout the 60 mins after the stress/control period. Measures included central blood pressure (cSBP), augmentation index (AIx), and brachial-radial pulse wave velocity (PWV). Mixed linear models were used to perform statistical analyses, covarying for baseline measures.

RESULTS: There was a significant fitness x condition interaction for AIx ($p=0.038$), such that the greatest AIx of fit individuals following stress exposure was 3.3 percentage points less than non-fit individuals (95% CI: -1.29 , -0.09 , $d=-1.34$). There was no interaction of fitness and condition on PWV ($p=0.785$; 95% CI: -0.18 , 0.16), but there was an inconclusive effect of fitness ($p=0.143$), such that fit individuals had a PWV 0.37 m/s less than non-fit individuals (95% CI: -0.27 , 0.04 ; $d=-0.43$). For cSBP, there was no fitness x condition interaction ($p=0.653$; 95% CI: -1.14 , 1.83), but there was an effect of condition ($p=0.045$), where regardless of fitness, stress elicited a 3.05 mmHg greater post-stress increase in cSBP compared to the non-stress condition (95% CI: 0.01 , 3.06 ; $d=0.69$).

CONCLUSIONS: Fitness was associated with a healthier wave reflection profile following a stressor, as well as better overall vascular function. These adaptive effects of fitness on hemodynamic and vascular measures ensued despite stress-induced increases in cSBP occurring regardless of fitness status.

017 A SINGLE SHORT SLEEP-WAKE CYCLE EFFECT ON HEART VARIABILITY AMONG GOOD QUALITY SLEEPERS

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BACKGROUND: Morning awakening hours are associated with increased risk of adverse cardiovascular events. Nocturnal sleep physiology is important to health and functioning. Short sleep (SS) impairs autonomic nervous system (ANS) activity. Low ANS function is reflected by decreased heart rate variability (HRV). High stress index (SI), parameter of HRV, is identified as a physiologic mechanism which sleep disturbances may potentially influence cardiovascular events, due to the imposed higher level of strain of ANS. This study aimed to examine the effect of one night of SS on SI among good sleepers.

METHODS: Fifteen males (age 31 ± 5 SD), with good sleep quality as determined by the Pittsburgh Sleep Quality Index (PSQI) participated in this study. After being in a supine position for 10 minutes in a quiet and temperature-controlled environment heart rate was recorded for 5 minutes with an elastic electrode belt (Polar Wearlink[®]). SI was recorded the night before and the morning of the next day during reference sleep (9-9.5 hrs) (RS) and SS (3-3.5 hrs) conditions. Sleep was performed at their own residence. SI data were processed using CardioMood[®] application. SI was analyzed using a 2 (condition) by 2 (time) repeated measures ANOVA. Significance was set at $p < 0.05$. All analyses were performed using SPSS[®].

RESULTS: There was a significant main effect of time on SI ($F_{1,14} = 4.7, p = .049, \eta^2 = .250$). Participants' mean SI was higher the night before ($m=82.1$) than the morning of the next day ($m=59.9$).

CONCLUSIONS: SI is not modified by a single episode of SS among good sleepers. In good sleepers, results contribute to the observed increase in cardiovascular vulnerability after awakening in the morning irrespectively whether they obtain their regular sleep or not.

018 MOTIVATIONAL INTERVIEWING AS A FOLLOW-UP INTERVENTION AMONG WOMEN AT RISK FOR METABOLIC SYNDROME

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BACKGROUND: Metabolic Syndrome is more prevalent among women than men (35.6% vs 30.3%). Research suggests that exercise training consisting of interval and resistance training would decrease risk factors associated with metabolic syndrome, however, a majority of adult women fail to meet exercise guidelines and are unable to continue an exercise program long-term. Therefore, the purpose of this study was to determine the effect of a motivational interviewing (MI) intervention, an emerging communication method shown to have long-term health behavior effects, compared to an online communication intervention on body composition and metabolic syndrome risk severity score (MetS-Z score) following an exercise intervention.

METHODS: 35 women with at least one risk factor for metabolic syndrome completed a 10-week, 30 session resistance training and sprint interval training intervention. Following the 10-week intervention, participants were randomized into either the MI group ($n = 15$) or an online communication (OC) group ($n=19$) for an additional 12-week intervention (Total weeks = 22). The MI group received three face-to-face interview sessions over 12-weeks lasting 15-30 minutes and were scored for fidelity. The online communication group received bi-monthly emails over 12 weeks that contained information on maintaining exercise and links to exercise videos.

RESULTS: Data were analyzed from 26 women (M age = 42.42 ± 9.48 yrs) who completed all aspects of the study (MI = 10 and OC = 16). An ANCOVA utilizing participants' data from week 10 as a covariate showed significant differences when comparing the two groups. MI participants showed significant improvements in fat mass (lbs) ($f = 897.903, p < .001$), bone mineral density ($f = 40.644, p < .001$), and MetS-Z score ($f = 137.375, p < .001$), while lean mass (lbs) ($f = 91.056, p < .001$) was significantly higher for the OC group.

CONCLUSIONS: Participants in the MI group showed significantly positive results in regards to fat mass, bone mineral density, and MetS-Z score when compared to the OC group. MI has potential as a method to extend positive results from exercise training studies and should be further explored. No funding was utilized for this intervention.

019 EXPLORING CORRELATES OF FORECASTED AND RECALLED AFFECTIVE RESPONSES TO ACUTE AEROBIC EXERCISE USING MOBILE SURVEYS

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BACKGROUND: Exercise-related affective valuations (feelings of pleasure/displeasure) purportedly impact exercise-related cognitions and future behavioral decisions. The majority of prior research is laboratory-based, and supports an inverse relationship between affect during exercise and ratings of perceived exertion (RPE), both of which may be impacted by pre-exercise mental states. **PURPOSE:** To explore correlates of forecasted and recalled affect to an acute bout of exercise in free-living conditions.

METHODS: Participants ($N=42$, 71% female, 36 ± 12 y, body mass index = 25 ± 4 kg/m²) were asked to complete an electronic survey via their smartphone immediately before and after a single bout of ambulatory exercise. RPE was measured via Category-Ratio 10 scale, forecasted and recalled affect was measured via 100mm Visual Analog Scale, and the Multidimensional Mood Questionnaire captured the affect circumplex (i.e. valence and activation). Data regarding psycho-perceptual variables were non-normally distributed and analyzed with Spearman's rank correlations.

RESULTS: Forecasted affect was moderately related to recalled affect ($\rho = .57, p < .001$). Forecasted and recalled RPE had no significant correlations with forecasted or recalled affect (ρ 's ranged between $-.05$ and $-.01$, all $p > .73$). Forecasted affect was moderately related to pre-exercise ratings of Valence ($\rho = .39, p = .01$), Calmness ($\rho = .36, p = .02$), and Energetic Arousal ($\rho = .39, p = .01$). Little-to-no correlation was observed between recalled affect and pre-exercise ratings of Valence ($\rho = .16, p = .29$), Calmness ($\rho = .05, p = .76$) or Energetic Arousal ($\rho = .15, p = .53$).

CONCLUSIONS: The voluntary, dynamic nature of exercise components in free-living conditions may explain the current data, which are contrary to current literature. Because individuals can opt to deviate from initial intentions or alter mode, duration, or intensity after beginning exercise, it may be important to create survey items capable of capturing such incongruencies.

020 THE EFFECT OF A NOCEBO ON PERCEIVED SORENESS, RANGE OF MOTION, AND EXERCISE PERFORMANCE FOLLOWING HIGH INTENSITY RESISTANCE EXERCISE

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BACKGROUND: A nocebo is an inert treatment that causes detrimental effects due to psychological or psychosomatic factors. Previous evidence has reported that nocebo administration impairs sprint performance in athletes. How the administration of a nocebo influences recovery from intense exercise is currently unknown. Thus, the purpose of this study was to investigate the effect of a nocebo on perceived muscle soreness, range of motion (ROM), and repetitions to failure following high intensity resistance exercise.

METHODS: Sedentary college-aged males were recruited. In a between groups study design, participants were randomly assigned to either control or nocebo groups. For the nocebo group, participants were given a capsule before exercise containing gluten-free cornstarch and were told the supplement would exacerbate soreness and hinder performance. The control group received no treatment. Participants completed a maximal bicep curl exercise pyramid. Follow-up assessment was conducted 48 hours later. Perceived soreness, ROM, and bicep curl repetitions to failure were analyzed.

RESULTS: Perceived soreness ($p = 0.88$) and ROM ($p = 0.65$) were not significantly different between groups 48 hours post. In addition, repetitions to failure 48 hours post were largely unaffected ($p = 0.71$).

