

Abstracts

Preconference Session (PC1-PC8)

PC1: WHERE ARE THOSE WHO LOOK LIKE ME? NAVIGATING SEACSM AND ACSM AS A DIVERSE INDIVIDUAL.

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The ACSM and SEACSM regional chapter value diversity within its membership and considers it vital to the mission of advancing and integrating scientific research into educational and practical applications. Conference attendees belonging to diverse populations and desiring to contribute their knowledge to support the organization's mission often experience problems finding or establishing a community where they feel comfortable sharing their unique and valuable perspectives. The lack of community, or the knowledge thereof, can lead to feelings of isolation and ultimately a lack of engagement at the regional and national levels. The purpose of this pre-conference tutorial is to provide students, faculty, and professional attendees with resources to increase their engagement, build their professional network, and improve their community and overall sense of belonging within the college. Discussion topics will include (1) ACSM and SEACSM Leadership and Diversity Training Program opportunities, (2) Special Interest Group networking events, and (3) maximizing the ACSM and SEACSM membership. The session attendees will leave with an increased knowledge of diversity initiatives within the organization and a commitment to engage in at least one new diversity initiative after the meeting.

PC2: CADENCE AND THE WALK-TO-RUN-TRANSITION IN 18-20 YEAR OLDS: THE SKYROCKET STUDY

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BACKGROUND: Running is a vigorous-intensity form of physical activity that is also an important facet of human locomotion. Emerging evidence indicates that adults (21 - 60 years of age) naturally transition from walking to running at a cadence between 135 - 140 steps/min. However, little evidence informs the optimal walk-to-run transition (WRT) cadence threshold in young adults 18 - 20 years of age. **METHODS:** Twenty-seven young people (37.0% women; mean age = 19.1 [standard deviation, SD 0.66] years; mean Body Mass Index or BMI = 24.5 [SD 3.6] kg/m²) completed a series of five-minute treadmill bouts (0% grade) progressing in 0.22 meters/sec (m/s) increments from speeds of 0.22 - 2.68 m/s, with two minutes standing rest in between bouts. All participants achieved at least one running bout. Researchers hand-tallied directly observed and video-recorded cadence (for backup verification as needed) and noted when a participant began to run. Each participant's first running bout and their immediately preceding walking bout were extracted for analysis. The optimal WRT cadence threshold was identified through receiver operating characteristic curve (ROC) analysis by selecting the cadence that maximized Youden's index (YI), which considers both sensitivity (Se) and specificity (Sp). Se, Sp, and area under the curve (AUC) were also calculated. **RESULTS:** The optimal WRT cadence threshold resulting from ROC curve analysis was 135.2 steps/min (95% CI: 126.2 - 137.1). This threshold correctly identified participants who were actually running 81% of the time (Se = 0.81) and correctly identified participants who were actually walking 100% of the time (Sp = 1); thus, YI was 0.81. Furthermore, the threshold was, overall, a highly accurate classifier (AUC = 0.95). **CONCLUSIONS:** The identified optimal WRT cadence threshold (135.2 steps/min) falls within the 135 - 140 steps/min range previously reported for adults 21 - 60 years of

age. This threshold can be useful for analyzing data derived from wearable technologies in the context of identifying or programming cadences associated with running. Grant or funding information: NIH NICHD - R01HD105768

PC3: INCIDENCE OF ON-DUTY CARDIAC EVENTS IN CAREER FIREFIGHTERS: A 4-YEAR RETROSPECTIVE DESCRIPTIVE ANALYSIS

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BACKGROUND: Career firefighters face a significant risk of mortality due to sudden cardiac death related to underlying cardiovascular (CV) disease risk factors. Although firefighters endure high physiological and psychological stress, these adverse CV events occur, in part, due to inadequate cardiorespiratory fitness, which can lead to overexertion and CV strain while performing occupational tasks on the fireground and during training exercises. The current study evaluated the incidence of adverse CV events among career firefighters. **METHODS:** Workers' compensation claim reports were compiled from 3 fire departments of varied sizes (110 to 1,000 personnel) over a 4-year period between July 1st, 2019 to June 30th, 2023. The data were deidentified and all musculoskeletal injury, exposure, and laceration reports were removed. **RESULTS:** A total of 114 (5.6%) adverse CV-related events were reported out of 2,036 claims. Approximately 28% (32 events) of CV-related claims occurred on the fireground while performing occupational fire duties, 41% occurred while performing a training exercise (28 events) or during exercise (19 events), and 31% of events occurred while resting at the fire station or an unspecified location. The total workers' compensation cost was \$1.4 million USD (\$223 per firefighter years) for all CV-related claims. 4 claims reported myocardial infarctions (MI) with subsequent care totaling \$1.2 million USD (\$202 per firefighter years); the remaining CV claims totaled \$129,581 USD (\$21 per firefighter years). Of the 4 MIs reported, 1 resulted in sudden cardiac death. Syncope and dizziness were the most commonly reported claims (35 cases alone, 7 combined with other symptoms) and occurred during all aforementioned activities. Dyspnea was reported in 27 cases (20 cases alone, 7 combined with other symptoms). Chest pain or tightness was reported in 22 cases (15 cases alone, 7 combined with other symptoms). Other claims reported alone or concurrently with other symptoms included tachycardia, hypertension, arrhythmia, sudden headache, and fatigue. **CONCLUSIONS:** Strenuous occupational tasks can place significant strain on a firefighter's CV system, increasing risk of adverse CV events. These findings highlight the importance of implementing a comprehensive wellness program, regular participation in vigorous exercise to provide cardioprotective benefits, and completion of annual health screenings.

PC4: EFFECT OF EXERCISE TRAINING ON HDL APOLIPOPROTEOMIC SCORE IN PREDIABETIC OR DIABETIC ADULTS

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BACKGROUND. Previous studies have validated a high-density lipoprotein (HDL) apolipoproteomic score (pCAD) as a biomarker of

coronary artery disease. However, the effect of regular exercise on pCAD has not been examined in adults with prediabetes or diabetes. Thus, the purpose of this study was to examine the effect of different types/doses of exercise on pCAD in two unique exercise cohorts consisting of adults with prediabetes and type 2 diabetes (T2D).

METHODS. Adults from two exercise trials (STRRIDE-PD: n=119, adults with prediabetes, 6 mo intervention; HART-D: n=142, adults with T2D, 9 mo intervention) engaged in one of seven exercise interventions (STRRIDE-PD: 4 groups, HART-D: 3 groups), including various doses of aerobic training (AT), resistance training (RT), or a combination of resistance and aerobic exercise (AT+RT). HDL-associated apolipoproteins were measured in APOA1-tagged plasma via LC-MS at baseline and following training. The pCAD score was calculated at each timepoint by a composite of five apolipoproteins (APOA1, APOC1, APOC2, APOC3, APOC4). An independent samples t-test was used to compare baseline pCAD between the two cohorts, while paired t-tests were used to test whether within group changes in pCAD were significant. Differences in pCAD change between exercise groups were tested with general linear models adjusted for age, sex, race, and baseline pCAD within each study. **RESULTS.** STRRIDE-PD participants had lower baseline pCAD scores compared to those in HART-D (STRRIDE-PD: 0.5 ± 0.2 , HART-D: 3.3 ± 0.2 , $p < 0.0001$). The exercise group engaging in low doses of moderate AT in STRRIDE-PD had a significant change in pCAD score (-0.7 ± 0.2 , $p = 0.008$). There were no differences in pCAD change within or between the other STRRIDE-PD intervention groups. HART-D participants in the AT+RT group had a significant change in pCAD score (-0.6 ± 0.2 , $p = 0.006$), which was significantly different ($p = 0.04$) than the change in the AT group (0.1 ± 0.2). **CONCLUSIONS.** Adults with prediabetes (STRRIDE-PD cohort) and T2D (HART-D cohort) experienced reductions in pCAD score following a low amount of moderate AT and AT+RT, respectively. Thus, the results of our analysis demonstrate that AT alone may improve the HDL apolipoproteomic biomarker of coronary artery disease in adults with prediabetes, but adults with T2D may need to engage in both AT and RT to experience reductions in pCAD. However, since the same exercise mode/dose was not employed across studies, further studies are needed to validate these findings.

PC5: COMPARISON OF STEPPING PROTOCOLS TO 2 MINUTE WALK TEST TO ASSESS CARDIORESPIRATORY FITNESS

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BACKGROUND: The 2-minute walk test (2MWT) is the preferred field test for assessing cardiovascular outcomes. Space and level surface requirements are a limitation to performing the 2MWT in certain environments. Stepping in place may be a suitable alternative for certain environments and for assessing population sub-groups. Currently, there is no consistency among stepping in-place protocols. Therefore, the purpose of this study was to investigate the effect of stepping style and cadence on heart rate (HR) and determine if a specific protocol would elicit similar results as the 2MWT. **METHODS:** Participants completed a series of 2-minute stepping protocols and the 2MWT. Two stepping styles: freestyle stepping (FS) and marching style (MS) and four stepping cadences: 90 BPM (BASE), 113 BPM (25% increase), 135 BPM (50% increase), and 158 BPM (75% increase) were included. This resulted in 9 test conditions presented in random order. 60 adults (18M/42F, mean age 20.88 years old) completed this study. Resting heart rates (HR) and HRs immediately following each 2-minute condition were collected using a H10 Polar Chest Monitor and the Power Flow app. A one-way ANOVA with repeated measures was conducted to compare HRs immediately following the 2-minute conditions. A two-way (2 style x 4 cadence) ANOVA with repeated measures were conducted to determine if there were style and cadence effects. Post-hoc pair-wise comparisons with Bonferroni adjustments were conducted when necessary, with a significance level of $\alpha = 0.05$. **RESULTS:** Results indicate that style and cadence affect HR. The MS elicited statistically significantly higher average HRs than the FS (135 BPM vs. 107 BPM) ($p < 0.001$). The 50% increase in cadence resulted in highest average HRs and were statistically higher than BASE and the 75% increase in cadence. The one-way ANOVA revealed that only the MS 25% and 50% increase in cadence were not significantly different than the 2MWT (128 BPM, 136 BPM, and 132 BPM, respectively) ($p = 0.4348$ and $p = 1$, respectively). For both conditions (MS 25 and 50% increase), HRs fell within the moderate intensity category (64% and 68% of age-predicted HR_{max}). **CONCLUSION:** Our results indicate that a stepping protocol with specific parameters (style and cadence) may be used as a substitute

for the 2MWT. Additional investigation into the reliability and validity of these stepping protocols could determine if one condition is more appropriate to assess CRF.

PC6: IMPACT OF THE GAMESQUAD EXERGAMING INTERVENTION FOR YOUNG ADULTS WITH DOWN SYNDROME ON FUNCTIONAL FITNESS.

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BACKGROUND: Adults with Down Syndrome (DS) face unique barriers to MVPA. Exergames are a home-based exercise option which has shown effectiveness for increasing MVPA in typically developed populations. An exergaming intervention with individual health coaching sessions called GameSquad has demonstrated effectiveness in improving MVPA in children with overweight/obesity and adolescents with neurodevelopmental and psychiatric diagnoses, though changes to functional fitness measures are unknown. The purpose of this study was to conduct a 12-week trial to assess the feasibility of GameSquad for adults with DS. **METHODS:** Adults with DS were given a video gaming console and the exergame Ring-Fit Adventure™. Ring-Fit Adventure™ is a novel exergame that uses both a resistance ring and body weight to perform numerous upper and lower body cardiovascular and resistance exercises. Participants were instructed to play the game for 120 minutes per week and attend weekly (15-minute) virtual health coaching sessions, during which an individual health coach promoted game usage, troubleshoot problems with technology, and collected self-reported minutes of gameplay. Outcomes included functional fitness test results (grip-strength, leg-press, timed up and go, 6-minute walk, y-balance test). Paired Sample t-tests were conducted to detail changes from pre to post. **RESULTS:** 20 adults with DS (M age = 23.2, 85% non-Hispanic white, 65% female) enrolled and completed the trial. Participants attended 93% of coaching sessions and 90% met the weekly gameplay goal. A significant increase in leg-press was noted ($p = .02$). No significant changes were noted in grip-strength ($p = .78$), timed up and go ($p = .69$), 6-minute walk ($p = .88$), y-balance test ($p = .21$). **CONCLUSION:** Attendance to coaching sessions and adherence to the weekly usage goal were high. Lower-body strength increased among this sample. At-home exergaming interventions may present an effective option to increase functional fitness among young adults with DS. **FUNDING:** Healthy Weight Research Network for Children with ASD/DD Pilot Award (UA3MC25735). Center for Children's Healthy Lifestyles and Nutrition Pilot Award (No number).

PC7: INFLUENCE OF EXOGENOUS KETOSIS ON EXERCISE PRESSOR RESPONSES AND CARDIOVAGAL BAROREFLEX SENSITIVITY IN METABOLIC SYNDROME

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BACKGROUND: Recently, exogenous ketone ester (KE) administration has been shown to significantly improve indices of vascular and metabolic function in individuals with obesity, and thus, may also have implications for correcting cardiovascular abnormalities in individuals with MetS. Thus, this study tested the hypothesis that exogenous KE administration would elicit transient reductions in exercise pressor responses while simultaneously increasing cBRS in individuals with MetS. **METHODS:** 11 individuals participated in this study, 7 of whom met the National Cholesterol Education Panel Adult Treatment Panel III criteria for MetS. Each participant completed three study visits, which included a cardiometabolic prescreening (visit 1) and two experimental visits (visits 2 and 3). During each experimental visit, participants ingested either an oral dose of a commercially available exogenous KE (~280 mg/kg) or a taste- and volume-matched placebo (random order). Exercise pressor responses were quantified as the changes in mean arterial pressure (Δ MAP; collected beat-by-beat via finger photoplethysmography) during two-minutes of isometric handgrip exercise (35% of the maximal voluntary contraction) and were assessed before (BL), and 30-, and 60-minutes post ingestion. Likewise, cBRS was evaluated using the sequence method (systolic blood pressure change ≥ 1.0 mmHg, pulse interval change ≥ 5.0 ms, $r \geq 0.80$, sequence length ≥ 3 beats), and was assessed before (BL), and 45-, and 105-minutes post ingestion. **RESULTS:** A significant

condition by time interaction was observed for Δ MAP ($F=7.036$, $p=0.01$) in the MetS group. Further inspection suggests this may be explained by a net decrease in the Δ MAP response at minute 30 in the KE condition (mean diff: -9.49 Δ mmHg), but a net increase at minute 30 in the placebo condition (mean diff: $+3.65$ Δ mmHg). Significant condition by time interactions were also observed for cBRS in the KE, but not placebo conditions in both the MetS ($F=4.11$, $p=0.04$) and control groups ($F=4.719$, $p=0.03$). Further inspection indicates these interactions may be mediated by decreases in cBRS during the KE condition that were not observed in the placebo condition. CONCLUSIONS: Based on these very preliminary findings, exogenous KE may transiently attenuate exercise pressure responses in individuals with MetS, while also acutely reducing cBRS.

PC8: PLAYING IT SAFE: USE OF VIRTUAL REALITY ANIMATION DURING TIME TRIAL LIMITS HAZARD SCORE

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Background: Virtual reality (VR) is a mode of technology that creates an animated world through which an individual can move and interact. Exercise enhancement with VR is a popular strategy for increasing enjoyment and in some cases performance. Some exercise tasks, such as time trials, require successful pacing strategies to ensure high performance without catastrophic fatigue. The Hazard Score (HS) is a way of quantifying the pacing strategy adopted during time trials using the individual's rating of perceived exertion (RPE). No studies to date have examined the effect of VR simulation on pacing strategy during a given time trial task. Therefore, the aims of this study were to determine the effect of VR program use on HS throughout a 1500 m rowing time trial and to investigate the potential effect of sex.

Methods: Healthy, untrained subjects ($N = 20$; age = 22.90 ± 7.81 ; 11 women/9 men) completed two 1500 m rowing time trials on a Concept 2 ergometer. The control condition (CON) and virtual reality condition (VR) were completed in a counterbalanced, randomized order separated by 3 days of recovery. RPE was collected and used to compute HS at 300 m, 600 m, 900 m, and 1200 m by multiplying the RPE at each distance point by the percent of the remaining distance [i.e. RPE of 15 at 300 m (80% remaining, or $.80$) = $15 \times .80 = 12.0$]. The effects of condition (CON and VR), distance (300 m, 600 m, 900 m, and 1200 m), and sex (man or woman) on HS were analyzed using a mixed factorial ANOVA and Bonferroni-adjusted post hoc tests ($\alpha = .05$). Results The main finding was that there was a significant interaction between condition and distance, $F_{1,9, 34.2} = 4.7$, $p = .02$, $\eta^2 = .21$. HS was significantly higher in CON than in VR at 300 m (8.0 ± 2.68 vs 6.8 ± 2.1), 600 m (6.6 ± 2.0 vs 5.9 ± 1.8), and 1200 m (2.4 ± 0.6 vs 2.1 ± 0.6). There was also a significant interaction between distance and sex, $F_{1,26, 22.76} = 4.38$, $p = .04$, $\eta^2 = .20$. Men had a higher HS than women when conditions were collapsed at 300 m (8.4 ± 2.0 vs 6.5 ± 2.0), 600 m (7.4 ± 1.4 vs 5.4 ± 1.4), 900 m (5.0 ± 1.0 vs 3.8 ± 1.0), and 1200 m (2.5 ± 0.4 vs 2.0 ± 0.4). Conclusions VR use during a 1500 m rowing time trial reduced HS compared to a control condition, ultimately a result of lower RPE throughout the time trial in VR. These findings suggest that a simple VR animation during a time trial causes a decrease in committed effort, potentially due to a distraction effect from the exercise task directive. Future studies are needed to determine the optimal VR strategy to pair with different types of exercise tasks.

Student Award Poster Competition (D1 - D8, M1-M8, U1-U8)

D1: FORCE AND NEUROMUSCULAR RESPONSES DURING CONTINUOUS HANDGRIP HOLDS ANCHORED TO A RATING OF PERCEIVED EXERTION

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PURPOSE: The rating of perceived exertion (RPE)-Clamp Model has been used to examine the interaction between fatigue-induced changes in force and neuromuscular responses when exercise intensity is anchored to a fixed RPE. Neuromuscular responses are commonly described by changes in the amplitude of electromyographic signal (EMG AMP) and neuromuscular efficiency (NME; normalized force divided by normalized EMG AMP), which provide information about muscle excitation and the level of muscle excitation required to produce a given amount of force, respectively. This study investigated the time course of changes in responses of force, EMG AMP, and NME during a sustained, isometric, handgrip hold to failure (HTF) using the

RPE-Clamp Model. **METHODS:** Twelve men (Mean \pm SD: 28.2 ± 3.8 yr) performed the handgrip HTF anchored to an RPE of 5 on the 10-point omnibus resistance scale. EMG signals were recorded from the brachioradialis throughout the HTF. Force, EMG AMP, and NME were calculated at standardized segments of 5% of time to task failure (T_{lim}) and normalized to the respective values from a pre-HTF maximum voluntary isometric contraction (MVIC). Analyses included 1(RPE=5) \times 21 (time:0-100% T_{lim}) repeated measures ANOVAs and post-hoc t-tests with a Bonferroni corrected alpha level ($p < 0.0025$). **RESULTS:** The T_{lim} was 512.4 ± 245.9 s and the initial normalized force was $25.9 \pm 14.3\%$ MVIC. There were significant differences across time for force ($F=24.989$, $p < 0.001$, $\eta^2=0.694$), EMG AMP ($F=8.416$, $p < 0.001$, $\eta^2=0.433$), NME ($F=22.368$, $p < 0.001$, $\eta^2=0.670$). Relative to the initial time point, force decreased from 40% to 100% T_{lim} , EMG AMP decreased at 30%, 60%, and 100% T_{lim} , and NME decreased from 50% to 65%, and 80% to 100% T_{lim} . **CONCLUSIONS:** The subjects' initial force selection may be explained by a feedforward mechanism, while a combination of corollary discharges and afferent feedback (i.e., sensory tolerance limit; STL) may explain the continuous decreases in force. Throughout the HTF, muscle excitation (EMG AMP) tracked the force decreases. However, the magnitude of force loss exceeded the magnitude of EMG AMP decreases (\downarrow NME) indicating greater levels of muscle excitation were required to compensate for the reductions in force generating capacity of fatigued muscle fibers. Task failure may be explained by the individual STL where central motor drive was continuously reduced to maintain the constant RPE.

D2: ARE SPORTS THE CATALYST FOR MVPA BENEFITS IN OUT OF SCHOOL PROGRAMS? A MODERATION ANALYSIS IN ELEMENTARY-AGED CHILDREN

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Background: The structured days hypothesis (SDH) suggests when children are in structured environments, they have healthier movement behaviors, including more moderate-to-vigorous physical activity (MVPA). Out of school programs (OSPs), such as sports, are a popular form of structured environments, and there is evidence that participation in these OSPs are associated with higher MVPA in elementary-aged children; however, it is not clear if sports are the primary driver of the association between OSPs and MVPA. Therefore, the purpose of this study was to examine whether attending sports programs, specifically, moderates the effect between OSPs and MVPA in elementary-aged children. **Methods:** Children ($N=685$; 48.7% female; 52.7% White; K-5th grade) participated in a 14-day observational protocol as part of a prospective cohort study in Spring 2022. Each night, parents completed texted surveys about their child's participation in OSPs, including timing and type. Children wore an Actigraph GT9X accelerometer on their non-dominant wrist to measure MVPA. Accelerometer data were processed using GGIR (v 2.8-2). Linear mixed-effects models predicted day-level MVPA from time spent in OSPs. Moderation effects were examined with sports (coded as sports vs. no sports) by OSP time interaction. Only weekdays were included for this analysis. Sex, income, grade, time spent in school, and accelerometer non-wear time were included as covariates. **Results:** Of the 421 children that attended OSPs, 53% attended sports programs, 34% attended after-school programs, and 13% attended other programs (art, dance, etc.). On average, on days when children went to an OSP, they attended for 117.2 ± 55.0 minutes, specifically, children spent 96.8 ± 53.7 minutes at sports, 156.2 ± 54.7 minutes at after-school programs, and 103.0 ± 57.6 minutes in other programs. Mixed-effects models suggested that time spent in OSPs on a given day were linked with higher MVPA for that day, such that children engaged in 0.1 more minutes of MVPA for every additional minute attending OSPs (95CI=0.1, 0.2). Attending sports programs specifically was not associated with additional MVPA beyond participating in other OSPs ($B=-0.1 \pm 0.1$; 95CI=-0.2, 0.0). **Conclusion:** On days when children spend more time in OSPs, they have higher MVPA, but there were not additional MVPA benefits when children were attending sports versus other OSPs. Our data supports the SDH suggesting that filling children's time with structure, despite what type of structure it is, is associated with healthier movement behaviors.

D3: THE INFLUENCE OF HIP TO SHOULDER SEPARATION IN THE VOLLEYBALL ATTACK

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The attack is the predominant offensive movement in volleyball utilized to score a point. This action has been linked to overuse shoulder injuries in volleyball players. As such, variables associated with loading at the shoulder should be investigated to mitigate injury. Hip to shoulder separation (HTS), defined as the angle between the pelvis and trunk in the transverse plane, has been thought to contribute to shoulder loading. The purpose of this study was to evaluate aspects of the kinetic chain, including HTS and trunk and pelvis motions, and their relationship with shoulder moment (SM) when performing the volleyball attack. **METHODS:** 21 experienced volleyball players were recruited to participate in this study. After providing consent, participants completed a self-selected warmup followed by 20 attacks. 10 attacks were aimed straight ahead (SA) and 10 were aimed "cross-court" (CC). The order of these attacks was randomized. Peak angular velocity and acceleration of the trunk and pelvis as well as hip to shoulder separation (HTS) angle (difference between trunk/pelvis axial rotation) were analyzed for a relationship to upper arm angular velocity (UA VEL) and SM. **RESULTS:** Spearman's correlations were performed due to normality violations. For all attacks overall, UA VEL ($r(21) = .577, p = .006$) was significantly related to SM. HTS ($r(21) = .519, p = .016$) was significantly related to UA VEL. In the SA attacks, SM was significantly related to UA VEL ($r(21) = .579, p = .006$). UA VEL was related to HTS in both the SA attacks ($r(21) = .439, p = .047$) and the CC attacks ($r(21) = .591, p = .005$). **CONCLUSION:** While HTS did not have a significant relationship with SM, it did prove to be related to UA VEL. Players who have greater HTS are able to move their arm with a greater velocity, therefore contacting the ball at a greater speed. It is possible the moderate relationship between upper arm velocity and shoulder moment masked a relationship between the trunk movement and shoulder moment, as no significant correlations were found. Future research should examine this relationship while accounting for UA VEL.

D4: PLAYING SURFACE TRANSITION AND INJURY RATES IN NFL-A COMPARATIVE STUDY ON GRASS AND TURF

Bahman Adlou, John L. Grace, Alex Prince, Elizabeth Wheeler, Liza Devane, Dell Sikes, Sarah Kim, Carson Kim, Mattie Alston, Jerad J. Kosek, Hannah H. Houde, Meghan E. Hancock, Christopher M. Wilburn, Wendi H. Weimar. *Auburn University, Auburn, AL.*

BACKGROUND Artificial turf is increasingly used in professional and collegiate sports due to cost and maintenance benefits. There is emerging evidence that differences in the sports field surface characteristics have considerable impact on the athletes' biomechanics. Such biomechanical influences may result in variations in sport performance and injury rates in these athletes. This study investigates the impact of moving from one surface type to another (natural grass (G) vs. artificial turf (T)) on injury rates among American football athletes. **METHODS** Data on 700 first- and second-round drafted NFL athletes (2012-2022), their collegiate and professional stadium surfaces, and injuries were collected. For each athlete, a 4-factor category variable was included to capture their collegiate to professional teams' surfaces (G to G; G to T; T to G; and T to T), and a 5-factor category variable that grouped the athlete based on his position (chase, evasive, linemen, QB, K). Chi-Square Test of Independence (χ^2 test) and logistic regression were used to analyze the association between surface differences, position groups, and injury. Results are reported as probability of injury occurring in odds ratios (OR), and statistical significance alpha was set to 0.05. **RESULTS** 433 athletes suffering a LE injury that resulted in a minimum of 1 game absence (GG=126, GT=119, TG=107, TT=81) were included in the statistical analysis. No statistical significance was found in χ^2 test results ($p = 0.61$). Compared to GG, injury OR were 2.05 times higher in GT, and 1.87 in TG and TT. Among position groups on GG, evasive group's injury OR were highest, followed by linemen, evasive, and then QB. When evaluating the interaction between surface and position group influencing injury, the injury OR were 6.49 higher for QBs in GT surface category than chase group in GG. There was no statistical significance for the effect of any combination of surface and position categories with injury. **CONCLUSIONS** Field surface type impacts athletes' biomechanics, potentially leading to

non-contact sports injuries. Athletes transitioning from collegiate to NFL on different surfaces had over 2 times higher injury odds. However, no statistical significance was found. Future research could further stratify the group to examine the impact of field surface type on injury and performance.

D5: RELIABILITY OF A PORTABLE, HANDHELD SALIVA OSMOMETER

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BACKGROUND: Assessing hydration status outside of labs (e.g., field settings) has presented a long-standing challenge given that most hydration status measures are invasive, stationary, costly, or have poor validity. Technological advances, however, are quickly allowing these barriers to be overcome. One of these recent advancements is the development of a cost-effective, noninvasive, and portable device to measure saliva osmolality (SOSM), which is used as a spot assessment of hydration status. This device, the MX3 Hydration Testing System (HTS, MX3 Diagnostics, Austin, TX), is currently available commercially for purchase. The purpose of this investigation was to determine the test-retest reliability of the MX3 HTS. **METHODS:** A sample of 35 subjects (30.4 ± 10.6 y; 20 men, 15 women) participated in this study. After avoiding any fluid intake for at least 5 minutes, participants were asked to generate a fresh saliva sample (i.e., new saliva generated after swallowing all existing saliva) and present the sample on their tongue with an open mouth. Using the MX3 HTS, a researcher then tapped the tip of a test strip to the saliva. Participants were asked to repeat this process after a short period of time (less than 5 minutes apart). The intra-class correlation (ICC) and minimal detectable change (MDC) were calculated as measures of reliability. A paired t-test was used to determine whether there were any significant differences in SOSM between the two timepoints. **RESULTS:** The means of the first and second SOSM measures were 61.4 ± 21.3 mOsm and 64.2 ± 18.9 mOsm, respectively. Based on a t-test, the mean difference of 2.8 ± 14.1 mOsm was not significant ($p = 0.253$). Within-day repeat SOSM measures yielded an ICC of 0.75. Using this ICC, an MDC at the 90% confidence level was calculated to be 23 mOsm. **CONCLUSION:** With moderate-to-good reliability, the MX3 HTS appears to be a reasonable and practical choice for reliably measuring moderate-sized changes (greater than 20 mOsm) in saliva osmolality outside of laboratory constraints. These results suggest this tool may be useful in field settings where hydration status is crucial to performance, such as athletics, military, and the workforce.

D6: VARIABILITY IN DAILY FLUID INTAKE AND INADEQUATE HYDRATION STATUS INFLUENCES OBJECTIVE SLEEP

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BACKGROUND: Previous subjective data suggests that shorter total sleep time is associated with greater odds of inadequate hydration, but it is unclear how variability in fluid intake alters objective sleep metrics. Thus, the purpose of this study was to examine the relationships between 3-day variability in individual daily fluid intake, hydration status, and objective sleep metrics. **METHODS:** Twenty-seven healthy males (mean \pm SD; age, 23 ± 4 y; height, 176 ± 6 cm; weight, 78.7 ± 12.9 kg; body fat, $16.6 \pm 8.7\%$) collected 24hr urine samples to assess mean hydration status (Urinary Osmolality (U_{OSMO})) for four consecutive days. Participants self-reported habitual fluid intake using a validated log (Liq.In.7) and sleep was captured over the same period using actigraphy. Separate random-intercept linear mixed fixed-effects models assessed the effects of within-subject variability and between-subject differences in daily fluid intake (L), U_{OSMO} , on objective sleep metrics (total sleep time, efficiency, latency, average awakening length). **RESULTS:** Every additional 1L increase in daily fluid intake above grand mean (2.9 ± 1.7 L), was associated with a 3-min increase in sleep latency ($\beta = 3.35, [0.7, 4.7], p = 0.009$). On days when a person's U_{OSMO} was higher than their typical U_{OSMO} , they experienced a longer duration of awakening bouts ($\beta = 0.005, [0.003, 0.009], p = 0.031$). There were no associations between fluid intake with total sleep time ($\beta = -0.03, [-0.580, 0.037], p = 0.679$), sleep efficiency ($\beta = -0.01, [-0.053, 0.023], p = 0.454$), wake after sleep onset ($\beta = 0.03, [-0.166, 0.245], p = 0.714$) or hydration status with total sleep time ($\beta = -0.23, [-0.517, 0.061], p = 0.130$), sleep efficiency ($\beta = -0.01, [-0.040, 0.010], p = 0.242$), wake after sleep onset ($\beta = 0.05, [-0.080, 0.197], p = 0.466$). **CONCLUSIONS:** Greater daily fluid intake affects onset of sleep, but not total sleep time, sleep

efficiency, or wake after sleep onset. Inadequate hydration compared to one's usual hydration status may negatively affect sleep outcomes. Day-to-day variability in fluid intake should be considered in longitudinal research to help contextualize biological and behavioral modifiers of hydration status and its subsequent effects on sleep quality and quantity.

D7: ASSESSING THE VALIDITY OF A CORE TEMPERATURE MONITORING TOOL FOR TACTICAL ATHLETES

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BACKGROUND: Core temperature information is important for guiding prevention and treatment measures. It is critical for those working in severe environments, such as firefighters, military, law enforcement, and construction and farm workers. Development of new physiological monitoring tools that are easy to use and provide reliable core temperature information is critical for heat injury prevention. Currently, less invasive core temperature monitoring tools come with significant accuracy limitations, whereas more accurate devices are difficult to use in the field. An easily wearable sensor that correctly estimates core temperature could prevent heat injuries and deaths. The ThriveHRI sensor system is being developed for use in a smartwatch platform. The current study compared the ThriveHRI sensor/smartwatch to an Equivital LifeMonitor and a rectal thermistor. The purpose of this study was to determine if the ThriveHRI sensor system provides an accurate and precise estimate of core temperature at rest and during physical activity representing firefighter occupational tasks at elevated temperatures in healthy adults. **METHODS:** Twenty-five healthy, physically active adults between the ages of 19-45 years volunteered. Participants completed multiple rounds of deadlifting and treadmill walking in an environmental chamber set to 43.3°C (115°F) and 50% relative humidity. Core temperature was monitored continuously via a Datatherm rectal thermometer, Equivital Eq02+LifeMonitor, and a ThriveHRI heat watch. **RESULTS:** No significant difference in accuracy between devices was found for any condition ($ps \geq 0.532$). A significant difference in bias between devices was found for easy walking ($t(21) = 5.55, p < 0.001, g = 1.01$), deadlift ($t(19) = 3.60, p = 0.002, g = 0.73$), and treadmill ($t(16) = 2.42, p = 0.028, g = 0.60$). A significant difference in precision between devices was found for easy walking ($t(21) = 4.23, p < 0.001, g = 1.21$), but no significant difference in precision between devices was found for deadlift, or treadmill ($ps \geq 0.067$). **CONCLUSIONS:** This study demonstrates that the agreeability between the Equivital EQ02+ LifeMonitor, ThriveHRI sensor, and the rectal thermometer remains consistent as core temperature increases and exposure to a heated environment is sustained. The ThriveHRI heat watch system may be an accurate and precise core temperature sensor system for use in the field.

D8: EFFECTS OF PLAYING 1 VS 2 MATCHES PER WEEK ON MATCH WORKLOAD IN NCAA DIVISION 1 WOMEN'S SOCCER PLAYERS

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BACKGROUND: Previous literature suggested that a single soccer match elicits prolonged periods of acute fatigue (~72 hours) and that periods of congested schedules may increase injury risk and decrease physical performance. The purpose of this study was to investigate the effects of playing one versus two matches per week (1M versus 2M) on match workload in NCAA Division I women's soccer athletes. **METHODS:** A total of 14 female soccer players, who played in matches during the 2020 and 2021 competitive seasons participated in this study. Data from nine matches from the 2020 season and 21 matches from the 2021 season were included in this retrospective analysis, representing 14 1M matches and 16 2M matches. The external and internal training load variables used to compare physical, perceptual, and physiological performance were: total distance covered (TD; km), number of sprints (Sprints), distanced covered at high-speed (HSD; >15.0 km/h, km), mechanical load (ML), session rating of perceived exertion training load (sRPE-TL; AU), and Polar's training load score (TLS; AU). ML was calculated as the sum of the accelerations above 2 m/s² and decelerations below -2 m/s². Minutes played, player position, match statistics, match results, match location, environmental factors (time of day and heat index), match importance (conference or non-conference), and opposition level were controlled for in the analysis. Linear mixed modeling was used to compare 1M and 2M matches on the workload variables adjusted for covariates (random intercept and random slope for 1M versus 2M). **RESULTS:** All

but one participant played in at least 75% of the matches and eight played in all matches. There were no significant differences between 1M and 2M matches in TD ($p=0.238$), ML ($p=0.621$), or TLS ($p=0.081$). However, the number of sprints (coefficient=-4.24, $p=0.049$) and HSD (coefficient=-0.072, $p=0.026$) were significantly lower for matches in 2M relative to 1M, while s-RPE-TL (coefficient=69.46, $p=0.037$) was significantly higher in 2M matches. **CONCLUSIONS:** Lower high-intensity external work and higher subjective ratings of effort were observed during matches in 2M relative to 1M. The present results highlight the need for player rotation, recovery procedures, and workload monitoring to adjust periodization schedules for 1M and 2M weeks.

M1: PEOPLE WITH MARFAN SYNDROME AMBULATE WITH ALTERED JOINT MECHANICS

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Introduction: Marfan syndrome (MFS) is an autosomal dominant connective tissue disorder caused by mutations in the fibrillin-1 (FBN-1) gene. MFS is associated with muscle dysfunction, severe joint pain, and a high incidence of osteoarthritis (OA). Marfan syndrome's impact on gait mechanics and possible association with joint degeneration has not previously been published. Therefore, the purpose of this study was to assess the effects of MFS on lower extremity joint kinematics and kinetics during walking. **Methods:** 18 people with MFS (16 F; age = 39.3±11.3 yrs.; body mass index (BMI) = 25.8±5.7 kg/m²) and 18 sex and BMI-matched healthy, asymptomatic controls (16 F; age = 26.4±7.5 yrs.; BMI = 23.7±3.9 kg/m²) underwent 3D gait analysis while walking at a fixed speed of 1.35m/s, the average level-ground walking speed of females and males. Between-group differences in Sagittal plane hip, knee, and ankle joint kinematics and kinetics were assessed using an analysis of covariance, adjusting for age, with $p < 0.05$ used for statistical significance. **Results:** The MFS cohort was significantly older than the control cohort ($p < 0.01$). The MFS cohort ambulated with a higher peak hip flexion angle ($p=0.02$), peak knee flexion angle during loading response ($p < 0.01$), knee excursion ($p < 0.001$), peak ankle dorsiflexion angle ($p < 0.01$), and ankle range of motion ($p=0.04$). The MFS cohort also exhibited a significantly higher hip extensor moment impulse ($p=0.02$) and impulse duration ($p=0.04$), higher knee extensor moment (KEM) impulse during the 1st half of stance ($p=0.03$), higher peak KEM during the 2nd half of stance ($p=0.01$), and a shorter KEM duration during the 2nd half of stance ($p=0.04$). The MFS group exhibited a significantly lower ankle dorsiflexion moment ($p < 0.01$) and moment impulse ($p < 0.01$) as well as a longer ankle plantarflexor moment duration ($p=0.01$). **Discussion:** These results suggest that people with MFS walk with altered hip, knee, and ankle joint mechanics. More specifically, people with MFS ambulate with a more flexed lower extremity, which places a higher demand on the hip and knee extensor musculature to maintain an upright position during walking. These altered lower extremity joint mechanics may explain the higher incidence of OA and joint pain in the MFS population, yet further evaluation to understand a causative link between joint mechanics and joint degeneration in the MFS population is needed.