CONCLUSIONS: Findings suggest that nocebo treatment does not negatively influence soreness or performance following high intensity resistance exercise.

021 EFFECTS OF AN 8-WEEK JUDO PROGRAM ON BEHAVIORS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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BACKGROUND: Prior studies suggest that a combination of physical activity and mind-body exercises, often seen in martial arts, may attenuate negative behaviors in youth with Autism Spectrum Disorder (ASD). Therefore, the aim of this study was to examine the effects of an 8-week judo program on behavioral factors in children with ASD, using a mixed-methods approach.

METHODS: A total of 25 children (ages 8-17), diagnosed with ASD, participated in an 8-week judo program (1x week). Parents of participants were given the Aberrant Behavior Checklist (ABC) to compare the severity of ASD-related behavior at baseline and at the end of the program. A subset of parents (n=9) participated in semi-structured interviews that focused on their child's behaviors during the judo program. Non-parametric paired t-tests were conducted to compare differences in the ABC scores from at baseline and at the end of the program. Interviews were coded independently by two trained researchers and categorized into behavioral themes.

RESULTS: Participants attended an average of 7.04 ± 1.06 classes (out of 8 possible sessions). There were no significant changes in ABC scores, however, parent interviews revealed that 78% of parents observed improvements in both social skills and self-esteem as a result of the judo program.

CONCLUSIONS: Despite no significant differences in ABC scores pre and post-judo, data from parent interviews indicate improvements in self-esteem and social skills. Future studies should further examine the effects of judo in a larger sample of youth with ASD, and include control conditions (e.g. no-exercise group) for comparison purposes.

022 INTERNAL LOAD METRICS IN DIVISION III WOMEN'S SOCCER. THE SIGNIFICANCE OF SLEEP QUALITY

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BACKGROUND: Wearable technology is the number one fitness trend for 2019. Sleep quality (SQ), mood, stress, soreness, and fatigue have been associated with performance in sports through a variety of physiological and psychological mechanisms. Division III (DIII) schools are the biggest participant in the National Collegiate Athletic Association (NCAA). In terms of number of student-athletes, soccer is the most popular sport in NCAA. Females are under-represented in Applied Sports Psychology research. Therefore, the purpose of this study was to investigate the relationship of SQ with mood, stress, soreness, and fatigue in a DIII women's soccer team.

METHODS: All 29 players agreed to participate ($M_{age}=19.32$, $SD=1.16$). Data were collected using readiness surveying based on the Titan 1+ sensor protocol. Subjective data on SQ, mood, stress, soreness, and fatigue were reported by each athlete before every practice and game on a 0-10 visual analog scale (e.g., SQ: 0=Excellent, 10=Poor). In total, forty-three assessments took place in pre-season and in-season. The analysis consisted of Pearson correlations and regression analysis in R.

RESULTS: The correlations indicate strong inter-relationships between SQ and mood ($r = .71$), stress ($r = .74$), soreness ($r = .66$), and fatigue ($r = .88$). The regressions were estimated to examine the expected increase in these outcomes for a one-point improvement in reported SQ (e.g., a one-point improvement in SQ is associated with an expected 1.05-point improvement in reported fatigue).

CONCLUSIONS: On average, the findings indicate a strong relationship between SQ and mood, stress, fatigue, and soreness in this DIII women's soccer team. Therefore, there is preliminary evidence to support that all stakeholders (e.g., coaches, parents, players, certified mental performance consultants) may need to focus on SQ strategies as means to manipulate several internal load variables that affect performance in sports. Future studies should add external metrics (e.g., speed/sprint/impact metrics), investigate differences between practice and game-day data, genders, and Divisions, and collect information from larger samples. Possible limitations include small sample size and self-reported data.

023 RACE AND GENDER DIFFERENCES IN OVERWEIGHT-OBESE POPULATION ON MENTAL TOUGHNESS

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BACKGROUND: Race, gender, and being overweight-obese are linked to health disparities. Adherence to weight management strategies may require certain levels of mental toughness (MT). Cultural and gender differences may have different impact on people battling with weight management when MT is under questioning. This study aimed to characterize the association and the effects of race and gender in overweight and obese population on MT. It was hypothesized that: (a) Race and gender are positively associated with MT; (b) Race and gender will have an effect on MT.

METHODS: Thirty-two participants (age 25.0 3.0 SD) completed surveys related to demographics and MT. Main and interaction effects were analyzed using factorial ANOVA. Significance was set at $p < 0.05$. All analyses were performed using SPSS.

RESULTS: Race was negatively correlated with MT ($r = -.437$, $p = .006$). Gender was negatively correlated with MT ($r = -.357$, $p = .022$). Race had a main effect on MT ($F_{5,2} = 4.119$, $p = .028$, $\eta^2 = .241$). Gender had a main effect on MT ($F_{5,1} = 5.268$, $p = .030$, $\eta^2 = .168$). No interaction of race and gender on MT was observed ($F_{5,2} = .506$, $p = .609$, $\eta^2 = .037$).

CONCLUSIONS: Hispanics are mentally tougher than African Americans, followed by Asians. Hispanics are not different than African Americans, but they do differ from Asians on MT, while African Americans do not differ from Asians. Males compared to females had higher levels of MT. Even though there was not an interaction effect between race and gender, Hispanic males have the highest MT levels, followed closely by African American males. The lowest MT levels were observed between Asian female individuals. Health care professionals working with overweight and obese minorities may need to be more cautious on their approaches and strategies applied to manage weight using stressful strategies that may require high levels of mental toughness.

024 PHYSICALACTIVITY: INVESTIGATING RELATIONSHIPS AMONG SOCIAL MEDIA, MENTAL HEALTH, AND PHYSICAL ACTIVITY.

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BACKGROUND: Seventy-five percent of American adults own a smart phone. Young adults spend 50% of the time on their phone using social media and studies have indicated young adults and adolescents who spend a long time on social media and smart phone have an increased chance of anxiety and depression, and have decreased physical activity (Caplan, et al, 2007). The purpose of this study is to discover the possible effects of social media on physical activity and mental health.

METHODS: A sample of 194 participants (41.1% male, 57.4% female, 1.5% unreported; MeanAGE= 20.74 \pm 2.7 years old) were recruited from two universities in the South. Participants provided demographic information and completed the State-Trait Anxiety Inventory, Beck Depression Inventory, UCLA Loneliness Scale, Godin-Shephard Leisure-time Physical Activity Questionnaire, and indicated their screen time and time on social media sites over the past week.

RESULTS: In individuals who reported low levels of anxiety, there was a positive relationship between their intention to be physically active and the amount of time they spend on Snapchat $r(84) = .23$, $p = .03$. However, in individuals with high levels of anxiety, there was no relationship between Snapchat and PA intention. Instead, among high anxiety individuals increased levels of Snapchat use was related to increased levels of both loneliness $r(112) = .35$, $p = .01$ and depression $r(112) = .27$, $p = .01$. Among individuals who reported low levels of loneliness there was a negative relationship between intention to be physically active and both Facebook $r(87) = .26$, $p = .02$ and Netflix/Hulu $r(87) = .23$, $p = .03$. These relationships were not significant in high loneliness individuals. Individuals classified as high depression intention to be physically active was negatively related to amount of time spent on Facebook $r(88) = .22$, $p = .04$.

CONCLUSIONS: Difficulty remains hard to make firm suppositions if physical activity is universally affected by social media in positive or negative manner. Based on the results of this study, loneliness had the greatest influence on physical activity and social media use. More research is needed to better explain the role of PA as it relates to screen time/social media use and mental health. However, individuals' mental health should be taken into consideration when examining the effects of physical activity interventions that use social media as their main vehicle for delivering the intervention.

025 SOMATOTYPING IN COLLEGE TRACK AND FIELD ATHLETES- EVALUATING CHANGE ACROSS A COMPETITIVE SEASON

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BACKGROUND: Coaches may find value in following track and field athletes' anthropometrics as the extended competitive season requires unique balance of peaking and maintaining preparation. Somatotyping may offer a more holistic metric compared with BMI, mass, or body fat percentage alone when tracking changes across competition mesocycles. The purpose of this study was to record track and field athletes' somatotype scores to elucidate potential changes across the competitive season according to sex and/or age. **METHODS:** Division II track and field athletes (n=47) were tested at the start and end of the outdoor season. Somatotype data were collected according to the Heath-Carter manual (skinfolds, girths, breadths, stature & mass). Raw data were converted to mesomorph, endomorph, and ectomorph scores. One-way RM ANOVAs with between subject variables (sex & age) were used to evaluate change in endomorphy, mesomorphy, and ectomorphy scores across the season. **RESULTS:** Scores for endomorphy (F(1,45)=117.9, p<.001, males (M)= +3.2%, females (F)= -0.1%) and mesomorphy (F(1,45)=10.1, p=.003, M= -3.4%, F= +4.6%) differed across time by sex, but not ectomorphy (F(1,52)=.03, p=.86, M= -6.2%, F= -6.3%). Age did not influence somatotype scores across the season. **CONCLUSIONS:** The rigors of a competitive season may influence only certain somatotype combinations between sexes. Influencing factors for the presently found, divergent changes in somatotype should be identified to optimize training approaches.

026 CHANGES IN JUMP HEIGHT DO NOT PREDICT CHANGES IN SQUAT PERFORMANCE FOLLOWING RESISTANCE TRAINING

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BACKGROUND: A pre-resistance training (RT) counter-movement jump (CMJ) has been proposed as a convenient neuromuscular readiness test to predict specific RT performance and thus guide acute program modification. The present study assessed whether fatigue-related decrements in CMJ were associated with concomitant reductions in barbell squat performance. **METHODS:** Adult males (n = 12, 25 ± 5 years; 178 ± 5 cm; 89 ± 12 kg) with >1 year RT experience performed 6 sets to failure with 90% of their 10 repetition maximum in the squat, bench press and latissimus dorsi pull-down. Relative changes (Δ) from pre- to 24 and 48 h post-RT were calculated for CMJ height (derived from force plate computed take-off velocity) and mean concentric barbell velocity (derived from a linear position transducer) in the barbell squat with loads corresponding to 1.0 (V1.0) and 0.8 m·s⁻¹ (V0.8). Differences in variables across time were assessed with repeated measures analysis of variance (for CMJ) or Friedman's test (for V1.0 and V0.8). Associations among Δ variables were quantified with Pearson's correlations. **RESULTS:** Squat V1.0 was significantly reduced at 24 (median ± interquartile range, 0.95 ± 0.07 m·s⁻¹, p = 0.04) and 48 h (0.93 ± 0.11 m·s⁻¹, p = 0.03) post-RT. Squat V0.8 was also significantly reduced at 24 (0.70 ± 0.09 m·s⁻¹, p <0.01) and 48 h (0.75 ± 0.04 m·s⁻¹, p = 0.03) post-RT. CMJ height was significantly reduced at 24 (mean ± standard deviation, 33.66 ± 5.20 cm, p = 0.02) but not 48 h (34.51 ± 5.12 cm) relative to pre-RT (36.00 ± 5.26 cm). No significant associations (all p >0.05) were observed between Δ CMJ and Δ V1.0 or Δ V0.8 at 24 ($r = -0.06 - 0.29$) or 48 h ($r = 0.17 - 0.37$) post-RT. **CONCLUSIONS:** Recovery of CMJ performance did not parallel recovery of barbell squat performance. CMJ height should not be used to predict daily barbell squat performance.

027 STEPWATCH AND OPTOGAIT ACCURACY IN MEASURING CADENCE DURING DIFFERENT TREADMILL SPEEDS

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BACKGROUND: The StepWatch is an ankle-mounted accelerometer-based device that is used to measure step counting in a variety of populations. The OptoGait uses LED sensors to analyze gait, including cadence (steps/min). Little is known about the accuracy of these two devices at various walking and running speeds. The purpose of this study was to examine the validity of the StepWatch and OptoGait for measuring cadence at six treadmill speeds.

METHODS: College age males and females completed six stages of treadmill walking or running at 0% incline for six minutes. Walking speeds included 2.0 mph, 3.0 mph, 4.0 mph and running speeds included 5.0 mph, 6.2 mph, and 7.5 mph. All participants wore a calibrated StepWatch on their right ankle and OptoGait bars were positioned on both sides of the treadmill during all stages. Device-reported cadences were compared to hand-counted steps from video footage. Percent error for each device was calculated using the formula [(device cadence - video cadence) / (device cadence) *100]. A paired samples t-test was used to compare the StepWatch and OptoGait percent error.

RESULTS: There were no significant differences between StepWatch percent error and OptoGait percent error at the walking treadmill speeds of 2.0 mph (p=0.55), 3.0 mph (p=0.44), and 4.0 mph (p=0.37). However, there was a significant difference in percent error between devices at 5.0 mph (p<0.00), 6.2 mph (p<0.00), and 7.5 mph (p<0.00). StepWatch percent error ranged from 1.9±6.9% to -1.4±1.5% in the walking speeds and -40.6±10.5% to -46.7±11.1%, with negative values indicating an underestimation of cadence and positive values representing an overestimation. Optogait percentage error ranged from 1.9±6.5% to -6.3±13.1% for walking and running, respectively.

CONCLUSIONS: These results suggest the OptoGait provides a valid cadence measure at a variety of treadmill speeds, while the StepWatch consistently underestimated cadence during running. Caution should be taken when using the StepWatch to measure cadence in a population that spends time running.

028 CHARACTERIZING PERFORMANCE IN ELITE TRACK AND FIELD SPRINTERS IN RELATION TO THE ACUTE:CHRONIC WORKLOAD RATIO

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BACKGROUND: The acute:chronic workload ratio is a method of training load quantification that quantifies internal and external responses to training. Chronic training load is a rolling average of the most recent 28 days of training, and the acute workload is the most recent 7 days. The purpose of this study was to explore the relationship between the acute:chronic workload ratio and peak performance in elite track and field sprinters over the course of the 2018 outdoor season.

METHODS: The acute:chronic workload ratio was determined retrospectively by calculating the sum of the 7 days before a competition session ratings of perceived exertion of training load (acute load) and dividing it by the average weekly session rating of perceived exertion of training load over the 28-days prior to competition (chronic workload). Partial correlations were used to characterize the relationship between race time (covaried for confounding variables of temperature, humidity, and wind) and the acute:chronic workload ratio. Secondly, the adjusted race times were used to create Z-scores for each sprinters' race time. Bins were then created for the acute:chronic workload ratio ranges, and the Z-scores were pooled into the acute:chronic workload ratio bins with which they corresponded.

RESULTS: Moderate, positive correlations between the acute:chronic workload ratio and race times for the 100m ($r = 0.542$) and 200m ($r = 0.711$) races were observed. 85% of 100m sprinters and 60% of 200m sprinters had their lowest times within the 0.8-1.3 z- score bin: a range cited in previous research as being associated with a lowest risk of injury.

CONCLUSIONS: Maintaining an acute:chronic workload ratio between 0.8 and 1.3 may be optimal for elite track and field sprinters to reach their peak performance in the 100m and 200m races. An individualized approach to training load using the acute:chronic workload ratio should help coaches and performance staff with individualized training-load prescription for the sprinters to reach peak performance.

029 EFFICACY OF NATURAL FREQUENCY TECHNOLOGY® ON STRESS AND WELLNESS IN HEALTHY ADULTS WITH HIGH STRESS

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BACKGROUND: Many adults report high levels of chronic stress, which when left unmanaged are associated with detrimental health effects including increases in negative mood and sleep disturbance. Natural Frequency Technology®(NFT), designed by NexQuest Life Sciences, harnesses and channels electromagnetic frequencies, and may serve as a natural method of improving stress levels and overall wellness. The purpose of this study was to determine if the NFT® was effective for reducing stress levels and improving sleep quality and mood in adults with high stress.

METHODS: Participants were 42 healthy adults aged 26 to 62 years (n = 11 men, n = 31 women) with scores of ≥ 14 on the Perceived Stress Scale (PSS). Using a double-blind crossover design, participants were assessed at baseline (BL) and assigned to either the Placebo Watch (PW) or Philip Stein Wellness Watch (WW) condition for 2-weeks, followed by a 1-week "washout period", and then 2-weeks in the alternate condition. Self-report surveys regarding stress (using the PSS), sleep quality (using the Insomnia Index and Pittsburgh Sleep Quality Index [PSQI]), and mood (using the Profile of Mood States [POMS]), were collected at BL and following each condition. The data were examined for normality and then analyzed using SPSS and excel to determine condition differences via paired sample t-tests on delta scores (p 's $\leq .05$). Chi-squared analyses were conducted to examine within group changes (p 's $\leq .05$).

RESULTS: The WW resulted in a significant improvement in sleep duration when compared to both BL and the PW group (WW: 1.13 ± 0.85 vs. PW: 1.38 ± 0.90). Compared to BL, both conditions significantly improved for PSS, insomnia symptoms, PSQI, and POMS. Chi square analyses showed a significant difference in the amount of participants who scored < 14 on the PSS between BL and the WW condition only (BL: 33 vs. WW: 25).

CONCLUSIONS: These findings indicate that the NFT® found in the Wellness Watches may be a safe, natural alternative for reducing stress levels and improving sleep quality and mood. Further research is needed to examine the effectiveness and efficacy of NFT® in a variety of populations and environments.