M2: RELATIONSHIPS BETWEEN HEART RATE RECOVERY AND CARDIOVASCULAR DISEASE RISK FACTORS IN ADULTS ACROSS THE LIFESPAN

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Purpose: Heart rate recovery (HRR) is a valuable tool for providing insight into risks of all-cause mortality as well as cardiovascular disease (CVD). To-date, limited data exists regarding the relationships between HRR and meaningful risk factors such as blood pressure (BP), resting heart rate (HR), and body fat percentage (%BF), especially across the lifespan. Therefore, our purpose was to discover potential relationships between measures of HRR and relevant CVD risk factors in adults across the lifespan. **Methods:** Thirty-four individuals (25 male, 9 female) across the lifespan (20-71 yrs) were assessed on two separate occasions. During the first visit, a SphygmoCor device was used to quantify resting BP, HR, and augmentation index (Aix, proxy of systemic vascular resistance). A DEXA was performed to derive measures of %BF, and a handheld dynamometer was used to determine maximal strength. The second visit consisted of a maximal ramp (25-35 Watt ramp, pending fitness status) cycle ergometry exercise test. Maximal cardiorespiratory fitness (VO_{2max}) was confirmed

by a HR reaching within 10 beats·min⁻¹ of age predicted maximum, a respiratory exchange ratio >1.10, and a rating of perceived exertion >17. Subsequently, HRR was calculated as the difference between achieved maximum HR and HR at 30 s, 1 min, and 2 min of recovery. Pearson correlation coefficients were used to assess relationships, and a $p \leq 0.05$ was considered significant. Results: Each HRR timepoint was significantly ($p < 0.05$) related to BF% ($r = -.444$ to $-.472$). The 30 s ($r = .360$) and 2 min ($r = .348$) HRR timepoints were significantly ($p < 0.05$) related to handgrip. At 2 min, HRR was related to cardiorespiratory fitness ($r = .477$; $p = 0.004$), Alx ($r = -.352$; $p = 0.041$), and resting HR ($r = -.404$; $p = 0.018$). **Conclusion:** We determined relationships between HRR and CVD risk factors were time dependent. That is, the 2-min timepoint was correlated with the most markers of cardiovascular function (e.g., VO_{2max}). Immediately following cessation of exercise, the 30 s timepoint was also related to modifiable risk factors (e.g., %BF). In agreement with previous findings, HRR was correlated to systemic vascular resistance, but here we extended this relationship to older adults. Overall, these findings highlight the utility of HRR, especially at the 2 min timepoint, as a valuable assessment of CVD risk.

M3: COMPARISON OF IN-GAME TRUNK AND UPPER EXTREMITY KINEMATICS BETWEEN PITCH TYPES IN COLLEGIATE BASEBALL PITCHERS

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BACKGROUND: Baseball pitchers commonly experience shoulder and elbow injuries. Pitch type has been identified as a possible risk factor, but previous biomechanical studies were limited to laboratory analysis. The purpose of this study was to compare in-game trunk and upper extremity kinematics between fastballs, breaking balls, and changeups in collegiate baseball pitchers. **METHODS:** Twenty-four NCAA Division I collegiate baseball pitchers ($1.9 \pm 0.1m$; $94.5 \pm 10.5kg$) who threw at least five in-game fastballs, breaking balls, and changeups were included in this study. Trunk and throwing-arm kinematics were recorded during games using a markerless motion capture system (300Hz). A TrackMan V3 Game Tracking unit defined pitch type. Kinematics of each pitcher's first five pitches of each pitch type were averaged for analysis. A repeated measures multivariate analysis of variance (MANOVA) was used to assess within-subject differences between each pitch type ($\alpha = .05$). The variables of interest were shoulder abduction at foot contact (FC), shoulder horizontal abduction at FC, shoulder external rotation at FC, shoulder maximum external rotation (MER), elbow flexion at MER, maximum shoulder rotational velocity, lateral trunk tilt at ball release (BR), shoulder abduction at BR, and elbow flexion at BR. **RESULTS:** The MANOVA revealed differences in kinematics between pitch types ($F_{18,78} = 3.49$, $p < .001$). Follow-up univariate testing revealed significant differences across pitch types for MER ($F_2 = 3.77$, $p = .03$) along with shoulder abduction ($F_2 = 6.27$, $p = .004$), lateral trunk tilt ($F_2 = 11.63$, $p < .001$), and elbow flexion ($F_2 = 5.06$, $p = .01$), all at BR. Pairwise comparisons revealed that fastballs had greater MER than breaking balls (mean within-subjects difference: $1.5 \pm 2.6^\circ$, $p = .03$). At BR, changeups resulted in greater shoulder abduction than fastballs ($1.2 \pm 2.0^\circ$, $p = .03$) and breaking balls ($1.5 \pm 2.3^\circ$, $p = .01$). Changeups produced less lateral trunk tilt at BR than fastballs ($-3.6 \pm 4.8^\circ$, $p = .003$) and breaking balls ($-2.9 \pm 4.2^\circ$, $p = .008$) and greater elbow flexion at BR than breaking balls ($1.2 \pm 1.7^\circ$, $p = .006$). All other variables were not significantly different ($p > .10$). **CONCLUSION:** Collegiate pitchers had in-game kinematic differences between pitch types, especially at BR. It is unknown if these differences alter injury risk, but they may impact performance by showing the batter which pitch type will be thrown.

M4: ABSTRACT WITHDRAWN

M5: IDENTIFYING MODIFIABLE VASCULAR RISK FACTORS AND RELATIONSHIPS TO COGNITION ACROSS THE LIFESPAN

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Background: Increased age is a primary risk factor for cardiovascular disease and cognitive decline. However, there is significant variation in rates of deteriorating health, and maintaining vascular function has emerged as a promising target for intervention. Relevant contributions from the peripheral vasculature to the maintenance of cognition remain understudied, especially at various levels (e.g., macro vs. microvascular). Therefore, our purpose was to determine the relative

contributions of arterial stiffness, central pulse pressure (cPP), and reactive hyperemia to cognition. **Methods:** 99 healthy adults (50 men, 49 women) across the lifespan (19-90 yrs) volunteered to complete a vascular occlusion test (VOT) and provide measures of arterial stiffness (as quantified by pulse wave velocity [PWV]), and cPP. A near-infrared spectroscopy (NIRS) device was attached to the forearm during the VOT (3 min baseline, 5 min occlusion, 3 min reperfusion). The highest skeletal tissue oxygenation (StO_2 , %) observed following occlusion was defined as StO_{2max} (marker of reactive hyperemia). PWV was assessed by the time difference between carotid-femoral pulses. Cognition was defined as the time to complete Part A of the trail-making test. Pearson correlations were used to evaluate relationships between the vasculature and cognition. Regression analyses were used to determine the full-model and stepwise linear regression model. **Results:** There were significant relationships between cognition and PWV ($r = 0.442$; $p < .001$), StO_{2max} ($r = -0.362$; $p < .001$), and cPP ($r = 0.328$; $p < .001$). Age had the greatest standardized β (0.329), whereas PWV (0.188) was greater than cPP (0.123) and StO_{2max} (-0.018). Stepwise linear regression indicated that age was the only significant predictor but removing age from the model suggested both PWV and cPP significantly ($R^2 = 0.235$, $p < 0.001$) predicted cognition. **Conclusion:** Age was the strongest predictor of cognition but is unmodifiable. However, our results indicate that central, macrovascular targets associated with aging may be a more advantageous focus for interventions than peripheral microvasculature targets to improve cognitive function. This aligns with previous studies showing end-organ (i.e., brain) damage resulting from excessive pulse velocity propagation. Future clinical trials are necessary to unravel the most potent exercise interventions for alleviating elevated arterial stiffness and cPP.

M6: EVALUATING VARIATION IN MENSTRUAL CYCLE LENGTH AND ASSOCIATED FACTORS IN ACTIVE WOMEN

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INTRODUCTION: Menstrual cycle (MC) and period length exhibit significant variation among naturally menstruating women. Misconceptions are prevalent due to the assumption that the typical MC is 28 days without considering factors that may impact length. Many women experience physical and psychological MC related symptoms, but their impact is unknown. This analysis aimed to characterize MC length, period length, and symptom prevalence in a population of recreationally active to active naturally menstruating women. Additionally, the impact of body composition on MC characteristics were explored. **METHODS:** Data were analyzed for 45 recreationally active and 45 active women (mean \pm SD; age: 22.6 ± 6.3 yrs, BMI: 23.8 ± 4.0 kg/m², weight: 64.8 ± 7.2 kg). Average period length (days), age of menarche (yrs), and symptoms were collected using a self-reported health history questionnaire. Daily basal body temperature and symptom tracking determined MC length (days). Body composition (percent fat, lean mass, and bone mineral density) was measured using dual-energy x-ray absorptiometry (DXA). Descriptive statistics were used to characterize period and MC length. One-way ANOVAs were used to explore between groups differences. Pearson correlations evaluated period length and body composition. **RESULTS:** The average period length for recreationally active women was (mean \pm SD) [min-max] 4.7 ± 1.2 [3-8] days with an MC length of 28.0 ± 4.7 [18-40] days. For active women, average period length was reported as 4.8 ± 1.3 [3-8] days, with no statistical differences observed between groups (MD: -0.06 ± 0.24 days; $p > 0.05$). There were no correlations between period length, body composition ($p = 0.525$ - 0.951), or MC symptoms ($p > 0.05$). 95% of active women reported MC related symptoms. 62% reported > 3 symptoms with the most common being cramps (71%), hunger (62%), and bloating (40%). **CONCLUSION:** Individual variability exists among MC and period length but does not appear to be modulated by activity, with an average bleed time of 4.7 days, and MC length of 28 days, with some lasting 40 days. Negative symptoms associated with the MC are highly prevalent but are not modulated by body composition or period characteristics. Exercise readiness and performance may be influenced by the duration and timing of their MC, especially when experiencing a multitude of MC related symptoms.

M7: ACCURACY OF PERSONALLY OWNED WEARABLE ACTIVITY MONITORS FOR ESTIMATING VO_{2max}

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BACKGROUND: Cardiorespiratory fitness is indicated by maximum oxygen consumption (VO_{2max}). Higher values of VO_{2max} are inversely related to all-cause mortality and the risk of developing cardiovascular disease. Indirect calorimetry, the gold standard method of assessing VO_{2max} , requires costly laboratory equipment, trained test administrators, and vigorous exercise on behalf of the participant. Thus, this assessment is out of reach for many. To improve the accessibility of this important health variable, methods of predicting VO_{2max} are available in many wearable activity monitors. However, the predictions have not been rigorously externally validated. The purpose of this study was to compare VO_{2max} estimates from personally owned consumer-grade activity monitors to VO_{2max} measured by indirect calorimetry. **METHODS:** Healthy individuals between the ages of 18 and 35 years, who owned a consumer-grade activity monitor with a predicted VO_{2max} were recruited for this study. Forty participants (23.4 ± 4.5 yrs) completed a VO_{2max} test using a treadmill-based ramp protocol in the Exercise Science lab. The treadmill protocol included walking or running at a constant speed while the grade was increased by 1% at the end of every minute. Participants were encouraged to continue exercising until maximal exertion. VO_{2max} was assessed with a metabolic gas analyzer (CardioCoach); oxygen consumption ($ml \cdot kg^{-1} \cdot min^{-1}$), rating of perceived exertion, and heart rate were recorded each minute. Paired samples t-tests were used to compare the monitor-predicted to measured VO_{2max} for 1) all monitors grouped together, 2) Apple monitors, and 3) Garmin monitors. **Results:** On average, when all monitors were grouped together, VO_{2max} estimates were 7.2 ± 7.0 $ml \cdot kg^{-1} \cdot min^{-1}$ lower than measured VO_{2max} ($P < .001$). Apple monitors estimated 8.3 ± 7.6 $ml \cdot kg^{-1} \cdot min^{-1}$ lower than measured VO_{2max} ($P < .001$) and Garmin estimated 5.3 ± 6.8 $ml \cdot kg^{-1} \cdot min^{-1}$ lower than measured VO_{2max} ($P = .011$). **Conclusion:** In this sample of ongoing research, VO_{2max} predicted by consumer-grade activity monitors was significantly lower than lab-measured VO_{2max} . This discrepancy between estimated and measured VO_{2max} should be considered when assessing cardiorespiratory fitness using consumer-grade activity monitors.

M8: PRE-LOADED BETAINE IMPROVES THERMOREGULATION WHEN CYCLING IN THE HEAT

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BACKGROUND: Heat-related illness compromises health and performance in endurance athletes during training and competition. Betaine (BET) is a nutrient that has been previously identified in animal models to act as an osmolyte and attenuates the effects of thermal stress. However, much of the prior research has only assessed the efficacy of preloading BET in passive heat models. Therefore, the purpose of this study is to examine the effects of preloaded BET in an active heat model. **METHODS:** Eight endurance-trained males (age 26.4 ± 6.8 years; VO_2 Peak 55.5 ± 4.8 $mL/kg/min$) completed 60 min of cycling at 70% VO_2 peak in a hot environment ($33^\circ C$, 35% RH) after a 7-day supplement loading protocol (50 mg/kg, 2x daily) of placebo (PLA) or BET in a double blind, randomized, counterbalanced, crossover study. Core temperature and thermal sensation were measured at rest and every 10 minutes throughout the active heat protocol. Nude body weight was measured prior to- and immediately post-exercise to calculate sweat rate. No fluid ingestion was allowed during this time. Blood samples were collected at rest, 30 minutes, and immediately after exercise. Visual analog scales were administered before and immediately after exercise to quantify sensations of thirst. Bioelectrical impedance assessed fluid compartments before and after the respective supplementation weeks. **RESULTS:** Area under curve analysis identified BET as having a smaller overall increase in core body temperature compared to PLA ($p = 0.012$). Further analysis showed ending core temperature was significantly lower in BET ($-0.023^\circ C$; $p = 0.029$) than PLA. BET also resulted in a significant increase in sweat rate (mean difference = 0.19 ± 0.20 L/hr; $p = 0.02$). Blood assessments revealed BET had lower hematocrit at the mid-exercise timepoint compared to PLA (BET: 48.3%; PLA: 50.8%; $p = 0.02$). Increases in total body water (TBW) and intracellular fluid (ICF) in the BET condition approached significance compared to PLA (TBW: $+1.69$ L, $p = 0.055$; ICF: $+1.39$ L, $p = 0.066$). No significant differences were found between conditions in subjective measures of thermal sensation or thirst ($p = 0.318$; $p = 0.862$). **CONCLUSION:** BET supplementation may have the capacity to mitigate the rise in core body temperature and maintain plasma volume during exercise in an uncompensable heat stress environment,

despite having no significant effect on subjective sensations of heat stress.

U1: ENERGY COST OF BIPEDAL WALKING VERSUS USE OF ASSISTIVE DEVICES AT CONTROLLED WALKING SPEEDS

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Background: In the case of lower limb injury, assistive devices may be needed for ambulation. Evidence suggests that crutches as well as manual wheelchair use increases energy expenditure compared to overground walking. However, direct comparison of assistive devices to each other and to walking at standardized speeds has not been done, making clinical recommendations regarding which assistive devices to use for injured populations difficult. The purpose of this study was to compare oxygen consumption (VO_2), respiratory exchange ratio (RER), heart rate (HR) and rating of perceived exertion (RPE) during bipedal walking (BW), walking with axillary crutches (AC), and ambulation with a knee scooter (KS) at three standardized paces: 1.0, 1.5, and 2.0 miles per hour. **Methods:** A total of $n=13$ college age males and females (20.3 years, 170.4 cm, 70.3 kg) were recruited to participate in a single laboratory visit. In a randomized and counterbalanced order, each participant completed a 3-minute walking trial at 1.0, 1.5, and 2.0 mph during which they walked normally, walked with crutches, or used a knee scooter. During each trial, VO_2 , RER, and HR were measured each minute. Values recorded during the final minute of each session were compared for the three trials at each speed using ANOVA tests with Tukey post hoc comparisons with $\alpha=0.05$. **Results:** There was a statistically significant difference in VO_2 , RER, and HR for all speeds among the three groups ($p < 0.05$). Pairwise comparisons revealed that at all three speeds, walking with crutches resulted in significantly higher VO_2 , RER, and HR compared to BW and KS conditions ($p < 0.05$). During walking at 1.5 and 2.0 mph, HR was significantly higher in KS compared to BW, and at 2.0 mph only, RER was greater during KS use compared to BW ($p < 0.05$). **Conclusions:** Collectively, these data indicate that use of axillary crutches elicits a greater physiological response than either bipedal walking or knee scooter use when speed is controlled.

U2: AGE-RELATED BREAKDOWN OF CARDIO-MUSCULAR COORDINATION

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BACKGROUND: The heart coordinates with skeletal muscles to facilitate movement, maintain cardiovascular homeostasis, and adapt to exercise. However, the precise mechanisms through which autonomic control of heart rate variability facilitates coordination with distinct muscles have yet to be elucidated, especially in the context of aging. Here we investigate the temporal evolution of cardio-muscular coordination during a maximal squat test, with specific focus on comparing young and older adults. **METHODS:** Thirty young and ten older adults performed one maximal body weight squat test until exhaustion. During the protocol, simultaneous recordings were taken of a 3-lead electrocardiogram (EKG Lead II) along with electromyography (EMG) signals from the following leg and back muscles: left and right vastus lateralis, and left and right erector spinae. We first obtained instantaneous heart rate (IHR, representing heart rate variability) derived from the EKG signal (Pan-Tomkins QRS detection), and decompose the EMG recordings in ten frequency bands [F1-F10], representing distinct muscle fiber types. We next quantified pair-wise coupling (cross-correlation C ; amplitude-amplitude coupling) between the time series for IHR and all EMG spectral power frequency bands in each leg/back muscle. **RESULTS:** Young adults showed a stronger level of cardio-muscular coordination between the heart and all leg and back muscles. Specifically, low [F1-F5] EMG frequency bands, associated with type-I slow muscle fibers, exhibited stronger coupling with IHR ($C_{MEAN} = 0.35$; $SD = 0.03$) compared to intermediate/fast frequency [F6-F10] EMG bands ($C_{MEAN} = 0.20$; $SD = 0.02$). In contrast, older adults showed an overall significant decline in coupling strength between IHR and all EMG frequency bands ($C_{MEAN} = 0.05$; $SD = 0.02$) compared to young adults ($p < 0.001$). **CONCLUSION:** The pronounced break-down in cardio-muscular coordination in older adults may be attributed to the age-related deterioration of heart rate variability, resulting from impaired autonomic nervous system function and reduced cardiac flexibility.

Understanding the mechanisms underlying the decline in cardio-muscular coordination during exercise is crucial for developing strategies to counteract the effects of aging. This dynamic network approach can lead to the development of novel network-based markers to assess the impact of aging on cardiac and neuro-muscular function.

U3: PREVALENCE AND INDICATORS OF GYM INTIMIDATION LEVELS IN FEMALE COLLEGE STUDENTS

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BACKGROUND: Gym intimidation is a major barrier to women's participation in exercise. The purpose of this study was to measure gym intimidation and determine indicators of gym intimidation levels in female college students. **METHODS:** A survey was emailed to female college students at a large, public university in the southeastern US. Age, class standing, academic college, major, frequency of gym visits, gym equipment used, and past/current participation in organized sports was assessed. Gym intimidation was measured using the Social Exercise and Anxiety Measure subscales: social exercise self-efficacy (SES: 5-items, 0-100 scale, assesses confidence in the ability to exercise in various environments), gym avoidance (GA: 4 items, 0-7 scale, assesses gym avoidant behavior), and exercise importance (EI: 3 items, 0-7 scale, assesses priority of exercise). Pearson's correlations were used to identify significant relationships. **RESULTS:** Of 388 respondents, 81% reported utilizing cardio equipment and 64% using strength machines and free weights. On the SES, the average for "I could work out/exercise in a crowded gym", was 48.71. Respondents were about 50% confident in that ability compared to 95% confidence "that I could work out/exercise at a private gym where only me and my close friends work out" ($x=94.72$). The GA item with the highest score was "when I go to the gym I think people are judging me" ($x=3.93$). On the EI, respondents placed a high level of importance on exercise "to maintain a healthy lifestyle" ($x=6.17$). Pearson's correlations revealed a significant relationship between frequency of gym attendance and SES (Q1 $r=0.54$, Q2 $r=0.26$, Q3 $r=0.42$, Q4 $r=0.42$, Q5 $r=0.56$, all $p<0.01$), GA (Q1 $r=-0.56$, Q2 $r=-0.50$, Q3 $r=-0.38$, all $p<0.01$), and EI (Q1 $r=0.19$, Q2 $r=0.51$, Q3 $r=0.55$, all $p<0.01$). Age was correlated with "I could work out/exercise with a group of people that I do not know" ($r=0.14$, $p<0.01$). A relationship was found between SES Q1 and Q5 ($r=0.72$, $p<0.01$) and EI Q2 ($r=0.42$) and Q3 ($r=0.41$), showing that self-predicted success at the gym is correlated with exercise importance and ability to use a public gym. **CONCLUSIONS:** Gym intimidation is prevalent in the female college students. Most concerns focused on perceived judgment as opposed to exercise itself. Those with higher levels of gym intimidation attend the gym less frequently. Combating intimidation from perceived judgment is critical.

U4: ASSOCIATION BETWEEN CARDIORESPIRATORY FITNESS AND PHYSICAL ACTIVITY WITH SLEEP METRICS IN APPARENTLY HEALTHY ADULTS

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Background: High cardiorespiratory fitness (CRF), healthy physical activity (e.g., taking >10,000 steps per day) and sleep habits (e.g., sleeping 7-9 hours per night) decrease the risk of all cause mortality. However, the association between CRF and physical activity with sleep are understudied and inconclusive. Thus, we sought to examine the associations between CRF and physical activity with objective and subjective sleep metrics. **Methods:** Thirty-two adults (14 female, age 40 ± 18 years, body mass index [BMI] 25.8 ± 6.2 kg/m²) participated in this study. We assessed CRF using a graded treadmill exercise test to volitional exhaustion to determine relative VO_{2peak} (mL/kg/min). We assessed physical activity using waist worn ActiGraph GT3X accelerometers for a minimum of 5-days (11.8 ± 3.6 days) to obtain average daily steps and moderate and vigorous physical activity (MVPA). Participants' self-reported sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) scored 0 [better] to 21 [worse]. Objective nightly sleep duration (hours) and efficiency (% of time in bed spent sleeping) were measured using Phillips Actiwatch Spectrum PLUS accelerometers (worn on the wrist) for a minimum of 5-days (7.1 ± 0.5 days). All variables were tested for normality using the Shapiro Wilk test. We used Pearson's r and Spearman's ρ correlations controlled for age, sex and BMI to examine associations

between CRF and physical activity with sleep quality variables. Significance was set as $p \leq 0.05$. Results: After controlling for age, sex and BMI there was an association between VO_{2peak} and sleep duration ($r = 0.428$, $p = 0.021$), but not PSQI ($\rho = -0.202$, $p = 0.313$), or sleep efficiency ($r = 0.168$, $p = 0.384$). MVPA was not associated with PSQI ($\rho = -0.207$, $p = 0.395$), sleep duration ($r = 0.301$, $p = 0.185$), or sleep efficiency ($r = 0.222$, $p = 0.333$). Steps were also not associated with PSQI ($\rho = -0.230$, $p = 0.344$), sleep duration ($r = 0.298$, $p = 0.189$), or sleep efficiency ($r = 0.258$, $p = 0.258$). **Conclusions:** Our preliminary data indicate there is an association between cardiorespiratory fitness and objectively measured sleep duration, but not sleep efficiency, or subjective sleep quality. Physical activity was not associated with sleep. Additional data are needed to determine directionality between cardiorespiratory fitness, sleep duration, and potential mechanisms.

U5: ANAEROBIC PERFORMANCE IMPROVEMENTS FOLLOWING INGESTION OF R-1,3-BUTANEDIOL (KETONEIQ)

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BACKGROUND: Current evidence demonstrates that ketone supplements have made it possible to ingest ketone molecules, elevating blood b-hydroxybutyrate (BHB) despite consuming carbohydrates (CHO). The purpose of this investigation was to determine the effects of R-1,3-butanediol (BDO) commercially available as KETONEIQ. **METHODS:** A randomized repeated measures placebo-controlled design was used to compare BDO and placebo (PLA). Performance testing consisted of ingestion of 0.5g/kg of BDO or PLA and a standard meal (31g CHO, 2.5g fat, 13g protein). Participants then conducted a 5km time-trial on a treadmill while breath gases were analyzed. BHB and GLU were determined at baseline, midpoint and post run. Following aerobic testing participants completed five 10-second sprints against resistance (7.5% body mass). Repeated-measures analysis of variance (ANOVA) was performed to test for differences in the various outcome variables. Main effects were evaluated by Fisher's least significant difference post hoc testing. A significance level of $p \leq 0.05$ was chosen. Smallest worthwhile change (SWC) in performance variables was calculated using Excel, the SWC was determined using 0.2 multiplied by between subject standard deviations during the PLA trial. **RESULTS:** BDO resulted in increased BHB at all time-points following baseline (20-minute $p<0.001$ and 40-minute). On the performance day, BDO supplementation resulted in significantly higher average power (BDO: 479.90 ± 282.60 watts; PLA: 414.86 ± 206.40 watts; $p<0.0001$) and average peak power (BDO: 597.42 ± 307.2 watts; PLA: 543.98 ± 270.80 watts; $p<0.001$) outputs across the five 10-second cycle sprints. Peak power was the highest wattage determined, while average peak power is the mean peak power across the five trials. Additionally, individuals supplemented with BDO demonstrated significantly higher pedal velocity max (BDO: 130.71 ± 13.3 RPM; PLA: 121.07 ± 25.7 RPM; $p<0.05$) Lastly, supplementation resulted in less fatigue as determined by Fatigue Index. SWC was determined to be 2.36 watts. Significantly less wattage decline was observed in the BDO (22.99 ± 11.8 watts) group compared to PLA (29.75 ± 5.5 watts) group ($p<0.01$). **CONCLUSION:** Acute supplementation with KETONEIQ significantly increases blood ketones and significantly improved anaerobic performance on a repeated cycle ergometer assessment. Funding: Health Via Modern Nutrition (HVMN)

U6: EXAMINING INERTIAL LOADS AND ACCELERATION DURING THE PRESEASON AND COMPETITIVE SEASON IN COLLEGIATE SOCCER PLAYERS.

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BACKGROUND: Advancement of wearable technology allow practitioners to collect measurements of external workload such as inertial load (IL) and acceleration zones (AZ) during an athletic activity. An athlete's IL and AZ can provide insight for athletic personnel to prescribe appropriate training loads over time. **PURPOSE:** The purpose of this study examined IL and AZ differences over a competitive season (preseason: 2 weeks, in-season: 10 weeks) in collegiate male soccer players. IL was characterized as an athletes position relative to a starting point and is calculated using the player load formula. AZs were determined by the sensor developers and categorized into five different zones which consisted of 1-2 m/s², 2-3

m/s², 3-4 m/s², 4-5 m/s², and 5-6 m/s². METHODS: Twenty-one (age: 19.6±1.2 years, height: 180.7±8.3cm, mass: 75.6±7.4kg) Division I collegiate male soccer players were monitored using wearable Global Positioning Systems (GPS). A 10Hz Titan +1 (2"x1.5"x0.25") sensor (Houston, Texas, United States) was secured by a jersey resting between the scapulae of each participant and was used to track every training session and match across the competitive season. Sensors were activated and distributed by the coaches fifteen minutes prior to players taking the field to allow for adequate synchronization. Sensors were collected immediately following completion of each session. To ensure adequate monitoring over the season, participants were excluded from analysis if <75% of the total number of sessions were not recorded (n=2). A series of paired sample t-tests with an alpha level of p<0.05 were used to compare differences in IL and AZ between preseason and in-season periods. RESULTS: Paired samples t-tests revealed significant differences between preseason IL (1219.6±146.7 m/s³) and in-season IL (1919.8±211.9 m/s³) (p<.001). These tests also showed significant differences within each AZ between preseason and in-season p<.05. CONCLUSION: Significant differences in the preseason/in-season IL signifies there is an increase in change of position and direction in-season compared to pre-season. The significant differences between the AZ's signifies athletes are spending more time accelerating and changing speeds in-season compared to pre-season. This study provides athletic personnel reports that can aid in developing training protocols based on the demands of competitive play in the regular season.

U7: THE EFFECT OF AN ORAL REHYDRATION SOLUTION ON SUBSEQUENT ANAEROBIC EXERCISE PERFORMANCE AND PERCEPTUAL MEASURES

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Dehydration is known to negatively influence exercise performance. Research has demonstrated that oral rehydration solutions (ORS) containing carbohydrates and electrolytes enhance exercise performance. It is unknown if ORS containing only electrolytes can improve subsequent anaerobic exercise performance. Therefore, the purpose of this study was to determine if rehydration with an electrolyte beverage improves anaerobic exercise performance. Four females (age = 23 ± 4; body mass = 65.5 ± 10.9) participated in this randomized, counterbalanced, crossover study. For both trials, participants arrived at the lab following a twelve-hour fluid restriction. Their first-morning urine was collected, and urine specific gravity (USG) and urine color were assessed (USG = 1.024 ± 0.005; Urine Color = 5 ± 1). Participants cycled on a cycle ergometer for 45 minutes, keeping their heart rate between 75-85% of their estimated heart rate max. No fluid was provided during this exercise. Participant's body mass was collected immediately following this bout of exercise. Participants were then provided with either an electrolyte beverage (EB) (LMT Inc.) or placebo (PL) (Mio Inc.) to replace fluid losses from exercise. Participants then reported several perceptual measures and completed three 15-second Wingates on a cycle ergometer. Desire for fluid was higher following the consumption of the EB compared to the PL and the difference was approaching statistical significance (p = 0.08). Participants reported an improved taste in their mouth following ingestion of EB compared to PL (p = 0.006). Anaerobic capacity (p = 0.135), mean watts (p = 0.999), and peak watts (p = 0.422) were not different between trials. Although the desire to drink more fluid and perceived taste was improved following the consumption of the EB, performance was not impacted. An EB does not appear to be an effective strategy to improve exercise performance but may be useful to drive the desire to drink fluid.

U8: PREVALENCE OF LEA AND RELATIVE ENERGY AVAILABILITY- SYNDROME (RED-S) IN DI COLLEGIATE VOLLEYBALL ATHLETES

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Collegiate athletes commonly fail to meet daily dietary recommendations for their energy expenditure, which may lead to low energy availability (LEA). Chronic LEA can affect the body characterized as relative energy deficiency syndrome (RED-S) including the gastrointestinal (GI), reproductive, and muscular systems. Severe LEA can lead to amenorrhea or oligomenorrhea,

decreased bone mineral density, and GI distress. PURPOSE: To investigate the prevalence of injuries, GI distress, and abnormal menstruation risk factors in DI collegiate volleyball athletes. METHODS: Athletes were sampled: (N=17; Ht:175.0±7.9cm, Wt: 77.9±20.6kg, BF%: 24.8±10.2%, and FFM: 57.0±7.7kg). Athletes attended pre-season testing that included demographic information and self-reported LEA using the Low Energy Availability Females Questionnaire (LEAFQ). Height was measured using a wall-mounted stadiometer and body weight and composition via bioelectrical impedance. LEAFQ evaluates LEA risk of athletes by separating questions into three sections: injuries, GI, and reproductive functions. LEAFQ has a 90% specificity and 78% sensitivity in accurately identifying LEA. A risk score of ≥8 is the threshold for LEA risk. Person correlations compared LEAFQ and demographic data. RESULTS: The LEAFQ composition score indicated that 50% of athletes were positive for LEA risk (8.2±3.5). No significant correlations were found despite a negative moderate relationship with body mass (r= -0.39 p =0.14, CI: 0.14,-0.74). 14/16 of athletes reported feeling gaseous/bloated independent of the menstrual cycle. However, of the 14 observed with GI distress 50% (7/14) were also at risk for LEA while 37% reported cramps or stomach ache unrelated to menstruation. Of those with LEA risk, 50% (4/8) experienced menstrual changes with increased exercise intensity, duration, and frequency while 44% of all athletes reported having lost their period for at least 3 months. CONCLUSION: 100% of those with LEA risk experienced symptoms of RED-S. GI distress symptoms seem to be a more prevalent indicator of LEA risk, while abnormal menstruation shows a smaller prevalence in LEA risk. LEA did not seem to impact injury risk. LEA can adversely affect athletes' health. It is important for coaches, staff, and athletes to be educated about the negative effects and preventative measures of LEA.

Symposia (S1-S15)

S1: CARBOHYDRATE-PROTEIN COINGESTION DURING SHORT-TERM RECOVERY FOR THE WIN

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Significant levels of glycogen depletion and associated fatigue have important implications for endurance as well as intermittent team sport athletes (soccer, hockey, and basketball), who perform repeated bouts of fast-paced running and skating. Athletes that undergo repetitive bouts of exhaustive exercise are encouraged to take advantage of the heightened physiological milieu that occurs in the early hours of recovery from exercise. The provision of carbohydrate to the glycogen depleted muscle is an important opportunity to accelerate glycogen resynthesis and support repetitive bouts of high-intensity exercise. Isoenergetic amounts of carbohydrate (CHO; 1.2 g/kg/bw) and carbohydrate-protein co-ingestion (0.8 g/kg/bw CHO + 0.4 g/kg/bw protein) within the first 90 min to 4 hours after exhaustive exercise has been shown to result in a similar level of glycogen resynthesis. Carbohydrate-protein co-ingestion has the added benefit of promoting a positive nitrogen balance that likely contributes to the repair and remodeling of acutely damaged proteins. Dr. Erica Goldstein will provide a review of glycogen depleting exercise as it relates to endurance and intermittent team sport athletes; describe the heterogeneous subcellular compartments where glycogen is stored; and discuss the association between low glycogen content and fatigue. In addition, Dr. Goldstein will review the key aspects of glucose uptake, transport capacity, and glycogen resynthesis in skeletal muscle. Finally, she will discuss the salient findings related to carbohydrate vs. carbohydrate-protein co-ingestion in the early hours of recovery from exhaustive exercise. By providing a review of the related physiology and recent findings related to carbohydrate vs carbohydrate-protein co-ingestion the exercise physiologist, strength coach, and student practitioner will be able to educate the athlete on the benefits of nutritional recovery to maximize performance, support repetitive bouts of exhaustive exercise, and promote the continued physical well-being of the athlete.

S2: SO YOU WANNA CONDUCT RESEARCH IN THE FIRE SERVICE: LESSONS FROM THE FIREGROUND

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There has been increased interest in creating academic research and programmatic collaborations with fire agencies. Existing collaborations have yielded empirical data to provide evidence-based recommendations to enhance the health, safety, and readiness of fire personnel. This engaging symposium will advise how to develop a comprehensive wellness program with a local fire agency and provide an overview of "hot" research topics. Specifically, Dr. Emily Langford will describe how to develop a collaboration with volunteer fire departments and define occupational readiness measures and their limitations. Ms. Sarah Lanham will address critical issues that may hinder implementation of a strength and conditioning program for firefighters. Dr. Bridget Melton will present on how to navigate academic research with fire departments by addressing issues ranging from working with an IRB to maintaining long standing agency partnerships. Finally, Dr. Mark Abel will discuss the current state of research in the Fire Service by addressing key issues associated with firefighters' health and safety. This symposium will provide practitioners with an understanding of key elements associated with developing a community-based partnership and guide investigators in conducting timely research on critical topics with the collective goal of protecting the most valuable resource in the Fire Service - the firefighter.

S3: CAPACITY BUILDER AND PLASTICITY ENHANCER: IS EXERCISE THE KEY TO IMPROVING CURRENT STROKE REHABILITATION PRACTICES?

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Stroke has remained a leading cause of disability for the past thirty years and the number of people living with stroke and subsequent economic burden is expected to continue to grow over the next several decades. The coupling of reduced stroke mortality rates and more survivors living with long-term disability highlights the need to develop rehabilitation strategies that can reduce disability and promote functional recovery and enhance quality of life. Individuals following stroke present with profound reductions in aerobic and muscular capacities. Consequently, survivors of stroke are required to work at a significantly greater relative intensity to complete activities such as walking, washing dishes, and climbing stairs. Such reductions in capacity interfere with community ambulation and community participation. As this vicious cycle evolves, survivors of stroke become more isolated and sedentary which in turn further exacerbates already diminished levels of physical capacity. Unfortunately, rehabilitation sessions have been found to be an insufficient stimulus to promote physical capacity building which highlights a liability in our current approach to stroke rehabilitation and an area of critical need. Evidence supports the effectiveness of aerobic exercise for improving cardiorespiratory fitness and resistance exercise for improving muscular fitness in chronic survivors of stroke. Such improvements in aerobic and muscular capacities are accompanied by improved walking velocity and walking endurance, emphasizing that physical capacity building is a critical component of effective stroke rehabilitation. However, despite evidence of benefit, aerobic and resistance exercise as a therapeutic intervention following stroke remains clinically underutilized. During this symposium we will: 1) describe the current state of the art of exercise's role in stroke rehabilitation; 2) present evidence supporting the inclusion of appropriately dosed aerobic and resistance exercise in stroke rehabilitation; 3) describe the synergistic effects of enhancing physical capacity and neuroplasticity in chronic stroke; and 4) propose a model of stroke rehabilitation that leverages the multi-system benefits of exercise to reduce disability, promote functional recovery, and maximize quality of life.