030 PHYSICAL AND COGNITIVE PERFORMANCE DURING UPPER-EXTREMITY VERSUS FULL-BODY EXERCISE UNDER DUAL-TASKING CONDITIONS

Sarah Duckworth, Carrie Higginbotham, Joe Pederson, Rebecca Rogers, Tyler Williams, Mallory Marshall, Christopher Ballmann. *Samford University, Birmingham, AL.*

BACKGROUND: Previous evidence has shown that when two tasks are being completed at once (dual-tasking), physical performance suffers to a greater extent than cognitive performance. However, it is currently unknown whether the amount of muscle mass involved during dual-tasking differentially affects cognitive and physical performance. Thus, the purpose of this study is to investigate physical and cognitive performance while performing upper-extremity or full-body rowing exercise during dual-tasking conditions.

METHODS: In a crossover counterbalanced design, college-aged male and female participants were subjected to four conditions: 1) Sitting, 2) Single task rowing, 2) Dual-task upper-extremity rowing, and 3) Dual-task full-body rowing. For rowing conditions, participants were asked to exercise as hard as possible. For sitting and dual-tasking conditions, a word-list memory test was administered. Power output, total distance rowed, and word-list memory score were compared between conditions.

RESULTS: No significant differences were found for word-list memory scores across any conditions ($p > 0.05$). Compared to single task rowing, power output ($p = 0.04$) and total distance ($p = 0.05$) were significantly lower during the dual-task full-body rowing condition. However, there were no decrements to power output ($p = 0.15$) or distance ($p = 0.08$) during the dual-task upper-extremity rowing compared to single task rowing.

CONCLUSIONS: Findings suggest that greater muscle mass activated during dual-tasking impairs physical performance but not cognitive performance.

031 COMPARISON OF PERCEPTUAL RESPONSES OF AN INDOOR CYCLING CLASS VERSUS CONSTANT LOAD CYCLING

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BACKGROUND: Technology has allowed increased popularity of in-home cycling classes. However, perceptual response of Spin class (SC) (characterized by undulating intensity) vs. constant load (CL) cycling are not well-understood. **PURPOSE:** This study compared perceptual responses between a virtual Spin class and cycling at a constant load.

METHODS: Fourteen college-aged participants of varying fitness (VO_2 max 41.0 ± 8.0 ml/kg/min) completed two cycling sessions; A) 30-min predetermined virtual Spin class on a Peloton bike and B) 30-min constant load (60 rpm) at a resistance to equate total work of SC. Following each bout, session RPE (SRPE) was estimated and a Physical Activity Enjoyment Scale (PACES) was completed. Paired t-tests compared perceptual measures SRPE and PACES questions.

RESULTS: SRPE was not significantly different from SC (6.21 ± 1.37) to CL (6.21 ± 2.15) ($p = 1.0$). PACES revealed significantly ($p < 0.01$) greater responses for enjoyment, interest, fun, exhilaration and accomplishment for SC vs. CL. Overall, 93% of participants preferred SC versus CL.

CONCLUSIONS: Although total work was equated between sessions, participants largely preferred the SC plausibly linked with a more positive experience as reflected in PACES responses. Participating in SC could increase exercise adherence due to significantly greater enjoyment and sense of accomplishment and future research should directly examine this.

032 EFFECTS OF IMPOSING SHORT DELAYS UNDER VARIOUS LOAD CONDITIONS DURING BENCH PRESS

James Rowe, Sean Langan, George Davies, Bryan Riemann. *Georgia Southern University, Savannah, GA.*

BACKGROUND: The bench press (BP) movement is utilized across many disciplines to develop strength and power. When performing the movement with 95% of the 1 repetition-max (1RM), the delay time between the eccentric and concentric phases of the movement was noted to potentially impact the peak and average of both force and power during the concentric phase, but potential impacts when performing the BP under lighter loads and varying delay times remains unknown. This study aims to examine the effects of short delays between eccentric and concentric phases of the bench press on concentric force and power production.

METHODS: Physically active males ($n=11$, 24.8 ± 3.3 yrs, 1.76 ± 0.10 m, 80.4 ± 9.9 kg) and ($n=9$, 25.2 ± 3.9 yrs, 1.66 ± 0.07 m, 66.1 ± 7.5 kg) with ≥ 6 weeks BP experience performed a 1RM assessment. Following a rest period of 3-14 days, subjects performed three BP repetitions at 65% (L1), 75% (L2), and 85% (L3) of their 1RM with delays of .25s, .5s, and .75s between the eccentric and concentric phases. Using bar mass along with bar displacement, captured by an electromagnetic tracking system, peak concentric force (PF) and power (PP) were computed and averaged across the three repetitions.

RESULTS: The actual delay times were statistically equal across the loads ($P > .139$). Delay had no significant effect on PF ($P > .090$); gender by load interaction post hoc analysis ($P = .001$) demonstrated PF between L1- L2 ($P = .037$, $d = .49$) and L2-L3 ($P = .006$, $d = .83$) to be significantly greater for the males (L1-L2: 207.1 ± 94.3 N, L2-L3: 228.4 ± 121.2 N) than the females (L1-L2: 130.1 ± 46.6 N, L2-L3: 102.7 ± 54.9 N). Delay had no significant effect on PP ($P > .269$); gender by load interaction post hoc analysis ($P = .046$) demonstrated PP between L2- L3 ($P = .046$, $d = .89$) to be significantly different for females (L1-L2: 23.2 ± 90.3 W, L2-L3: 84.0 ± 94.1 W), whereas PP between L1-L2 ($P = .006$, $d = 1.6$) was significantly different for the males (L1-L2: 146.7 ± 90.3 W, L2-L3: 55.6 ± 94.1 W).

CONCLUSIONS: These results confirm that delay manipulation had no effects on PF and PP across the three loads with both males and females. The failure to demonstrate delay effects is attributed to insufficient stretch of the pectoralis major. The different load effects on PF and PP between genders is likely related to BP proficiency.

S1 Methodological Do's And Do Not's For Studying The Acute Cardiovascular Effects Of Sitting

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Chronically high exposure to prolonged sedentary behavior, particularly sitting, is related to cardiovascular health. However, mechanistically it is unclear how repeated sitting exposures lead to chronic cardiovascular complications. To better understand this mechanism(s) there is a need for rigorous and standardized methodological practices. Therefore, this symposium will include the following topics: (i) an overview of the cardiovascular physiological mechanisms related to prolonged sitting; (ii) discussion of potential cardiovascular tools for monitoring acute sitting behavior, and special considerations for using these tools during sitting (e.g., posture, time of measurement, interpretation considerations); and (iii) ecological validity considerations when designing acute sitting studies (e.g., study design, appropriate control, lifestyle standardization), gaps in knowledge and future considerations. Following the presentations, 5-10 minutes will be allotted for Q&A.

S2 PRACTICAL APPLICATIONS AND EXTENSIONS OF HEART RATE VARIABILITY IN SPORT SCIENCE

Laurie Wideman, Nathaniel T. Berry, Travis Anderson, William M. Adams. *UNC Greensboro, Greensboro, NC.*

Heart rate variability (HRV) is widely utilized as an assessment of cardiac autonomic regulation at rest and in response to various perturbations. In athletic settings, indices of HRV, such as high frequency (HF) power and the root mean square of successive differences (rMSSD) are often used to track changes in acute and chronic stresses, while in the clinical setting, these indices are used to reflect disease risk and mortality. In psychology, cardiac autonomic regulation is often assessed through resting respiratory sinus arrhythmia (RSA) and used to examine changes in self-regulation, but little is known about exercise-induced sympathetic and other non-neural influences on RSA. While time-domain and frequency-domain metrics are most commonly utilized in the literature, measures of complexity offer more information about the overall status of the system. Nonlinear Dynamics (NLD) can be used to assess the behavior and complexity of cardiac dynamics and each of these metrics should be further investigated in a variety of conditions. Methodological limitations associated with these conditions, such as exercise-related data, limits the use of HRV and NLD. However, existing and new methods to extract meaningful information from these time-series is a vital step in utilizing these metrics during exercise. This symposium has several specific goals; 1) to explore the top-down and systemic regulatory mechanisms of cardiac control, 2) to discuss the relations between RSA and other indices of HRV, 3) to review options for using exercise-related data, 4) to assess the utility of NLD as a marker of system-wide status, and 5) to apply HRV related metrics to athletic performance.