S4: IT'S MORE THAN JUST A NAP AND A SACC LUNCH - BUILDING HEALTHY CHILD CARE CENTERS

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In early childhood, preschoolers experience a pivotal developmental stage, and instilling healthy habits early can have a profound impact on their future well-being. While physical education (PE) programs work effectively in schools, there are limited opportunities for something similarly tailored for young children, specifically in the preschool-age range. Child care centers have become increasingly recognized as pivotal in the battle against the obesity epidemic as more than half of children aged 3-5 years spend significant time in

center-based child care settings, thus the child care center environment itself plays a significant role in influencing children's physical activity levels (Bower et al., 2008). Led by Dr. Dianne Ward, the Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) is a valuable intervention tool that has impacted young children's health and paved the way for the development of significant interventions for fighting childhood obesity. The NAP SACC program consists of four fundamental steps: 1) the completion of a self-assessment questionnaire by the child care center director; 2) goal setting based on the assessment findings; 3) participation in workshops focused on nutrition and physical activity guidelines, along with strategies for implementing changes at the center level; and 4) a subsequent reassessment by the child care center director to track progress and identify areas in need of improvement. The information obtained from the NAP SACC self-assessment results and recommendations equips child care centers with valuable insights, enabling them to pinpoint specific areas that require attention and improvement. The primary objective of this symposium is to provide a comprehensive background on the NAP SACC tool for assessing, planning, and implementing actions related to physical activity and nutrition within child care centers. We aim to explore various approaches to utilizing this tool in reshaping our perception of child care centers as key players in promoting healthy lifestyles among young children. In closing, we will shed light on the remarkable career of Dr. Dianne Ward, the visionary behind NAP SACC, and discuss the profound influence her contributions have had in reshaping our perception and utilization of child care centers as a frontline defense against childhood obesity.

S5: FITNESS VS. FATNESS: WHICH MATTERS MORE FOR HEALTH?

Nathan R. Weeldreyer, Siddhartha S. Angadi, FACSM. *University of Virginia, Charlottesville, VA.*

The prevalence of obesity has increased significantly over the past 40 years, and it is associated with increased rates of both cardiovascular disease (CVD) and all-cause mortality. During this period the prevalence of weight loss attempts has increased significantly, however, recidivism remains high. Moreover, cycles of weight loss and regain (weight cycling or "yo-yo dieting") are associated with elevated morbidity and mortality risks. This symposium will explore the underlying physiology and determinants of obesity, physiological causes of weight regain and will examine the utility of exercise for mitigating risks associated with overweight and obesity. To that end, Dr. Angadi will discuss the underlying physiology of obesity, metabolic adaptations observed during weight loss, and provide an overview of randomized controlled trials utilizing diet and exercise for weight loss. Mr. Weeldreyer will present data from our recent analysis conducted by our group assessing the joint relationship between obesity and cardiorespiratory fitness (CRF as defined by VO_{2peak}) on CVD and all-cause mortality. This study included data from 458,784 individuals and demonstrated that CRF status is a significant predictor of mortality risk. Further, BMI lost predictive value after adjustment for CRF. Specifically, when compared to the reference group of fit normal weight individuals, those who were fit and overweight (CVD [95%CI]: 1.50 [0.82-2.76], All-cause HR: 0.96 [0.61-1.50]) or fit and obese (CVD: 1.62 [0.87-3.01], All-cause: 1.11 [0.88-1.40]) saw no increased risk of mortality. In contrast, those who were unfit but normal weight (CVD: 2.04 [1.32-3.14], All-cause: 1.92 [1.43-2.57]), overweight (CVD: 2.58 [1.48-4.52], All-cause: 1.82 [1.47-2.24]), or obese (CVD: 3.35 [1.17-9.61], All-cause: 2.04 [1.54-2.71]) all showed increased risk when compared to those who are fit and normal weight. These data have implications for risk reduction and a public health focus on CRF instead of BMI may result in improved outcomes.

S6: REMEMBERING STEVE BLAIR: MEMORIES FROM STUDENTS AND COLLEAGUES

Russell R. Pate, FACSM¹, James S. Skinner, FACSM², Leanna M. Ross³, Jennifer L. Triik, FACSM⁴. ¹*University of South Carolina, Columbia, SC.* ²*Indiana University, Lexington, NC.* ³*Duke University School of Medicine, Durham, NC.* ⁴*University of South Carolina School of Medicine Greenville, Greenville, SC.*

During this 50-minute session, we celebrate Steve Blair's life and recount stories and memories about who he was and what he meant to many people. It will open with a brief 5-minute overview of his life and accomplishments by Jim Skinner. This will be followed by four 8-minute presentations by: A former doctoral student: Leanna Ross (Duke University). A former postdoctoral fellow: Jennifer Triik

(University of South Carolina at Greenville). A co-worker and friend of many years: Russ Pate (University of South Carolina, Columbia). A colleague and friend of many years: Jim Skinner (Indiana University). This will be followed by about 10 minutes for people from the audience to briefly talk about Steve.

S7: GAIT ANALYSIS CONSIDERATIONS FOR INDIVIDUALS POST-STROKE WITH SEVERE HEMIPARESIS

J. J. Cash¹, J. H. Kindred^{2,1}, S. A. Kautz^{1,2}, M. G. Bowden³. ¹*Medical University of South Carolina, Charleston, SC*, ²*Ralph H. Johnson Veterans Administration Medical Center, Charleston, SC*, ³*Brooks Rehabilitation, Jacksonville, FL*

Gait analysis is commonly used in research and clinical practice to understand walking mechanics in healthy and impaired populations. It is particularly helpful in neurological conditions, such as stroke, as gait analysis can be used to assess maladaptive movement strategies and inform rehabilitation efforts to improve walking ability. Standardized Rancho Los Amigos Observational Gait Analysis (OGA) techniques identify gait cycle events or tasks by specific movements (e.g., heel strike is the start of the gait cycle, mid-stance is defined by an individual exhibiting support of the body on a single limb, etc.). While useful, many stroke survivors do not exhibit these specific walking strategies, which may preclude gait event identification in this way. Currently defined OGA methods may not capture unique walking patterns often observed in post-stroke individuals (e.g., greater hip circumduction, reduced dorsiflexion, reduced propulsion). Further, those with severe walking impairments may require additional methods of analysis, as these individuals may not be able to perform events as described by OGA methods. This symposium aims to provide insight into current methods of post-stroke gait analysis and considerations for individuals with severe hemiparesis. Dr. Kindred will provide an overview of current/classical gait analysis methods, in addition to commonly observed walking patterns in post-stroke individuals. Ms. Cash will then discuss considerations of gait analysis methods in stroke and present a case series highlighting the need for gait analysis methods independent of stroke severity. Researchers and practitioners will gain an understanding of the unique considerations required for gait analysis in individuals post-stroke, particularly those with severe hemiparesis. Researchers and practitioners may seek to apply different methods of gait analysis in stroke that are more sensitive to various walking patterns.

S8: BLOOD LACTATE DURING RECOVERY FROM EXERCISE: MECHANISMS AND PRACTICALITIES

L. Gladden, N. L. Stute, A. C. Berry. *Auburn University, Auburn, AL*

Lactate metabolism in general, and recovery blood lactate in particular, have been studied for well more than a century. However, interest in recovery and speeding the return of blood lactate concentration to the resting level remains of great interest. Muscle lactate concentration can exceed 30mmol/kg and blood lactate concentration can exceed 20mM early in recovery from short-term, high-intensity exercise. There is an accompanying acidosis which has implications for muscle function/fatigue. The fate of this lactate disappearance is likely glyconeogenesis in muscle, uptake by the liver and/or kidneys with subsequent formation of glucose and/or glycogen, and oxidation in numerous tissues, particularly skeletal muscle. The purpose of this symposium is three-fold: 1) to review the potential mechanisms of lactate removal, 2) to discuss the potential effect of breathing hyperoxic gases on blood lactate decline in recovery, and 3) to evaluate an array of reported practical approaches to hastening blood lactate decline in recovery (e.g., foam rolling, massage, cold water immersion). This symposium will appeal to a broad audience from basic scientists to those with applied interests.

S9: THE FAMILY NUTRITION AND PHYSICAL ACTIVITY SCREENING TOOL: DEVELOPMENT, RESEARCH AND CLINICAL USE SUGGESTIONS

K. L. Peyer. *University of Tennessee at Chattanooga, Chattanooga, TN*

The Family Nutrition and Physical Activity (FNPA) screening tool is comprised of twenty questions to assess child and family behaviors related to physical activity, nutrition, screen time and sleep. Originally developed following an evidence analysis by the Academy of Nutrition and Dietetics, the FNPA is intended to be used to identify obesogenic behaviors before weight becomes a concern. Originally published in 2009, the FNPA has undergone additional revisions and evaluations in

the past fifteen years and will soon be available as a Patient Reported Outcome in EPIC electronic medical records. This symposium will provide a synopsis of the revision process and the current tool and an overview of the association between FNPA and health outcomes. With more than 60 peer-reviewed publications that either evaluate the utility of the FNPA or report on its use in clinical and community-based interventions, this symposium will provide examples of how attendees could incorporate the FNPA into their research related to childhood obesity. Researchers and clinicians will gain an understanding of the history and research base for the FNPA, how the FNPA might be integrated into clinical care and the potential for FNPA to serve as a basis for motivational interviewing interventions to improve family obesogenic behaviors.

S10: UNDERSTANDING VALUE OF LONGITUDINAL TESTING WITH A SMALL BUDGET: LESSONS FROM CLINICAL AND APPLIED DATA

Troy Purdom¹, Greg Ryan². ¹*North Carolina Agricultural and Technical State University, Greensboro, NC*. ²*Piedmont University, Demorest, GA*.

Many exercise physiologists encounter both physical and passive barriers as they embark on testing athletes: equipment, portability, personnel limitations, time, and applicability to everyone involved to name a few. However, finding common ground and utility for coaches and athletes is paramount to a successful collaboration. Furthermore, with <3min contact time with athletes, physiologists can manufacture significant value when considering clinical and applied testing. The outcomes of this talk will include the novel findings of high-frequency cardiovascular disease, seasonal transition effect, coaching style effects on athletes, and communication style, all of which have empirical physiological effects. Dr. Purdom will discuss coaching style effect on physiological outcomes including cardiovascular disease, aerobic and anaerobic capacity, and injury risk while Dr. Ryan will discuss applied performance testing variables in professional athletes.

S11: DIETARY NITRATE SUPPLEMENTATION: EFFICACY AND APPLICATIONS FOR EXERCISE PERFORMANCE

Michael J. Saunders, FACSM¹, Daniel A. Baur². ¹*James Madison University, Harrisonburg, VA*. ²*Virginia Military Institute, Lexington, VA*.

The effects of dietary nitrate supplementation (i.e. beetroot juice) on physiological responses to exercise have been studied extensively in recent years. The consumption of dietary nitrates acutely elevates plasma nitrate/nitrite levels, thereby increasing the bioavailability of nitric oxide (NO). NO is a signaling molecule that influences numerous physiological functions, including blood flow, blood pressure, cell signaling, glucose regulation, and tissue responses to hypoxia. Furthermore, the conversion of nitrates/nitrites to NO is facilitated in conditions of low oxygen availability and low pH, which makes this mechanism of NO production particularly important during exercise. Numerous studies have reported that dietary nitrate supplementation has positive effects on muscle function, exercise efficiency, and exercise performance. However, the efficacy of dietary nitrates for these outcomes appears to be influenced by a variety of factors, including dosage (amount and timing of nitrate ingestion), exercise conditions (duration/intensity/altitude), and exercise population (clinical/recreational/elite). Therefore, the purpose of this symposium is to discuss the efficacy and applications of dietary nitrate supplementation. Dr. Saunders will discuss the metabolism of dietary nitrates, effects of nitrate supplementation on physiological responses to exercise, and potential mechanisms responsible for these outcomes. Dr. Baur will address various factors influencing the efficacy of dietary nitrates, and the application of this information to different exercise populations.

S12: IMPACT OF THE COVID-19 PANDEMIC ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR

Charles R. Darracott. *Augusta University, Augusta, GA*.

In March 2020, the U.S., Canada, and many other countries enacted shelter-at-home measures to curb the spread of the COVID-19 virus. A widely held view was that these restrictions would lead to reduced physical activity (PA) and increased sedentary behavior (SB) triggering adverse effects on immune function and enhancing the risk for chronic conditions. Jim Sallis and colleagues published an opinion paper in May 2020 outlining an international research agenda to inform COVID-19

policies and practices. This review symposium will examine studies of children and adults related to the COVID-19 pandemic, PA, and SB published in early 2020 through the present. It will be organized around aspects of the framework recommended in the Sallis paper. Nearly all early studies of adults (March-July 2020) found reduced PA and increased SB compared to pre-pandemic levels, however, methodological challenges abounded related to the measurement of PA and SB during a pandemic. These challenges will be explored as well as possible adaptations to existing instruments for use in a pandemic. The studies reviewed will be examined for factors that influenced PA and SB in the context of the COVID-19 pandemic. The impact of COVID-19 on families was nuanced and related to issues such as number of working parents in the home, age of children, number of children in the household, as well as availability of outside play space. Results of studies using "big data" will be reported. Other current issues explored in this review include: 1) how to reduce disparities in PA opportunities during a pandemic; 2) examining the potential of PA in moderating the impact of the COVID-19 pandemic; 3) recommended interventions to increase PA and reduce SB during a pandemic; and 4) evaluation of methods for managing safe use of PA locations. This review may inform policy and practice for future pandemics.

S13: OPTIMAL AND UNIQUE TRAINING CONSIDERATIONS FOR ELITE SPORT PERFORMANCE FOR THE HIGH SCHOOL ATHLETE
Andy Bosak. *Liberty University, Lynchburg, VA.*

Obtaining peak performance for collegiate and professional athletes is very important to sport coaches, strength training and conditioning coaches, athletic trainers, and sports scientists, etc. However, an area of major interest is the performance of high school (ie. varsity) athletes. With various strength training and conditioning and/or sports performance centers and summer sport camps focusing on younger athletes, many research and career opportunities have become available working with varsity athletes. Helping varsity athletes receive college scholarships can sometimes be as rewarding to coaches as it is in helping professional and collegiate athletes succeed. While high school athletes can train hard, training these athletes yield interesting challenges and potential barriers as compared to collegiate or professional athletes who have already gone through puberty. It is vital that varsity athletes are trained in a somewhat similar manner as collegiate athletes, but with important training program differences due to the demands of their sport as well as their physiological capabilities and potential adaptations to training. Thus, this symposium's purpose and objective will be to 1) emphasize the importance of physical training for the varsity athlete, 2) discuss the unique challenges of training and assessing these special athletes, 3) review relevant research and outline future research opportunities, 4) suggest appropriate training program principles with reliance on sports science concepts specific to the varsity athlete, and 5) outline the importance of strength and conditioning programs for prevention of potential injury for high school athletes. This symposium is intended for students and faculty as well as strength training and conditioning professionals and sport coaches, sport science researchers and practitioners, future and current athletic trainers and rehab specialists, etc. who are interested in various aspects (ie. strength training and conditioning, physiology, nutrition, etc.) associated with varsity athletes. Since interest continues to increase pertaining to how sports science can improve high school athletes' performance, more research is needed that will assist coaches and varsity athletes in meeting the demands of their sport while also trying to avoid under-recovery, overtraining, and potential burnout that may occur as their athletic career continues in the future.

S14: INTERGENERATIONAL PHYSICAL ACTIVITY PROGRAMMING: CURRENT LITERATURE AND FUTURE DIRECTIONS

K. M. Mendez¹, L. A. Reid², S. Aguiñaga³, N. Henkin⁴, D. X. Marquez⁵, D. Werner⁶, A. Bryan⁷. ¹University of Georgia, Athens, GA, ²South College, Atlanta, GA, ³University of Illinois, Urbana-Champaign, IL, ⁴Generations United, Washington, DC, ⁵University of Illinois, Chicago, IL, ⁶Auburn University, Auburn, AL, ⁷Columbus State University, Columbus, GA

Current data show marginalized populations often fall short of the Physical Activity Guidelines for Americans, potentially contributing to higher health risks. Through the design and implementation of generation- and culture-appropriate initiatives, intergenerational physical activity programming (IGPAP) encourages greater physical

activity in such communities. The purpose of this symposium is to introduce the concept of IGPAP, discuss resulting health benefits, and present how tailoring programs to specific populations may help improve adherence. Ms. Mendez will first establish a working definition of intergenerational programming. She will then discuss potential barriers to physical activity in marginalized communities, and explain why incorporating IGPAP may help increase physical activity levels overall. Ms. Mendez will proceed to introduce each speaker, all of whom will present for 10 minutes, highlighting different areas related to this topic. Dr. Werner will explain the favorable effect of IGPAP on obesity in children. Dr. Marquez will provide insight on creating culturally appropriate physical activity programs. He will highlight the creation of the BAILAMOS™ program, a Latin dance initiative to increase physical activity in older Latinos. Dr. Aguiñaga will discuss how community-based IGPAP can be used to support older adults at risk of and with dementia-related diseases. Dr. Henkin will present on the importance of establishing intergenerational community centers and designing intergenerational practices, policies, and research. To conclude, Dr. Reid will summarize all main points of this symposium and future directions of IGPAP. She will close the symposium with a facilitated discussion on IGPAP. Presentation attendees will leave with knowledge of the multigenerational health benefits of IGPAP as well as understand how community-specific IGPAP policy, methodology and implementation can increase physical activity adherence in underserved and underrepresented populations. Our experts hail from across the United States; therefore, this symposium will be a hybrid in-person/live stream presentation facilitated by the Southeast Chapter American College of Sports Medicine Minority and Health Research Special Interest Group. Dr. Bryan will review and approve the final presentation.

S15: UNDERSTANDING THE WHY AND HOW OF USING VERIFICATION STAGES FOR VO_{2max} TESTING

C. J. Womack. *James Madison University, Harrisonburg, VA*

Historically, the achievement of maximal oxygen uptake (VO_{2max}) during a graded exercise test (GXT) has been verified via the achievement of a plateau in oxygen uptake (VO₂) with increasing exercise intensity. However, because the incidence of a plateau can be highly variable, use of secondary criteria associated with variables such as respiratory exchange ratio (RER), heart rate, blood lactate, and ratings of perceived exertion (RPE) have been utilized. These secondary criteria have notably low specificity and the critical values associated with these variables are somewhat arbitrary. Increasingly, investigators are utilizing verification stages to confirm achievement of VO_{2max}. These stages occur after a brief rest period following the GXT. The participant begins work at or near the final stage achieved during the GXT and continues until volitional fatigue. Research findings on the utility of verification stages are promising. This symposium will address the following points: 1) the limited efficacy of secondary criteria, 2) the arbitrary nature of the values assigned to both primary and secondary criteria, 3) the efficacy of using verification stages to improve the validity of VO_{2max} testing, and 4) the best structure of an appropriate verification stage.

Tutorials (T1-T17)

T1: GET YOUR CAMPUS MOVING: EXPLORING EIM-OC ACTIVITIES, EVENTS, PROGRAMMING AND OUTCOMES

Patricia Bauer¹, Rebecca A. Battista, FACSM², Cayla McAvoy³. ¹Florida Gulf Coast University, Fort Myers, FL. ²Appalachian State University, Boone, NC. ³UNC- Charlotte, Charlotte, NC.

Exercise Is Medicine® On Campus (EIM-OC) opens dialogues on how to promote physical activity (PA) and its health benefits on university/college campuses and provides opportunities for interdisciplinary collaboration (ACSM, 2022). Universities and colleges may register their program with the ACSM, joining over 220 other college campuses dedicated to inspiring students, faculty and staff to get-up and get-moving. The EIM-OC program has three levels of recognition: Bronze, Silver, and Gold. Recognition by ACSM encourages campuses to engage in PA-promoting activities fostering a culture of well-being and improving the health of students, patients, and the community in a manner that is appropriate for their campus. Activities include promoting PA on campus (Bronze Level) and providing educational opportunities or guidance (Silver level). Gold

level campuses (the highest recognition level) must agree to one Silver-level activity and one Bronze-level activity, institute the PA Vital Sign (PAVS), or some type of routine PA assessment within their campus health, and perform at least one referral activity (e.g., prescription for PA). However, despite the large number of institutions receiving EIM-OC recognition there's a shortage of examples and information about their activities. Engaging in dialogues within the EIM-OC community can prove beneficial not only for enhancing program quality but also for promoting increased PA participation. In 2021, Morgan et al., created a casebook as an effective resource for campuses involved in EIM-OC, allowing the sharing of best practices and enhancing program implementation. Thus, we will explore EIM-OC resources related to programming and events and the challenges associated with implementation. Additionally, we will showcase various examples of EIM-OC programming, events, and themes across different educational institutions and EIM-OC Levels. Presenters will provide a brief overview of their EIM-OC program, share top activities for EIM-OC Month, and highlight key findings from their EIM-OC research. The objectives of this session are to offer a repository of diverse implementable activity ideas and facilitate discussions about the associated opportunities/challenges. We will center our attention on categorizing activities by EIM-OC recognition levels. Finally, we will delve into the required resources necessary for successfully executing these activities and events.

T2: VISUALIZING SKELETAL MUSCLE: A COMPREHENSIVE ASSESSMENT OF SKELETAL MUSCLE HEALTH USING MICRO-BIOPSIES AND ELECTRON MICROSCOPY

T. D. Cardaci¹, B. N. VanderVeen¹, C. M. Fairman², E. Murphy¹.

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Skeletal muscle health is pivotal for overall physical well-being. The assessment of its ultrastructural and architectural components is essential for understanding muscle-related pathologies, managing treatments and exercise responses, in addition to studying the metabolic milieu. We outline a methodological approach for conducting skeletal muscle micro-biopsies and utilizing advanced electron microscopy techniques to comprehensively evaluate the health of skeletal muscle. This methodology involves the analysis of various cellular components (i.e. mitochondria, glycogen, lipid, ECM, etc.) with a focus on ultrastructural details provided by transmission (TEM) and scanning electron microscopy (SEM), along with 3-D electron microscopy tomography (EM tomography) to comprehensively evaluate the health of skeletal muscle. Muscle micro-biopsies are obtained from human subjects using a minimally invasive technique, ensuring minimal discomfort and tissue disruption. Following tissue collection, samples are processed, and/or embedded and sectioned for TEM, SEM, and EM tomography. Using TEM, SEM, and EM tomography allows for high-resolution visualization of mitochondrial morphology, mitochondrial network organization, cristae ultrastructure, and mitochondrial interactions offering a multi-dimensional view of mitochondrial content, dynamics and distribution. Further, glycogen granules and lipid droplets are analyzed using TEM providing insight into storage capacity and metabolic state. Satellite cells are identified and quantified using TEM, as an assessment of muscle regenerative potential. Our method also explores additional ultrastructural parameters, including ECM and myofibrillar organization, Z-line structure, and sarcomere length, providing a comprehensive understanding of muscle microarchitecture. In conclusion, our methodology for muscle micro-biopsies combined with electron microscopy provides a holistic perspective on skeletal muscle health and holds promise for improving the overall quality of life for individuals affected by muscle disorders. This approach offers valuable insights into the state of skeletal muscle tissues, paving the way for advancements in the diagnosis and treatment of muscle-related conditions in addition to understanding the skeletal muscle responses to exercise. The learning objectives are to a) introduce cutting-edge microscopy techniques and analyses from a minimally invasive muscle micro-biopsy sample and b) encourage implementation of such analyses to better understand muscle-related pathologies and exercise responses in various populations. The target audience for this tutorial is researchers who are interested in skeletal muscle biology and exercise physiology.

T3: A PEDAGOGICAL JOURNEY THROUGH HEART RATE VARIABILITY BASICS

Erica M. Marshall. *Florida Southern College, Lakeland, FL.*

Heart rate variability (HRV) refers to the time between heartbeats intervals and is widely recognized as a tool to quantify activity of the autonomic nervous system, particularly the parasympathetic nervous system. HRV is intricately linked to both health and exercise performance. Higher HRV is generally associated with better cardiovascular health and well-being. Additionally, athletes and individuals involved in intense physical training utilize HRV monitoring to improve their performance and recovery, ultimately enhancing their athletic achievements. Thus, HRV serves as a valuable tool for optimizing both health and performance outcomes. Despite this, HRV education is often excluded from the undergraduate exercise science curriculum due to its perceived complexity. However, with the advent of wearable technology and mobile phone applications that make HRV and its assessment more accessible, its inclusion in the undergraduate exercise science education seems not just relevant, but essential. Therefore, the purpose of this tutorial lecture is to empower attendees with the knowledge and skills to educate undergraduate exercise science students regarding HRV. Concepts will include a) background to HRV, b) HRV assessment methods, including wearable technology and mobile phone applications, 3) HRV interpretation, 4) evidence-based interventions, and 5) practical scenarios through case studies and simulated exercises. The target audience for this tutorial will be exercise science faculty, as well as health and fitness professionals.

T4: EXERCISE IN A PILL: CAN EXERCISE MIMETICS REPLACE PHYSICAL ACTIVITY?

S. K. Powers. *Stetson University, Deland, FL*

Regular physical activity and/or exercise provides many health benefits including a reduction in all-cause mortality and a decreased risk of developing several chronic diseases. Indeed, increased physical activity/exercise can reduce the risk of acquiring Alzheimer's disease, numerous types of cancer, type 2 diabetes, and cardiovascular disease. Unfortunately, not everyone is able to engage in regular physical activity and exercise due to disease or injury. Therefore, developing a pharmacological approach to provide the health benefits of physical activity/exercise is important. Exercise mimetics are a class of therapeutics that are designed to mimic the health benefits of regular exercise. Research identifying the cell signaling pathways activated by physical activity/exercise can lead to the development of new drugs that can promote the health benefits of exercise. This tutorial lecture will discuss several classes of compounds that are proposed to target skeletal muscles and serve as exercise mimetics. The potential benefits as well as the potential for harm from these pharmacological alternatives to exercise will be discussed.

T5: USING FINKS EXPERIENTIAL LEARNING (EL) TAXONOMY TO REPLACE LAB IN EXERCISE PHYSIOLOGY COURSE.

Mikaele F. Iosia. *Lee University, Cleveland, TN.*

Seeking to understand how students learn is the constant pursuit of faculty. Avoiding memorization and regurgitation of facts does not lead to long term learning. Blooms taxonomy of learning has influenced course development since the 1950s. Blooms taxonomy included: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Dee Fink provided an alternative taxonomy of significant learning in 2003. Fink's framework is made up: Foundational Knowledge (K), Application (A), Integration (I), Human Dimension (HD), Caring (C), and Learning How to Learn (LHL). Connecting content with experiences inside and outside the classroom builds deeper inroads to long term learning. In the context of a program that lacks an Exercise Physiology Lab, utilizing Polar Heart Rate Monitors and the Polar Beat App provided the experiential application of several concepts in our undergraduate Exercise Physiology I course. The learning objectives of this tutorial are 1) provide faculty with alternative course development framework that utilizes EL using Polar heart rate monitors and Polar Beat app (K,A,I), 2) provide course organization and a list of outside assignments that support learning (LHL) foundational concepts in Exercise Physiology, and 3) provide insight from students (HD, C, LHL). Dr. Iosia will cover EL framework using weekly workouts (A,I) and accountability partners (HD,C), course management, and lessons learned over the last three years. Each student will discuss their perspective on the "pros" and "cons" of EL and which workout (I,HD) helped them best understand a concept (K,A,I, HD) from class. Jessikiah Brown, Pre-Athletic Training major, will discuss dealing with injuries (LHL) over the course of the semester and completing weekly reflection (HD) assignments. Kathryn Franco, Pre-Physical Therapy major will discuss the differences in EL versus traditional lab course, and use of accountability partners (HD,C).

Jordan Blair, Exercise Science major and student-athlete will discuss EP carry over to athletics (I) and the final EL presentation (LHL). Attendees will leave with course organizational materials, semester plan, weekly workouts, weekly assignments and grading rubrics to be edited to fit their courses.

T6: WHY SHOULD WE NORMALIZE DATA? EXPLORING DIVERSE TECHNIQUES FOR DATA NORMALIZATION IN EXERCISE SCIENCE

Jacob Hurwitz, Zachary Gillen. *Mississippi State University, Mississippi State, MS.*

Data normalization is a critical processing step in data analysis for exercise and sports science with the aim of standardizing data to improve interpretation and application. Normalization is crucial for facilitating the understanding of different types of data, such as distances, times, and performance scores, enabling meaningful statistical analysis, performance metrics, athletic profiling, and testing parameters. There are numerous methods of data normalization, and which one is chosen is highly dependent on the nature of the population and the question being asked. Normalization techniques to be discussed include ratio scaling, min/max scaling, Z-scores, robust normalization, log transformation, power transformation, and decimal scaling. Ratio scaling is the most commonly used normalization technique and involves dividing some metric by a variable such as body mass to control for the potential confounding factor of various characteristics when comparing different individuals. Min/max scaling rescales data to a specific range, typically 0 to 1, making it suitable for algorithms sensitive to input value ranges. Z-scores transform data to have a mean of 0 and a standard deviation of 1, facilitating comparison and interpretation of data in a standardized form. Robust normalization is strong for outliers and is particularly useful when dealing with data containing extreme values. Log and power transformation alters data distribution, allowing for a more linear relationship with the target variable in cases of nonlinearity. Decimal scaling involves scaling data by a factor of 10 raised to a specified power, simplifying data representation while preserving its inherent characteristics. Understanding and appropriately applying these data normalization techniques is important for achieving accurate and meaningful results in exercise and sports science. Mr. Hurwitz will discuss the in-depth details of the mathematical calculations of these normalization techniques, providing real-world examples with exercise and sports science data. Dr. Gillen will discuss best practices for the implementation of these data normalization techniques and how to determine which method is the most appropriate for various scenarios. Researchers and practitioners will have a foundational knowledge of these methods and be better informed in selecting the most appropriate normalization technique for their data and objectives.

T7: BODY WEIGHT SUPPORT TREADMILLS: UPDATES AND USES

H. Oliver, R. Thornburg, J. Walbolt. *Montreat College, Montreat, NC*

Bodyweight support treadmills (BWS) are popular rehabilitation tools in both athlete and clinical populations. BWS have been shown to reduce user bodyweight and ground reaction forces. This has useful applications for athletes recovering from an impact-related injury or decreasing future injury risk. In clinical populations such as stroke or post-arthroplasty patients, BWS reduces metabolic demands at faster walking speeds, increases balance support, and improves mobility. Widespread use of BWS has to date been limited by high costs and technical maintenance. Newly developed forms of BWS are more affordable, highly mobile, and easily functioned. This allows for widespread use in clinics, sports facilities, or homes. Increased accessibility of BWS may be of particular interest in helping close the health disparities of rural and low socioeconomic regions. The purpose of this tutorial is to discuss how to incorporate the use of novel BWS into rehabilitation across populations and discuss the limitations. Ms. Oliver will talk about therapeutical aspects for athletes. Mr. Thornburg will discuss use in non-athletic clinical settings. Dr. Walbolt will talk about future directives of research and limitations of the novel BWS. The learning objectives of this session include (a) discuss how both athlete and non-athlete clinical populations could benefit from BWS and (b) encourage the development of new protocols and uses of BWS. After attending this session, attendees will be able to utilize BWS to improve clinical outcomes related to mobility, cardiorespiratory fitness, muscular strength, and balance across multiple clinical populations.

T8: THE EXERCISE SCIENCE PRACTICE MODEL: CRITICAL THINKING/REASONING APPLICATIONS IN EXERCISE SCIENCE EDUCATION

M. R. Erickson, P. W. Bauer, J. C. Craddock. *Florida Gulf Coast University, Fort Myers, FL*

One of the greatest challenges faced by Exercise Science (ES) educators is teaching students to think critically and problem solve in a manner consistent with ES professional expectations. To meet these challenges, an innovative practice model was developed and implemented in an ES curriculum. The purpose of this tutorial is to describe the implementation of the Exercise Science Practice Model (ESPM) in ES education and practice as a model to teach and assess the critical reasoning that occurs during client management and training. The model consists of the following 6 categories/lines of thought (LOTs): psychosocial, assessment, diagnosis, prognosis, interventions and outcomes. Additionally, within ESPM, 10 critical thinking/reasoning classifications have been developed and implemented in an undergraduate ES program. They are narrative, interactive, collaborative, ethical, intuitive, assessment, diagnostic, prognostic, intervention, and outcome reasoning. Preliminary data indicate the ESPM helps students organize their thought processes and advances recall and application during laboratory activities, written and practical examinations. It facilitates critical thinking/reasoning, problem solving and promotes comprehensive exercise prescription. The ESPM also advances the ES profession by delineating clear professional boundaries and identifying the types of reasoning that occur within the ES scope of practice. In summary, the authors have implemented a well-received instructional model to effectively teach critical thinking/reasoning and problem solving to exercise science students while promoting professional advancement within the health care system. Without a shift toward a more intentional, standardized practice model, and the associated desired client management reasoning, the schism between ES education and delivery of care will persist, inhibiting the ES impact on societal needs. Learning objectives include: 1) know current exercise science trends in practice and their associated repercussions for ES educators and learners, 2) understand the basis for and implementation of the ESPM critical thinking and problem solving model in exercise science education, 3) learn specific instructional strategies and assessment components within the six lines of thought and across the 10 types of reasoning, 4) apply ESPM to ES courses and curricula. The tutorial target audience is all Exercise Science related faculty, preceptors, practitioners, as well as undergraduate and graduate students.

T9: METHODS FOR IMPLEMENTING HIGH-IMPACT PRACTICES AND PROGRAM EVALUATION IN THE GIRLS EMPOWERING MOVEMENT INITIATIVE

Sarah Gross, Ashlee S. Davis. *University of West Georgia, Carrollton, GA.*

Best practices in teaching and learning emphasize high-impact practices to promote learning in university settings. High-impact practices allow students to apply learning in real-world settings through internships, service learning opportunities, and other field-based experiences. Through the Girls Empowering Movement (GEM) initiative, university students are trained to serve as mentors and physical activity leaders at local middle schools. Students who participate in the program are trained by project staff using a unique student-focused training curriculum that provides education and training in the following domains: onboarding, social-emotional leadership, physical activity leadership, program implementation, lab procedures, data collection and evaluation, reporting, and experiential reflection. This presentation will highlight techniques for engaging undergraduate students in field-based experiences, how to implement a student-focused training program, training strategies for physical activity leadership and mentoring skills, and community-based program evaluation approaches. Sarah Gross will discuss the development and implementation of the unique student-focused training curriculum, program implementation, strategies for engaging students in experiential learning experiences, and tools for program replication. Dr. Davis will discuss using mixed-method approaches within the RE-AIM framework and COM-B model to evaluate the university student mentors' and middle school girls' physical activity intentions and behaviors, as well as overall program experience. The learning objectives are to 1) encourage implementation of experiential-based learning experiences within community-based

initiatives and 2) improve expertise in theoretically-based evaluation methods for these initiatives. The target audience for this tutorial will be faculty or practitioners interested in training university students to lead physical activity in community-based initiatives for adolescent girls. Funding: Atlanta Falcons Youth Foundation

T10: A NEED FOR MORE INDIVIDUALIZED HYDRATION ASSESSMENT APPROACHES IN SPORT

P. B. Wilson. *Old Dominion University, Norfolk, VA*

Proper hydration is an important aspect of athlete performance, health, and recovery. However, scientific debate persists as to how to best evaluate the hydration status of athletes. In practical settings and research, simple thresholds are often used to define hypohydration, such as a urine specific gravity (USG) of greater than 1.020. However, research done in the past several years highlights that these simple thresholds may be prone to mis-classifying hydration status, in large part because measures like USG are impacted by body size and composition, sex, and race/ethnicity. If these factors are ignored, the risk of misclassifying hydration status could substantially increase. A learning objective of this presentation is to review the literature on how body mass and body composition, race/ethnicity, sex, and dietary factors influence field-based hydration biomarkers. Practical recommendations regarding the assessment of hydration will also be discussed given the issues raised.

T11: THE "WRITE" OF PASSAGE - NAVIGATING YOUR FIRST JOURNEY FROM EXPERIMENT TO PUBLICATION

Leanna M. Ross¹, Katherine A. Collins¹, William E. Kraus, FACSM¹, J. Larry Durstine, FACSM². ¹*Duke University School of Medicine, Durham, NC.* ²*University of South Carolina, Columbia, SC.*

The dissemination of research findings is the backbone of scientific progress. Thus, the ability to translate experimental data into a peer-reviewed publication is a core scientific competency. However, formal education regarding the process of developing and publishing a manuscript is not always incorporated into undergraduate and graduate curricula. Without education, practice, guidance, and experience, students and early career investigators may not adequately develop this critical competency. Furthermore, one of the professional development responsibilities of scientific mentors is to enhance their mentees' ability to successfully disseminate their research findings. Thus, the purpose of this tutorial session is to 1) provide a didactic overview of manuscript development, submission, and the peer-review process; 2) highlight key principles that increase the likelihood of successful dissemination; and 3) facilitate interactive panelist discussion based on questions generated by the attendees. Panelists' career stages range from early career to distinguished professor emeritus. After participating in this tutorial session, attendees will be able to 1) identify the structure and components of a scientific manuscript; 2) demonstrate familiarity with the manuscript submission and peer-review process; and 3) incorporate the identified key principles when navigating their own publication journey. As developing well-written manuscripts and revisions is a skill continually developed throughout a scientist's career, the target audience for this tutorial session ranges from undergraduate students to faculty members.

T12: THINKING OUTSIDE THE BOX: A PRAGMATIC APPROACH TOWARD TEACHING TODAY'S EXERCISE SCIENCE STUDENTS

C. M. Wilburn¹, B. E. Decoux², W. H. Weimar¹. ¹*Auburn University, Auburn, AL,* ²*Southeastern Louisiana University, Hammond, LA*

Exercise science students must develop a comprehensive understanding of biomechanics to properly assess human movement and exercise. However, biomechanics instruction often places an unnecessary, heavy focus on quantitative analysis while neglecting the qualitative observation and interpretation skills also required of exercise science professionals. This tutorial will provide a holistic framework for biomechanics instruction and assessment that addresses the value of developing quantitative analysis competency while also cultivating a flexible conceptual understanding of key content and crucial qualitative analysis skills required to be an adaptable, dynamic practitioner in the field. We will present a multifaceted approach that remains sensitive to nuances of human movement while still leveraging the objectivity of quantitative motion analysis. Attendees will be actively engaged in biomechanical analysis of fundamental movements observed in athletic, clinical, and research

settings. The pragmatic approach presented will offer insight to exercise science students about evaluating human movement with greater intricacy, identifying areas requiring correction and guiding technique improvements. In addition, attendees with an interest in teaching Exercise Science students in any capacity will be presented with new ideas and perspectives on instructional strategies and considerations for developing well-rounded future professionals.

T13: CONNECTING WITH YOUR CLIENT: OPEN-ENDED QUESTIONS, ACTIVE LISTENING, AND REFLECTIONS

K. A. Collins. *Duke University School of Medicine, Durham, NC*

With over half of US adults suffering from one or more chronic diseases, the ability to connect with your patient or client is a critical skill for disease prevention and treatment. Key skills necessary to develop strong connections with your patients include the use of OAR's: 1) open-ended questions; 2) active listening; and 3) reflections. Without education, practice, guidance, and experience students and early career investigators may not adequately develop this critical skill. Thus, the purpose of this tutorial session is to 1) provide a didactic overview of OAR's; 2) collaboratively evaluate examples of types of reflections and how to open up a question; and 3) facilitate an interactive discussion based on questions generated by the attendees. The proposed presenter is an early career investigator and a trained health and wellness coach. The learning objectives are to 1) identify the importance and basic use of open-ended questions, active listening, and reflections; and 2) improve the application of these key concepts for developing a better connection with clients. As connecting with patients and clients is a skill that can be continually developed throughout a scientist's career, the target audience for this tutorial session ranges from undergraduate students to faculty members.

T14: HOW TO PRESENT INTERESTING, INFORMATIVE, AND READABLE SLIDES

James S. Skinner, FACSM. *Indiana University, Lexington, NC.*

Alternate title #1: If you do not want to show me what you found in a clear, concise and understandable way, why are you wasting your time and especially mine? Alternate title #2: I can read or I can listen, but not both at the same time. Alternate title #3: Ideas should be seen to be heard. The purpose of presentations at conventions, in the classroom, and other venues is to communicate. However, many presenters do not do this well because their slides are too complex, have too much unnecessary information, and are difficult to read. Based on many slide presentations throughout my teaching and lecturing career, as well as research on how to improve communication, this tutorial will discuss general guidelines for preparing and using slides. There also will be information on such topics as slide format, bullet points, fonts, color, background, graphs, and tables. The learning objective is to improve the ability to communicate clearly using simpler, more informative and more readable slides. The target audience for this tutorial will be faculty, students, and others who use slides to present their research or to teach.

T15: BINGOCIZE: ENHANCING EXPERIENTIAL LEARNING THROUGH SERVICE-LEARNING

Heath Burton¹, Joni Boyd², Vanessa Rettinger¹, Jennifer B. Wetzel², Jakob Lauver³, Jason Crandall⁴. ¹*Anderson University, Anderson, SC.* ²*Winthrop University, Rock Hill, SC.* ³*Coastal Carolina University, Conway, SC.* ⁴*Western Kentucky University, Bowling Green, KY.*

Falls are among the most common causes of injuries among older adults, with 800,000 hospitalizations yearly due to fall injuries, and limiting mobility and activities can lead to further social isolation. Bingocize is an evidence-based, fall-prevention program combining exercise, health education, and the popular game of bingo. The program was created by Dr. Jason Crandall (WKU) and can be implemented in any population that is able to play bingo. Through a Civil Money Penalties grant, several South Carolina University faculty at three institutions have created an opportunity to provide 800 students with engaging service-learning activities that further contribute to experiential learning through Bingocize over a 3-year period. Experiential learning allows students to gain a broader view of their community and world, better understand course material, and gain insight into their own skills, interests, and passions. The purpose of this presentation is to describe the Bingocize-SC program and how it

has been used to create meaningful experiential learning opportunities for university students. The learning outcome is that attendees will understand the benefit of intra and inter-institution collaboration and how they facilitate positive experiences, skill development, and enhance student learning outcomes. Dr. Lauver will describe the basics of Bingocize, Drs. Rettinger and Burton will discuss how to engage students in service-learning activities utilizing Bingocize in the health professions, Dr. Bossi will discuss how Bingocize has been used to create research opportunities to engage students, and Dr. Boyd will discuss what external funding is available to support the implementation of programs to provide students with service learning opportunities. Funding information: United States Center for Medicare Services Civil Money Penalty Grant; Boyd, J. Bingocize: An evidence-based health promotion program to improve the quality of life of South Carolina certified nursing facility residents. \$1,302,340, 2021.

T16: YOU CAN'T POUR FROM AN EMPTY CUP: REGULATING SELF-CARE TO PREVENT BURNOUT IN CLINICIANS

T. N. Hunt, M. Yarbrough. *Georgia Southern University, Statesboro, GA*

According to Mental Health America, mental health is at the forefront of discussions with 19% of adults reporting a mental illness, which is equivalent to over 47 million Americans. These changes highlight the importance of being able to cope in a healthy manner, especially as people face extremely difficult situations such as COVID-19, political unrest, and unstable economies and job markets. The healthcare field exacerbates the problem with increased incidence of illnesses with long-term effects, changes in job duties as a result of shortages in positions, and changes to duties because of demand creating less time for self-care. Those who are dedicated to taking care of others' wellbeing often let their own mental health decline due to the stresses of work and personal life demands. The purpose of this presentation is to discuss the importance of self-care to mitigate burnout and to incorporate strategies to reduce stress into one's general practice and everyday life. Dr. Tamerah Hunt will discuss strategies to reduce burnout and improve mental health such as hands-on demonstrations of mindfulness strategies that can be incorporated into daily activities and easy ways to implement mental health spaces into the workplace. Mrs. Yarbrough will discuss how to conceptualize work life balance and provide the audience with generalized strategies to manage stress. Learning objectives: After completing this session, attendees will: a) understand the concept of burnout b) apply stress reducing techniques and c) develop a personal self-care plan. The target audience for this tutorial is students, faculty, staff and anyone that exhibits stress in their lives.

T17: WHERE ARE THEY NOW? IMPORTANCE OF ALUMNI FEEDBACK AND ENGAGEMENT IN EXERCISE SCIENCE PROGRAMS

R. T. Conners, P. N. Whitehead, A. M. Reno-Smith, S. A. Harper. *The University of Alabama in Huntsville, Huntsville, AL*

One source of under-utilized Exercise Science program feedback is from program alumni. While challenges exist with tracking where program alumni are now, alumni feedback and engagement can help inform future Exercise Science program revision. Interactions with alumni foster and build relationships with current faculty, staff, and students. Additionally, staying engaged with alumni provides proper feedback for program accreditation, a source of future fundraising targets, and enhanced engagement with current program students. Therefore, we aim to discuss approaches to gather and assess alumni feedback to inform future pedagogical approaches, promote alumni engagement, and enhance networking opportunities. Dr. Conners will discuss alumni engagement strategies, the importance of alumni feedback, and how to utilize alumni engagement, specifically in Exercise Science programs. Furthermore, Mrs. Reno-Smith will discuss utilizing undergraduate internship assignments and exit surveys for alumni program reflection. Next, Dr. Harper will present approaches for tracking and utilizing alumni information. Dr. Whitehead will discuss the opportunities to integrate alumni feedback for future pedagogical approaches and the implications alumni feedback has on engagement with students, both past and present. Finally, all speakers will discuss the importance of alumni engagement and building a student community following graduation. Our tutorial will actively poll the audience for successful and unsuccessful feedback strategies. The target audience for this tutorial is current students, faculty, staff, and administration in Exercise Science programs who want to engage

program alumni to inform program feedback and enhance alumni relationships.

Oral Presentation Sessions (O1-O35)

O1: COMPARISON OF GAME EXTERNAL DEMANDS OF NCAA DIVISION I FOOTBALL PLAYERS BETWEEN POSITIONAL GROUPS

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BACKGROUND: In-season competition represents a particularly critical and demanding training phase for American football players. Moreover, these in-season demands can vary widely based on position. Efforts to screen for and thereby mitigate performance decrements by monitoring game loads during the off-season decreases risk of injury and helps to maintain physical and mental performance throughout the season. However, few studies have investigated position-specific external loads during in-season competition. Therefore, the present study assessed differences in external loads among positional groups during in-season competition. **METHODS:** Forty-nine National Collegiate Athletic Association (NCAA) Division I football players were monitored using GPS receivers with integrated accelerometers and gyroscope (Catapult) during 13 games throughout the 2022 season. Groups were categorized as skill (SK: defensive backs, quarterbacks, running backs, wide receivers, n = 19), midfield (MD: linebackers, tight ends, n = 9), or linemen (LM: defensive line, offensive line, edge rushers, n = 21) positions. Mean daily external load (Player Load [PL]) was quantified as the sum of accelerations across all axes of the internal triaxial accelerometer during movement in arbitrary units (AU). A One-way ANOVA was used to determine positional group differences ($\alpha=0.05$). **RESULTS:** Positional group had a significant effect on PL ($p < 0.01$). Bonferroni post-hoc analysis revealed significant differences between LM vs. MD (317 AU vs. 424 AU, $p < 0.01$) and LM vs. SK (317 AU vs. 449, $p < 0.01$). However, there were no differences between SK and MD (SK: 449 AU vs. MD: 424 AU, $p = 0.31$). **CONCLUSIONS:** LM positions exhibit lower external demands compared to other positions during in-season competition. These findings should be considered when developing training programs during an athlete's off-season and pre-season training to prepare for position-specific demands during in-season competition. Future studies should investigate internal load demands during in-season competition and explore alternative load metrics for LM positions.

O2: RETROSPECTIVE EVALUATION OF POSITIONAL DIFFERENCES IN BIOMETRIC DATA OF COLLEGIATE FOOTBALL PLAYERS

G. A. Ryan¹, T. Purdom², D. Rice², S. Brothers², C. Johnson², T. Good². ¹Piedmont University, Demorest, GA, ²North Carolina A&T, Greensboro, NC

BACKGROUND: Athletes in team sports like football are subjected to test batteries throughout the competitive season. Some data collected during this testing includes basic biometric parameters: height (HT); weight (WT); body fat percentage (BF%); fat free mass (FFM); resting heart rate (RHR); systolic blood pressure (SBP); and diastolic blood pressure (DBP). Biometric data nonconformities may exist across teams as players are recruited for position specific purposes. However, such data are rarely analyzed by sport scientists to determine potential variation within a team considering health implications. While not as noticeably valuable as performance metrics, this biometric data may provide an insight into the overall health of players on each side of the ball as well as the whole team. **PURPOSE:** The purpose of this study was to evaluate positional variation in biometric variables collected in collegiate football players. **METHODS:** Biometric data was collected by trained medical professionals on 70 players from one NCAA Division I football team. Players were separated for analysis for the current study as either Offense ([O]; n = 36) or Defense ([D]; n = 34) based on their primary position played during the competitive season. Independent samples t-tests were run to determine the difference between positional (O and D) differences and each biometric variable of interest for the team. Significance of relationships was calculated at $p \leq 0.05$. **RESULTS:** Significant differences were noted between O and D for HT (O: 185.8 ± 6.8cm, D: 180.3 ± 13.3; $p = 0.03$; $d = 0.52$), WT (O: 108.9 ± 24.1kg, D: 97.5 ± 17.4; $p = 0.03$; $d = 0.54$), and

BF% (O: $21.2 \pm 10.9\%$, D: 16.6 ± 6.7 ; $p = 0.04$; $d = 0.51$). No significant differences were noted between positions and FFM ($p = 0.77$; $d = 0.16$), RHR ($p = 0.30$; $d = 0.25$), SBP ($p = 0.26$; $d = 0.27$), and DBP ($p = 1.00$; $d < 0.01$). **CONCLUSIONS:** This data provides insight on the general biometric health of a Division I collegiate football team. The results suggest that O players are overall bigger, based on HT, WT, and BF% compared to D players for this collegiate team. Other than the size difference between groups, no differences existed in other biometric data (FFM, RHR, SPB, or DBP). These results indicate that other than size, all football players share similar biometric data, which could suggest that all players share equal health and cardiovascular risk during a competitive season.

O3: AGE-RELATED POWER, FORCE, AND VELOCITY IN ELITE MASTERS OLYMPIC WEIGHTLIFTERS

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Background: Lower extremity peak power (PP) declines with age, including among masters running, and track and field athletes. PP in Masters Olympic weightlifters has not been examined, nor have velocity (VPP) and force (FPP) at peak power been explored. **Purpose:** To determine sex differences and age-related associations in PP, FPP and VPP in older adult (≥ 60 years) Masters Olympic weightlifters. **Methods:** Forty-two qualifiers for the 2022 World Masters Weightlifting Championships (60-86 years) including 23 women (age 64.7 ± 2.9 years) and 19 men (68.0 ± 7.5 years) completed three maximal effort countermovement jumps (CMJ) with 1 minute rest periods between trials. During each jump, vertical ground reaction forces were collected from four force platforms and were used to compute PP (W/kg), FPP (N/kg), and VPP (m/s). Nonparametric sex comparisons (median [inter-quartile range]) and associations with age were conducted. **Results:** Males demonstrated significantly higher PP ($33.5[10.3]$) vs $27.9[5.1]$, $P=.003$), FPP ($17.5[1.5]$ vs $16.5[1.6]$, $P=.004$), and VPP ($1.9[.4]$ vs $1.7[.2]$, $P=.009$) compared to the females. Significant associations between age with PP ($r_s=-.78$, $P<.001$), FPP ($r_s=-.49$, $P=.035$) and VPP ($r_s=-.85$, $P<.001$) were revealed for males. For females, VPP was significantly associated with age ($r_s=-.446$ $P=.029$), whereas the associations with PP ($r_s=-.36$, $P=.096$) and FPP ($r_s=-.18$, $P=.405$) were not significant. **Conclusions:** Weaker relationships for females than males suggesting less decline in all three variables for females compared to males. Although males demonstrated greater PP, FPP, the decline for males was greater than the females. Age demonstrated a stronger association with velocity for both sexes, signaling a faster decline in the velocity component of power compared to force. Future research should consider sex and age associations with the eccentric components contributing to CMJ performance.

O4: ABSTRACT WITHDRAWN

O5: AEROBIC FITNESS, BODY COMPOSITION, AND CARDIOMETABOLIC RISK IN YOUNG NATURAL BODYBUILDERS AND RECREATIONALLY ACTIVE MALES

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BACKGROUND: Bodybuilding is an established competitive sport with the goal of presenting a balanced physique while emphasizing muscular size and leanness. Little is known about the effects of the off-season training phase, often called the "bulking phase," on important health-related outcomes (e.g., aerobic fitness [VO₂ max] and cardiometabolic risk [CMR] factors). The purpose of this study was to compare VO₂ max, body composition, and CMR factors in natural male bodybuilders (BB) in the off-season training phase with those of recreationally active young males (RA). **METHODS:** Participants completed one laboratory visit in which body composition was determined via DEXA (General Electric), as well as BIA using an InBody 770 analyzer. Thereafter, 40 microliters of blood were collected and analyzed for plasma CMR factors (fasting total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, and glucose) using an Alere Cholestech LDX analyzer. Participants then performed a treadmill GXT to volitional exhaustion, and expired gases were measured using a Parvomedics TrueOne 2400 to determine VO₂ max. **RESULTS:** A total of 8 BB (age = 21.8 ± 2.9 yrs, body mass = 89.3 ± 13.0 kg) and 7 RA (24.6 ± 2.1 yrs, body mass = 81.5 ± 10.5 kg) completed the study.

Compared with RA, BB exhibited a leaner body fat percentage (12.9 ± 4.7 vs $21.0 \pm 4.2\%$ fat, $p = 0.004$) and less fat mass (11.4 ± 4.2 vs 17.0 ± 3.7 kg, $p = 0.018$), though body mass did not differ significantly ($p = 0.23$). Although VO₂ max was not significantly different, RA tended to exhibit higher VO₂ max (60.5 ± 5.5 vs 54.5 ± 7.6 mlO₂·kg of fat-free mass⁻¹·min⁻¹, $p = 0.108$), only when VO₂ max was expressed relative to fat-free mass (mlO₂·kg of fat-free mass⁻¹·min⁻¹). Likewise, there were no differences between groups in CMR factors, but BB tended to exhibit lower HDL cholesterol (40.2 ± 11.1 vs 53.6 ± 13.5 mg·dl⁻¹, $p = 0.100$) and higher total cholesterol: HDL cholesterol ratio (4.1 ± 1.7 vs 2.8 ± 0.65 , $p = 0.088$). **CONCLUSIONS:** Although BB exhibited similar absolute VO₂ max as RA, their VO₂ max relative to fat-free mass (mlO₂·kg of fat-free mass⁻¹·min⁻¹) tended to be lower, and their CMR profiles tended to be less favorable. These findings may be explained in part by the absence of aerobic exercise performed by BB in the off-season training phase, and highlights the importance of BB considering CMR, particularly during the bulking phase of training.

O6: NAVIGATING THE RELATIONSHIP BETWEEN READINESS AND PERFORMANCE IN ELITE COLLEGIATE WOMEN SOCCER PLAYERS

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BACKGROUND: Readiness evaluates an athlete's physical and mental preparedness to perform on a particular day. Characterizing the interplay between readiness and gameday performance could optimize training programs to enhance success in elite sports. The purpose of this study was to evaluate the impact of the individual components of readiness on gameday performance in Division I women's soccer players. **METHODS:** Thirty-three NCAA Division I women's soccer players (mean \pm SD; age= 20.2 ± 1.5 yrs; height= 167.1 ± 5.7 cm; weight= 64.1 ± 6.2 kg) completed eight weeks of a daily survey prior to each training session. The daily survey aggregates stress, mood, fatigue, soreness, sleep duration, and sleep quality for a single readiness score. Performance metrics [high intensity running distance (m), maximum speed (km/hr), and meters per minute (m/min)] were tracked daily with wearable GPS units (PlayerData, Edinburgh, UK) and evaluated on match day (MD). Bivariate correlations were used to characterize relationships between MD variables, with stepwise linear regressions applied to significant performance outcomes. **RESULTS:** MD readiness was predictive of MD maximum speed ($r=0.354$; $p=0.043$) but not of high intensity running ($p=0.084$) or meters per minute ($p=0.105$). No significant correlations were found between individual components of MD readiness (stress, mood, fatigue, soreness, sleep duration, and sleep quality) and MD performance outcomes (maximum speed, high intensity running, meters per minute; $p>0.05$). Stepwise linear regressions demonstrated MD readiness and fatigue as significant predictors of MD maximum speed, together predicting 22% of the variability. No other components of readiness emerged as significant predictors of MD performance outcomes ($p>0.05$). **CONCLUSION:** A comprehensive readiness score appears to be predictive of maximum speed on MD, with fatigue being the most influential component that influences the predictability. Load management, recovery and nutrition strategies that may have a direct impact on readiness and fatigue should be explored to enhance on-field performance. Future studies should evaluate these factors in a larger sample and through different parts of the season.

O7: HYDRATION MONITORING IN COLLEGIATE FEMALE LACROSSE ATHLETES DURING COMPETITION WEEK

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BACKGROUND: Applied research related to monitoring hydration status in female athletes warrants further investigation. To date, no studies have examined relationships between body weight, urine color (Ucol), and thirst (WUT) with urine specific gravity (USG) in female lacrosse athletes approaching a competitive match. The purpose of this study was to describe and investigate trends of hydration indices during a competition week in female, collegiate lacrosse athletes. **METHODS:** A total of 22 female, lacrosse athletes (mean \pm SD; age, 20 ± 1 y) participated in this study. After waking, participants collected their first morning void and transported the urine sample to the facility where body mass, thirst, Ucol, and USG (digital refractometer) were assessed over a 3-day period (48-hr prior to

Game Day = GD-2, 24-hr prior to Game Day = GD-1, Game Day = GD). USG ≥ 1.0210 , body mass loss $>1\%$ of highest mass recorded, urine color >5 , and thirst level ≥ 5 were used as the thresholds to denote hypohydration. Athletes were categorized as having 0, 1, 2, or 3 WUT indicators. WUT score frequencies were reported, and Spearman's correlations calculated the relationship between WUT score and USG. Repeated-measures ANOVA was used to explore mean differences between days for USG and body mass. Ucol differences between days were investigated using a Friedman Test, due to the ordinal nature. Pairwise comparisons utilized LSD post-hoc, when warranted ($\alpha = 0.05$). **RESULTS:** Group means by day did not differ for body mass (GD-2 = 67.3 ± 10.3 kg, GD-1 = 67.3 ± 10.2 kg, GD = 67.5 ± 10.2 kg; $p = 0.36$), thirst (GD-2 = 5 ± 2 au, GD-1 = 5 ± 2 au, GD = 5 ± 2 au; $p = 0.46$), nor USG (GD-2 = 1.0228 ± 0.0059 , GD-1 = 1.0228 ± 0.0054 , GD = 1.0231 ± 0.0048 ; $p = 0.98$). Furthermore, Ucol was not different by day (GD-2 Mdn = 5 au, GD-1 Mdn = 3 au, GD Mdn = 4 au; $p = 0.17$). Of the 66 observations, WUT score frequencies were as follows: WUT 0, $n = 25$ (37.9%), WUT 1, $n = 36$ (54.5%), WUT 2, $n = 4$ (6.1%), WUT 3, $n = 1$ (1.5%). Spearman's correlations revealed a weak, positive relationship between WUT score and USG ($r = 0.25$, $p = 0.04$). Critically, 46/66 (70%) of the urine samples presented a USG > 1.0200 , including 16/22 (73%) on GD. **CONCLUSIONS:** A sizable portion of female, collegiate lacrosse athletes in this study provided urine samples that indicated hypohydration. Additionally, this sample's WUT scores were not strongly related to USG scores.

08: AGE-RELATED CARDIOVASCULAR HEALTH AMONG ELITE ULTRA-ENDURANCE ATHLETES

J. D. Vondrasek¹, S. Jeong², O. B. El-Kurd³, B. A. Linder², N. L. Stute², C. Dormeier¹, T. G. Bissen¹, J. R. Bagley³, A. T. Robinson², M. C. Babcock⁴, G. J. Grosicki⁵, J. C. Watson¹. ¹Florida State University, Tallahassee, FL, ²Auburn University, Auburn, AL, ³San Francisco State University, San Francisco, CA, ⁴University of Colorado - Anschutz, Aurora, CO, ⁵Georgia Southern University - Armstrong, Savannah, GA

Aging is associated with increased cardiovascular (CV) disease risk which is partly attributable to increased blood pressure (BP) and central arterial stiffness. Regular exercise is recommended to slow CV aging, but it is unclear whether "extreme exercise", such as ultra-endurance running (>42.2 km), elicits the same CV benefits as lower-volume training. Therefore, the purpose of this investigation was to test the hypothesis that ultra-endurance running preserves CV health across the lifespan. **METHODS:** We measured supine BP with an automated brachial cuff and arterial stiffness (carotid-to-femoral pulse wave velocity [cfPWV]) with applanation tonometry (SphygmoCor XCEL, AtCor Medical) among 72 athletes (16F/56M; BMI: 22.6 ± 1.8 kg/m²) 1-3 days before they competed in the 161-km Western States Endurance Race (WSER) (Olympic Valley, CA; elevation: 1890 m). We present data as mean \pm SD and confirmed normality using Shapiro-Wilk tests ($\alpha \geq 0.05$). We used simple linear regression to assess the relationship between age and systolic BP (SBP), diastolic BP (DBP), and cfPWV. We compared individual cfPWV outcomes to available normative data. **RESULTS:** Among 72 WSER athletes, age (46 ± 10 years; range: 26-69 yrs), SBP (129 ± 9 mmHg), DBP (78 ± 7 mmHg), and cfPWV ($n = 70$; 6.5 ± 1.0 m/s) were normally distributed ($W_s \geq 0.97$, $P_s \geq 0.06$). Approximately 60% (43/72) of the athletes presented with hypertension (≥ 130 mmHg SBP and/or >80 mmHg DBP) but age was not associated with SBP ($R^2 = 0.02$, $P = 0.23$) or DBP ($R^2 = 0.05$, $P = 0.06$). Age was positively associated with cfPWV ($R^2 = 0.25$, $P < 0.001$) but 84% (59/70) of participants had cfPWV values below their age-predicted value (mean difference: -0.9 m/s). **CONCLUSIONS:** Among these WSER athletes, a majority were hypertensive, but there was not a meaningful relationship between age and BP. Moreover, in this sample, the increase in SBP per decade (1.3 mmHg/decade) was much lower compared to previously reported increases among the general population (6.5 mmHg/decade). Despite an age-related increase in cfPWV, 84% of athletes had cfPWV values below their age-predicted value. These findings suggest that ultra-endurance training is associated with preserved CV health across the lifespan via attenuated age-related increases in BP and cfPWV values below age-predicted norms.

09: THE EFFECT OF FEMALE AGING ON SYMPATHETIC TRANSDUCTION DURING THE COLD PRESSOR TEST

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BACKGROUND: Older female adults (OF) have the highest risk for hypertension and cardiovascular disease among any demographic in America. Exaggerated blood pressure (BP) responses during the cold pressor test (CPT) are associated with higher cardiovascular disease risk. However, previous studies report no age-related differences in BP or sympathetic responses during the CPT in females, but data are limited and partly confounded by differences in body mass index (BMI), which can independently influence CPT responses. Therefore, we tested the hypothesis that aging increases BP and sympathetic responses during the CPT in OF (>55 years) compared with YF (18 - 35 years) matched for BMI. **METHODS:** We studied nine post-menopausal OF and 17 YF (early follicular phase) with brachial BP $<140/90$ mmHg and BMI <30 kg/m². We measured mean BP (photoplethysmography) during a 10-min rest period and a 2-min CPT. In a subset (6 OF, 10 YF), we also measured muscle sympathetic nerve activity (MSNA; microneurography). We calculated time-averaged sympathetic transduction of BP during the CPT (CPT-baseline) as sympathetic-pressure ratios (mean BP/MSNA burst frequency & mean BP/MSNA total activity). We compared age groups using unpaired, two-tailed t-tests for normally distributed data and Mann-Whitney U tests for non-normally distributed data (i.e., failed Shapiro-Wilk test). **RESULTS:** The data are presented as OF vs. YF with mean \pm SD or median[IQR]. By design, age (66 ± 6 vs. 24 ± 4 years, $p < 0.0001$), but not BMI (22.8 ± 2.8 vs. 22.6 ± 3.5 kg/m², $p = 0.85$), was higher in OF. Mean BP (97 ± 13 vs. 78 ± 4 mmHg, $p < 0.0001$), MSNA burst frequency (35 ± 6 vs. 11 ± 6 bursts/min, $p < 0.0001$), and MSNA total activity ($1096[559]$ vs. $114[147]$ AU, $p = 0.001$) were higher in OF at rest. Mean BP responses during the CPT did not differ between groups ($\Delta 17\pm 9$ vs. 14 ± 8 mmHg, $p = 0.79$). However, MSNA burst frequency ($\Delta 7\pm 5$ vs. 17 ± 11 bursts/min, $p = 0.01$) and total activity ($\Delta 24[93]$ vs. $514[3648]$ %, $p < 0.001$) responses during the CPT were higher in YF. Finally, the sympathetic-pressure ratios did not differ between groups ($1.6[13.7]$ vs. $0.7[0.4]$ mmHg/bursts/min, $p = 0.09$ & $0.25[1.69]$ vs. $0.02[0.04]$ mmHg/%, $p = 0.40$). **CONCLUSION:** In partial support of our hypothesis, these preliminary data suggest that MSNA, but not BP, responses during the CPT are attenuated in OF. A higher baseline MSNA in OF relative to YF may explain these reduced sympathetic responses during the CPT.

010: AGING IS NOT ASSOCIATED WITH DECREASED KIDNEY VASCULAR CONDUCTANCE IN ULTRA-MARATHON RUNNERS

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BACKGROUND: Vascular conductance refers to the ease with which blood flows through arteries. Vascular conductance is reduced with aging due to impairments of vascular structure (i.e., arterial stiffness and wall thickening) and function. Reduction in renal blood flow demonstrates an increase in blood pressure (BP) which contributes to the pathogenesis of hypertension. Habitual exercise reduces age-related declines in vascular function. Whether chronic ultra-endurance training offsets age-associated reductions in vascular conductance is largely unexplored. Therefore, we evaluated associations between age and kidney vascular conductance in ultra-marathon runners aged 22-66 years. **METHODS:** Thirty-nine ultra-marathon runners competing in the 2023 Western States 100-mile Endurance Run were included in this analysis (33 M/6 F, 41 ± 10 years, BMI: 23 ± 2 kg/m²; mean \pm SD). Kidney blood velocity in the renal and segmental arteries was measured in the decubitus position using a GE Logiq e ultrasound (3 - 5 MHz). We measured supine brachial and central blood pressure using SphygmoCor XCEL. Renal and segmental artery conductance were calculated as blood velocity divided by central mean BP ($\text{cm}\cdot\text{s}^{-1}/\text{mmHg}$). All data were normally distributed (Shapiro-Wilk test, $p_s > 0.05$). We conducted Pearson's r correlations between age and kidney vascular conductance and kidney blood velocity with a set at ≤ 0.05 . **RESULTS:** Central mean BP in our sample was 92 ± 8 mmHg. Age was not associated with renal (0.58 ± 0.13 $\text{cm}\cdot\text{s}^{-1}/\text{mmHg}$; $r = -0.243$, $p = 0.137$) or segmental (0.35 ± 0.08 $\text{cm}\cdot\text{s}^{-1}/\text{mmHg}$; $r = -0.239$, $p = 0.160$) artery vascular conductance. Similarly, when central BP was not accounted for, age was not associated with renal (53 ± 12 $\text{cm}\cdot\text{s}^{-1}$; $r = -0.086$, $p = 0.603$) or segmental (32 ± 7 $\text{cm}\cdot\text{s}^{-1}$; $r = -0.055$, $p = 0.748$) artery velocity. **CONCLUSIONS:** While additional data in a

larger sample size and age-matched control participants are needed, our data indicate that age is not associated with reduced resting kidney vascular conductance or blood velocity in ultra-marathon runners.

O11: INFLUENCE OF HYPERTENSION, HYPERGLYCEMIA, AND OBESITY ON METABOLIC SYNDROME RELATED IMPAIRMENTS IN CARDIOVAGAL BAROREFLEX SENSITIVITY

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BACKGROUND: The multi-dimensional characteristics of metabolic syndrome (MetS) pose a challenge in understanding how its individual components contribute to the impairment of cardiovagal baroreflex sensitivity (cBRS). Thus, the present study explores the hypothesis that cBRS remains significantly attenuated in individuals with MetS, even after considering the influence of resting systolic blood pressure (SBP), fasting blood glucose (FBG), and waist circumference (WC). **METHODS:** Both phases of the study were completed by seventy-five participants, twenty of whom met the National Cholesterol Education Panel Adult Treatment Panel III criteria for MetS, supplemented with HbA1C as a secondary indicator of glycemic control. These criteria include 1) a WC ≥ 102 cm for males and ≥ 88 cm for females (≥ 80 cm for Asian females), 2) a SBP ≥ 130 mmHg or a diastolic (DBP) ≥ 85 mmHg, 3) a FBG ≥ 100 mg/dL or HbA1C ≥ 5.7 %, 4) a fasting triglyceride (TRG) ≥ 150 mg/dL, or 5) a high-density lipoprotein cholesterol (HDL-C) < 40 mg/dL for males or < 50 mg/dL for females, which were recorded in visit one. Of these 20 participants, 19 could be matched to a control participant by age, biological sex, race, and ethnicity. In the second visit, cBRS data was evaluated during ten minutes of supine rest, where heart rate, beat-by-beat blood pressure, and breathing frequency were recorded continuously and analyzed using the sequence method (systolic blood pressure change ≥ 1.0 mmHg, pulse interval change ≥ 5.0 ms, $r \geq 0.80$, sequence length > 3 beats). **RESULTS:** cBRS_{all} ($p < 0.01$), cBRS_{up} ($p < 0.01$), and cBRS_{down} ($p < 0.01$) were shown to be significantly lower in the MetS group relative to the control. When comparisons were independently adjusted for SBP ($p = 0.03$), FBG ($p < 0.01$), and WC ($p < 0.03$), cBRS_{all} and cBRS_{down} remained significantly lower in the MetS group. cBRS_{up} was also significantly depressed in the MetS group after independently adjusting for FBG ($p = 0.01$), however, this effect was not consistent when adjusting for SBP or WC (all $p \geq 0.05$). **CONCLUSION:** The findings of this study demonstrate cBRS remains significantly impaired in MetS, independently of these three individual components, which suggests baroreflex dysfunction is an inherent characteristic of MetS.

O12: IMPACT OF PHYSICAL ACTIVITY AND SLEEP QUALITY ON HEART RATE VARIABILITY IN COLLEGE STUDENTS

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BACKGROUND: Poor sleep quality links to health issues like obesity and insulin resistance. Heart rate variability (HRV) measures autonomic nervous system imbalance, possibly connecting poor sleep to these problems. Emerging evidence suggests a negative link between physical activity (PA) and HRV. However, past studies mainly used subjective questionnaires, neglecting college students (CS) who often have suboptimal sleep habits. Our study explores sleep quality, PA, and HRV in CS. **METHODS:** Fifteen highly active CS (7 male, 8 female; age = 20.6 ± 2.0 yr; BMI = 23.9 ± 3.8 kg/m²; body fat = 18.9 ± 7.4 %) underwent 7 days of PA and sleep assessment using accelerometry (ActiGraph GT3X). Subjects wore the device on their hip during waking hours and on their non-dominant wrist during sleep. HRV was assessed over 24 hours using a continuous measurement device worn on the chest (Wellue 24-hour ECG recorder). **RESULTS:** A negative association was found between daily moderate-to-vigorous PA (MVPA) minutes and the low frequency to high frequency ratio (LF:HF Ratio) ($r = -0.63$, $P = 0.015$). Those with a higher LF:HF Ratio spent less time in MVPA ($4.6\% \pm 0.7$) compared to those with a lower LF:HF Ratio ($7.5\% \pm 3.0$, $P = 0.03$), and accumulated fewer average MVPA minutes per hour (2.6 ± 0.4 vs. 4.1 ± 1.7 , $p = 0.04$). Unexpectedly, sleep efficiency ($r = -0.68$, $P = 0.008$) and average awakenings per night ($r = 0.81$, $P = 0.001$) were associated with a higher root mean square of successive RR intervals (RMSSD). **CONCLUSIONS:** The LF:HF ratio reflects autonomic nervous system balance, with a higher ratio indicating greater imbalance. Results suggest that less daily MVPA is associated with more significant autonomic imbalance. The connection between sleep and RMSSD

remains unclear, but low sleep efficiency and frequent awakenings may hinder achieving rapid-eye-movement sleep, increasing sympathetic activity and reducing HRV.

O13: ASSOCIATION BETWEEN MARKERS OF CARDIAC-PARASYMPATHETIC FUNCTION AND MYOCARDIAL OXYGEN SUPPLY DEMAND BALANCE IN YOUNG ADULTS

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BACKGROUND: The subendocardial viability ratio (SEVR) is an index of myocardial oxygen supply relative to demand, with lower values suggestive of increased cardiovascular risk. We aimed to determine if indices of cardiac-parasympathetic function were associated with SEVR in young adults. **METHODS:** Thirty-eight healthy young men ($n = 19$, 24 ± 4 yrs, 27 ± 4 kg/m²) and women ($n = 19$, 22 ± 3 yrs, 26 ± 4 kg/m²) participated in the study. Heart rate variability (HRV) was used to index resting cardiac-parasympathetic function. Participants performed post-waking HRV recordings for 60 s in the supine and standing positions for seven consecutive days. The average root-mean square of successive differences (RMSSD) from each position was recorded for analysis. Relative (%) heart rate recovery at one min (HRR1) and two min (HRR2) post-graded maximal exercise test on a cycle ergometer were subsequently obtained to index post-exercise cardiac-parasympathetic reactivation. SEVR was measured in a fasted state via pulse wave analysis approximately 1 h before the graded exercise test. **RESULTS:** In men, standing LnRMSSD (3.46 ± 0.46 , $r = 0.52$), HRR1 ($13 \pm 5\%$, $r = 0.46$) and HRR2 ($19 \pm 7\%$, $r = 0.50$) were associated ($P < 0.05$) with SEVR ($154 \pm 32\%$). In women, only HRR2 ($19 \pm 8\%$, $r = 0.52$) was associated ($P < 0.05$) with SEVR ($126 \pm 23\%$). **CONCLUSIONS:** Greater cardiac-parasympathetic function was associated with greater myocardial perfusion relative to left ventricular workload in healthy young adults. HRV and HRR are accessible and modifiable markers of cardiac-autonomic function that may be useful targets for young adults, particularly men, to reduce their future risk of ischemic heart disease. **FUNDING:** Supported by Georgia Southern University Faculty Research Committee Research Seed Funding Award.