S3 The Past, Present and Future of Exercise Oncology: What We Know and Where to Next

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Exercise oncology is an emerging field, having only been in existence for ~35 years. During these initial three decades, the benefits of exercise during and after cancer treatment have become established and now includes work from most types of cancer along with growing evidence in advanced (metastatic) disease. However, key areas remain understudied and addressing these knowledge gaps is critical to improving exercise prescription in cancer survivors. This symposium will provide an overview of exercise oncology, summarizing what is currently known and strategically identifying target areas to advance the field. As poor motivation and exercise adherence are problematic, these factors will then be discussed relative to current social, environmental, and interpersonal issues that accompany oncology treatments. By identifying exercise barriers faced during and after cancer treatments, strategies can be developed to overcome these challenges to increase physical activity levels, mitigate treatment-related side effects, and enhance quality of life. Looking to the future, there is also a need to identify novel biomarkers that are clinically relevant and that give potential insight into the development of secondary conditions (e.g. cardiovascular disease) often accompanying anti-cancer therapies. Combining basic and applied science may help to clarify heterogeneity in exercise training responses and unravel important mechanisms that can be selectively targeted to optimize health outcomes in cancer survivors. Following the presentations, 5-10 minutes will be allotted for questions.

S4 FOR THOSE ABOUT TO ROCK: MUSIC PREFERENCE AND EXERCISE PERFORMANCE

Christopher G. Ballmann. *Samford University, Birmingham, AL.*

Music and exercise performance has been extensively researched. Listening to music has been shown to increase endurance, sprint, and strength performance. Ergogenic benefits of listening to music during exercise may be due to disassociation, increased arousal, and greater effort. In addition, previous evidence has shown music may improve mood and motivation during exercise. To date, many previous studies have used predetermined music leaving the role of how music preference influences exercise performance less clear. In this presentation, novel information will be provided for how listening to preferred versus non-preferred music impacts exercise performance. How music preference influences sprint and resistance exercise will be discussed in particular. In addition, key features of proposed mechanisms for ergogenic benefits of music preference such as dissociation and motivation will be featured. Novel information on other factors such as music volume and tempo will also be shown. Lastly, practical implications for coaches, athletes, and practitioners on using music preference to optimize performance will be discussed.

S5 RESEARCH IN EXERCISE PHYSIOLOGY: TOOL FOR THERAPEUTIC DISCOVERY

Matthew Bomkamp, Mustafa Ozdemir, Hayden Hyatt, Scott Powers. *University of Florida, Gainesville, FL*

It is well-established that endurance exercise training promotes changes in cardiac and skeletal muscle fibers that result in a protective phenotype. For example, endurance exercise training protects cardiac myocytes against ischemia-reperfusion injury. Similarly, exercise training safeguards skeletal muscle fibers against inactivity-induced wasting. This symposium will examine the proposition that investigation of the mechanism(s) responsible for exercise-induced protection of cardiac and skeletal muscle fibers provides a powerful tool to develop treatments capable of protecting cardiac and skeletal muscle against toxic insults. Specifically, this session will provide examples of how exploring the mechanism(s) responsible for exercise-induced protection can identify molecular targets that can be manipulated pharmacologically to provide new therapies to prevent cardiac damage in response to toxic stimuli or muscle atrophy due to prolonged inactivity.

S6 EXERCISE IS MEDICINE® ON CAMPUS: 2020 AND BEYOND

Carena S. Winters. *Jacksonville University, Jacksonville, FL.*
Renee Jeffreys-Heil. *FMB Wellness Project, LLC, Ft. Myers Beach, FL.*

Exercise is Medicine on Campus (EIM-OC) celebrated its 10th year Anniversary in Orlando, Florida at the 2019 Annual American College of Sports Medicine conference. Over the last 10 years, EIM-OC has established itself as a highly recognized and successful Exercise is Medicine initiative. Currently, over 250 institutions of higher learning have registered with EIM-OC globally, with 139 institutions earning gold, silver, or bronze level recognition. This symposium will provide a brief review of the first 10 years of EIM-OC, current updates, and the first glimpse of future directions of EIM-OC. Specifically, this session will provide information on the new EIM-OC webinar series, an EIM-OC newsletter, updates on credentialing and EIM-OC recognition application requirements. This session will also provide the first preview of the vision for the next decade of EIM-OC. This presentation will include current efforts on the integration of technology in EIM-OC programs and a top-level overview of the current literature on EIM-OC. EIM-OC programs have been shown to not only have implications on student health, but data suggests that they may also have impact on student retention and academic performance. Successful EIM-OC programs also provide service to the University and increasing opportunities for recognition and robust research. At the conclusion, a breakout session will be conducted. The EIM-OC committee is specifically looking to further support institutions' pursuit of EIM-OC implementation and participants are encouraged to identify wants/needs for their EIM-OC implementation and research efforts.

T1 THE NEED TO CLEAVE: ROLE OF CALPAINS IN EXERCISE AND DISUSE ATROPHY

Hayden William Hyatt. *University of Florida, Gainesville, FL.*

Skeletal muscle is a highly plastic tissue that undergoes significant remodeling in response to increased contractile activity or prolonged inactivity (e.g. hypertrophy following resistance training vs atrophy during prolonged disuse). While many cellular processes are involved in the adaptive responses of skeletal muscle, both exercise and prolonged muscle inactivity activate proteolytic pathways that facilitate the remodeling of muscle fibers. Indeed, protein degradation is required to remove exercise-induced damaged proteins and proteins that are no longer required due to prolonged muscle disuse. In this regard, calpains are a family of Ca²⁺-activated cysteine proteases that function to cleave their target proteins and are essential for skeletal muscle adaptation to both exercise training and in response to prolonged inactivity. This tutorial lecture will discuss the role that calpains play in skeletal muscle remodeling in response to exercise training and during periods of prolonged muscle inactivity. Specifically, this session will outline the history of calpain research in skeletal muscle and discuss the advancements that have led to the acknowledgement that calpains play an essential role in skeletal muscle adaptation. Moreover, this session will discuss lesser known functions of calpains in skeletal muscle that include structural scaffolding for triad junction formation, calpain-mediated membrane repair, and cell signaling. In hopes of stimulating future research in the field, the discussion will close by identifying unanswered questions in the field.

T2 HAMSTRING INJURIES: A CONTEMPORARY REVIEW OF THE INJURY TO PERFORMANCE SPECTRUM

Joel Sattgast. *Methodist University, Fayetteville, NC.*

Hamstring injury is a leading cause of injury in both recreational and professional sports leading to lost training and competitive playing time. However, despite the high incidence of injury and progressive rehabilitation process, over one third of individuals will suffer a reoccurrence of their injury. This session will review the mechanisms of injury and risk factors associated with muscle injury, discuss criteria for establishing an appropriate return to play (RTP) timeline utilizing contemporary, best-evidence and clinical reasoning, and propose interventional training and activities to minimize the risk of recurrent injury and improve the RTP timeline. Learning Objectives Include: 1) Identification of modifiable and non-modifiable risk factors which contribute to acute and recurrent hamstring injury, 2) compare and contrast functional outcomes used to guide the timeline for RTP, 3) list multifactorial RTP criteria to enable clinicians and interdisciplinary providers to guide athletes back to participation following hamstring injury, 4) outline a strength and conditioning program focusing on graded exposure for the athlete and preventative measures for the non-injured at-risk athlete, 5) discuss clinical examination and clinical reasoning as part of case-study discussion to guide decision making for establishing RTP criteria.

T3 Preparing for the Silver Tsunami: Can Exercise Shift Projections in Disability Among Aging Midlifers?

Heather K. Vincent, Terrie V. Vasilopoulos, *University of Florida, Gainesville, FL.*

By 2050, the oldest-old (aged =80 years) will comprise over 20% of the 122 million older adults in North America. As the baby-boomer generation ('Silver Tsunami') advances to the oldest age bracket – is this generation physically prepared to live a good quality of life? An unanticipated, alarming health trend is that U.S. population levels of disability are rising among adults transitioning into older age. Once disabled, the probability of recovery from that disability drops as people age. Body mass index (BMI) and physical activity levels are dynamic characteristics that influence functional status throughout life. In this two-part Tutorial Lecture, the latest epidemiological evidence of physical activity patterns among midlifers with different BMIs and successful transition into old age will be shared. Key translational outcome measures to track disability will be identified. The role of physical activity and exercise patterns (intensity, frequency, when initiated in life) on functional outcomes including chair rise, grip strength, walking speed, lung function, activities of daily living and self-rated health will be discussed. This session on exercise will have direct relevance to individual and population health and will provoke thought on whether additional functional optimization is needed to prepare for quality life in old age.

T4 RED-S, the Triad and the Exercise Hypogonadal Male Condition: Similarities and Differences

David R. Hooper. *Jacksonville University, Jacksonville, FL.*

There are now several terms being used to describe the interrelationship between high levels of physical activity, reduced sex hormone concentrations and a reduction in bone mineral density. On this note, separate terms are being used for women or men exclusively, and another all-encompassing term for both sexes. This talk will present a brief history of the research related to this field, as well as provide an up-to-date assessment of the latest research in this hot topic, highlighting both areas of agreement in the literature, as well as areas that are being hotly debated. In terms of learning objectives, this talk will help attendees understand the similarities and differences between these different terminologies. In addition, attendees will learn the impact that these conditions may have on performance level and injury risk. Following the tutorial, learners should be better able to identify cases of these conditions as well as have a better understanding of whether intervening is necessary and if so, what appropriate interventions are for each condition outlined.

T5 STRENGTH TRAINING AND CONDITIONING FOR THE ELEMENTARY AND MIDDLE SCHOOL ATHLETE

Andy Mark Bosak. *Liberty University, Lynchburg, VA.*

The performance of collegiate and high school athletes is important to sports performance professionals. However, an area of great interest is the performance of elementary and middle school athletes. With some strength training and conditioning performance centers and summer sport camps geared towards younger athletes, many career and research opportunities have become available working with pediatric athletes. While pediatric athletes can train hard, training these athletes poses interesting challenges as they are not just “little high school or collegiate” athletes. Yet, it is crucial that elementary and middle school athletes are trained in a somewhat similar manner as high school athletes, but also with important training program differences due to the demands of their sport as well as their physiological capabilities and potential adaptations to training. Therefore, this presentation’s purpose and objective will be to 1) emphasize the importance of physical training for the elementary and middle school athlete, 2) discuss the unique challenges of training and assessing these special athletes, 3) review relevant research and outline future research opportunities, and 4) suggest appropriate training programs principles with reliance on sports science concepts specific to the pediatric athlete. This presentation is intended for students and faculty who are interested in various aspects (ie. strength training and conditioning, physiology, etc.) associated with training elementary and middle school athletes. Since interest is increasing in regards to how sports science can improve pediatric athletes’ performance, more research is needed that will assist coaches and pediatric athletes in meeting the demands of their sport, but with a focus on trying to avoid overtraining and burnout later in their athletic careers.

T6 Taking The Best Foot Forward

Christopher Wilburn¹, Brandi Decoux², Portia Williams³, Imani Hill¹, Jerad Kosek¹, Wendi Weimar¹, Sarah Price⁴. ¹*Auburn University, Auburn, AL*, ²*Bridgewater State University, Bridgewater, MA*, ³*North Carolina A&T University, Greensboro, NC*, ⁴*Florida A&M University, Tallahassee, FL*.

The anatomical and intricate structure of the foot is a subject of high interest in biomechanics, due to the direct influence it has on locomotion and balancing tasks. Early biomechanical research developed morphological theories and assessments to describe structural alterations within the foot. However, present lifestyle changes, such as increases in body mass, sedentary lifestyles and even footwear choice, provide mechanical stresses that induce alterations within the structural framework of the foot. Therefore, the purpose of this tutorial is to present the evolution of the foot in the face of body type, lifestyle and footwear. Specifically, this tutorial will present: a) a brief history of foot development from an evolution and neonatal perspective, b) how the foot is affected by the present day conditions and c) how the foot may change in the future. As the foot is the method by which we propel ourselves, this tutorial will have a broad appeal. Those interested in all types of gait, and even those interested in the physiological influence of poor gait mechanics will find this tutorial valuable.

T7 MUSCULOSKELETAL FITNESS IN PRESCHOOLERS: A BIOMECHANICAL PERSPECTIVE

Danielle D. Wadsworth, Wendi H. Weimar, Christopher W. Wilburn, Brandi E. Decoux. *Auburn University, Auburn, AL.*

Musculoskeletal fitness and physical activity are key components of health for young children as they are associated with improved bone mass and reduced risk for disease. Unfortunately, current musculoskeletal fitness measures for preschoolers such as the standing long jump and hand grip show mixed results in terms of validity and reliability in young children. Other fitness measures for preschoolers simply utilize measures developed and validated for older children and/or adults which is not feasible for young children aged 3 -5. Furthermore, fitness testing for young children should be motivating enough for the child to persevere, but not so taxing to induce exhaustion. Therefore, the purpose of this tutorial is to present and discuss new measures for assessing fitness, particularly musculoskeletal fitness in preschool children. Specifically, we will discuss measures of lower extremity power, upper body strength and whole body strength for preschoolers. This tutorial will (a) provide a brief overview of the current state of preschool fitness research, (b) how each assessment task provides evidence of fitness (c) relationship between our measures and physical activity, fundamental motor skills and weight status and (d) future implementation. This seminar should have broad appeal to individuals as fitness is a large area of interest and children are an emerging population of interest for many professionals.

T8 APPLYING THE QUALITY MATTERS RUBRIC TO IMPROVE EXERCISE SCIENCE COURSE OUTCOMES

Karissa Peyer. *University of Tennessee at Chattanooga, Chattanooga, TN.*

The Quality Matters (QM, qualitymatters.org) Higher Ed rubric standards provide a systematic approach to course design for online and blended courses at the undergraduate and graduate level. The process of Quality Matters course certification allows an instructor to review their course design and policies and to make adjustments that encourage active student engagement and improve student understanding and course outcomes. The QM rubric includes eight General Standards that guide course design: Course Overview and Introduction, Learning Objectives, Assessment and Measurement, Instructional Materials, Learning Activities and Learner Interaction, Course Technology, Learner Support, and Accessibility and Usability. This session will provide an overview of the QM rubric and certification process. It will also provide evidence of the impact of QM certification for two courses in an undergraduate exercise science curriculum: Exercise Prescription in Health and Disease and Interpretation of ECG I. Both courses have been taught by the presenter prior to and following QM certification and changes in course evaluations from pre- to post-certification will be shared. Following this tutorial, attendees should be able to describe the QM approach to course design and the course certification process.

T9 The Female and Male Athlete Triad: What's the difference?

Toni M. Torres-McGehee¹, Erin M. Moore². ¹*University of South Carolina, Columbia, SC.*
²*University of South Florida, Tampa, FL.*

Research on female athletes has shown negative health outcomes in various physiological systems due to LEA including cardiovascular, gastrointestinal, endocrine, reproductive, skeletal, and central nervous systems. Literature has also highlighted LEA as the catalyst which drives the Triad and spurs the acute and long-term reduction of hormonal and metabolic functions. New investigations have demonstrated that males in various sporting activities have similar physiological results to the Triad in relation to decreases in reproductive hormones, bone density, and compromised dietary intake; however, it is unclear the extent of these outcomes. Previously established research has examined and recognized the physiological differences in males and females, prompting the need to establish independent clinical guidelines in relation to energy deficiency and the physiological impacts specifically for males and females. This tutorial will focus on practical measurements for clinicians and addressing clinical prevention strategies (ie., screening and management of Triad symptoms) for female and male athletes.

T10 EXERTIONAL HEAT ILLNESSES: INCIDENCE ACROSS GENDERS, SPORT, AND COMPETITION LEVEL

Susan Walker Yeargin. *University of South Carolina, Columbia, SC.*

Exertional heat illnesses (EHI) include a variety of conditions such as exercise-associated muscle cramps and exertional heart stroke. Exertional heat stroke is a medical emergency and consistently in the top five causes of death in athletes. Historically, EHI incidence data were predominately derived from military research. The development of formal injury surveillance systems over the last decade have provided insight into the incidence and types of EHI experienced in organized sport. This tutorial will review research on the incidence of EHI across genders in military and sport populations. It will provide the latest research on EHI incidence across competition levels (youth to collegiate sports). Gaps in incidence data will highlight possible diagnosis under reporting. Additionally, the lecture will present recent epidemiological research studies that are identifying common factors associated with EHI in gender, sport, and competition level. Recognition of such factors can allow members of the sports medicine team to implement targeted EHI prevention strategies.

T11 PHYSICAL ACTIVITY: PLAYING TO THE BEST OF ONE'S (DIS)ABILITY

Dawn P. Coe, Vincenzo G. Nocera, Aaron P. Wood, Angela J. Wozencroft. *University of Tennessee, Knoxville, TN.*

Youth with disabilities are limited in their ability to engage in adequate physical activity that meets recommendations. Currently, less than 20% of youth with disabilities are meeting the physical activity guidelines. Anatomical and physiological limitations may contribute to impaired resting metabolic rate and low levels of physical activity due to a lack of neuromuscular coordination and functional aerobic impairment. Despite these disadvantages, youth with disabilities should acquire the same amount of daily physical activity as their able-bodied peers. Intellectual and developmental disabilities may lead to difficulties in conducting assessments of physical activity, resting metabolic rate, and motor proficiency as well as limit compliance with physical activity measurement protocols. These assessments are critical to identifying areas to improve in youth with disabilities and for detecting changes that may occur as a result of activity programming. Additionally, these data may be useful in the development of inclusive, adapted physical activity programs tailored towards these children and adolescents. The overall objective of this tutorial is to provide researchers, teachers, and practitioners with information regarding anatomical and physiological factors that may limit the ability to be active, barriers to conducting assessments, and strategies to improve compliance with assessment protocols. The health benefits of physical activity for youth with disabilities will be addressed. We will also discuss results from several studies that have been conducted in our laboratory focusing on youth with disabilities. Finally, we will identify resources for improving physical activity levels and compliance with activity programs in this specific population.