O14: ELEVATED PULSE WAVE VELOCITY IN HIGHLY SEDENTARY ENDOMETRIAL CANCER SURVIVORS: A CALL FOR FUTURE INTERVENTIONS

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BACKGROUND: Endometrial cancer survivors (ECS) experience high incidence of cardiovascular disease (CVD). Unhealthy 24-hour activity behaviors (24-ABs), including high amounts of sedentary behavior (SB), low moderate-to-vigorous physical activity (MVPA) and poor sleep, may contribute to CVD risk in ECS. Pulse wave velocity (PWV) is a non-invasive assessment of arterial stiffness, which is an indicator CVD risk. However, associations between 24-ABs and arterial stiffness in ECS are unknown. Interventions targeting 24-ABs to reduce CVD risk in ECS are needed but simultaneously changing multiple 24-ABs is not feasible. **PURPOSE:** Therefore, the purpose of this study is to investigate 24-ABs and CVD risk in ECS to inform intervention development. **METHODS:** Stage 1 ECS (< 12 months post-treatment, BMI ≥ 25.0 kg/m², 50-80 years old) were recruited. Oscillometric PWV was measured via Mobil-O-Graph. Body composition (% fat) was measured via Bioelectrical Impedance Analysis. Accelerometry was used to measure 24-ABs for 7-days. Participants were categorized as highly sedentary if they spent $> 50\%$ of the 24-hour day engaging in SB. Linear regression was used to compare 24-ABs and PWV. 7.3 m/s was used as an age-matched hypertensive referent value. **RESULTS:** Nineteen ECS (63% White, 21% Black, 5% Asian, 11% American Indian, 63 ± 7 years old, 6 ± 4 months post-treatment, $44 \pm 6\%$ body fat) participated in the study. Highly sedentary ECS ($N = 11$, MVPA: 144 ± 123 min., and sleep: 8 ± 2 hours) spent 13.8 ± 1.6 hours sedentary. Less sedentary ECS ($N = 8$, MVPA: 216 ± 159 min., and sleep: 8 ± 1 hours) spent 11.3 ± 1.9 hours sedentary. Highly sedentary ECS had higher PWV compared to those who engaged in less SB (0.6 ± 0.8 m/s, $R = 0.21$, $R^2 = 0.05$, $F = 0.86$, $p < 0.001$). There were no differences in age, body fat %, time since treatment, MVPA, sleep or bout length between groups. **DISCUSSION:** Overall, ECS engage in concerning amounts of SB and PWV was elevated compared to normative data despite achieving recommended amounts of MVPA and sleep. Highly sedentary ECS have increased PWV compared to less sedentary ECS, yet the difference is below the clinically relevant 1 m/s threshold. All ECS were sedentary with elevated PWV. Therefore,

future interventions for ECS should focus on strategies to improve intensity or duration of SB interruption.

O15: DAILY MOVEMENT PATTERNS AND RELATED CHANGES IN PAIN AND QUALITY OF LIFE IN OLDER ADULTS

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BACKGROUND: PA is a potential non-pharmaceutical treatment to improve pain symptoms and quality of life; however, little is known about the effect of daily movement patterns on these outcomes. This study aimed to investigate the relationship between phenotypes of baseline daily movement patterns and changes in pain and Health-Related Quality of Life (HRQOL). **METHODS:** Participants were low-active older adults with chronic pain and obesity who were enrolled in one of two randomized controlled pilot trials wherein participants were assigned to a 12-week remote group-mediated behavioral PA intervention (MORPH I & II), or a control group. PA was measured with an ActivPAL 4 triaxial accelerometer for 7 consecutive days at baseline. The 36-item Short Form quality of life scale (SF-36) was to measure HRQOL. Pain intensity and interference were assessed using the PROMIS 3-item pain intensity scale and the PROMIS 8-item pain interference scale. A functional principal components analysis (FPCA) was performed to identify phenotypes of daily movement patterns, and component scores were entered into a series of linear regressions to predict related changes in pain and HRQOL subdomains. Statistical significance was established at $p < .05$. **RESULTS:** Participants (N=68) were 69.54 ± 6.74 years on average. Two components were retained based on the FPCA scree plot. Component 1 (52.8%) scores differentiated subjects engaging in more vs less activity across the day. Component 2 (16.1%) scores captured those who took more vs less time to begin moving in the day. "High movers" (i.e., higher component 1 scores) demonstrated more positive changes in HRQOL subdomains (physical function, emotional role limitation, energy/fatigue, social functioning, pain, and general health), and reductions in pain intensity. "Late starters" (i.e., lower component 2 scores) demonstrated worsening scores in unique HRQOL subdomains (physical function, physical role limitation, and general health) and worsening pain interference. **CONCLUSIONS:** Results highlight that amount and distribution of activity differentially relate to changes in pain and quality of life among older adults with chronic pain. Future intervention development may benefit from targeting overall movement while providing additional support with those who struggle to move early in the day due to pain.

O16: EXPLORING REGULAR EXERCISERS' EXPERIENCES WITH READINESS/RECOVERY SCORES PRODUCED BY WEARABLE DEVICES: A DESCRIPTIVE QUALITATIVE STUDY

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BACKGROUND: Meta-session autoregulation offers a framework for person-adaptive exercise programming by matching session demand with an individual's current mental, emotional, and physical resources ('readiness'). Some consumer wearables have been designed to guide users' exercise decisions by providing 'recovery' or 'readiness' scores, computed primarily based on heart rate variability. Despite the growing popularity of consumer wearables and interest in person-adaptive programming, there is limited research on how users interact, interpret and use these scores. Thus, the purpose of this study was to understand individuals' experiences using and interacting with their wearable device and scores. **METHODS:** Seventeen regular exercisers self-reported owning and utilizing a Whoop™ band or Oura™ ring for at least 3 months and underwent a one-on-one virtual semi-structured interview. Interviews were recorded, transcribed verbatim, and analyzed using reflexive thematic analysis. 'In-vivo' quotes from our sample were used to both craft titles for and provide evidence underlying each emerging theme. **RESULTS:** While our analysis identified six overarching themes, we focus on three, providing each with sufficient attention and space required for a thorough exploration and comprehensive demonstration. Theme 1, 'It's more about how I can make adjustments to optimize my programming,' (MPR) highlights using their wearables as intended, for guiding training purposes (e.g., reducing intensity when recovery is low). Theme 2, 'So many things outside of training modifications have changed,' (Misty) indicates users concurrently modify non-exercise behaviors (e.g., sleep, nutrition) to manage and optimize recovery/readiness scores. Within theme 3, 'It's just a wearable. It's not God! It doesn't know exactly what is happening,' (Susan) users acknowledge the limitations and errors

associated with these devices (e.g., provided scores sometimes incongruent with subjective perceptions), in capturing the complexities of human experiences, necessitating self-reliance to further direct behavioral adjustments. **CONCLUSION:** While these devices offer a simplified numeric-based approach to passively measuring individuals' readiness/recovery status, users emphasized the importance of self-awareness, flexibility, and personal judgment in their exercise decisions. They viewed their wearables as valuable tools but not infallible authorities. Understanding these experiences, in addition to exploring the psycho-behavioral aspects of user interactions, can contribute to refining meta-session autoregulation as a person-adaptive approach to exercise.

O17: TOP-DOWN AND BOTTOM-UP ATTENTION AS CRITICAL MECHANISMS OF MEMORY PERFORMANCE

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Purpose: Moderate intensity exercise has been shown to positively influence memory performance. This observed increase in memory performance may be due to an increase in attention from exercise. Attention has two distinct pathways that must be carefully considered when evaluating its association with memory performance. The purpose of this study was to investigate the relationship between top-down and bottom-up attentional pathways and their respective effects on memory performance, ultimately allowing for follow-up experimental work evaluating these pathways in the exercise-memory relationship. **Methods:** Participants (N = 16, M_{age} = 21.4) came to the lab and completed a two-phase cognitive task, including an attention-switching (AS) task (encoding) and a subsequent memory recognition test. The AS task consisted of 300 unique trials, including an attention cue followed by a compound stimulus; the compound stimuli included one stimulus (object or word) superimposed on the other. The preceding attention cue directed the participant to attend to only one of the stimuli (object or word). Trials included either repeat trials - attending to the same stimuli type (object or word) between the current and preceding trial - or switch trials, which included the current attended item type (e.g., object) switching from the attended item type (i.e., word) of the immediately preceding trial. The memory test consisted of a recognition test involving rendering old/new judgements for each of the attended and unattended (object or word) items; a 2 (Transition: Switch, Repeat) × 2 (Attention: Attended, Unattended) repeated measures ANOVA was performed with memory ratings as the outcome. **Results:** An interaction of Transition by Attention, $F(1, 15) = 6.266, p = .024$, was observed, indicating a decrease in memory selectivity; when attention was switched on the subsequent trial, the memory ratings for the attended stimuli decreased while memory for the unattended stimuli on the subsequent trial increased. These results indicate a decrease in top-down attentional processing and, consequently, an increase in bottom-up processes. **Conclusion:** The evaluated attention-switching paradigm provides a reliable evaluation of top-down and bottom-up attentional processes and their respective effects on memory performance. Our follow-up work will evaluate these attentional processes as potential mechanisms in the exercise-memory relationship.

O18: SMARTPHONE USE AND ITS IMPACT ON SOCIAL SUPPORT AND WELL-BEING IN COLLEGIATE ATHLETES

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BACKGROUND: Smartphone usage has a detrimental effect on various aspects of well-being, including depression, anxiety, the fear of missing out, loneliness, and overall quality of life among collegiate athletes. Moreover, it hinders the development of healthy and supportive relationships with teammates, coaches, family, and friends. This concern is heightened by the fact that collegiate athletes heavily depend on informal help-seeking and social support during periods of diminished well-being. The purpose of this study was to investigate the relationship between smartphone use, social support, and well-being in collegiate athletes. **METHODS:** Collegiate athletes were recruited, and their smartphone use was assessed via self-reported screen time and the Use of Social Media During Daily Activities Questionnaire. Social support was measured using the Perceived Available Support in Sport Questionnaire. Well-being was evaluated through the Student Well-Being Questionnaire. Pearson correlations were used to determine the relationships between smartphone use, social support, and well-being. **RESULTS:** Participants (N = 14; $20.88 \pm 2.26y$; 86% F) demonstrated higher levels of social media using during daily activities and screen time had a small negative association with well-being ($r = -0.204$ and

$r = -0.198$). Social media use during daily activities and perceived social support ($r = -0.250$) had a small negative association while screen time was a large negative association with social support ($r = -0.537$). Social support and well-being ($r = 0.182$) had a small positive association. **CONCLUSION:** The relationship between collegiate athletes and their smartphone usage reveals a significant negative impact on their social support and overall well-being. Specifically, increased screen time is strongly associated with decreased levels of social support among athletes. Conversely, higher levels of perceived social support correspond to improved well-being. These findings underscore the importance of investigating protective behavioral strategies for smartphone usage as potential solutions to mitigate the adverse consequences of excessive smartphone use.

O19: THE POTENTIAL IMPACT OF CARDIAC CONCERNS RELATED TO COVID-19 ON MOOD DISORDERS IN COLLEGIATE ATHLETES

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BACKGROUND: Physical manifestations related to a COVID-19 diagnosis have been studied, but gaps exist in understanding COVID-19 and mental health. This study evaluates the presence of short-term and persistent cardiac symptoms among collegiate athletes diagnosed with COVID-19 and determines if cardiac-related symptomatology was associated with anxiety or depression. **METHODS:** Data was collected during pre-participation screening with NCAA Division II collegiate athletes ($n=1730$) from 2021-2023. COVID-19 history and symptoms experienced were self-reported via REDCap. Anxiety and depression were evaluated using the GAD-7 and PHQ-9, respectively. Differences between groups were assessed with Chi-Square and correlations with Pearson's Correlation Coefficient. **RESULTS:** The presence of anxiety and depression (GAD-7, PHQ-9) were statistically significant among athletes who self-reported experiencing short-term cardiac-related symptoms related to COVID-19 ($n=625$), including shortness of breath (0.10 ($p<0.001$), 0.10 ($p<0.001$)), chest pain (0.09 ($p<0.001$), 0.08 ($p<0.001$)), fatigue (0.10 ($p<0.001$), 0.10 ($p<0.001$)), and rapid heartbeat (0.09 ($p<0.001$), 0.11 ($p<0.001$)). Results were not statistically significant for athletes who reported experiencing palpitations (-0.01 ($p=0.68$), 0.02 ($p=0.53$)) or leg swelling (0.01 ($p=0.66$), 0.03 ($p=0.18$)). No statistically significant correlation was determined between athletes who self-reported experiencing persistent cardiac symptoms related to COVID-19 and mood disorders. **CONCLUSIONS:** Experiencing common cardiac symptoms in the interim after a COVID-19 diagnosis appears to correlate with mood disorders among collegiate athletes. However, correlation values were minimal, and clinical significance must be explored further. These findings highlight the importance of emphasizing mental health support for athletes amid the development of physical symptoms to ensure optimal performance.

O20: THE EFFECTS OF A DIGITAL DIABETES PREVENTION PROGRAM ON PHYSICAL ACTIVITY AND DIET

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BACKGROUND: Modest weight loss is the cornerstone of diabetes prevention programs (DPP); however, few DPPs report changes in physical activity and diet claimed to induce weight loss. Therefore, the purpose of this study is to evaluate physical activity and diet changes among digital DPP users relative to a comparison group. **METHODS:** In the Preventing Diabetes with Digital Health and Coaching for Translation and Scalability (PREDICTS) randomized control trial, 599 individuals with prediabetes were randomized to a digital DPP or a group education class/comparison group. The digital DPP provided weekly educational curriculum, lifestyle coaching, virtual peer support, and behavior tracking tools. The self-reported Godin-Shepherd Leisure-Time Physical Activity and Starting the Conversation (STC) food intake questionnaires were collected at baseline, 4- and 12 months. Linear mixed effects models assessed changes in physical activity and diet from baseline to 4 and 12 months. Post hoc analyses using proportional models assessed changes in individual STC items. **RESULTS:** The digital DPP produced significant reduction in body weight (-5.5% vs. -2.1% , $p<0.001$) at 12 months. The DPP group significantly increased physical activity (80.4 vs. 44.6 minutes/week, $p=0.008$) and improved food intake (-2.3 vs -1.4 , $p<0.001$) post-intervention. At 4 and 12 months, the DPP group was less likely to consume more processed snacks, sweets and fats relative to the

comparison group (Odds Ratios = 1.33 - 1.61, $ps < .001$).

CONCLUSIONS: The digital DPP improved physical activity and dietary behavior for individuals with prediabetes.

O21: EXPLORING PSYCHOSOCIAL DETERMINANTS OF HYDRATION BIOMARKERS IN YOUNG ADULT MALES

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BACKGROUND: Previous work has identified associations between attitudes about hydration and fluid intake behaviors, but the association between these psychosocial factors and hydration biomarkers has not been evaluated. The purpose of this study was to explore the relationship between psychosocial factors contributing to fluid intake (hydration-related knowledge, attitudes, and behaviors) and hydration biomarkers in young adult males. **METHODS:** Thirty males (mean \pm SD; age, 23 \pm 4 y; height, 175 \pm 6 cm; weight, 79.8 \pm 14.2 kg; body fat, 17.4 \pm 9.4 %) collected 24h urine samples for 4 consecutive days to assess mean urine volume (U_{VOL}), urinary osmolality (U_{OSMO}), urinary specific gravity (U_{SG}) and urine color (U_{COL}). A fasted blood draw was obtained on day 4 to assess serum coceptin. Participants also completed three validated surveys on day 4 to assess hydration knowledge (Hydration Knowledge Scale - K), attitudes (Hydration Facilitators and Barriers - A), and behaviors (Fluid Behavior Index - B). Outcomes from the K, A, and B questionnaires were used as continuous predictors of hydration biomarkers in separate regression models for each domain and hydration biomarker, respectively. **RESULTS:** Higher K was associated with higher U_{VOL} ($\beta = 0.061$, [0.003, 0.120], $p = 0.041$), but no other hydration biomarker. More perceived barriers, specifically related to "Lack of Effort," were associated with higher U_{OSMO} ($\beta = 38.5$, [7.6, 69.1], $p = 0.0167$), higher U_{SG} ($\beta = 0.001$, [0.000, 0.002], $p = 0.024$), darker U_{COL} ($\beta = 0.2$ [0.01, 0.35], $p = 0.038$), but not U_{VOL} ($p = 0.569$). No other barriers were associated with any hydration biomarkers ($p > 0.05$). Higher scores on the Fluid Behavior Index, reflective of behaviors associated with greater fluid consumption, were associated with lower U_{OSMO} ($\beta = -71.65$, [-120.86, -22.43], $p = 0.006$), U_{SG} ($\beta = -0.002$, [-0.003, -0.004e-1], $p = 0.011$) and lower coceptin ($\beta = -0.57$, [-1.13, -0.02], $p = 0.043$), lighter U_{COL} ($\beta = -0.4$ [-0.6, -0.1], $p = 0.008$), but not U_{VOL} ($p = 0.07$). **CONCLUSIONS:** Knowledge about hydration appears to have limited influence on hydration biomarkers, while behaviors captured by the Fluid Behavior Index (e.g., keeping a beverage within arm's reach, drinking fluids even when not thirsty) were associated with improvements in hydration biomarkers in healthy, young males.

O22: INCLUDING A VERIFICATION STAGE DURING VO2MAX TESTING IS MORE USEFUL IN NORMOXIA THAN NORMOBARIC HYPOXIA

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BACKGROUND: Maximum oxygen consumption (VO_{2max}) is regarded as the gold standard measurement of cardiorespiratory fitness and is classically assessed by a graded exercise test (GXT) until volitional fatigue. The limitations of primary ($VO_{2plateau}$) and secondary criteria [max heart rate (HR) and respiratory exchange ratio (RER)] to confirm true VO_{2max} achievement during the GXT led to the adoption of a verification stage. This study aimed to determine the utility of including a verification stage when assessing VO_{2max} in normobaric hypoxia (i.e., simulated high altitude), compared to sea level. Additionally, we sought to assess the efficacy of primary and secondary criteria traditionally used to confirm the attainment of VO_{2max} during the GXT, in both normoxia and hypoxia. **METHODS:** Twenty male ($n=15$) and female ($n=5$) subjects completed two separate cycling VO_{2max} trials consisting of a GXT and verification stage, separated by 10 min of passive rest. Tests in normoxia and hypoxia were separated by ≥ 48 h and completed in a randomly counterbalanced order. The highest VO_2 aggregate over 30 s was used as the VO_{2max} value from each stage and condition. Data were analyzed using a series of repeated-measures ANOVAs. **RESULTS:** VO_{2max} was higher in normoxia compared to hypoxia ($p < 0.05$), with no significant differences between stages (GXT vs. verification) within each condition. When applying a threshold of 2% to classify whether VO_2 attained in verification vs. GXT was similar or not, 12 of 20

subjects exhibited higher values during the verification stage in normoxia, whereas only 3 of 20 subjects had higher VO_{2max} values during the verification stage in hypoxia. Based on sensitivity and specificity calculations, primary (plateau < 150 mL/min increase in VO_2 with an increase in workload) and secondary criteria (peak HR within \pm 10 bpm of age-predicted HR max and $RER \geq 1.10$) were unable to verify VO_{2max} attainment in the GXT due to low sensitivity/specificity. **CONCLUSIONS:** A stage x condition interaction was not observed; however, there appeared to be a meaningful difference in the proportion of subjects that achieved > 2% higher values during verification vs. GXT in normoxia when compared to subjects in hypoxia. Primary and secondary criteria were inadequate at confirming a true VO_{2max} during the GXT. Including a verification stage when VO_{2max} testing appears to be more useful when testing in normoxia vs. hypoxia.

O23: PERFORMANCE OF MVIC DOES NOT ENHANCE ACCURACY OF NEUROMUSCULAR FUNCTION AT SUBMAXIMAL INTENSITIES

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BACKGROUND: The purpose of this study was to evaluate the accuracy of neuromuscular function at submaximal intensities of perceived maximal voluntary isometric contractions (MVIC) pre- and post-MVIC. **METHODS:** Thirteen healthy females and 15 males were recruited to participate in this study. Subjects were asked to visit the lab for a single visit in which they were seated on a bench with their elbows fixed at 90° of elbow flexion. Subjects were asked to perform 3 submaximal isometric contractions (SVIC) of bilateral elbow flexion at 25, 50, and 75% of their perceived MVIC strength. Force and muscle excitation of the dominant biceps brachii were recorded via a load cell and surface electromyography (EMG), respectively. Following completion of the SVICs, subjects performed 2 MVICs, each separated by 1 minute of rest. Subjects then repeated the same sequence of SVICs after MVIC testing. Peak force (PF) and EMG amplitude (EMG_{AMP}) were calculated during a 500ms window of each contraction where PF occurred. Normalized percent error for EMG_{AMP} ($nEMG_{ERROR}$) and PF (nPF_{ERROR}) were calculated by subtracting the normalized EMG_{AMP} and PF (relative to MVIC) from the target intensity (i.e., 25/50/75% MVIC). Separate time (pre/post) x intensity (25/50/75%) x sex (M/F) repeated measures ANOVAs were run for each variable and alpha was set a-priori at 0.05. **RESULTS:** There were no interaction effects for either dependent variable ($p=0.158-0.798$). However, there was a significant main effect for intensity for $nEMG_{ERROR}$ and nPF_{ERROR} ($p<0.001$ for both). Post-hoc analysis indicated that $nEMG_{ERROR}$ and nPF_{ERROR} at 25% ($nEMG_{ERROR}$: $11.7 \pm 16.4\%$; nPF_{ERROR} : $12.7 \pm 14.8\%$) was significantly greater than 50% ($nEMG_{ERROR}$: $-0.5 \pm 17.7\%$; nPF_{ERROR} : $-0.6 \pm 16.5\%$; $p<0.001$ for both) and 75% ($nEMG_{ERROR}$: $-13.2 \pm 17.4\%$; nPF_{ERROR} : $-14.0 \pm 15.9\%$; $p<0.001$ for both), when collapsed across time and sex. Additionally, $nEMG_{ERROR}$ and nPF_{ERROR} at 50% were significantly greater than 75% ($p<0.001$ for both). **CONCLUSIONS:** Our findings suggest that performing an MVIC attempt does not enhance one's ability to accurately estimate submaximal force. Additionally, subjects consistently underestimated 25% effort, overestimated 75% effort, and slightly underestimated 50% effort. Our data suggests that this phenomenon occurs independent of sex, as similar error patterns of muscle excitation and peak force were seen between males and females across all intensities. **FUNDING:** This project was funded by the University of South Alabama's Summer Undergraduate Research Fellowship and Bukstein Fellowship.

O24: ASSOCIATION OF 2-MINUTE STEP TEST PERFORMANCE WITH CARDIORESPIRATORY FITNESS IN OLDER ADULTS WITH HIV

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BACKGROUND: Cardiorespiratory fitness (CRF) is an independent predictor of mortality yet requires specialized equipment to measure peak oxygen utilization (VO_{2peak}). Identifying alternative tests, which can be conducted in a clinical setting, is a priority for patient populations with substantial impairment in CRF, such as people with

HIV (PWH). Our objective was to determine if the two-minute step test (2-MST), conducted by video teleconferencing, predicted VO_{2peak} in PWH. **METHODS:** Participants were PWH ≥ 50 years of age who were clinically stable and eligible for a telehealth exercise training intervention. Baseline cardiorespiratory exercise test (CPET) was performed on a treadmill using the modified Bruce protocol to measure VO_{2peak} and maximum heart rate (HRmax). Baseline functional performance was measured using video conferencing technology between different VA medical centers and included 2-MST, 10 time sit-to-stand test, arm curl, and 8-foot up and go. The step count on 2-MST was classified as low or high based on the median value (80 steps). Percent of age predicted HRmax (APMHR) was calculated using formula $208 - (0.7 \times \text{age})$. Two-tailed tests of associations were used with values expressed as mean (standard deviation). **RESULTS:** The 72 participants were 62.8 (6.7) years old, 88% Black, and 95% men. CPET showed $VO_{2peak} = 23.4$ (5.5) mL/kg/min, treadmill duration = 13.6 (3.4) minutes, %APMHR=95(8)%, and $RER = 1.12$ (0.11). Based on Pearson's correlation, the number of steps in 2-MST was associated with VO_{2peak} ($r=0.44$, $p<0.001$) and time on treadmill ($r=0.48$, $p<0.001$). 2-MST also correlated with other functional performance measures (p -values <0.01) and age ($r = -0.43$, $p<0.001$). There was a significant difference in VO_{2peak} between participants with 2-MST classified as low ($n=36$) versus high ($n=37$) (mean (SD) mL/min/kg: 21.6 (5.3) vs. 25.0 (5.1), $p<0.01$). Age adjusted linear regression showed 2-MST predicted VO_{2peak} (beta (95%CI)= 0.065 (0.008,0.123), $p=0.027$). **CONCLUSIONS:** Our findings demonstrated that performance in the 2-MST conducted by video conferencing is significantly associated with CRF, independent of age in PWH. The difference in VO_{2peak} between low and high number of steps is approximately 1 MET, suggesting a clinically meaningful difference. In telehealth or space-limited settings, the 2-MST should be considered as an estimate of CRF in older patient populations with reduced fitness. **Grant or funding information:** VA Office of Research and Development (ORD), Rehabilitation Research and Development, I01 RX002790 (Oursler/Ryan/Marconi)

O25: ACCURACY OF VO_{2MAX} ESTIMATES FROM THE GARMIN FORERUNNER 265.

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BACKGROUND: Many runners have adopted Garmin watches to monitor their exercise training loads, estimate VO_{2max} , and analyze recovery data. However, the accuracy of wrist-based fitness trackers and the reliability of the VO_{2max} estimates has been mixed. While technology continues to greatly improve the quality of the data from these devices, no studies have empirically tested the accuracy of the new Garmin Forerunner 265. Accordingly, we determined the accuracy of VO_{2max} measurements from the Garmin Forerunner 265 compared to values obtained in our applied physiology laboratory. **METHODS:** Six subjects (average age 28.5 ± 6.9 years) wore the Garmin Forerunner 265 on the wrist of their non-dominant arm while completing a mapped, 10-minute outdoor run. The Garmin-estimated VO_{2max} (mL/kg/min) obtained after this run was then compared against oxygen consumption data obtained following a standard, graded exercise test using a Woodway treadmill and Parvo metabolic cart. Mean absolute percentage error (MAPE), percent change, and dependent samples t-test were used to compare values. Significance was accepted at $p \leq 0.05$. **RESULTS:** We determined that VO_{2max} was achieved during the graded exercise test due to several criterion, including a high rate of perceived exertion (19.5 ± 0.5), heart rate within 10 bpm of predicted max (190.2 ± 15.7), an RER over 1.1 (1.13 ± 0.06), and a plateau in oxygen consumption. Average VO_{2max} estimates following this challenge were 46.1 ± 7.41 mL/kg/min and were not significantly different ($p = 0.15$) than estimates from the Garmin Forerunner 265 (51.3 ± 3.6 mL/kg/min). Together, the average percent change ($13.3 \pm 15.5\%$) and relatively high MAPE ($18.4 \pm 8.6\%$) suggest that Garmin may overestimate oxygen consumption compared to values acquired in the laboratory. **CONCLUSION:** The Garmin Forerunner 265 should be used with caution when designing or adjusting training programs based on oxygen consumption data, particularly as the MAPE is greater than 10%. Future studies should investigate if extended, continual use of the Garmin Forerunner 265 would normalize VO_{2max} estimates and make them comparable to values obtained using gold-standard equipment in a controlled laboratory setting.

O26: EFFECTS OF HIGH-INTENSITY INTERVAL, ENDURANCE, AND COMBINED TRAINING ON VO₂MAX, BODY COMPOSITION, MUSCULAR ENDURANCE

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BACKGROUND: Functional training is commonly conducted using high-intensity interval training (HIIT) where heart rate exceeds 85% of age-predicted maximum. Traditional forms of HIIT have primarily been studied using cycling or running, and more work is needed to define the effects of functional HIIT and to compare it to combined training that incorporates an equal mix of traditional and functional work. The purpose of the present study was to compare 4 weeks of functional HIIT, endurance, and combined HIIT and endurance training on markers of health-related fitness. **METHODS:** Fifteen recreationally active participants (age = 21.8 ± 3.1 years, BMI = 24.5 ± 3.9 kg/m², VO₂max = 33.6 ± 8.7 ml/kg/min, percent body fat = 33.2 ± 8.9 %) were divided into 3 groups: HIIT, endurance, or combined training. HIIT workouts consisted of 3 rounds of 8 bodyweight exercises with a 2:1 work-rest ratio, and participants were coached to exercise maximally or near-maximally during each block with heart rate recorded continuously throughout each session. Endurance exercise was performed on a treadmill at an intensity of 60-70% heart rate reserve (HRR) for 30 minutes. All participants completed 3 exercise sessions per week over 4 weeks, with the combined group completing 6 sessions of HIIT and 6 sessions of endurance exercise. VO₂max, body composition, and muscular endurance (1-minute push-ups, curl-ups, and weighted goblet box squats) were measured pre- and post-training. Separate factorial ANOVAs were used to assess changes in each dependent variable with Bonferroni post-hoc testing. **RESULTS:** Significant main effects for time were found for VO₂max (p=0.01) with improvements in the HIIT group post-training (p=0.014). Significant interaction (p=0.013) and main effects for time (p=0.013) were observed for lean body mass with significant increases in the HIIT group (p<0.001). Push-ups and curl-ups displayed significant main effects for time (p<0.001 and p=0.001, respectively), with improvements in the HIIT(push-ups: p=0.005; curl-ups: p=0.016) and combined (push-ups: p=0.007; curl-ups: p=0.001) groups. **CONCLUSIONS:** Engaging in functional HIIT 3 days per week for 4 weeks improves VO₂max and lean body mass. HIIT and combined training are effective for improving muscular endurance, but more than 6 sessions of HIIT are necessary to induce changes in aerobic fitness or body composition.

O27: EFFECTS OF AEROBIC FITNESS ON ASSOCIATIONS BETWEEN PHYSICAL ACTIVITY AND BLOOD PRESSURE IN YOUNG ADULTS

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BACKGROUND: Both aerobic fitness and physical activity levels are protective against cardiovascular diseases. The purpose of this study was to determine if the association between resting blood pressure and activity levels varied as a function of aerobic fitness status. **METHODS:** Forty healthy young men (n = 20, 24 ± 5 yrs, 27 ± 4 kg/m²) and women (n = 20, 22 ± 3 yrs, 26 ± 4 kg/m²) participated in the study. Physical activity was quantified via wrist actigraphy for seven consecutive days. Relative proportions of sedentary time, low intensity physical activity (LPA), and moderate-to-vigorous intensity physical activity (MVPA) were recorded for analysis. Following the observation period, resting systolic and diastolic blood pressures were obtained in the laboratory in accordance with standardized procedures. Subsequently, peak oxygen uptake was obtained via a graded maximal exercise test on a cycle ergometer. Participants were then categorized as "low fit" or "high fit" based on median split. An equal number of men and women comprised each group. **RESULTS:** Maximal oxygen uptake was higher in the high fit (38.8 ± 7.2 ml·kg⁻¹·min⁻¹) versus low fit (29.9 ± 6.6 ml·kg⁻¹·min⁻¹) group (P < 0.05). In addition, systolic (121.4 ± 13.5 vs. 131 ± 10.9 mmHg) and diastolic (67.7 ± 6.6 vs. 73.8 ± 8.7 mmHg) blood pressures were lower for the high fit versus low fit groups (P < 0.05). Nevertheless, no differences (Ps > 0.05) were observed between groups for sedentary time (62 ± 8 vs. 66 ± 9%), LPA (9 ± 1 vs. 9 ± 1%), or MVPA (12 ± 2 vs. 11 ± 2%). Moreover, systolic blood pressure was associated with sedentary time (r = 0.45, P < 0.05) and MVPA (r = -0.48, P < 0.05), and diastolic blood pressure was associated with MVPA (r = -0.46, P < 0.05) in the low fit group, whereas no associations were observed for the high fit group. **CONCLUSIONS:** Being less sedentary and performing more MVPA had favorable effects on blood pressure in participants with lower aerobic

fitness. Lack of associations in the high fit group suggest that activity levels may be less important for lowering blood pressure among individuals with greater aerobic fitness. **FUNDING:** Supported by Georgia Southern University Faculty Research Committee Research Seed Funding Award.

O28: VALIDATION OF EXERCISE AND POST-EXERCISE ENERGY EXPENDITURE ESTIMATES USING HIP AND WRIST ACCELEROMETER ALGORITHMS

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BACKGROUND: Accelerometer-based devices are objective monitors of physical activity (PA) used to estimate energy expenditure (EE). Most EE estimation algorithms are based on steady-state data and do not consider excess post-exercise oxygen consumption (EPOC) after exercise. The purpose of this study was to quantify the error in accelerometer-based EE estimates due to EPOC after varying durations of high-intensity treadmill running. **METHODS:** Nine healthy, recreationally active adult males participated in 3 visits. Visit 1: treadmill VO₂ peak test to determine treadmill speed at 80% VO₂ peak for visits 2 and 3. Visit 2: seated 20min baseline and 3 vigorous treadmill running bouts (30s, 60s, 120s) each followed by 20min seated rest. Visit 3: supine 60min baseline and a 30min treadmill running bout followed by 3 hrs of supine rest. Fifteen EE estimation algorithms using a non-dominant wrist or right hip ActiGraph GT3X+ accelerometer (AG) were compared to measured EE using indirect calorimetry (IC). The 95% confidence interval (CI) of EE bias (AG - IC) was used to determine significance. **RESULTS:** The 11 linear regression EE algorithms tended to overestimate EE at rest after each exercise bout (mean bias kCals [95% CIs]; 30s: 12.5 [3.30, 21.6], 60s: 9.6 [0.37, 18.9], 120s: 6.5 [-2.74, 15.7], 30min: 177.5 [84.6, 262.1]). Adding criterion measured EPOC to the linear EE estimates often resulted in additional EE overestimation. The 4 non-linear algorithms underestimated EE after the short bouts and demonstrated no significant bias after the 30min bout (30s: -7.91 [-10.2, -5.57], 60s: -10.9 [-14.0, -7.88], 120s: -15.4 [-15.9, -14.8], 30min: 14.83 [-39.5, 69.2]). Adding EPOC to the non-linear EE estimates reduced bias after the short bouts but resulted in overestimation after the 30min bout. **CONCLUSION:** Linear regression algorithm estimated EE after exercise was dependent on the y-intercept, which was often higher than the measured resting EE in this study resulting in EE overestimation. Therefore, for most methods, the addition of measured EPOC to the estimated values increased the amount of EE overestimation during the post-exercise period. When calculating EE estimates from wearable-device data, researchers must be deliberate in selecting an appropriate algorithm based on the activities the algorithm is being applied to and the activities included in the calibration of that algorithm.

O29: USE OF AN INSTRUMENTED IN-SHOE SENSOR FOR PROPULSION BIOFEEDBACK IN ABLE-BODIED AND GAIT-IMPAIRED ADULTS

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BACKGROUND: Post-stroke hemiparesis and diabetic peripheral neuropathy (DPN) commonly result in reduced propulsion during gait, measured as anterior ground reaction force (AGRF). Reduced propulsion results in decreased gait speed and impaired functional ambulation. The loadsol® (novel electronics inc., Saint Paul, MN) is an in-shoe sensor that may be able to provide propulsion biofeedback in a clinical setting. **METHODS:** Seventeen able-bodied (AB) individuals (7 M, 10 F, age = 26.5 ± 3.5 y), 12 participants with chronic post-stroke hemiparesis (6 M, 6 F, age = 57.0 ± 12.0 y, 70.0 ± 57.2 months post-stroke), and 5 individuals with DPN (5 F, age = 57.4 ± 4.3 y) walked on a split-belt instrumented treadmill with 3-sensor (hindfoot, midfoot, forefoot) loadsol® in both shoes. Following a baseline (BS) walking trial, loadsol® was used to provide auditory and haptic biofeedback with a 3-10% increase in unilateral forefoot plantar force in the dominant foot in AB, the paretic limb in post-stroke participants, and the more impaired limb in DPN. Peak forefoot loadsol® plantar force (N) and peak forceplate AGRF (N) were calculated for each trial. One-way ANOVAs with post-hoc t-tests were performed to compare BS to biofeedback trials. **RESULTS:** Auditory and haptic biofeedback induced significant increases in plantar force measured by the loadsol® in AB (BS = 694.6 ± 203.3, auditory = 753.8 ± 216.7, haptic = 758.6 ± 202.8, p < .001), stroke (BS = 497.9 ± 167.3, auditory = 591.5 ±

156.7, haptic = 597.8 ± 147.4, $p = .017$), and DPN (BS = 533.5 ± 188.1, auditory = 730.2 ± 225.7, haptic = 657.8 ± 243.6, $p = .044$) and AGRF measured by the forceplate in AB (BS = 142.3 ± 57.4, auditory = 225.7 ± 136.8, haptic = 218.1 ± 133.4, $p < .001$), stroke (BS = 81.6 ± 34.4, auditory = 102.1 ± 39.3, haptic = 98.0 ± 40.9, $p = .001$), and DPN (BS = 91.5 ± 34.2, auditory = 148.6 ± 34.8, haptic = 140.5 ± 42.9, $p = .002$). There were no differences between audio and haptic biofeedback trials. **CONCLUSIONS:** Both auditory and haptic biofeedback delivered by the loadsol® resulted in increased propulsion during gait in AB, stroke, and DPN participants, showing that the loadsol® may be a feasible device to modify gait in individuals with decreased propulsion. **FUNDING:** NICHD K01HD107294, NIDDK P30DK111024

O30: GENDER DIFFERENCES IN LUMBAR INTERVERTEBRAL MOTION IN A SYMPTOMATIC POPULATION

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BACKGROUND: Functional anatomy and prevalence of lumbar spine conditions differ between males and females. For instance, females have greater lumbar lordosis than males and females are also at a greater risk for age-related spinal conditions, such as degenerative spondylolisthesis. If and to what extent lumbar mobility and intervertebral stability differ by sex, however, remains unclear. Given that intervertebral motion is used to diagnose spinal stability, a better understanding of how lumbar intervertebral segment mobility and stability differ by sex in patient populations is needed. **METHODS:** A retrospective analysis of lumbar intervertebral rotational (IVR) and translation (IVT) motion in the sagittal plane was conducted using dynamic fluoroscopy image analysis of age-matched males ($n=350$) and females ($n=350$) with non-traumatic symptoms and no prior spinal surgeries. Multivariate linear regression analyses were used to examine how intervertebral motion variables related to sex with age and BMI adjusted. **RESULTS:** The results suggest IVR in flexion was 9.1% less in females (21.5 degrees) than males (23.8 degrees) for L3-L4 ($p=0.05$) and L4-L5 (F: 22.7 degrees M: 24.7 degrees; $p=0.03$) and IVR in extension was greater in females (17.1, 18.1, 16.8 degrees) compared to males (16.2, 17.6, 15.9 degrees) for L2-L3, L3-L4, and L4-L5, respectively. For IVT, the greatest difference 0.5% ($p<0.01$) between the sexes occurred at L4-L5 with average translation in males indicating retrolisthesis and in females, spondylolisthesis. Sex differences in IVT at L4-L5 were significant in flexion, neutral posture, and extension for both our younger and older halves of our sample. **CONCLUSIONS:** The findings demonstrate that females have a greater range of lumbar intervertebral extension in the mid-lumbar disc segments, which may relate to greater lumbar lordosis. Females appear to be more affected by age-related reductions of lumbar intervertebral mobility. The reduction in rotational motion may coincide with the sex differences in translation. The results highlight the importance of accounting for age and BMI in studies of lumbar motion, as well as using valid and repeatable methods. To create clearer lumbar motion standards indicative of instability, future work should compare our results to similar intervertebral motion data from an asymptomatic population.