T12 Data Forward: Where Does Machine Learning belong in Exercise Science?

Nathaniel T. Berry. *UNC Greensboro, Greensboro, NC.*

Improvements in technology are making data easier to produce and access while increased processing power has made it cheaper and faster to process. This increased processing power, combined with point-and-click applications, has made it easier for individuals without advanced training in machine learning to train, validate, compare, and deploy complex learning models. Used appropriately, supervised learning methods can provide more robust findings and improved resolution of the data, while unsupervised learning methods can provide unique insights and findings that extend outside of our hypotheses. Whether using deep learning algorithms to explore large datasets, ensemble methods in neuroscience or proteomics, decision trees to develop rule-systems for activity guidelines, Bayesian methods for systems models, or nonparametric extensions of traditional regression techniques to explore non-linearities and interactions among variables, machine learning is here to stay. This tutorial aims to explore and discuss some of the most promising applications of machine learning in exercise science and physiological research.

T13 Dairy vs. Dairy Alternatives: Translating the science for your clients

Jim D. White. *Dairy Alliance, Virginia Beach, VA.*

In the nutritional world, the benefits of cow's milk are well-known: It's a good source of several important nutrients, including protein, calcium and vitamin D, and an important staple for all Americans, especially children. But despite its winning nutrient profile, cow's milk doesn't always have a place within one's diet. More and more people are deciding to give up dairy products. There are plenty of reasons for it, ranging from milk allergies and lactose intolerance to ethical principles. But can they both live in tandem? With the growing popularity in plant-based food options, this session will explore the science behind the nutritional, health and sustainability qualities for dairy and plant-based dairy alternatives, and the opportunities both can play in fueling your client's workout.

T14 EXERCISE APPROACHES TO ESTABLISH AND MAINTAIN WELLNESS IN PEOPLE WITH MULTIPLE SCLEROSIS

Marina Moldavskiy, Christopher Wells, Elizabeth Thomas.. *Shepherd Center, Atlanta, GA.*

Multiple sclerosis is a neurodegenerative disease that affects the central nervous system causing motor impairment, fatigue, spasticity and pain, thus impacting overall quality of life. As these symptoms progress, physical activity is further impacted, which ultimately leads to inactivity and physical deconditioning. For many years people with MS were told to avoid exercise altogether. There is a growing body of literature that suggests exercise can mitigate physical changes and symptoms while improving muscle function and mobility. This symposium will 1.) provide an overview of the current literature regarding safe exercise prescription for persons with MS; 2.) discuss the role of an exercise physiologist working with people with neurologic diseases in a rehabilitation setting; 3.) discuss the utilization of data outcomes on people with MS to inform implementation of a wellness program that is sensitive to the specific needs of someone with chronic disease. By the end of the session, attendees will be able to discuss evidence-based approaches to exercise, with potential applications to a special population. The Eula C. and Andrew C. Carlos MS Rehabilitation and Wellness Program.

T15 How to Rewire the Sprained Brain

Alan R. Needle. *Appalachian State University, Boone, NC.*

Acute ligamentous injury commonly results in greatly elevated re-injury risk, prolonged instability and rapid osteoarthritis emphasizing the need for innovative rehabilitation techniques to improve patient quality of life. Studies of neurological function in patients with musculoskeletal injuries has discovered critical changes within the brain that may predispose individuals for reinjury and poor outcomes. Specifically, reliance on extraneous cortical areas and decreased sensorimotor activation explains why individuals may function at acceptable levels in the clinic, but experience reinjury on return-to-activity and importantly this neuroplasticity can be targeted with novel therapy. Therefore, the purpose of this tutorial lecture is to review and discuss the current state of knowledge regarding interventions capable of correcting maladaptive neuroplasticity after ligament injury. This is to include the application of motor learning principles towards decreasing cortical spread and reliance on extraneous areas, as well as the use of neuromodulatory therapies for improving sensorimotor function after injury.

T16 FROM 60M TO 6 DAYS: FATIGUE IN RUNNING PERFORMANCE ACROSS A SPECTRUM OF DISTANCES

William Scott Black. *University of Kentucky, Lexington, KY.*

Plotting world-best running performances as average running velocity versus duration results in a familiar negative exponential curve of diminishing speed as distance increases. The shape of this curve provides an opportunity to discuss specific mechanisms of fatigue, their potential contributions to impairment of performance, and possible strategies to combat fatigue when preparing for races of specific distances. This tutorial lecture will review current world-best running performances spanning sprints to ultramarathons in the context of current theories of fatigue. Individual mechanisms of fatigue will be discussed in consideration of their contribution to performance during sprint, middle distance, distance, and ultra-distance running competitions. Both central and peripheral processes will be reviewed. Specifically, this tutorial is intended to demonstrate that fatigue is multifactorial and that differing processes contribute in varying degrees depending on the specific demands of the event in question. Finally, the lecture will briefly introduce training and nutritional interventions to potentially mitigate the effects of fatigue on performance. Learning Objective Following the tutorial, learners will be able to stratify potential causes for fatigue (and therefore performance impairment) in sprint, middle distance, distance, and ultra-distance running events. Changes Following the tutorial, learners will be better able to rationalize specific training and nutritional interventions intended to limit the negative effects of fatigue on running performances at distances ranging from sprints to ultramarathons.

T17 Inclusion of Clinical Exercise Physiologists Into Clinical Practice & Other Strategies For Partnering with Healthcare Setting

Kristi M. King, Jason R. Jagers. *University of Louisville, Louisville, KY*

Health and fitness professionals can become integral partners within the clinical sector given that they have the knowledge, attitudes, skills, experience, and credentials, necessary to develop, implement, and evaluate evidence-based physical activity interventions along with individualized exercise prescriptions. More recently there has been a renewed push in the literature for physical activity to be a part of routine healthcare practices. The purpose of this tutorial lecture is to introduce the following strategies for partnering with healthcare settings, 1) inclusion of certified clinical exercise physiologists (CEP) as part of patient care team in clinical settings, 2) promoting physical activity vital signs, 3) incorporating technology, 4) providing referral information and services, and 5) educating and advocating to healthcare professionals about physical activity. Finally, this lecture will also highlight specific examples of successful inclusion of a CEP in an established clinic at the Wendy Novak Diabetes Center.

T18 Caffeine: Performance, Perception and Future Inquiries

Lauren G. Killen, James M. Green. *University of North Alabama, Florence, AL*

Caffeine is commonly consumed by athletes via coffee or energy drinks. Caffeine has shown ergogenic effects on mental and physical performance in a variety of exercise paradigms including aerobic and anaerobic performance, and muscular strength. Additionally, caffeine may positively impact reaction time, focus of attention, and influence shot accuracy in a positive (golf, tennis) or negative (marksmanship) manner. Caffeine's ergogenic benefit may be linked to the influence on the CNS and its analgesic effect. Altered Ratings of Perceived Exertion (RPE) frequently associated with performance enhancement supports the notion that attenuated pain may be mechanistic in some paradigms. These findings are important in performance and training. Further, the potential for caffeine to increase high-intensity exercise tolerance, and total energy expenditure make application plausible for those desiring to reduce body weight. The magnitude and direction of caffeine's effect on performance shows considerable inter-individual variability due to the rate in which caffeine is metabolized owing in part to the genotype of the CYP1A2 gene. This tutorial will review current research involving a) brief historical perspective of caffeine, b) current research on the effects of caffeine consumption on mental and physical performance, c) caffeine's impact on perceptual responses (during and after exercise), d) individual responses and e) future research avenues that warrant additional attention. The focus will include current research including multiple studies from our lab. The tutorial will close with audience Q and A as well as discussion and recommendations for future research.