O31: COMPARISON OF CLINICAL AND BIOMECHANICAL METRICS FOLLOWING GAIT RETRAINING FOR RUNNING-RELATED INJURY IN MILITARY PERSONNEL

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BACKGROUND: All Military Service Members (MSMs) are required to run in accordance with their work; addressing running mechanics (i.e., gait retraining) could provide a means to reduce running-related injury rates and/or improve clinical outcomes post-injury. Prior research has identified biomechanical patterns during running associated with increased injury risk. Troublingly, MSMs need access to laboratory-grade running evaluations. However, the advent of telehealth in health care offers a potential means to incorporate gait retraining to address running-related injury risk within the MSM population. **METHODS:** After a physical therapy referral for running-related knee pain, 25 MSMs were recruited to participate. Participants received standard physical therapy (Control, $n=13$) or supplemental telehealth gait retraining consisting of video feedback regarding running form over a cloud-based coaching platform (Telehealth, $n=12$) for 8 weeks. Kinetic

(peak ground reaction force (GRF), AVLR) and spatiotemporal (contact time, cadence) variables were collected while running on a treadmill at baseline and following the conclusion of the intervention. Participants also provided reports of their pain ranging from 0 (absent) to 100 (severe). Biomechanical variables were assessed using 2x2 mixed-design ANOVAs, whereas changes in pain scores between groups were assessed via independent t-test. **RESULTS:** There were no between-group differences in participant demographics, pain, or running parameters at baseline ($p<.05$). There was an observed main effect for time for all participants for pain during running ($p<0.001$), but no interaction effect between groups. Despite not reaching statistical significance, moderate to large effect sizes were observed as the Telehealth group displayed greater magnitude improvements in cadence (mean difference= 18.78 steps/min, $d=0.553$), AVLR (mean difference=10.75 body weights/s, $d=0.902$), and contact time (mean difference=18.55 ms, $d=0.578$) compared to the Control group. No significant differences or effect sizes were observed for changes in reported pain (mean difference= 4.18, $d=0.152$). **CONCLUSIONS:** Telehealth gait retraining influenced gait parameters conducive to running-related injury in MSMs similar to standard care. Potentially clinically meaningful cadence, AVLR, and contact time improvements were observed in the Telehealth group; further research with larger samples is indicated.

O32: CO-CONTRACTION DURING A REACTIONARY DROP JUMP: SINGLE-SPORT AND MULTI-SPORT ATHLETES ARE NOT DIFFERENT

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Multi-sport athletes are exposed to many different positions and situations, thus requiring a higher level of neuromuscular function to complete rapid, whole-body movements in different sports. The use of a reactionary drop jump task to analyze neuromuscular function between single-sport and multi-sport athletes has yet to be examined. Therefore, the purpose of this study is to determine the influence of single-sport and multi-sport participation on rectus femoris and biceps femoris co-contraction during the landing and propulsive phases of a reactionary drop jump. Sixteen former high school athletes (age: 22.06 ± 2.80 years; height: 1.70 ± 0.09 meters; weight: 162.00 ± 26.16 pounds) were recruited with an athletic background of participating in 1 high school sport (8 total, 4 males, 4 females) or more than 1 high school sport (8 total, 4 males, 4 females). Participants performed 3 MVICs for the left and right Rectus Femoris and Biceps Femoris for normalization (12 total MVICs). Next, 5 reactionary drop jumps and 5 reactionary drop lands were completed in a randomized order based on a custom light system that indicated which task to perform. Electromyography (EMG) data were collected using four Noraxon Surface EMG Dual Electrode Transmitters, sampling at 1000 Hz. EMG data were imported to C-Motion Visual3D for processing during the landing and propulsive phases of the drop jumps, and imported to MATLAB for calculation of normalized EMG during the trials and co-contraction index (CCI). Due to no differences in CCI between sexes, data were separated into two groups for analysis (Single-Sport and Multi-Sport). However, CCI differences were observed between limbs. Therefore, analysis included 2 x 2 repeated measures (Phase of Movement x Right and Left CCI) MANOVAs with 1 between groups factor (Sports Group). No significant differences in CCI were observed between single-sport and multi-sport athletes during the landing ($F_{2,13} = 0.064$, $p=0.938$; Wilks' $\lambda = 0.990$) and propulsive ($F_{2,13} = 0.004$, $p=0.996$, Wilks' $\lambda = 0.999$) phases of the drop jump. Multi-sport athletes do not prioritize stability by co-contracting the musculature about the knee joint differently than single-sport athletes during a reactionary drop jump. However, the asymmetry in CCI was an unexpected outcome. Therefore, future research should investigate differences in the amount of asymmetry between athlete types.

O33: RELATIONSHIP BETWEEN SINGLE AND DOUBLE-LEG VERTICAL JUMP, DORSIFLEXION, AND STATIC BALANCE IN D1 MEN'S SOCCER

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BACKGROUND: Soccer requires intermittent bouts of aerobic and anaerobic activities such as jumping. Further, soccer can induce a limitation of the ankle range of motion (ROM) over time. Previous research on elite youth soccer players has shown that functional

assessments of movement may identify injury risk, but is less accurate at identifying performance outcomes. Further, lower extremity ROM such as the ankle are a key contributor to sports specific tasks such as jumping, and balance. However, it is unknown what influence ankle ROM has on jumping and balance performance in Division I soccer. Thus, the purpose of this study was to investigate the relationship between single and double leg vertical jump height, dorsiflexion ROM, and static balance in Division I men's soccer. **METHODS:** Fifteen Division I men's soccer players completed a battery of tests during the off-season. All participants were healthy and without injury. Testing included a brief self-determined warm-up followed by the BTrackS™ Sport Balance test, vertical jump testing, and the dorsiflexion weight-bearing lunge test (WBLT). For vertical jump testing, each participant completed one practice and three test trials of a bilateral countermovement jump and single-leg countermovement jumps on each limb. All jump trials were completed using a jump mat, and the maximum height was used in the analysis. The BTrackS™ test assessed center of pressure (COP) path length in cm, and the WBLT was recorded in cm. A Pearson's product-moment correlation was used to assess the relationship between the vertical jump measures, WBLT, and COP path length with an alpha level set a priori to $p < 0.05$. **RESULTS:** There was a moderate negative correlation between bilateral jump height and COP path length ($r(13) = -.55, p = 0.035$), and a moderate positive correlation between right limb vertical jump height and right WBLT ($r(13) = .55, p = 0.034$). **CONCLUSIONS:** The results suggest that as COP path length goes down, bilateral jump height goes up, and greater dorsiflexion range of motion may be associated with greater single leg jump height. This would support the importance of having sufficient balance and dorsiflexion to complete a countermovement vertical jump. Dorsiflexion and balance are often measured in sport as injury risk predictors, but may influence jump performance.

O34: LOWER BODY FATIGUE INCREASES VALGUS STRESS DURING LANDING

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During many sports activities, landing is a reoccurring action that receives little attention from athletes and coaches. There is an increased risk of musculoskeletal injury with repetitive loading and high impact forces during landing. To mitigate this effect, it is important to understand the role fatigue plays on landing kinetics during landing. **PURPOSE:** This study aimed to address two objectives: (1) how fatigue affects GRFs during landing, (2) to investigate how lower body fatigue influences the amount of muscle activity during landing. **METHODS:** Sixteen healthy adults (6M,10F, HT: 1.69 ± 0.08 m, WT: 76.94 ± 18.47 kg, 24.12 ± 6.06 yrs) participated in this study. Participants were equipped with Electromyography (EMG) sensors placed on their Rectus Femoris (RF) and Gastrocnemius (GA) to record electrical activity of the muscles. Participants performed five single-leg drop-landings in a rested state from a 30.48cm platform onto a force plate to measure normal and parallel forces upon landing. Following the initial landing task, participants engaged in a progressive exercise protocol utilizing the Monark Cycle Ergometer. Cycle protocol increased 50W every minute, until participants could not maintain 50rpm for three consecutive seconds. Throughout this exercise period, heart rate (HR) was continuously monitored using a Polar telemetric monitor, HR and Rating of Perceived Exertion (RPE) were recorded in minute intervals. Upon completion participants were asked questions about their perceived fatigue levels. Subsequently, participants immediately repeated the series of five drops, whilst EMG and GRF data were recorded. Each variable was analyzed for differences using a paired t-test ($\alpha = 0.05$). **RESULTS:** Peak Mediolateral GRF increased during landing from 34.01 ± 81.52 N to 70.91 ± 81.31 N ($p = 0.01$) after fatiguing exercise. Peak vertical GRF were not different before and after fatigue ($p > 0.05$). Average EMG for both RF and GA were not different before and after fatigue ($p > 0.05$). **CONCLUSION:** Peak valgus stress during landing increases after a bout of fatiguing exercise. Although mediolateral stress may increase following fatigue, muscle activity of the rectus femoris and gastrocnemius do not. These data suggest that athletes and coaches should take steps to actively mitigate injury risk during activity where high levels of fatigue may occur.

O35: THE QUIET EYE EMERGES WITHIN A TACTICAL GOALKEEPING SCENARIO

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BACKGROUND - The goalkeeper's role in soccer has evolved beyond traditional shot-blocking to include active participation in tactical components of the game. This expanded role emphasizes the goalkeeper's ability to detect changes rapidly and accurately during open play, which is vital for effective decision-making and perception-action coupling during matches. Skilled perception-action coupling during goalkeeping involves the systematic discovery, exploration, and exploitation of visual information to guide on-field behavior. By analyzing visual search strategies (VSS) and specific perception-action variables (e.g., Quiet Eye (QE)), the coach, practitioner, and researcher may enhance the goalkeeper's effectiveness in executing their multifaceted role in modern soccer. The purpose of this study was to understand and identify a range of perception-action coupling measures including VSS and the QE that may underpin saving and subsequent distributive actions in skilled women's soccer goalkeepers during different scenarios. We expected to see a shorter QE and fewer total eye movements performed when the goalkeeper made a save as compared to allowing a goal, representative of expert goalkeeper performance. **METHODS -** 3 NCAA Division I women's soccer goalkeepers were tasked with making a save within a shooter vs. goalkeeper *in situ* dyadic system (1v1) to replicate the demands of the modern goalkeeper's performance environment. Goalkeepers were fitted with a head-mounted eye-tracking system which recorded eye movements. VSS and movement phases were collected and analyzed via a custom Vision-In-Action system. Trials were performed until each goalie accrued a total of 5 saves. **RESULTS -** Results showed the average QE duration for saves (200.4 ± 150.2 ms) was significantly shorter than the QE duration for a goal (248.5 ± 95.7 ms; $t = 9.34, p = 0.03$). When assessing VSS no statistically significant difference was found between the count of eye movements when a save was made compared to when a goal was scored (count/trial: 12 ± 5 vs 16 ± 7 , respectively; $p = 0.19$). **CONCLUSIONS -** Our results agree with previous literature regarding the QE and VSS within a tactical sport setting. Thus, we further support the notion of the QE and VSS emerging as potential variables to assess a goalkeeper's perception-action coupling and extend its relation to performance within a tactical scenario.

Thematic Poster Presentations (TP1-TP48)

TP1: THE IMPACT OF LOAD CARRIAGE ON HYDRATION AND PERFORMANCE IN PHYSICALLY FIT ADULTS

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Introduction: The loads tactical athletes must carry have been shown to alter physical and cognitive performance, increase thermal load, and may induce dehydration. Decrements in performance could negatively influence mission outcomes. While load carriage and hydration are known to influence performance, they are rarely studied together in a controlled manner. The purpose of this study was to assess how a ruck march (RM) alters hydration, physical and cognitive performance. **Methods:** 9 adults with load carriage experience volunteered for the study ($m = 6, f = 3, \text{age} = 33.2 \pm 7.1$ yrs, $\text{height} = 172.5 \pm 9.31$ cm, $\text{mass} = 75.7 \pm 18.2$ kg). Participants' body composition and $\text{VO}_{2\text{max}}$ were assessed at least 2 days prior to the RM. Participants completed a 9.65-km RM with a 20kg ruck sack on a treadmill at 4.83-km/h in a temperature controlled laboratory (22.2 degrees C). Hydration, physical and cognitive performance were tested pre-, mid-, and post-RM. Hydration was tested via Urine Specific Gravity (USG). No water intake was allowed. Physical performance was tested via vertical countermovement jump, isometric mid-thigh pull (IMTP), and postural stability during a mental math task on force plates sampling at 1000Hz. Cognitive performance was assessed via psychomotor vigilance task reaction time. Wilcoxon signed ranks tests with Bonferroni correction were used to analyze changes between time points. Wilcoxon effect sizes (ES) were calculated. Alpha level was set a priori at 0.05. **Results:** Participants were physically fit with $\text{VO}_{2\text{max}}$ of 48.1 ± 7.5 ml/kg/min, body composition of 15.7 ± 4.7 percent body fat, and IMTP Peak Relative Force of 33.6 ± 4.3 N/kg. USG significantly increased from pre- to post-RM ($p = 0.012, \text{ES} = 0.889$) and mid- to post-RM ($p = 0.012, \text{ES} = 0.889$), indicating dehydration. There were no significant differences in physical measures, ranging from static postural stability to maximal dynamic and static strength, or cognitive

measure of reaction time. Conclusion: A RM in a controlled environment induced dehydration but, contrary to previous research, had no effect on physical and cognitive performance. The participants in the study were physically fit and may not be representative of all initial entry soldiers. Future research should incorporate a more diverse sample and utilize regression models to more accurately detect the potential moderating role of physical fitness on performance fatigue under mild dehydration.

TP2: COMPARING A DIGITAL URINE COLOR SCALE TO PAPER SCALE IN FEMALE ATHLETE HYDRATION MONITORING

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BACKGROUND: Urine color (Ucol) is a practical tool with which hydration status can be monitored. In 2023 a new digital urine color chart (DUcol) was utilized in research. Digital devices are ubiquitous; therefore, DUcol has the ability to help improve athlete safety and performance through quality monitoring. The purpose of this study was to investigate potential differences and relationships between a DUcol and a paper urine color scale (PUcol) in female, collegiate-lacrosse athletes. **METHODS:** Over three days, female collegiate athletes (n=22) provided two, morning urine voids. The first was collected at their home and the second at the research facility (total samples n=132). Both samples were collected after an overnight fast. Three different raters scored each sample. Two raters utilized the PUcol scale (PUcol_a & PUcol_b), and one rater utilized the DUcol scale. Group comparisons were evaluated using a Friedman's Test for repeated measures, ordinal data ($\alpha = 0.05$). Durbin-Conover post-hoc corrections were utilized for pair-wise comparisons ($\alpha = 0.05$). Additionally, Spearman's rho correlations evaluated relationships between groups and between Ucol and USG. **RESULTS:** The results of the Friedman's Test indicated group differences [$X^2(2) = 10.1, p = 0.006$]. Pair-wise comparisons revealed PUcol_a and PUcol_b were not different ($p = 0.75$) but DUcol was different and lower than PUcol_a ($p = 0.004$) and PUcol_b ($p = 0.009$). Spearman's rho demonstrated moderate-to-strong relationships between all groups (PUcol_a and PUcol_b $r = 0.71, p < 0.001$; PUcol_a and DUcol $r = 0.77, p < 0.001$; DUcol and PUcol_b $r = 0.64, p < 0.001$). Additionally, Spearman's rho showed moderate, positive relationships between each of the Ucol measures and USG (PUcol_a and USG $r = 0.68, p < 0.001$; PUcol_b and USG $r = 0.52, p < 0.001$; DUcol and USG $r = 0.63, p < 0.001$). USG measures were hypohydrated, on average (USG = 1.022 ± 0.005). **CONCLUSIONS:** Strong associations between the digital and paper measures were present. Additionally, all Ucol measures were similarly correlated with USG. However, there were group differences between the digital measures and each of the paper measures. The practical relevance of this difference is difficult to interpret. More research is needed to further investigate the validity of DUcol.

TP3: ACUTE INGESTION OF A KETONE MONOESTER WITH CARBOHYDRATE IMPROVES COGNITIVE MEASURES BUT NOT PERFORMANCE IN TRAINED FEMALES

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BACKGROUND: In recent years, the field of sports performance and cognitive enhancement has witnessed a growing interest in the potential benefits offered to athletes with the supplementation of exogenous ketones, specifically the ketone monoester (KME). However, the present literature has examined KME ingestion in male or mixed cohorts, with female research currently underrepresented. Thus, we examined the acute ingestion of a KME with co-ingestion of a carbohydrate (KME+CHO) compared to carbohydrate alone (CHO) on cycling performance and cognitive performance in trained females. **METHODS:** Using a two condition, placebo-controlled, crossover design, twelve trained females (mean \pm SD: age, 23 ± 3 y; height, 1.64 ± 0.08 m; mass, 65.2 ± 12.7 kg) completed a baseline assessment of cognitive performance (psychomotor vigilance testing (PVT), task switching, and incongruent flanker), followed by 6x5-min intervals at 40%, 45%, 50%, 55%, 60%, and 65% of their maximal power output (W_{max}) and then a 10-km time trial (TT), concluding with the same assessments of cognitive performance post-exercise. Participants consumed either $375 \text{ mg} \cdot \text{kg}^{-1}$ body mass of KME with a 6%

CHO solution ($1 \text{ g} \cdot \text{min}^{-1}$ of exercise) or CHO alone, across 3 boluses (50:25:25). **RESULTS:** Blood β -hydroxybutyrate concentrations averaged 1.80 ± 0.07 mM and 0.13 ± 0.01 mM during exercise in KME+CHO and CHO, respectively. Blood glucose decreased following drink 1 of KME+CHO ($\sim 15\%$; $P=0.01$) but not CHO alone, and lactate concentrations were significantly lower in KME+CHO at 50%, 55%, 60%, and $-65\%W_{max}$ (all $P<0.05$), compared to CHO. Despite these changes, no differences were found between conditions for TT finishing times (KME+CHO, 29.7 ± 5.7 min; CHO, 29.6 ± 5.7 min; $P=0.92$). However, only KME+CHO resulted in increases in PVT speed ($\sim 4\%$; $P=0.01$) and faster reaction times ($\sim 14\%$; $P<0.01$), and speed ($\sim 15\%$; $P<0.01$) and correct responses ($\sim 13\%$; $P=0.03$) in the incongruent flanker during post-testing compared to CHO alone. **CONCLUSION:** Acute ingestion of a KME+CHO elevated blood β -hydroxybutyrate and simultaneously lowered glucose and lactate across multiple timepoints during exercise compared to CHO alone. Although these changes did not affect physical performance, several markers of cognitive performance were improved by the addition of a KME in trained females.

TP4: TIME COURSE OF MUSCLE PROTEIN SYNTHESIS & RELATED PATHWAY MARKERS IN RESPONSE TO WHEY PROTEIN AND CREATINE IN VITRO

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Introduction: Whey protein (WP) and creatine (CRE) are supplements known to stimulate muscle protein synthesis (MPS) and enhance exercise performance. However, the synergistic effect of these supplements on MPS and mTOR pathway-related markers has yet to be fully elucidated. Therefore, the purpose of this study is to determine if a synergistic effect exists between WP and CRE on MPS and mTOR pathway-related markers associated with skeletal muscle growth. **Methods:** C₂C₁₂ murine myoblasts were grown to 80% confluency in growth media (GM) containing 10% fetal bovine serum. Upon reaching confluency myoblasts were differentiated into myotubes with differentiation media (DM) containing 2% normal horse serum. Mature myotubes were treated with either, control (CTL) containing PBS, whey protein (WP), creatine (CRE), or whey protein + creatine (WP+CRE). Myotubes were collected following 1-, 2-, 4-, 8-, and 24-hours of treatment. Prior to collection, myotubes were pulse labeled with puromycin to assess the MPS response. Puromycin and mTOR pathway-related marker were assessed via western blotting. **Results:** MPS response measured with puromycin revealed a significant treatment x time interaction, treatment main effect, and time main effect (all $p<0.001$). For puromycin, 1-h WP was significantly higher compared all group ($p<0.050$), at 4-h WP+CRE was higher than CTL and CRE ($p<0.040$), and at 24-h WP was higher than CTL and CRE ($p<0.040$). p70S6K expression revealed a significant time x treatment interaction ($p=0.012$) and main effect of time ($p=0.003$) but not treatment ($p=0.382$). At 1-h both CRE and WP+CRE exhibited higher p70S6K expression compared to CTL ($p<0.020$). RPS6 expression revealed a significant treatment x time interaction ($p=0.009$), main effect of treatment ($p=0.011$), and main effect of time ($p<0.001$). At 1-h the WP treated group had higher RPS6 expression compared to CTL ($p=0.004$). 4-EBP1 expression revealed a significant treatment x time ($p<0.001$), main effect of treatment ($p=0.003$), and main effect of time ($p=0.025$). At 2-h, 4-EBP1 expression was higher in CRE compared to CTL ($p=0.014$) and at 4-h both CRE and WP+CRE was higher than CTL ($p=0.030$). **Conclusion:** Both WP and CRE stimulate the MPS response at differing time points and WP+CRE exhibited notable synergistic effects at varying time points.

TP5: EFFECTS OF DIETARY NITRATE SUPPLEMENTATION IN RECREATIONAL AND TRAINED CYCLISTS IN NORMOXIC AND HYPOXIC CONDITIONS

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BACKGROUND: The purpose of this study was to examine the effects of dietary nitrate supplementation on physiological responses and cycling performance in recreationally trained (RT; $VO_{2max} = 44 \pm 7$ ml/kg/min), and highly trained (HT; $VO_{2max} = 66 \pm 5$ ml/kg/min) cyclists in normoxic (NO; 20.9% FIO₂) and hypoxic (HY; 15.2% FIO₂) conditions. **METHODS:** 13 cyclists (RT = 8, HT = 5) completed 4 identical exercise trials. For 3 days prior to each trial, subjects consumed 140 mL/d of concentrated beetroot juice (BRJ; 12.8 mmol nitrates) or placebo (PLA). Subjects completed trials for both

treatments (PLA or BRJ) in both environmental conditions (NO or HY), in a randomly counterbalanced, double-blinded study design. Exercise trials consisted of 20 min of constant-load cycling (10 min at 45% W_{max} , 10 min at 65% W_{max}), followed immediately by a 4 km cycling time trial (TT). Physiological responses to exercise (VO_2 , ventilation, RER, heart rate, RPE, blood glucose/lactate, and O_2 saturation) were obtained 5 min into constant-load exercise at each intensity. Performance was assessed as the time to complete the 4 km TT. Treatment effects were assessed using a series of two-way repeated measures ANOVAs, with an alpha-level for statistical significance at $p < 0.05$. RESULTS: The HT group had significantly faster 4 km TT times than RT (384 ± 16 s versus 446 ± 42 s, respectively), and significant between-group effects were observed for various physiological responses during constant-load exercise (VO_2 , ventilation, blood lactate, heart rate, and O_2 saturation). Similarly, TT times were significantly faster in NO (410 ± 46 s) versus HY (434 ± 45 s), with significantly different physiological values observed between environmental conditions during constant-load exercise (VO_2 , ventilation, RER, blood lactate, heart rate, O_2 saturation, and RPE). However, there was no difference in TT performance between PL (422 ± 44 s) and BRJ treatments (422 ± 46 s), and no significant treatment*altitude or treatment*altitude*group interactions for TT performance or any physiological variables. CONCLUSION: Dietary nitrate supplementation did not alter physiological responses during exercise, or 4 km TT performance in cyclists. Furthermore, the efficacy of dietary nitrate supplementation was not affected by hypoxic conditions or the training status of subjects.

TP6: ACUTE EFFECTS OF CORDYCEPS MILITARIS POWDER ON SUBMAXIMAL OXYGEN COST OF CYCLING IN COLLEGIATE ROWERS.

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BACKGROUND: Several authors have suggested that acute and chronic supplementation with *cordyceps militaris* (CM) mushroom may improve maximal endurance performance. However, limited research has examined potential acute effects of CM supplementation during submaximal exercise in competitive endurance athletes. The purpose of this study was to investigate whether acute administration of CM would reduce the oxygen cost of cycling at a submaximal intensity. **METHODS:** Using a randomized crossover design, a sample of 9 (6 men, 3 women) NCAA Division I rowers (age 20.4 ± 1.4 y) was administered 1500 mg of either CM or a placebo of Lion's Mane (LM) organic mushroom powder. Thirty minutes after administration of the mushroom powder, subjects cycled on a Lode electronically braked cycle ergometer at 2 submaximal intensities (170 watts in men; 150 watts in women). Oxygen cost of cycling was assessed using submaximal VO_2 and RER with a Cosmed Quark CPET metabolic cart during the last minute of each 6-minute cycling stage. Group comparisons across these variables were determined using paired t-tests. **RESULTS:** There was a significantly reduced oxygen cost with acute CM vs. LM (23.2 ± 1.0 vs. 24.0 ± 0.78 ml $O_2 \cdot kg^{-1} \cdot min^{-1}$, $p = 0.045$) supplementation. No significant differences were found for RER for CM vs. LM (0.99 ± 0.04 vs. 0.96 ± 0.03 , $p = 0.60$). **CONCLUSIONS:** Consistent with the study hypothesis, there was a significantly lower oxygen cost associated with with CM vs. LM administration suggesting a need for future investigation and study of potential mechanisms.

TP7: THE EFFECTS OF A BRAND-SPECIFIC HEMP-DERIVED CANNABIDIOL PRODUCT IN HEALTHY ADULTS

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BACKGROUND: Cannabidiol (CBD) is a non-psychoactive phyto-cannabinoid that has recently gained traction for its potential anti-inflammatory, immunomodulatory, psychological, and pain-relieving effects. This study aimed to investigate the effects of a brand-specific hemp-derived CBD product in healthy adults over 12 weeks, compared to a placebo product. **METHODS:** 54 healthy adults (27 women and 27 men, age = 25 ± 7 y; BMI = 24.82 ± 3.25 kg/m²) participated in the study. Participants arrived after >8 h of fasting and >48 h without alcohol consumption and vigorous exercise. Following baseline measurements (height, weight, blood pressure, EKG, and blood work to ensure health status), participants were stratified by sex and randomized into a placebo or CBD (50 mg/mL) group. Participants were instructed to

consume 2mL daily. Data were collected at baseline and days 30 ± 3 , 60 ± 3 , and 90 ± 3 . Urine samples calculated chronic pain according to the foundational pain index (FPI) developed by Ethos laboratory. Blood was drawn to assess serum TNF- α , IL-10, and IL-6 levels. Psychological states were assessed using psychometric questionnaires: Cohen's Perceived Stress Scale, Pittsburgh Sleep Quality Index, Profile of Mood States, and a 10-item Likert scale for perceived pain. Daily surveys were completed to determine overall well-being. A Two-way ANOVA was used to determine group differences over time while adjusting for baseline values ($\alpha = 0.05$). **RESULTS:** There were no main effects of group or time or group-by-time interactions for serum TNF- α , IL-6, and IL-10 ($p > 0.05$). Similarly, there were no group-by-time interactions or main effects for perceptual measures and most profile of mood state subscales ($p > 0.05$). No significant differences were found between groups in the incidence and prevalence of "colds or flus" ($p > 0.05$). However, the sub-score for "vigor" decreased ($p = 0.007$) from visit 3 to visit 5 ($p = 0.014$). In addition, the placebo group exhibited greater pain scores than the CBD group ($p = 0.028$). **CONCLUSIONS:** CBD appears safe and well tolerated in healthy adults over a 12-week period. Moreover, CBD supplementation may help improve pain in healthy adults. Vigor decreased across the intervention for both groups, this may be an effect of time due to the academic semester. The present dosing appears safe but minimally effective, higher doses may be required to elicit more pronounced anti-inflammatory, pain-relieving, and mood-altering effects in healthy populations.

TP8: IMPACT OF CREATINE SUPPLEMENTATION ON REPEATED SPRINT PERFORMANCE IN NORMOBARIC HYPOXIA

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BACKGROUND: Creatine supplementation (CrS) elevates phosphocreatine (PCr) levels and expedites PCr replenishment following exercise. Furthermore, hypoxic environments increase the reliance on anaerobic metabolism and impairs PCr replenishment during recovery, which could potentially enhance the efficacy of CrS under these conditions. The aim of this study was to determine the effect of CrS on repeated sprint performance in both normoxia (N) and normobaric hypoxia (NH) (simulated altitude $\sim 3,000$ m). **METHODS:** 19 recreationally trained cyclists ($VO_{2max} = 40.6 \pm 5.0$ mL/kg/min) were randomly assigned to either six days of CrS ($n = 12$; 0.3 g/kg of body mass of creatine monohydrate) or placebo (PLA; $n = 7$; 0.3 g/kg of maltodextrin). All subjects completed separate trials in normoxia (inspired $O_2 = 20.9\%$) and hypoxia ($O_2 = 15.0\%$) before and after the supplementation phase. Body water content was estimated via bioelectrical impedance before and after supplementation. The repeated sprint protocol consisted of 6 x 10 s maximal cycling sprints (separated by 20 s recovery intervals), two minutes of rest, and a final 30 s sprint, on a cycle ergometer. **RESULTS:** Body water content increased by $1.24 \pm 2.03\%$ with CrS ($p < 0.05$), but not PLA. Compared to N, NH impaired mean power (pwr) and O_2 saturation in both CrS ($N_{pwr}: 432.7 \pm 128.8$ W, $NH_{pwr}: 413.2 \pm 114.1$ W; $N O_2$ saturation $97.4 \pm 0.7\%$; $NH O_2$ saturation $86.7 \pm 2.5\%$) and PLA ($N_{pwr}: 465.3 \pm 139.0$ W, $NH_{pwr}: 450.2 \pm 128.1$ W; $N O_2$ saturation $97.3 \pm 1.7\%$; $NH O_2$ saturation $86.3 \pm 3.0\%$). However, there was no treatment x time interaction for peak or mean power output and fatigue index during any of the sprints, in either normoxia or hypoxia. **CONCLUSIONS:** CrS had no impact on sprint performance in normoxia or hypoxia. Similarly, there was no change in sprint performance following PLA in either condition.

TP9: EFFECT OF ON-DUTY RESISTANCE TRAINING ON NEUROMUSCULAR FUNCTION IN STRUCTURAL FIREFIGHTERS: A PRELIMINARY ANALYSIS

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BACKGROUND: The National Fire Protection Association (NFPA) reports approximately 65,000 firefighter injuries annually; 21% of fireground injuries result from a slip/trip/fall and 40% are classified as a strain, sprain, or muscular pain. The NFPA recommends participation in regular exercise while on duty, however, it's unclear how exercise-induced fatigue may impact firefighters' ability to safely perform subsequent occupational tasks, as fatigue is considered a risk factor for slip/trip/fall-related injuries. The current study aims to investigate

the impact of exercise-induced fatigue on firefighters' injury risk. **METHODS:** A convenience sample of 3 career structural firefighters (Age: 30±7 yr) were recruited from a local fire department. Participants completed 3 testing sessions, separated by at least 72 hr. During Session 1 participants' anthropometrics and familiarization trials of the balance and neuromuscular function assessments were completed, which included single-leg drop landing (SLDL), postural sway (PS), and Functional Balance Test (FBT). The FBT required ambulation on a plank while maneuvering over and under standardized barriers. Sessions 2 and 3 were randomized, where participants completed either heavy resistance training (HRT; 5RM loads, 2 min passive recovery) or a circuit training (CT; 10RM loads, 45 s passive recovery) session. Balance and neuromuscular assessments were conducted pre- and 10 min post-exercise. Pre- and post-exercise absolute and relative differences were calculated for both conditions. **RESULTS:** The mean SLDL time-to-stabilization decrements were greater in HRT (left leg: 18±4%, right leg: 27±10%) than CT (left leg: 12±16%, right leg: 8±29%). Bipedal PS mean velocity decrements were greater in CT (32±68%) than HRT (11±19%); whereas single leg PS improved slightly following HRT (left leg: -3±12%, right leg: -6±21%) and CT (left leg: -1±14%, right leg: -5±16%), with greater improvements following HRT. FBT performance index increased post-exercise with greater decrements in CT (15±25%) than HRT (7±9%). **CONCLUSIONS:** Preliminary results suggest that CT may lead to greater balance and neuromuscular decrements than HRT post-exercise among firefighters which may guide on-duty exercise prescription.

TP10: THE EFFECT OF TWO ACUTE EXERCISE MODALITIES ON PHYSIOLOGY AND CONDITION DURING FIREFIGHTER OCCUPATIONAL TASKS

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BACKGROUND: Firefighters are concerned fatigue from on-shift exercise decreases occupational performance. Evidence suggests acute exercise can impair occupational performance. No study to date has compared how different exercise modalities affect physiological and cognitive outcomes. The aim of this study was to determine how resistance training or aerobic endurance training impact physiological responses to occupational tasks. **METHODS:** Thirty-two participants (M/F: 17/15; 25.19 ± 4.12 yrs; 173.78 ± 9.84 cm; 75.57 ± 13.22 kg; 23.28 ± 7.43% body fat) completed 5 trials including 2 pre-testing visits to assess fitness levels and cognitive performance. Participants then completed three sessions, in quasi-randomized order, of acute exercise, resistance exercise (RE), aerobic, high-intensity interval training (AE), rested control (CON). Each of these trials were immediately followed by simulated firefighter tasks (SFT). During the SFT participants entered an environmental chamber set to 35°C and 50% humidity where they completed 4 rounds of 10 deadlifts (set to either 85 or 135lbs) followed by a 0.15 mile, 40lb-sandbag carry. After the second round, participants completed the Wisconsin Card Sorting Task (WCST) to assess cognitive flexibility prior to completing the final two rounds. **RESULTS:** Average heart rate, core temperature, and skin temperature were significantly elevated during the AE (166.28 bpm, 38.68°C, 37.48°C) compared to CON (148.49 bpm, 37.56°C, 36.33°C; $p < 0.001$) and RE (159.91 bpm, 38.44°C, 36.87°C; $p = 0.002$). WCST errors (CON: 8.23, AE: 8.19, RE: 8.87; $p = 0.274$) and reaction time (CON: 1445 ms, AE: 1470ms, RE: 1415ms; $p = 0.697$) were not significantly different across conditions. There were also no significant differences in time to complete SFT between conditions (CON: 1133.62 sec, AE: 1197.83 sec, RE: 1211.48 sec; $p = 0.243$). **CONCLUSIONS:** Our findings suggest that an acute bout of high intensity interval training does significantly impact markers of physiological stress during occupational task performance. However, acute exercise, regardless of the modality, did not significantly affect occupational task performance or cognitive function. These findings contribute to our understanding of the acute impact of different methods of on-shift exercise, providing actionable knowledge which may help firefighters reduce injury and optimize occupational readiness.

TP11: THE ASSOCIATION BETWEEN FIREFIGHTER RANK, AGE, AND SELECTED PHYSICAL FITNESS COMPONENTS

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INTRODUCTION: Physical fitness is essential for firefighters to reduce the risk of chronic disease, injuries and to perform duties effectively. An occupational factor that may affect physical fitness levels is rank. As firefighters advance in rank across their career (e.g., firefighter, to lieutenant, to captain) their job responsibilities and, consequently, physical demands change. To our knowledge literature examining the association between firefighter rank and physical fitness is scarce. Therefore, this study examined the association between rank, age, and the physical fitness of firefighters.

METHODS: Physical fitness records from 1361 firefighters (male, 1225; female, 136; age: 37.4±10.1 yrs; height 173.0±13.1 cm; mass 90.8±14.8 kg; BMI 30.6±5.7 kg/m²) were analyzed. The fitness test battery included body composition, maximum pull-up repetitions, curl-up repetitions in 60 seconds, push-up repetitions in 60 seconds, and a 3-minute step test to estimate maximal aerobic capacity (VO₂max). The relationship between the potential confounding factor of age with fitness measures were first assessed with Pearson correlations. Analysis of covariances (ANCOVAs) were conducted to assess the association of rank on fitness outcomes with age included as a covariate.