T19 CAUSES, CONSEQUENCES AND REMEDIES OF GASTROINTESTINAL DISTRESS IN SPORT

Patrick Benjamin Wilson. *Old Dominion University, Norfolk, VA.*

Gastrointestinal (GI) symptoms are highly prevalent during training and competition, particularly among endurance athletes. If severe enough, GI symptoms can negatively impact exercise performance and interfere with training. Although there are a few shared underlying causes of GI distress, each symptom often has its own unique triggers and its own prevention and management strategies. Therefore, this tutorial lecture will provide a review of the causes and underlying pathophysiologies of the various GI symptoms (nausea/vomiting, reflux, fullness/bloating, cramps, diarrhea, etc.) that are commonly experienced by athletes. In addition, this session will also feature a discussion of the documented strategies for mitigating GI problems during exercise. Finally, recent developments in the research on GI symptoms in athletes will be highlighted, including the links between stress/anxiety and GI distress, the gut microbiome and the effects of probiotics, and the use of specialized diets (e.g., low FODMAP) to mitigate GI problems. Because GI disturbances are often multifactorial in nature, attendees of this lecture will gain a broad, holistic view of managing GI issues in athletes and exercisers.

T20 ACSM CERTIFICATIONS: DEFINING AN EXERCISE PROFESSION FROM CONCEPT TO ASSESSMENT

Meir NA Magal¹, Francis B. Neric². ¹*North Carolina Wesleyan College, Rocky Mount, NC,* ²*American College of Sports Medicine, Indianapolis, IN.*

Professional certification is a voluntary process in which a reputable organization, such as the American College of Sports Medicine (ACSM), grants time-limited recognition and use of a credential to individuals who comply with eligibility requirements and meet a minimum level of competence. ACSM certifications are a pivotal pillar, in conjunction with appropriate academic preparation, in the development of exercise professionals in both the health fitness industry and in clinical exercise settings. The ACSM Certification Department and the ACSM Committee on Certification and Registry Boards (CCRB) implements rigorous psychometric development standards and continual process improvement strategies to ensure its certification exams are valid, reliable, and fair for exam candidates, and, more importantly, provide reasonable assurance to the public the ACSM exercise professionals can safely and effectively perform their job duties. This tutorial will (1) provide information concerning the complex and meticulous processes of exam development and on-going maintenance of ACSM certifications, (2) describe purpose of the four core, professional ACSM certifications, (3) note examples of recent content changes to the ACSM certifications, and (4) provide faculty insights in how to adequately prepare for a high stakes ACSM certification exam.

T21 Integration of Evidence-Based Medicine for the Prevention, Recognition, Management and Care of Exertional Heat Stroke

William M. Adams. *University of North Carolina at Greensboro, Greensboro, NC.*

The purpose of this tutorial is to address current evidence-based practices in the realm of exertional heat stroke (EHS). The course will highlight the current best practices for the prevention, recognition, management and care of EHS and identify the gaps in which these best practices are not being utilized or practiced. The tutorial will bridge the gap between current best practices and what clinicians are or are not doing. This is to ensure that first-rate knowledge is available for clinicians in order for them to implement in their own clinical practice (implement policy changes at their place of employment to use current evidence based best practice, practice using the most up-to-date best practices, etc).

T22 EFFECTS OF ACTIVE LIFESTYLES ON HEALTH AND FUNCTIONAL INDEPENDENCE IN OLDER ADULTS

Trudy Moore-Harrison¹. L. Jerome Brandon². ¹*UNC Charlotte, Charlotte, NC.* ²*Georgia State University, Atlanta, GA.*

Adults are prone to developing chronic diseases and loss of functional independence as they age. Multiple factors contribute to these conditions, but physical inactivity appears to be a major contributor as physical inactivity has been cited as a risk factor for the development of chronic diseases and becoming dependent on others. Poor balance appears to be a critical component that influence the activity level of older adults. Fall fears and physical inactivity are common attributes of older adults with multimorbidities. Therefore, the purpose of this tutorial is twofold: 1) to discuss the impact of physical activity participation and developing readiness for physical activity participation in older adults. Further the benefits of physical active lifestyles in controlling cardiometabolic risk factors for cardiovascular and metabolic disease. 2) to discuss the impact of resistive training on strength, balance, physical function and metabolic diseases in older adults. This presentation will discuss the role of community, socioeconomic status and program protocol in increasing physicality among older adults. This presentation will also include discussions relative to the effective resistive training protocols and functional skill development. The take home message from this presentation is that older adults can actively participate in physical activity and improve their quality of life.

T23 Evaluation and Management of Achilles Tendinopathies

Leonardo Oliveira, Peter Buffington, Orlando Sports Medicine, *Orlando, FL.*

Tendinopathies involve athletes of running and jumping sports and are frequently challenging to treat. Many times, tendinopathies are career-ending injuries. The goal of this tutorial lecture is to provide a current and practical method to evaluate and manage achilles tendinopathies in athletes of running and jumping sports. The speakers will seek to provide a step-by-step approach that the audience can implement in their respective practices with resources available at any rehabilitation facility and discuss return to running and return to sports protocols. Dr.Leonardo Oliveira is a sports medicine physician and will be discussing the clinical evaluation of individuals with achilles tendinopathy and discussing the treatment approach. Dr.Peter Buffington is a physical therapist and a experience runner having completed Boston Marathon for more than 6 years in a row. Dr.Buffington will address the practical approaches he applies in the physical therapy office and while working with athletes.

T24 FRIEND, FOE, OR FORGOTTEN: THE CONFUSION SURROUNDING DIETARY FAT FOR HEALTH AND PERFORMANCE

Catherine Saenz. *Jacksonville University, Jacksonville, FL.*

Dietary fat is an essential nutrient for optimal health and growing research highlights the importance of dietary fat for performance as well. Dietary fat is involved in nutrient absorption, cell health, hormone health, muscle recovery, and resiliency. So often, however, athletes hear of the negative aspects of dietary fat and are confused or unaware of why fat is an essential component of a healthy dietary profile. The primary goal of this session is to dispel myths about dietary fat and understand what research suggests about how to include dietary fat to maximize health and performance. This translational session will review the role of dietary fat for optimal health and its impact on athletic performance and recovery. The learning objectives focus on dietary fat's primary role for health, how this translates to athletic performance and recovery, and practical applications for including high quality fat sources into a diet. This session will commence with a brief history of dietary fat for performance and how this has shifted over the centuries. Dietary fat sources, metabolism, and its primary physiological roles will be reviewed in more detail. This will focus on novel research regarding how dietary fat fits into a health-driven paradigm and why this is of interest for active and athletic populations. This research highlights the strengths of properly including fat in the diet and the negative impacts of improper or inadequate quantities of fat on health, performance, and recovery. Practical implications for understanding different types of dietary fat, how they may shift for different types of diets (i.e. High carbohydrate vs High fat), and how to apply this information will be presented. After this session, attendees should gain a greater awareness of emerging research highlighting the role of dietary fat, what sources of fat to consume, how to include fat in their diets, and how this macronutrient translates to health, performance, and recovery.

T25 ACTIVE TRANSPORTATION 101

Brian B. Parr¹, Janet R. Wojcik². ¹*University of South Carolina Aiken, Aiken, SC,*
²*Winthrop University, Rock Hill, SC.*

The ActivEarth initiative aims to improve public health, the environment, and the economy through greater levels of physical activity. One specific goal is to increase active transportation, including walking, bicycling, and wheelchair rolling, as a way for individuals and communities to achieve benefits for personal health, the economy, and the environment. The purpose of this tutorial is to describe the ActivEarth initiative, define active transportation, summarize the benefits of active transportation for personal health, and describe the environmental and economic impacts of active transportation. Strategies that exercise and health professionals can use to promote active transportation to meet physical activity goals as well as directions for future research will also be discussed.

T26 USE OF THE ANATOMAGE TABLE AND VISUAL HUMAN DATASETS TO IMPROVE ANATOMY LEARNING

Robert S. Bowen. *Truett McConnell University, Cleveland, GA.*

The study of anatomy is central to a variety of different academic specialties including exercise science and kinesiology-related disciplines. The use of cadaveric dissection, while the gold standard in anatomy learning, is increasingly expensive and inaccessible for many academic programs and institutions. Limited detail, low resolution, and unrealistic anatomical representations often plague other less expensive methods of anatomical study. Real cadaveric imagery collected from the Visual Human Projects in both the United States and South Korea provides new opportunities to learn anatomy without the restrictions associated with traditional methods of learning. In particular, Anatomage Tables provide a viable option for accessing and utilizing the Visual Human Projects' datasets. The evolving technology is accessible to and useful for many different types of learning and academic institutions that host a wide array of students, financial resources, and physical infrastructures. This tutorial will introduce the audience to the data from the Visual Human Projects and the use of the Anatomage Table to optimize and navigate these datasets. Furthermore, this session will provide a strategy to incorporate these resources into a traditional two-semester undergraduate anatomy and physiology course. The proposed strategy has significantly improved anatomy learning and retention in a mixed degree program (biology, pre-health science, nursing, and exercise science) course and exceeded the learning outcomes associated with a traditional approach to human anatomy learning.