RESULTS: The majority (n=973) of the participants were classified as firefighters, followed by lieutenants or captains (n=290), recruits (n=60), and chiefs (n=38). Age was negatively associated with pull-ups ($r = -0.39$, $r^2 = 0.15$, $p < 0.001$), curl-ups ($r = -0.39$, $r^2 = 0.15$, $p < 0.001$) and push-ups ($r = -0.32$, $r^2 = 0.10$, $p < 0.001$), but positively associated with estimated VO₂max ($r = 0.17$, $r^2 = 0.03$, $p < 0.001$) and body fat percentage ($r = 0.39$, $r^2 = 0.15$, $p < 0.001$). The ANCOVAs indicated rank had a small but significant effect on pull-ups ($F(3,1356) = 3.053$, $p = 0.028$, $\eta^2 = 0.007$) and curl-ups ($F(3,1356) = 2.863$, $p = 0.034$, $\eta^2 = 0.005$). Post-hoc tests revealed recruits performed better on curl-ups than chiefs. Rank was not found to have a significant main effect on push-ups, VO₂max, or body fat percentage. The covariate of age was significant in all ANCOVA tests. **CONCLUSION:** The findings indicate that rank does not substantially impact firefighter physical fitness. However, the findings do provide further evidence of age-related effects on physical fitness amongst firefighters, which may necessitate a more targeted approach to fitness programming and training for older firefighters.

TP12: PHYSIOLOGICAL DETERMINANTS OF FIREFIGHTER PHYSICAL ABILITY TEST PERFORMANCE: A FOLLOW-UP INVESTIGATION INTO ANAEROBIC FITNESS PARAMETERS.

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BACKGROUND: The *Physical Ability Test (PAT)* is essential for assessing firefighters' fitness for occupational tasks. While aerobic fitness's role in PAT is established, anaerobic fitness's contribution remains uncertain. This study builds upon previous research to explore the relationship between specific *anaerobic fitness (AF)* parameters and PAT performance. Therefore, the purpose of this study was to determine if specific anaerobic fitness parameters can effectively predict PAT performance, shedding light on the physiological factors influencing firefighters' occupational fitness. **METHODS:** Sixty-two male firefighters from two southern Florida Fire departments participated in a two-day data collection process. On the first day, firefighters completed the PAT, consisting of occupationally-specific tasks while wearing full gear. On the second day, they performed a series of anaerobic fitness assessments, including *handgrip dynamometry (HG)*, *maximal vertical jump (VJ)*, *Margaria-Kalamen staircase test (MK)*, and the *300-yard shuttle run(300YD)*, all while wearing full gear. A Pearson-product moment correlation coefficients and linear regression analysis were employed, using R statistical packages in Jamovi version 2.4.8 ($p < 0.05$). **RESULTS:** The findings reveal significant negative correlations between PAT and HG ($r = -0.67$, $p < 0.001$), VJ ($r = -0.60$, $p < 0.001$), and the MK ($r = -0.47$, $p < 0.001$), with a notable positive correlation with the 300YD ($r = 0.46$, $p < 0.001$). These AF parameters elucidate 65% of the variation in PAT ($F_{4, 57} = 26.6$, $p < 0.001$). Specifically, PAT performance is predicted by HG ($\beta = -3.38$, $p < 0.001$, 95%CI [-5.27, -1.50]), VJ ($\beta = -0.03$, $p = 0.02$, 95%CI [-0.05, -0.00]), and 300YD ($\beta = 1.05$, $p < 0.001$, 95%CI [0.48, 1.61]). **CONCLUSION:** This study reaffirms the significance of specific anaerobic subsystems in PAT performance

among firefighters. It emphasizes the need to optimize anaerobic fitness training to enhance occupational performance during the PAT.

TP13: EFFECTS OF AN 8-WEEK FIREFIGHTER RECRUIT TRAINING PROGRAM ON SELECTED FITNESS VARIABLES

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BACKGROUND: [1] Successful fitness program for firefighter recruits involves designed training to , prepare them for the dangerous tasks involved in firefighting.[2] An 8-week program was created and tailored to the demands of firefighting[3] [4] [5] , ensuring recruits were prepared for challenges faced on duty. [6] [7] [8] [9] **PURPOSE:** Evaluate the effectiveness of an 8-week firefighter recruit training program in a rural setting. **METHODS:** Eleven firefighter recruits in southeast Georgia participated in an 8- week [10] training program to improve their physical performance. This program consisted of 1 day of job-specific tasks performed in bunker [11] [12] [13] gear (with amount worn gear increasing as program progressed)[14] ; 1-2 days of circuit training; , 1 day of formation runs of progressively greater distance; , and 1 day of Tabata at individual VO_2 max. Pre and post data of health and fitness variables were collected, including blood pressure, anthropometric measures, strength, aerobic capacity, and functional movement. Nonparametric Wilcoxon signed-rank test were used to determine statistically significant differences in health and performance measures after program implementation. **RESULTS:** There was a significant increase in systolic blood pressure ($p=.018$, Median pre [M1]= 125.00 mmHg; Median post [M2]=132 mmHg; Median of difference [MD]=+5.00 mmHg) while abdominal circumference decreased significantly ($p=0.004$; M1=95.0 cm; M2=96.0 cm; MD=-4.5 cm). FMS total significantly increased from M1=16.0 to M2=19.0 ($p=0.017$; MD=+3.0) and there was a significant increase in handgrip strength ($p=0.002$; M1=90.0 kg; M2=100.0 kg; MD=+12.00 kg). Participants showed significant increases in intermittent fitness test (IFT) speed ($p=0.031$; M1=15.50 km/h; M2=16.50 km/h; MD=+0.50 km/h) as well as improvement in aerobic capacity after the program with significant increases in VO_2 max ($p=0.008$; M1=42.70 ml/kg/bw; M2=45.30 ml/kg/bw; MD=1.00 ml/kg/bw). **CONCLUSIONS:** [15] [16] [17] The periodized program demonstrated positive significant changes in functional movement, handgrip strength, abdominal circumference, and aerobic capacity (VO_2 max, IFT). Blood pressure was found significantly higher, which could be due to post testing and agency occupation- specific testing culminating at the same time.

TP14: RELATIONSHIP BETWEEN RESILIENCE AND PHYSIOLOGICAL HEALTH MEASURES IN FIREFIGHTERS

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BACKGROUND: Firefighters suffer from physiological and psychological stressors abnormal to many other work environments. Many agencies require physical fitness tests to assess candidates' abilities to meet the expected occupational requirements. However, this does not include the psychological skills to adapt, overcome, and recover which are components of resilience. Incorporating assessments of resilience into firefighter candidate entrance examinations may allow for a more appropriate implementation of personalized training protocols to reduce psychological risk factors common in this population (i.e., PTSD). Health outcomes, such as blood pressure, body composition, and sleep health, may be related to and possibly indicative of resilience, however, more studies are needed to understand the relationships. Therefore, the purpose of this study was to determine the relationship between resilience and health outcomes including blood pressure, body fat percentage, and insomnia severity. **METHODS:** Forty-one firefighters participated in this cross-sectional study. Age, body fat percentage via bioelectrical impedance analysis (InBody 570), and blood pressure were recorded. Insomnia and resilience were assessed via the insomnia severity index and dispositional resilience 15-item assessment, respectively. Partial correlations controlling for body fat percentage and age were calculated between resilience and the variables systolic blood pressure (SBP), diastolic blood pressure (DBP), and insomnia. Analyses were conducted with SPSS version 29 using an alpha level of .05. **RESULTS:** The relationships between resilience (23.30±3.39) and the variables SBP (126.46±12.21 mmHg) and DBP (79.32±11.27 mmHg)

were negligible and not significant [$r(34)=.016$, $p=.927$ and $r(35)=.050$, $p=.768$, respectively]. The relationship between resilience and insomnia (12.21±6.86) was weak and not significant [$r(34)=.252$, $p=.139$]. **CONCLUSION:** Within this sample of firefighters, the correlations between resilience and blood pressure and between resilience and insomnia were not significant. However, the sample was generally pre-hypertensive, a subthreshold level of insomnia, and a resilience score is lower than the general population. The restricted range of these variables may have limited the ability to detect a linear relationship. Future studies using a larger and more diverse sample will help determine resiliency-related factors.

TP15: CHANGES IN LUNG FUNCTION THROUGH THE PANDEMIC AMONG RURAL FIREFIGHTERS

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BACKGROUND: The emergence of the coronavirus brought about significant respiratory challenges in various groups, including those groups with increased risk of respiratory damage such as firefighters. Given the prevalence of COVID-19 and the unknown long-term complications, it imperative to investigate the changes in respiratory function among firefighters. **PURPOSE:** The aim of this study was to assess respiratory function among firefighters over the course of the pandemic years (2019-2023). **METHODS:** 73 career firefighters participated in health and fitness assessments, following the guidelines set by the National Fire Protection Association (NFPA). The pandemic posed a challenge to the program's continuity and the measurement of specific physical health variables, particularly those related to lung function in the year 2020. To gauge annual changes in lung function variables while considering repeated measures and adjusting for baseline age, mixed models were employed. Additionally, correlational analyses were conducted utilizing plots to explore the interplay between changes in body composition and lung function. **RESULTS:** The average age of participants at baseline was 30.96 ± 10.7 years old in 2019 and all were male. Mixed models showed a pattern of improvement in lung function from 2019 to 2020, but deterioration in 2021, 2022, and 2023. As compared to 2019, VO_2 max significantly increased in 2020 ($p=0.047$, Mean Difference [MD] 2.59 ± 1.28 ml/kg/min, Effect Size [ES]=2.02, Large ES), but significantly decreased in 2022 and 2023 ($p<0.0001$, MD -4.92 ± 1.03 ml/kg/min, ES=-4.78, Large ES, and $p<0.0001$, MD=-6.06 \pm 1.11 ml/kg/min, ES=-5.45, respectively); 2021 did not show statistically significant change. FEV1/FVC ratio significantly increased in 2021 ($p<0.0001$, MD=8.36 \pm 0.89%, ES=9.39); but for 2022 the change was not statistically significant. Improvement was not maintained in 2023 ($p=0.001$, MD=2.83 \pm 0.81%, ES=3.49). **CONCLUSIONS:** The data suggest a decrease of lung function and VO_2 max since 2020 while FEV1/FVC ratio significantly increased in 2021 but was not maintained. It is important to continue to monitor lung function not only due to the occupational hazard but other environmental factors that could exacerbate the complications in fire fighters.

TP16: INFLUENCE OF ANAEROBIC POWER ON CARDIOVASCULAR STRAIN IN FIREFIGHTERS DURING NON-FIRE EMERGENCY SERVICES

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BACKGROUND: Firefighters (FFs) require a combination of exceptional aerobic capacity and an ability to generate force rapidly to effectively perform their duties. Indeed, both high aerobic and anaerobic capacity have been reported to independently predict FF performance in fire-suppression-related duties. FFs often provide non-fire emergency services, for example, at large-scale local events. Despite this, it is relatively unknown how anaerobic capacity influences cardiovascular (CV) strain and FF performance while providing these non-fire emergency services. **METHODS:** 15 FFs were observed across 5 NCAA DI football games while performing emergency medical services at a large university located in the Southeastern United States. FFs completed health and exercise history questionnaires; heart rate (HR), blood pressure (BP), body weight, handgrip strength, and vertical jump height were measured pre- and post-shift. FFs were assigned to a bike ($n=6$) or logistics ($n=9$) team and wore GPS-enabled monitoring systems that recorded physiological and environmental data. Analyses included descriptive statistics, independent t-tests, and correlations. **RESULTS:** Shifts lasted (M±SD) 8.2 ± 1.0 h and reached temperatures of 22.8 ± 3.0 °C. FFs were obese (body mass index [BMI]= 33.1 ± 6.2 kg/m²), had stage 2 hypertension

(based on pre-shift resting systolic/diastolic BP values=142.6±14.2/85.7±29.2 mmHg), and had worked 14.7±10.3 h of overtime in the last 7 days. FFs assigned to the bike team were younger (MD±SD; -13.8±16.6 y, $p<0.001$), had a lower BMI (-5.1±9.2 kg/m², $p=0.02$), achieved higher relative peak power (26.4±6.9 W/kg, $p=0.003$), and experienced greater CV strain (average HR response expressed as a percentage of age-predicted maximal HR; 8.1%±11.5%, $p=0.002$) than logistics. Partial correlations (controlling for team assignment) revealed a strong, inverse association between CV strain and relative peak power ($\beta=-0.761$, $p=0.007$). Handgrip strength was unrelated to CV strain ($\beta=0.119$, $p=0.71$). **CONCLUSIONS:** FFs had suboptimal CV health and experienced increased levels of CV strain when performing non-fire emergency services. After controlling for team assignment, anaerobic power—but not muscular strength—was associated with reduced CV strain during non-fire suppression activities. Further research, in a larger and more diverse sample, is necessary to explore how individual factors may modulate this relationship further.

TP17: METABOLOMICS OF BLOOD BIOMARKERS OF HYPERTENSION: EFFECT OF SUPERVISED EXERCISE TRAINING IN BLACK AMERICANS

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Background: Black Americans (BAs) have a significant burden of hypertension (HTN) and endothelial dysfunction (EnDy) is one established mechanism of the elevated HTN burden in BAs. Blood pressure (BP) regulation occurs through integration of multiple physiological systems and behaviors (e.g., exercise). The *focus of our lab* is to discover exercise-adaptable biomarkers of gut microbial metabolism that might be epigenetic regulators of EnDy. **Purpose:** To evaluate blood metabolites associated with BP status (normal vs. HTN) and in 12 subjects after 8 weeks of supervised aerobic exercise that promoted a significant reduction in resting BP in BAs with HTN. **Methods:** The present work implemented untargeted metabolomics (mass spectrometry) of fasted blood samples (serum) in BA subjects with and without HTN and after 8 weeks of exercise in BAs with HTN. **Results:** Although manually recorded resting systolic BP was significantly lower after 8 weeks of exercise, 24-hr ambulatory BP was not significantly lower. Further, we report the top 5 metabolic pathways associated with HTN status, with the strongest associations shown with Vitamin A (retinol) metabolism, sex hormone biosynthesis and metabolism, pentose phosphate pathway, and de novo fatty acid biosynthesis. Further, an OPLS-discriminant analysis recognized a clear separation of individuals with and without HTN and between time points after 8 weeks of exercise training (T1-pre, T3-8 week). Analysis is ongoing to define biomarkers associated with the exercise-induced reduction in resting BP and gut microbiome characteristics. **Significance:** Our initial results highlight a novel relationship between retinal/lipid signaling in HTN in BA. As we work through the analysis of these data, we expect to identify additional metabolites and translate our findings by investigating the metabolite's role in endothelial cell function (epigenetic regulation) and the reversal and/or promotion of EnDy (*in vitro*).

TP18: EVALUATING BLOOD PRESSURE AND HYPERTENSION PROGRAMMING IN MUNICIPAL WORKERS IN THE SOUTHEAST

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BACKGROUND: Chronic hypertension increases a person's risk for stroke and heart disease, which are two leading causes of death in the United States. **PURPOSE:** The purpose of this study was to determine if an incentive-based traveling health fair influenced the blood pressure or hypertension awareness in municipal employees. **METHODS:** Incentive-based traveling health fairs took place at four different municipal worksite locations within a southeastern rural community. These fairs, which happened during shift changes, consisted of ~15-minute interactions, a brief survey, health measurements, and consultation. The brief interaction consisted of the employee self-selecting health behaviors that they were willing to focus on for the next six weeks. The researcher gave the employee an informational handout on the topic, answered any questions, and discussed making small changes. During the six weeks between health fairs, target hypertension messaging was sent via employee email. Topics included

physical activity, nutrition, sleep, stress management, and smoking cessation. Blood pressure was measured using an automated blood pressure cuff (OMRON), while hypertension awareness was measured through the BASIS Hypertension Awareness and Insight Scale. Forty municipal employees provided data before and after the health fairs. The average age of participants was 34.38±9.89 years old. Paired samples t-test was used to compare the changes in blood pressure and awareness scores, and Spearman correlation were used to estimate the correlation between them. **RESULTS:** There was a significant decrease in systolic blood pressure (SBP) by 6.55±1.80 mmHg on average ($p\text{ val}=0.0001$; Mean Pre [M1]=132.73 ± 13.08; Mean Post [M2]=126.18 ± 14.20; Effect Size [ES]=-3.64,). Diastolic blood pressure (DBP) was also significantly lower in post-measurement by 3.50 ± 1.47 mmHG ($p =0.022$; M1=83.11 ± 11.86 mmHg; M2=79.60 ± 12.11 mmHg; ES=-2.38). There was no statistically significant changes in the Hypertension Awareness score ($p\text{ val}=0.949$; M1=3.57±1.96; M2=3.64±1.41, ES=-0.02). Spearman correlation showed no significant correlation between the change in awareness score and changes in SBP and DBP ($\rho=0.230$; $p\text{ val}=0.172$ and $\rho=0.051$; $p\text{ val}=0.766$, respectively). **CONCLUSIONS:** Targeted hypertension awareness programming was effective in achieving clinically significant changes in blood pressure.

TP19: ASSESSING QUALITY OF LIFE IN PATIENTS WITH HEART FAILURE: WHAT'S THE SECRET?

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BACKGROUND: Heart failure with preserved ejection fraction (HFpEF) is the fastest growing form of heart failure in the United States. Studies have shown that interventions, such as supervised exercise training, can be beneficial to the quality of life (QOL) of patients with HFpEF. However, data from SECRET 1 suggests that several widely used QOL instruments can lead to different conclusions regarding the QOL in older adults with obese HFpEF. The present study further investigates the relationship of these QOL instruments and the subsequent impact on patient classification. **METHODS:** Data was obtained from the Minnesota Living with Heart Failure Questionnaire (MLHF), the Kansas City Cardiomyopathy Questionnaire (KCCQ), and Short-Form 36 (SF-36) were obtained at baseline on 104 SECRET 1 study participants. Descriptive statistics were performed, and SPSS was used to perform t-test, 1-way ANOVA, and 2-proportion z-test. **RESULTS:** The overall QOL values on MLHF vs. KCCQ at baseline were statistically different (40±8 vs. 65±9, respectively; $p=0.001$). Furthermore, the physical function subscale of the MLHF, KCCQ, and SF-36 were also significantly different. at baseline in these subjects. For QOL classifications, the number of individuals classified by the MLHF and KCCQ as "very poor-poor" and "poor-fair" QOL were not significantly different, however the number of those classified as "fair-good" (36 vs. 57, respectively) and "good-excellent" (42 vs. 22, respectively) QOL classifications were significantly different. **CONCLUSION:** In these older patients with obese HFpEF, the three widely used QOL instruments did lead to different results and patient classifications. This may result in provider mismanagement and treatment of patients based on which QOL instrument is used. Further research is required to determine which is the optimal QOL instruments to use in this patient population.

TP20: ASSOCIATIONS BETWEEN INDICES OF CARDIOVASCULAR HEALTH, BODY MASS INDEX, AND OBSTRUCTIVE SLEEP APNEA

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BACKGROUND: Obstructive sleep apnea (OSA) is associated with poor cardiovascular (CV) health and an increased risk for CV disease and premature mortality. Noninvasive measures of CV health have been linked to sleep-disordered breathing, although the relationship between OSA severity, body mass index (BMI), and hemodynamic measures are less clear. **METHODS:** This study is part of a larger investigation with on-going data collection. Preliminary analysis includes a subsample of 49 adults (53% women, 67% white) who were assessed following an overnight fast, including anthropometrics (height and body mass) and noninvasive measures of CV health derived from pulse wave analysis (e.g., carotid-femoral pulse wave velocity [cfPWV], augmentation index [AIx], bendocardial velocity ratio [SEVR], ejection duration [ED], and central systolic, diastolic, and pulse pressures). Participants also completed a home sleep study to evaluate the presence and severity of OSA. OSA was quantified using

the apnea hypopnea index (AHI; the number of apneas plus hypopneas per hour of sleep) and categorized as <5, 5-14.9, 15-29.9, and ≥ 30 events/h of sleep. Multiple regression analysis was used to explore associations between CV health indices, BMI, and AHI.

RESULTS: Participants (M \pm SD: age=34 \pm 12 y, BMI=27.7 \pm 6.8 kg/m², resting systolic/diastolic blood pressure=121.7 \pm 12.2/77.2 \pm 8.7 mmHg) had AHI severity scores of 8.7 \pm 10.0 (range: 0.8-53.8); 47% reported <5 events/h of sleep (the lowest clinical rating) compared to 39% that reported mild and 14% that reported moderate-to-severe sleep apnea (>15 events/h of sleep). Pearson correlations revealed no associations between AHI and CV indices ($p > 0.05$ for all). AHI was moderately correlated with BMI ($r = 0.40$, $p = 0.004$). Multiple regression analysis revealed that age ($\beta = 0.627$, $p < 0.001$) and the interaction between BMI \times AHI ($\beta = -0.373$, $p = 0.003$) were associated with cPWV (the gold standard measure of aortic stiffness), accounting for ~51% of the observed variability. We observed a similar model for AIX (an indirect measure of arterial stiffness). **CONCLUSIONS:** We observed associations between noninvasive measures of arterial stiffness and AHI that were mediated by BMI. Participants with obesity and more severe OSA had stiffer arteries, and thus poorer CV health. The lack of association between AHI and other CV indices was surprising and warrants further exploration in a larger and more diverse sample.

TP21: KIDNEY DYSFUNCTION IS ASSOCIATED WITH DIMINISHED SKELETAL MUSCLE MITOCHONDRIAL PLASTICITY IN LIVER TRANSPLANT RECIPIENTS

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BACKGROUND: Liver transplant (LT) recipients experience severe weight gain after transplant. This weight gain is driven by myopenia and subsequent metabolic inflexibility that culminates in an exacerbated risk of cardiometabolic disease. The risk of cardiovascular disease is increased in LT recipients with impaired kidney function. We do not fully understand the underlying physiological mechanisms that link kidney dysfunction with cardiometabolic disease in this patient population. Therefore, the purpose of this study was to determine the relationship between renal dysfunction and skeletal muscle mitochondrial plasticity in LT patients. We hypothesized that worse kidney function would be associated with impaired skeletal muscle mitochondrial oxidative capacity. **METHODS:** LT recipients were recruited from Virginia Commonwealth University Health Systems outpatient clinic visits. Venous blood samples were analyzed as part of routine clinical labs including renal function reported as estimated glomerular filtration rate (eGFR) calculated using the race free CKD-EPI equation. Skeletal muscle mitochondrial capacity of the wrist flexor muscle group was determined using near-infrared spectroscopy coupled with repeated, transient arterial occlusions to measure the recovery kinetics of oxygen consumption following an acute bout of handgrip exercise. The metabolic recovery rate constant (T_c) of muscle metabolism was calculated and reported as an index of mitochondrial oxidative capacity. Statistical associations were conducted using Pearson's correlation test. **RESULTS:** 21 LT recipients (11 Male/10 Female; 5 African American/1 Asian/15 Caucasian; Mean \pm SD: Age 58 \pm 9 years; body mass index 36.5 \pm 5.9 kg/m²) were enrolled. Renal function measured by eGFR (54 \pm 19 mL/min/1.73m²) was negatively associated with skeletal muscle mitochondrial oxidative capacity (T_c : 79.73 \pm 26.47 seconds; $r = -0.51$, $p = 0.02$). **CONCLUSIONS:** Impaired kidney function was associated with diminished skeletal muscle mitochondrial oxidative capacity in LT recipients. Future studies are warranted to establish if the observed impairments in mitochondrial plasticity are the mechanistic underpinning of metabolic inflexibility and cardiometabolic sequelae that are increased in LT recipients with impaired kidney function. **FUNDING:** Supported by NIH UL1TR002649

TP22: BREAST CANCER SURVIVORS EXHIBIT NORMAL T-CELL MOBILIZATION BUT DIVERGENT INTRACELLULAR CYTOKINE EXPRESSION WITH ACUTE EXERCISE

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Background: Breast cancer (BC) treatment decreases circulating T-cells, with delayed recovery being associated with greater rates of metastasis. Additionally, BC survivors (BCS) may have attenuated responses to acute exercise, with reduced cellular mobilization compared to non-cancer controls. Moreover, the inclusion of functional markers is limited. As such, the purpose of this study was to investigate the effects of acute exercise in BCS and healthy older women (CON) on T-cell counts, frequency, and intracellular cytokine expression. **Methods:** Age-matched BCS (n=13, age=57 \pm 9) and CON (n=13, age=58 \pm 7) performed 45 min of intermittent cycling at 60% peak power output. Blood samples were obtained at rest, immediately (0h) and 1h post-exercise. T-cell counts, frequency, and intracellular cytokine levels were determined with flow cytometry. $p < 0.05$ and $p < 0.1$ were used for main effects and interactions. **Results:** Independent of time, CON had higher CD3 (+481 cells, 95% CI: 188, 773, $p = 0.004$) and CD4 counts (+376 cells, 95% CI: 135, 618; $p = 0.005$). Independent of group, there were increases in CD3 (+387 cells, 95% CI: 242, 492), CD4 (+199 cells, 95% CI: 101, 297) and CD8 counts (+76 cells, 95% CI: 46, 105; all $p < 0.001$) at 0h which returned to baseline by 1h. CD4 frequency revealed a significant interaction ($p = 0.047$). Both groups decreased similarly at 0h (-4.4%, 95% CI: -7.4, -1.3; $p = 0.007$) while CON increased by 4.5% (95% CI: 0.1, 9.0; $p = 0.044$) at 1h while BCS remained suppressed. The CD8 frequency interaction was also significant ($p < 0.001$). CON was unchanged throughout while BCS increased by 4.9% (95% CI: 2.0, 7.7; $p = 0.001$) at 1h. There was an interaction for CD4 TNF α ($p = 0.006$), where CON increased at 1h (+10.8%, 95% CI: 3.5, 18.2; $p = 0.005$) while BCS tended to decrease (-6.7%, 95% CI: -14.1, 0.8; $p = 0.079$). Similar patterns were seen in CD8 TNF α frequency, although the relationship was not as strong. Lastly, there was a CD4 IFN γ frequency interaction ($p = 0.081$), with CON increasing at 0h (+5.6%, 95% CI: 0.1, 11.0; $p = 0.045$) and remaining constant, while BCS revealed a non-significant decrease at 1h (-3.2%, 95% CI: -8.5, 2.1; $p = 0.233$). **Conclusions:** Independent of exercise, BCS had lower CD3 and CD4 T-cell counts compared to healthy older women. Following acute exercise, CD4 frequency experienced the expected decline but with a slower return to baseline levels in BCS. Intracellular cytokine responses to acute exercise appear to be divergent, with lower levels in BCS that may be indicative of reduced functional capacity for T-cell pathogenic responses and infection control.

TP23: PHYSICAL ACTIVITY AS A PREDICTOR OF SURVIVAL IN BREAST CANCER SURVIVORS

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BACKGROUND: Breast cancer is the leading cause of cancer mortality among women, with an estimated 43,700 deaths in the US in 2023. Clinical factors, such as higher stage, greater lymph node involvement, and poor treatment adherence are known to influence survival; however, less is known about the effects of lifestyle factors at diagnosis, such as physical activity (PA). According to the American College of Sports Medicine, survivors should engage in at least 150 minutes of moderate intensity aerobic activity and 2 days of muscle strengthening per week to improve physical function, health-related quality of life, and weight management, among other health benefits. Despite this, 53-83% of cancer survivors do not meet guidelines, and PA is not part of standard cancer care. Therefore, this study aims to determine the effect of PA at diagnosis on mortality in women with breast cancer. **METHODS:** Participants were recruited from 2004-2017 as part of the ongoing Strength and Range of Motion cohort study. Women were eligible if they had recently been diagnosed with stage 0-IV breast cancer and were scheduled to receive surgery. The primary outcome was defined as all-cause mortality, collected via electronic health record. PA exposure was assessed using the Godin Leisure-Time Exercise Questionnaire (GLTEQ). Participants were asked to report frequency, intensity (mild, moderate, or strenuous), and duration of PA each week during the previous month, and the number of days for each intensity are weighted to produce a total activity score. Data will be analyzed using Cox proportional hazards models to estimate the hazard ratio for the association between PA exposure at diagnosis and all-cause mortality, adjusting for demographic and clinical covariates. **ANTICIPATED RESULTS:** At diagnosis, women (n=392) were, on

average, 57.1±11.9 years old and overweight (M BMI=29.2±6.2 kg/m²) with early-stage breast cancer diagnosis (45.6% Stage I). Across a median follow-up period of 151 months, 73 deaths have been recorded thus far. Participants reported low levels of PA (M GLETQ=15.8±19.6) at time of diagnosis. Once analyses are complete, it is expected that meeting PA guidelines at time of diagnosis will be associated with improved survival in women diagnosed with breast cancer. If findings support the hypothesis, this would provide evidence to support early PA promotion efforts in women with breast cancer.

TP24: MODERATION OF BODY FAT ON THE RELATIONSHIP BETWEEN AGE AND ARTERIAL STIFFNESS IN DOWN SYNDROME

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BACKGROUND: Adults with Down syndrome (DS) have high levels of BF% despite attenuated increases in arterial stiffness compared to adults without DS, indicating that BF% may not contribute to increased arterial stiffness in this population. This study investigated the associations between age, BF%, and arterial stiffness, and the moderation of BF% on the relationship between age and arterial stiffness in adults with and without DS. **METHODS:** Thirty-three adults with DS (age 36±11 years) and 58 adults without DS (age 28±11 years) underwent measurements of BF% by bioelectrical impedance and carotid-femoral pulse wave velocity (CF-PWV) by applanation tonometry. Pearson's correlation was used to examine the associations between age, body composition, and arterial stiffness. Moderation analysis was performed to determine if BF% moderates the relationship between age and arterial stiffness in adults with and without DS. **RESULTS:** Age was significantly associated with BF% ($r=.33, p=.006$) and CF-PWV ($r=.71, p<.001$), and %BF was significantly associated with CF-PWV ($r=.43, p<.001$) in adults without DS. In adults with DS, age was significantly correlated with CF-PWV ($r=.59, p<.001$). BF% was not associated with age ($r=-.02, p=.453$) or CF-PWV ($r=.13, p=.233$). Moderation analysis showed significant main effects of age ($\beta=.49, 95\%CI [.24, .74], p<.001$) and BF% ($\beta=.28, 95\%CI [.08, .48], p=.007$) in adults without DS. Simple slopes analysis demonstrated that, in adults without DS with low BF% ($-1SD$), age had a non-significant impact on CF-PWV ($\beta=.25, 95\%CI [-.22, .72], p=.295$). For those with average BF%, age had a significant impact on CF-PWV ($\beta=.49, 95\%CI [.24, .74], p<.001$) and for those with high BF% ($+1SD$) the significant impact of age on CF-PWV became even larger ($\beta=.72, 95\%CI [.51, .93], p<.001$). In adults with DS, the main effect of age on CF-PWV was significant ($\beta=.69, 95\%CI [.36, 1.02], p<.001$); however, the effect of BF% was not significant ($\beta=.16, 95\%CI [-.14, .45], p=.285$). **CONCLUSION:** The relationship between arterial stiffness and %BF differs between adults with and without DS. In adults without DS, increased BF% increases the impact of age on arterial stiffness. Body composition does not appear to significantly contribute to the age-related increases in arterial stiffness in adults with DS.

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TP25: WHY ADIPOSITY NEGATIVELY INFLUENCES DYNAMIC BALANCE IN CHILDREN: A ROLE FOR MUSCULO-TENDON STIFFNESS?

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BACKGROUND: Potential physiological mechanisms contributing to reduced physical activity in children with obesity or at risk for obesity include poor neuromuscular performance. Children with obesity demonstrate poorer neuromuscular performance, particularly in activities that involve simultaneous body movement and control (dynamic balance) compared to more static object-control tasks. However, the relationship between adiposity and dynamic balance in children is unknown. Emerging evidence in adults suggests that muscle stiffness positively contributes to dynamic balance, but whether this applies to children remains unclear. Understanding these factors can provide insights into the physiological mechanisms influencing a child's level of physical activity. Therefore, the aim of this study was to examine the relationships between body composition, musculo-tendon stiffness, and dynamic balance in children. **METHODS:** Nine children aged 5 to 16, consisting of 2 males and 7 females, participated in the study. Height and weight were assessed using standard clinical procedures. Body mass index (BMI) percentile was determined using the CDC reference data. Measures of adiposity such as percent total body fat and leg fat (g) were estimated via a total body Dual energy X-ray absorptiometry (DXA) scan. A handheld device (Myoton) was

used to assess musculo-tendon stiffness (N/m) in a relaxed state, at the gluteus maximus, vastus lateralis, lateral head of the gastrocnemius, quadriceps tendon, patellar tendon, and Achilles tendon. Dynamic balance was evaluated by the Four-square step test (FSST), which is a multi-directional, timed clinical test of balance, where a greater time taken to complete FSST depicts poor performance. **RESULTS:** FSST was positively related to percent total body fat ($r=0.77, p=0.01$), BMI percentile ($r=0.78, p=0.01$), and leg fat ($r=0.75, p=0.02$). Stiffness of the quadriceps tendon was negatively related to BMI percentile ($r=-0.84, p < 0.01$) and leg fat ($r=-0.72, p=0.03$) while showing a negative trend with percent total body fat ($r=-0.61, p=0.08$). Additionally, the FSST was negatively related to the quadriceps tendon stiffness ($r=-0.84, p=0.005$) only. **CONCLUSIONS:** We provide preliminary evidence that adiposity is negatively related to dynamic balance and musculo-tendon stiffness in children. Specifically, our results suggest that poor dynamic balance in children may be partially explained by the negative relationship between adiposity and stiffness of the quadriceps tendon.

TP26: OPENING THE BLACK BOX: FEASIBILITY OF COLLECTING RAW ACCELEROMETRY DATA FROM CONSUMER WEARABLE DEVICES FOR RESEARCH WITH CHILDREN.

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Background: Accessing consumer wearable accelerometry data may provide an accurate, reproducible, open-access, and device agnostic method for classifying movement. Recent studies show that raw accelerometry data (x-, y-, and z-axis accelerometry data in g's) can be collected from consumer wearable devices via application programming interfaces (API) and physical activity estimates produced from applying open-source algorithms are comparable to research grade accelerometers. A key next step is to establish the feasibility of collecting free-living raw accelerometry data from consumer wearables. This study examined the data coverage of consumer wearable raw accelerometry data in comparison to a research grade device. **Methods:** Fifty-five 5-12-year-old children (63% male, 72% White) wore two of three wrist-placed consumer wearables (Apple Watch Series 7, Garmin Vivoactive 4, Fitbit Sense) and a wrist-placed research grade accelerometer (Actigraph GT9X) while attending a summer camp and over a one night at home sleep. Raw accelerometry data from the consumer wearables were extracted using a custom application that leveraged the devices' API. Data were aggregated into 10 second epochs and explored separately for camp and sleep. Data coverage was calculated as the % of epochs that contained at least one raw accelerometry data point. A protocol was considered to be 'complete' if there was at least one reading every 10 seconds for the entirety of the protocol. **Results:** At camp data coverage was the highest for Actigraph (93%,SD=26%) followed by Apple (86%,SD=33%), Garmin (79%,SD=29%), Fitbit (65%,SD=32%). At camp 92.7% of children had complete Actigraph data, followed by Apple (61.3%), Garmin (35.1%), and Fitbit (19.1%). For sleep accelerometer data coverage was the highest for Actigraph (96%,SD=20%) followed by Apple (80%,SD=16%), Garmin (73%,SD=41%), and Fitbit (40%,SD=36%). For sleep 95.8% of children had complete Actigraph data, followed by Garmin (50%), Apple (15.4%), and Fitbit (0%). Factors that lead to reduced coverage could include inadvertent button push that turns off the API, battery life, and unstable application design. **Conclusions:** Raw accelerometry data can be collected from consumer wearable devices but data coverage is poor, currently limiting the application of a device agnostic approach in consumer wearables for the collection of free-living movement data in research studies.

TP27: INEQUITIES IN CHILDREN'S INVOLVEMENT IN STRUCTURED PROGRAMMING DURING SCHOOL AND SUMMER: AN OBSERVATIONAL COHORT TIME USE STUDY

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Background: In the US, children are at a greater risk of excessive weight gain during summer vacation compared to the school year. The Structured Days Hypothesis theorizes this is because in summer, children spend less time in structured environments that promote

healthy behaviors. However, little is known about how children spend their time during the summer vs school and how this may differ by income and age. **Methods:** In an observational cohort of 890 children (50% girls, 43% $\leq 200\%$ Poverty, grades K-6th), parents completed a time use record (TUR) on their smartphones every evening for 14d in April/May (school) and 14d in July (summer) in 2021 and 2022. Parents reported the timing of setting-specific contexts of their child's daily activities (e.g., afterschool program, sports, summer programs). Zero-inflated hurdle models estimated the probability of involvement in structure (0/1) and percent of wake time children spent in structured settings (non-zeros) between school and summer. Poverty status (living in poverty [LP] vs not living in poverty [NLP]) and grade were examined as moderators. **Results:** A total of 17,029 TUR were completed. Compared to children NLP, children LP were more likely to never engage in structured activities outside of school (19% vs 38%, OR 0.19, 95CI 0.11-0.34) or during summer (23% vs 32%, 0.51, 0.28-0.92). For children NLP, involvement in structured activities during school peaked at 3rd grade and declined through 6th; while summer structure was greatest during K and declined through 6th. For children LP, involvement in structure did not vary across grades during school or summer. For children involved in structure, percent of time spent in structure varied by grade and income. During school and summer, children LP spent the greatest amount of time in structure in K and this declined thru 6th. Conversely, children NLP in 3rd and 4th spent the greatest amount of time in structure during school, whereas during summer children in K spent the greatest amount of time in structure. **Conclusions:** During school and summer, fewer children LP were involved in structured activities compared to children NLP. However, when they were involved, they spent a greater percentage of their day in structure compared to children NLP. Additional policies are needed to reduce the gap between children LP vs NLP and involvement in structured programs during school and summer. **Grant Funding:** Research reported in this publication was supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health under Award Number R01DK116665. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

TP28: MACHINE LEARNING MODELS FOR PREDICTING LABORATORY-BASED PHYSICAL ACTIVITY TYPE FROM CONSUMER WEARABLES IN CHILDREN

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Background: Accurate classification of physical activity type could improve estimates of free-living (i.e., occurring in everyday environments) physical activity energy expenditure (PAEE) in children. Studies have shown pattern recognition approaches trained on accelerometer data from research-grade devices can predict children's free-living activities. However, there has been limited examination of the potential of using accelerometry (accel) and heart rate (HR) data from consumer wearables for increasing the accuracy of children's activity type prediction. Thus, this study evaluated underlying accel and HR features from consumer wearables to predict children's activities compared to accel and HR data from research-grade devices. **Methods:** One hundred ninety-one children (5-12 years, 53% male, 57% White) completed a 60-minute protocol consisting of simulated free-living activities (e.g., walking, running, soccer, etc.). These activities were directly observed and categorized into four activity classes: Lying Down, Enrichment, Fundamental Movement Skills (FMS), and Sports/Games. Using the underlying accel and HR data from wrist-placed consumer wearables (i.e., Apple Watch Series 7 and Garmin Vivoactive 4S) and the combined accel and HR data (i.e., ActiGraph accel+Actiheart HR) from a wrist-placed, research-grade accelerometer (i.e., ActiGraph GT9X) and a chest-placed research-grade device (i.e., Actiheart 5), 13 time and frequency domain features were extracted at each second and 21 additional features were extracted using 60-second sliding windows for Random Forest model training. Leave-one-subject-out cross validation was used to evaluate the performance of each model. **Results:** Underlying data from Apple exhibited the highest accuracy (90.8%, 95%CI: 90.7%, 90.9%) followed by ActiGraph+Actiheart (87.6%, 95%CI: 87.6%, 87.7%), and Garmin (85.5%, 95%CI: 85.4%, 85.6%). Apple also exhibited the highest sensitivity (87%, 91%, 92%, 78%) and specificity (98%, 95%, 94%, 97%) across the four activity classes, respectively. **Conclusions:** These results demonstrate the potential of consumer wearables to predict children's activities with similar (or

better) precision than research-grade devices. Future studies should evaluate whether features from these devices can accurately predict children's activities in free-living environments. Grant or funding information: Research reported in this abstract was supported by the National Institute of Diabetes and Digestive and Kidney Diseases under Award Numbers F31DK136205 and R01DK129215 of the National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

TP29: QUANTIFYING SCHOOL-BASED PHYSICAL ACTIVITY USING A CLEARINGHOUSE MODEL: PHYSICAL ACTIVITY CLEARINGHOUSE IN EDUCATION (P.A.C.E.)

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Background: An obesogenic environment where physical activity (PA) is limited can be deemed an important factor associated with the increased prevalence of childhood obesity. Physical education (P.E.) and recess should offer children opportunities to engage in sufficient moderate-to-vigorous PA (MVPA), however, school-based PA policies remain ill-defined, underfunded, and difficult for schools to implement. Declines in youth PA testify to the need for a PA assessment model to positively impact the health of children. This study aimed to quantify in-school PA levels among elementary students during school hours. **Methods:** Fourth grade public school students participated by donning an accelerometer (ActiGraph GT9X+, ActiGraph LLC, Pensacola, FL) on the right hip during school hours for 5 consecutive days. Tri-axial movement was recorded using 5-second 'epochs' and converted to minutes of PA according to previously published cut-points. PA logs were kept by teachers and demographic questionnaires were submitted by the parents of participating students. All data was imported to ActiLife (v6.13.4) software and analyzed by one-way ANOVA using SPSS (version 24, Chicago, IL). **Results:** These results show students (N=102, male=54, female=48) averaged 4727.9 \pm 3053.7 steps per day and 13.0 \pm 7.9 min. of MVPA out of 79.5 min. of PA opportunity. During recess, 18% (8.9 \pm 4.9 min.) of daily offered time (50.4 min.) was considered MVPA. Combining sedentary and light intensities accounted for 82% of recess (41.4 \pm 22.6 min.). During daily P.E. opportunities (29.1 min.), 86% was accounted for when combining sedentary and light intensities (25.0 \pm 18.7 min). Only 14% of P.E. classified as MVPA (4.1 \pm 3.3 min./day). Questionnaires showed parents estimated students engage in 45.1 \pm 32.0 minutes of MVPA per day. **Conclusions:** An abundance of childhood waking hours are spent in school which presents a unique setting to address PA behaviors. These results show in-school PA was significantly lower than the recommended minimum of 30 minutes of MVPA as represented in the state mandate. This information provides valuable insight to the PA level and potential health status of children, which supports the need for P.A.C.E. to serve as a model for assessing in-school PA and implementing strategies to promote a more active learning environment. Future research will investigate the impact of strategic plans built around classroom-integrated activity.

TP30: EFFECTS OF PSYCHOSOCIAL PREDICTORS ON FEMALE ADOLESCENTS' DAILY PHYSICAL ACTIVITY

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BACKGROUND: Despite the numerous benefits of engaging in physical activity (PA), many adolescents fall short of meeting daily recommended levels of PA, and adolescent girls are more likely to be inactive or insufficiently active compared to boys. Social-ecological models suggest that, in part, behavior can be explained by individual-level factors (e.g., motivation) and factors that are external to the individual (e.g., social environment) and that these influences across multiple levels may interact to influence behavior. Despite the fact that one's motivation, social environment, and PA levels can change on a day-to-day basis, few studies have evaluated the extent to which relations between these constructs are connected at the day level. The purpose of this study was to examine the association between adolescent girls' daily intentions to engage in PA and their subsequent PA that day, with a focus of investigating whether social support moderates these associations. **METHODS:** This study included adolescent girls n=66; ages 12-18 years; 13.64% self-reported meeting PA guidelines at baseline) who received beginning and end-of-day questionnaires for 28 days. Beginning-of-day questionnaires assessed intentions to engage in PA that day. End-of-day questionnaires assessed their perceptions of social support for PA from

family, friends, and teachers and asked girls to report their PA for that day. **RESULTS:** Participants provided valid beginning and end-of-day data on 75% of possible days ($n = 1,336$ person-days). Results from a linear multilevel model indicated a significant interaction between daily intentions and social support in predicting PA, such that on days when adolescent girls reported more social support to engage in PA than usual, the association between intentions and subsequent behavior was weaker, compared to days when girls reported less social support than usual ($\beta = 0.01, p = 0.04$). **DISCUSSION:** These findings suggest that when adolescent girls are experiencing particularly high levels of social support (compared to their typical levels of social support), girls' own motivation may not be as important in determining their PA behavior. Efforts to increase PA in adolescent girls should consider developing intervention programs that are adaptive to the needs of these girls in the context of their daily lives.

TP31: ASSESSMENT OF SWEAT RATE AND HYDRATION STATUS IN YOUTH CROSS-COUNTRY RUNNERS IN MISSISSIPPI

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Background: This was an observational study aimed at assessing sweat rates and hydration status of local youth runners. Cross-country (XC) running is a sport that takes place during some of the hottest months of the year. Thus, the risk of heat-related illness is very present and is potentially higher in youth athletes due to incomplete development of their sweat response. Monitoring these athletes allows researchers and the athletic community to gain deeper understanding of youth athlete responses to heat, thus decreasing the likelihood of heat-related injury and illness. **Methods:** 25 youth XC runners (age: 14.47 ± 1.46 yrs, 11 female, 14 male) participated in this study. Each runner was tested once during August or September during a school-sanctioned XC practice with coaches present. Water bottles were provided and weighed before and after practice. Every athlete was weighed in a private area without socks, shoes, or shirt. One sweat patch was then applied to each forearm of the athlete, with an elastic netting covering the patch. Immediately after practice, athletes were weighed again and patches were removed. Patches were stored in airtight plastic tubes and wrapped in plastic wrap to decrease risk of evaporation. Samples were analyzed the day of collection. Samples were centrifuged for 10 minutes then analyzed via ion-selective electrode technology. Mean and SD were calculated, and independent sample t-tests were run to compare means between males and females. **Results:** Average sweat rate was 1.13 ± 0.50 L/h and average sodium loss was 1290 ± 322 mg/h. Average percent body weight lost was $1 \pm 1\%$. There was a significant difference between males and females in sweat rate ($p < 0.05$) and sodium loss ($p = 0.016$), but no difference in %BW lost ($p=0.165$). **Conclusions:** Both sweat rate and sodium loss are greater than published youth overall norms. This is expected as these published norms are not based specifically on youth cross-country runners. Continued assessments of youth athletes will yield greater understanding of proper hydration strategies for this population. This study provided participants with individualized hydration packets to provide awareness on the importance of hydration for training and performance.

TP32: VALIDITY OF A PEDIATRIC-SPECIFIC BIA EQUATION TO PREDICT FAT-FREE MASS IN CHILDREN AGES 2-4 YEARS

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BACKGROUND: Measures of body composition provide a better risk classification assessment than body mass index for sex and age percentiles in young children. The challenge is to identify a safe, non-invasive, economical (cost and time), and valid method of assessing body composition in young children. We previously created and cross-validated a pediatric specific, tetra-polar bioelectrical impedance analyses (BIA) equation for use in 5-11 year old White Non-Hispanic, Black Non-Hispanic, and biracial children. We recognized the need for a valid BIA equation in preschool-aged children. Thus, the purpose of this study is to determine the validity of using our previously reported BIA equation to estimate body composition in 2-4 years old children. **METHODS:** Participants were 43 (21 boys) children 2-4 years (Mean \pm SD: 3.7 ± 0.9 yrs) of age. Total body DXA scan fat-free mass (FFM) measures were used as the criterion measure, and a multi-frequency tetra-polar BIA device was employed using our previously published BIA equation (Clasey et al Obesity 19:1813-1817, 2011) of: **DXA FFM (kg) = (-7655 + 297 (Ht) + 125 (BM) - 17.4 (Imp))/1000**

where Ht, standing height (cm); BM, body mass (kg); and Imp, BIA impedance at a frequency of 50 khz (ohms). **RESULTS:** Our previously published BIA equation explained a significant ($p < 0.01$) amount (94.2%) of the variance in DXA FFM of our study participants. The FFM pure error of the BIA FFM calculated as the square root of the sum of the squared difference between the observed and predicted values divided by the number of study participants was 2.2 kg. A modified Bland-Altman plot demonstrated a mean difference of 1.8 kg with 98% of the measures falling within the 95% confidence intervals of -0.8 kg to 4.5 kg. **CONCLUSIONS:** We conclude that our previously published BIA equation is valid for use in 2-4 year old children. The use of this equation may assist in identifying effective strategies to prevent or combat childhood obesity in preschool-aged children in a variety of field, clinical and research settings.

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TP33: INTERPRETATION OF ADIPOSITY INDICATORS IN NJCAA FEMALE ATHLETES

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BACKGROUND: Body mass index (BMI) and waist circumference (WC) are commonly used as quick, noninvasive indicators of adiposity. However, these measures can misrepresent the obesity or nutritional status of an individual. This is particularly true in athletes. Thus, it is important to have rapid, noninvasive, and portable methods of body composition measurement available. The purpose of this study was to determine if differences in BMI and WC between NJCAA female athletes with a healthy body fat percent (HBF) and those who are considered overfat (OBF). **METHODS:** Fourteen NJCAA female student-athletes at a two-year university participated in this study during the preseason. Height (cm) and weight (kg) were measured, and body mass index was calculated. Waist circumferences (cm) were measured at the narrowest part of the trunk between the xiphoid process and the umbilicus in triplicate and averaged. Tetrapolar BIA was conducted using the RJL Systems Quantum X. The participants were divided into either the HBF group ($n=8$, BF $<32.0\%$) or the OBF group ($n=6$, $>32.0\%$). Independent sample t-tests were used to compare BMI and WC means between groups. The level of significance was set at 0.05. **RESULTS:** There were significant differences between groups in BMI (HBF, 21.50 ± 1.64 kg/m² vs. OBF, 24.22 ± 1.58 kg/m², $p=0.004$) and WC (HBF, 67.62 ± 3.15 cm vs. OBF= 71.83 ± 3.82 cm, $p=0.021$). **DISCUSSION:** While it is not surprising that differences exist between the two groups in BMI and WC, the clinical interpretation of these values may be unexpected. The mean BMI for each group fell within the normal or healthy range of 18.5-24.9 kg/m². Similarly, the WC average for the HBF group would be categorized as very low risk per ACSM standards (<71 cm) and the WC average for OBF group would be categorized as low (70-89 cm). Furthermore, given that the mean BMI for the OBF group was in the healthy range, the obesity status of some of these athletes was incorrectly classified. This often occurs when BMI misclassifies athletes due to high fat-free mass; however, it may be even more detrimental when it indicates that an athlete is healthy when they are actually overfat and/or under lean. This further confirms the need for body composition measures in a young, apparently healthy, athletic population. Supported by the Research and Productive Scholarship Grant.

TP34: RELATIONSHIPS BETWEEN ANTHROPOMETRIC AND ATHLETIC PERFORMANCE MEASURES IN AMERICAN FOOTBALL OFFENSIVE AND DEFENSIVE LINEMEN.

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Background: The National Football Association (NFL) records anthropometric and athletic performance data for potential NFL players annually. Of the participants, offensive linemen (OL) and defensive linemen (DL) record the highest body mass indices (BMI), typically being categorized as overweight or obese based on BMI. When considering their elite athletic performance, BMI may poorly reflect weight status as it does not consider fat vs. fat-free mass. Therefore, this study examined differences in anthropometrics and athletic performance between OL and DL, and relationships between anthropometrics and athletic performance for OL and DL. **Methods:** OL and DL ($n=710$, height= 193 ± 4 cm, body mass= 135 ± 11 kg, BMI= 36 ± 3) from the annual NFL combine between 2017-2023 were assessed. Athletic performance included: 10-yard split (10YS), 20-yard split (20YS), 40-yard dash (40YD), bench press test (BP), vertical jump (VJ), broad jump (BJ), pro agility test (PA), and the L-cone drill

(LC). BMI was calculated as body mass (kg) divided by height (m) squared. Independent samples t-tests examined differences between OL and DL. Pearson correlation coefficients examined relationships between anthropometrics and athletic performance for OL and DL. **Results:** OL had greater anthropometrics than DL ($p < 0.001$). DL had better performance for the 10YS, 20YS, 40YD, VJ, BJ, PA, and LC ($p < 0.001$). For DL, BMI had moderate to high relationships with 10YS, 20YS, 40YD, VJ, BJ, PA, and LC ($r \geq 0.548$) and a low relationship with BP, height had negligible relationships with athletic performance ($r \geq 0.171$), and body mass had moderate to high relationships with 10YS, 20YS, 40YD, VJ, BJ, PA, and LC ($r \geq 0.548$) and a low relationship with BP ($r = 0.311$). For OL, BMI had negligible to low relationships with athletic performance ($r \geq 0.165$), height had negligible relationships with BP and PA ($r \geq 0.141$), and body mass had negligible to low relationships with 10YS, 20YS, 40YD, VJ, BJ, PA, and LC ($r \geq 0.190$). **Conclusion:** Anthropometrics had greater magnitudes of relationship with athletic performance for DL than OL. Lower BMI and body mass in DL, with better athletic performance and relationships between BMI and performance, may suggest that BMI for DL reflects greater fat-free, rather than fat, mass, which may not be the case for OL. Assessing fat vs. fat-free mass should be considered in this population to accurately assess obesity status and its impact on performance.

TP35: FAT-FREE MASS INDEX AND BONE MINERAL DENSITY: DIFFERENCES BETWEEN ELITE FEMALE ATHLETES AND ACTIVE FEMALES

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INTRODUCTION: Fat free mass index (FFMI) and bone mineral density (BMD) are often used as health and functionality indicators; however normative data only exist in sedentary adults. Determining if a difference in FFMI and BMD exists between elite female athletes and active females may enhance body composition assessments to identify injury risk and inform training and nutritional guidance. The purpose of this study was to evaluate FFMI and BMD in both recreationally active females and Division I collegiate female athletes. **METHODS:** Data were analyzed for 82 NCAA Division I collegiate female athletes (mean \pm SD; age: 20.2 \pm 1.4 yrs, height: 164.9 \pm 5.8 cm, percent body fat: 22.5 \pm 3.9%), and 191 recreationally active women (>2 hrs of weekly exercise; age: 20.5 \pm 1.7 yrs, height: 165.1 \pm 6.4 cm, percent body fat: 29.4 \pm 5.2%). Body composition was measured using a whole-body dual-energy x-ray absorptiometry (DXA) scan to evaluate LM (kg) and BMD (g/cm²). FFMI (kg/m²) was calculated based on total LM (kg), divided by height (m²). Descriptive statistics were applied to characterize the sample. Independent sample t-tests were used to evaluate between groups differences for FFMI and BMD. **RESULTS:** FFMI values were significantly higher in female athletes (16.5 \pm 1.5 kg/m²; range: 13.4-20.6 kg/m²) compared to active females (15.5 \pm 1.6 kg/m², 12.9-23.4 kg/m²; $p < 0.001$). Similarly, BMD was statistically significant between female athletes (1.255 \pm 0.113 g/cm², 0.915-1.533 g/cm²) and active females (1.225 \pm 0.106 g/cm², 0.884-1.508 g/cm²; $p = 0.040$). Quartiles for FFMI were (Q1-Q4) 15.3-17.7 kg/m² for female athletes and 14.4-16.3 kg/m² for active females. BMD quartiles were: 1.191-1.333 g/cm² for female athletes compared to active females: 1.144-1.295 g/cm². **CONCLUSION:** FFMI and BMD values were statistically different and clinically meaningful between elite female athletes and active women. The variability demonstrated in both FFMI and BMD among active and elite females provides evidence of the need for more meaningful body composition normative data for active females. Establishing normative FFMI and BMD data for active and elite female athletes will better support injury prevention and more effective exercise and nutritional programming.

TP36: PREDICTORS OF WEIGHT LOSS IN ADULTS WITH OVERWEIGHT AND OBESITY

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BACKGROUND: Clinically significant weight loss (CWL) of $\geq 7\%$ is often attainable initially, yet nearly eighty percent of adults that lose weight tend to return to baseline levels, if not above. During initial weight loss, cardiometabolic risk factors tend to recede, however, upon regaining weight, disease and metabolic profiles often return to high-risk stratifications. Few data are available for predictors of weight

loss in response to exercise and an OPTIFAST diet, thus, the purpose of this analysis, was to evaluate predictors of weight loss in adults with overweight and obesity in response to a 10-week lifestyle intervention. **METHODS:** Thirty-six sedentary adults with overweight and obesity (Age: 46.5 \pm 10.5 yrs; BMI: 34.2 \pm 3.4 kg/m²) completed a 10-week lifestyle intervention involving a hypocaloric diet, weekly behavioral education, and exercise to achieve CWL ($\geq 7\%$). Concurrent, supervised aerobic exercise began at 300 MET-min/week and increased weekly until 700 MET-min/week was reached. Percent weight loss was used as the dependent variable in the stepwise linear regression models. Predictors used in the regression models included body composition variables, behavioral class attendance, and exercise variables. **RESULTS:** Participants decreased average bodyweight (-8.3%) and waist circumference (cm) (-8.4), and improved relative fitness (ml/kg/min) (2.4) during the intervention ($ps < 0.001$). Linear regression analysis revealed that the strongest predictors ($R^2 = 0.65$) of weight loss in response to the intervention were changes in waist circumference (cm) ($\beta = 0.61$, $p = 0.002$), initial weight loss ($\beta = 0.37$, $p < 0.001$) and behavioral class attendance (%) ($\beta = -0.36$, $p = 0.002$). **CONCLUSIONS:** Weight loss was at least in part predicted by initial weight loss, body composition changes, and intervention adherence following a 10-week lifestyle intervention in adults with overweight and obesity. These results indicate that greater adherence to a short-term lifestyle intervention during an active weight loss phase can predict adults reaching clinically significant weight loss.

TP37: CHARACTERIZATION OF RAW BIOIMPEDANCE VALUES ACROSS MENSTRUAL PHASES IN MODERATELY ACTIVE WOMEN

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BACKGROUND: Bioelectrical impedance spectroscopy (BIS) outcomes of impedance (Z; Ω), resistance (R; Ω), reactance (Xc; Ω), and phase angle (PhA; $^\circ$) are markers of tissue hydration and cellular health, parameters that may fluctuate across the menstrual cycle. Raw impedance values are also sensitive to acute nutrition and hydration status. This study sought to characterize differences in whole-body raw bioimpedance values across the menstrual cycle. **METHODS:** Forty-three healthy, moderately active females were categorized by menstrual status: eumenorrheic (EUM; n=21; age: 27.1 \pm 6.8 yrs) or hormonal contraceptive users (HC; n=22; age: 24.2 \pm 4.0 yrs). Measurements of Z, R, Xc, and PhA were obtained in the follicular phase (FP) and luteal phase (LP) using a multi-frequency BIS device (SFB7 Impedimed, Queensland, Australia) after a 12-hour fast and 48-hour abstention from exercise. Subjects were asked to lay supine, following a 3-5 min equilibration period, with electrodes placed 5 cm apart on the right wrist and ankle. Acute hydration was evaluated via urine specific gravity (USG) and used as a covariate. Between group (EUM vs HC) and phase (FP vs LP) differences were evaluated using mixed model ANOVAs. **RESULTS:** Xc demonstrated a significant interaction ($p = 0.03$). Pairwise comparisons showed significantly lower Xc values in EUM vs HC in the FP (Mean Difference [EUM-HC] \pm Standard Error: -4.22 \pm 1.44 Ω ; $p < 0.01$), and significantly lower values within EUM for FP compared to LP ([FP-LP] -1.84 \pm 0.87 Ω ; $p = 0.04$). A significant interaction was also observed for PhA ($p = 0.04$), with pairwise comparisons demonstrating significantly lower values for EUM in FP compared to LP (-0.15 \pm 0.06 $^\circ$; $p = 0.02$), but no significant difference between EUM and HC (-0.21 \pm 0.11 $^\circ$; $p = 0.07$). No significant differences were observed ($p > 0.05$) for Z or R values. **CONCLUSION:** The lower Xc and PhA values observed during the FP, specifically in EUM subjects, may be a result of fluid, inflammatory, and cell integrity changes during menstruation. The lack of changes observed in Z and R values, markers of cellular hydration, may suggest alterations in Xc and PhA could be due to loss of erythrocytes, and related iron, rather than simply fluid loss alone. These data suggest the need for future exploration during the FP as a unique window for nutritional support to reduce potential impairments of cellular function.

TP38: DOES PRESERVATION OF RMR WITH WEIGHTED VEST USE HELP WITH WEIGHT LOSS MAINTENANCE?

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BACKGROUND: Weight regain after weight loss is a substantial problem in obesity therapeutics. Recent provocative evidence points to mechanical loading as a signaling mechanism for the body defending its weight and may represent an intervenable target to promote successful weight loss maintenance. The primary purpose of this

project is to explore whether maintaining gravitational loading during intentional weight loss results in less regain of body mass following treatment. Secondly, we aim to explore whether change in resting metabolic rate (RMR) during active weight loss is correlated with subsequent weight regain. **METHODS:** 18 older adults (70.4±3.1 years, 83% women, 78% white) living with obesity (body mass index [BMI]: 35.2±2.8 kg/m²) participated in a six-month weight loss intervention where half (n=9) were assigned to caloric restriction plus 8 hours/day weighted vest use and the other half (n=9) were assigned to caloric restriction only. Total body weight and RMR were collected at baseline and 6 months, with an additional weight measurement taken at 24 months. Body weight and RMR change estimates come from a mixed model containing treatment group, visit, treatment group by visit interaction, and baseline measure of the outcome. **RESULTS:** Average 6-month body weight change was -11.2 kg (-14.6, -7.7) and -10.3 kg (-13.7, -6.8) for the caloric restriction plus weighted vest and caloric restriction only groups, respectively (p=0.71). By 24 months, weight change from baseline was -4.8 kg (-9.6, 0.1) and +0.9 kg (-3.9, 5.8) for the caloric restriction plus weighted vest and caloric restriction only groups, respectively (p=0.10). Average 6-month RMR change was -16.3 kcal (-100.8, 68.2) and -237.5 kcal (-321.9, -153.0) for the caloric restriction plus weighted vest and caloric restriction only groups, respectively (p<0.01). At 24 months, RMR returned to baseline for both groups. Amount of weight regained tended to correlate with change in RMR during active weight loss (r=-0.39; p=0.11). **CONCLUSIONS:** 18 months following a successful weight loss intervention, participants assigned to caloric restriction-only fully regained lost weight; however, participants assigned to caloric restriction plus weighted vest use regained half of lost weight. Change in RMR during active weight loss was modestly and inversely associated with weight change during the follow up period.

TP39: I-CAN: INDEPENDENT WEIGHT-LOSS MAINTENANCE FOR COMMUNITIES WITH ARTHRITIS IN NORTH CAROLINA

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BACKGROUND: Osteoarthritis (OA) is one of the chief forms of arthritis and a major reason for disability among older adults. Weight loss is a non-pharmacologic intervention that may help decrease the effects of OA while improving one's quality of life. The objective of the I-CAN study was to determine whether the weight-loss maintenance (WLM) intervention had a long lasting impact on self-efficacy, maintained weight loss, and ultimately better clinical outcomes. **METHODS:** Participants who lost more than 5% of their base body weight in the parent study (Weight Loss and Exercise for Communities with Arthritis in North Carolina), were re-randomized and placed into a WLM or an attention control (AC) group. The WLM intervention was a 6-month facilitated maintenance phase that included exercise, as well as group and individual behavioral sessions grounded in social cognitive theory to increase self-efficacy. The AC group included sessions to provide social interaction and health education. The primary outcome was weight change from baseline to the end of intervention. This treatment effect was estimated using mixed linear models adjusted for site, sex, and baseline values of the outcome. Effect sizes were estimated using Cohen's d. Additionally, the role played by self-efficacy for maintaining weight loss on one's own was examined. **RESULTS:** At the start of I-CAN, the participants (n=104, 79 females, mean age=67 years) had a weight of 85.1 kg (SD 13.9). At the 6-month follow up the WLM group gained back less weight (mean=1.3 kg; 95% CI -0.25, 2.86) compared to the control group who regained at nearly twice the rate (mean=3.5 kg; 95% CI 1.80, 5.11; P=.037). Self-efficacy accounted for 22% of the total effect of the WLM group. Interviews at the end of the intervention suggest that the WLM was well-received, with all participants endorsing the statement "The program had a positive impact on my confidence that I can maintain my weight indefinitely" and one participant commenting that "it is possible to lose weight and keep it off and feel better about yourself with a simple and systematic approach." **CONCLUSION:** These findings support a short-term WLM program, based on social cognitive theory, in the maintenance of weight loss, while also promoting an increase in self-efficacy. This program has the potential to sustain both the functional and symptomatic improvements achieved through weight loss for older adults with knee OA.

TP40: EXERCISE PRESSOR RESPONSES BUT NOT COLD PRESSOR RESPONSES ARE INFLUENCED BY FAT-FREE MASS

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BACKGROUND: Sympathetic activity is known to be elevated in individuals with obesity, commonly demonstrated through cardiovascular tests, such as isometric handgrip exercise and cold-pressor activation. While prior research has identified a causal influence of adipose tissue on sympathetic tone, the relative contribution of fat-free mass (FFM) remains unclear. The purpose of this study was to determine the relative contributions of fat-mass (FM) and FFM to the hemodynamic responses to voluntary contractions and cold pressor activation. **METHODS:** 69 individuals participated in both visits of this 2-visit study. The first visit consisted of a prescreening, where height, weight, and body composition were evaluated using a calibrated scale, stadiometer, and bioimpedance spectroscopy (BIS), respectively. In the second visit, participants performed a 2-minute bout of isometric handgrip exercise at 35% of the predetermined maximal voluntary contraction, as well as a cold pressor test (CPT). Both tests began with a 2-minute baseline, followed by 2-minutes of isometric handgrip or cold-water hand immersion. During each protocol, heart rate (via electrocardiography) and blood pressure (via finger photoplethysmography) were monitored continuously. Responses to CPT and handgrip were quantified as the area under the curve for mean arterial pressure (blood pressure index; BPI) during each 2-minute stimulus period. Linear regression was then used to examine the relationships between each pressor variable (BPI responses to each test) and measures of body composition and anthropometrics (FFM, FM, and BMI). **RESULTS:** BPI during handgrip was significantly and positively correlated with FFM (r: 0.242, p: 0.04), but not BMI (r: 0.099, p:0.42) or FM (r: 0.034, p: 0.78). The association with FFM remained significant even after independently adjusting for FM (r: 0.288, p: 0.01) and BMI (r: 0.258, p: 0.03). In contrast, the BPI responses observed CPT were not significantly associated with BMI (r: 0.017, p: 0.89), FFM (r: 0.064, p: 0.60), or FM (r: 0.041, p: 0.74). **CONCLUSIONS:** Our results suggest that FFM, but not FM or BMI, functions as a primary driver of exercise pressor responses in humans. However, these findings do not extend to cold pressor responses.

TP41: DIFFERENCES IN POST-ACTIVATION POTENTIATION OF KNEE EXTENSORS WITHIN WOMEN DURING OVULATION VERSUS MENSTRUATION

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BACKGROUND: Post-activation potentiation (PAP) equates to the increase in muscle (or muscle group) twitch force (or torque) in response to prior contractile activity [(e.g., a maximal voluntary contraction (MVC)] by the investigated muscle and is thought to help offset fatigue during endurance exercise and increase the rate of force development, thus improving speed and power performance. Animal models have used post-tetanic potentiation (PTP), a measure similar to PAP that can be assessed in animals in vivo and in rodent isolated muscle preparations, to show that normal mature female mice have a higher PTP compared to ovariectomized mature female mice, indicating that estrogen impacts skeletal muscle contractility, specifically phosphorylation of the regulatory light chain (pRLC) of myosin; therefore, we aim to determine if this relationship is present within the menstrual cycle during phases of high estrogen (i.e., ovulation) versus low estrogen (i.e., menstruation) by examining PAP of knee extensors in women during these two phases.

METHODS: Eleven premenopausal women with regular menstrual cycles, age 18-35, were recruited to participate in this study. After potential subjects were screened for contraceptive use and contraindications to exercise, each participant attended three sessions. Two test sessions took place when the women were ovulating for familiarization and to capture data at the high-estrogen phase of the menstrual cycle using an ovulation test kit. A third session took place on the first day of the menstrual cycle, i.e., the low-estrogen phase. Each session began by determining the subject's optimized current which is the stimulation amplitude that facilitated peak muscle twitch force in their quadriceps muscles. This current was then used to stimulate the quadriceps muscles preceding and following a MVC of the knee extensors. Two trials were conducted during each session with ten-minute rest periods between each. A paired t-test was used to compare PAP values at the two phases of the menstrual cycle.

RESULTS: Women at ovulation versus menstruation demonstrated a mean (±SD) PAP of 82 (±24)% and 73 (± 20)%, respectively but were not significantly different (p=0.25).

CONCLUSION: In ovulating women, PAP was 13% greater than in menstruating women; however, this change is not statistically significant, and the clinical implications of this finding warrants further exploration.

TP42: INFLUENCE OF MUSCLE STRENGTH ON BMD FOLLOWING WEIGHT LOSS AND WEIGHT REGAIN IN PREMENOPAUSAL WOMEN

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BACKGROUND: Many studies have demonstrated a decrease in absolute bone mineral density (BMD) with weight (wt) loss; however, few have examined adjusted changes in BMD with wt loss and wt regain with muscular strength. The purpose of this research was to see associations between BMD after wt loss with muscular strength. **METHODS:** 43 women (34.6+/-5.8 yrs) underwent diet induced wt loss. BMD was assessed by dual energy x-ray absorptiometry (DXA). BMD was adjusted for wt, age, sex, and race to obtain BMD z-scores. Maximal isometric bicep and quadriceps strength was assessed in the overweight (OW) state. Subjects were divided into tertiles by muscular strength. Group comparisons were made using repeated measures ANOVA at OW, post-wt loss (PW), and 1-year follow-up (FU). **RESULTS:** Subjects lost 13.0+/-3.2 kg. At FU subjects regained 4.0+/-5.2 kg. BMD did not decrease at PW and FU. Z-BMD increased at PW ($p=0.00$, OW 0.20+/-0.72 vs PW 0.29+/-0.82); however, z-BMD at FU decreased from PW ($p=0.001$). There were significant relationships between bicep strength and changes in BMD from OW to PW. There were significant relationships between quadriceps strength and changes in BMD from OW to FU and PW to FU. Subjects in the lowest strength tertile lost more BMD compared to the highest tertile at both PW (low 0.007+/-0.02 vs. high 0.0005+/-0.01 kg/m²) and FU (low 0.008+/-0.02 vs high -0.01+/-0.03 kg/m²). **CONCLUSIONS:** Diet induced wt loss was associated with changes in adjusted BMD and was higher after weight loss. These results suggest that stronger individuals lose less BMD following wt loss. The protective effects of strength on BMD may persist for up to 12-months post wt loss in premenopausal women. Supported by NIH RO1 DK-49779 and RO1 DK-51684, NCCR RR 11811, UAB GCRC MO1-RR-32.

TP43: ASSOCIATIONS BETWEEN SLEEP AND CHANGES IN BODY WEIGHT AND ENERGY BALANCE IN AFRICAN AMERICAN FEMALES

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BACKGROUND: Body weight is determined by sustained changes in energy balance (EB), reflecting the difference between energy intake (EI) and energy expenditure (EE). Insufficient sleep negatively impacts body weight control to favor weight gain. African American young adults have a higher risk for insufficient sleep and obesity, but little data exists on these measures in this population. The purpose of this analysis is to examine the relationship between sleep duration and efficiency with baseline and 6-month changes in parameters of energy balance, body mass, and body fat in African American female young adults. **METHODS:** In a repeated measures design, 12 African American female young adults (age, 21±2.6 y; height, 164±6.6 cm; weight, 72.5±13.9 kg; body fat, 29.1±9.9%) completed an initial (BLN) and 6-month (6M) visit. Seven days of actigraphy-derived sleep efficiency and sleep duration were calculated using the Sadeh algorithm at BLN. Physical activity EE (PAEE) and moderate-to-vigorous physical activity (MVPA) were measured with actigraphy and calculated using the Freedson VM3 Combination and Freedson (1998) algorithms, respectively. Resting metabolic rate and thermic effect of food were measured via indirect calorimetry. Ad libitum EI was measured using 3 days of provided meals. Body mass and body fat were assessed via BodPod. Paired t-tests evaluated differences in EB parameters, body mass, and body fat between BLN and 6M. Pearson r correlations assessed the relationship between baseline sleep measures with changes in parameters of EB, body mass, and body fat at BLN over 6M. **RESULTS:** There was a significant increase in body mass (MD: 2.8 kg, 95%CI[0.82, 4.74], $p=0.01$), MVPA (MD: 45.2 min/d, 95%CI[0.94, 89.5], $p=0.05$), and PAEE (MD: 327.1 kcal/d, 95%CI[73.5, 580.6], $p=0.02$), but not body fat (MD: 2.2 kg, 95%CI[-1.3, 5.7], $p=0.20$) from BLN to 6M. Greater sleep efficiency at BLN was associated with a decrease in body fat ($r = 0.59$, $p=0.04$) and a more negative EB ($r = 0.72$, $p=0.01$) from BLN to 6M. There were no associations between sleep variables and changes in body weight ($p>0.05$). **CONCLUSIONS:** In this sample of African American females,

greater baseline sleep efficiency was associated with a greater decrease in body fat and a more negative energy balance, suggesting that those with better sleep efficiency may have less risk of weight and fat mass gains during the key developmental period of young adulthood.

TP44: 12 WEEKS OF RESISTANCE EXERCISE TRAINING OR ENDURANCE EXERCISE TRAINING HAS NO EFFECT ON ENERGY EXPENDITURE BEFORE, DURING, OR AFTER AN ACUTE BOUT OF WALKING EXERCISE IN SEDENTARY POSTMENOPAUSAL WOMEN WITH OBESITY AND PREDIABETES.

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Prediabetes, often seen alongside obesity and as a precursor to type 2 diabetes, is prevalent in over 50% of women aged 60 years and above. The metabolic health benefits of exercise are widely acknowledged; however, a clear understanding of metabolic changes induced by resistance training (RT) compared to endurance training (ET) is lacking, particularly in older women. Furthermore, it is unclear what the effects are of 12 weeks of RT or ET training on metabolic activity before, during, and after general physical activities, like walking. **OBJECTIVE:** To investigate the impacts of 12-week energy-matched RT or ET on energy expenditure before (resting metabolic rate (RMR)), during, and after an acute bout of walking exercise in postmenopausal women with obesity and prediabetes. **METHODS:** The study included postmenopausal women with obesity and prediabetes that participated in an ongoing larger study of fat metabolism ($n = 15$; mean ± SD: age: 59 ± 6 yrs.; BMI: 35.17 ± 3.53 kg/m²; BF: 46.87 ± 3.94%). Participants were randomized to 12-weeks of ET ($n = 7$) or RT ($n = 8$). In addition, six participants ($n=3ET$, $n=3RT$) were randomized for an acute bout of low-intensity (50% VO₂ peak) treadmill exercise before and after the 12-weeks of training. Energy expenditure before, during, and after an acute bout of exercise at the same absolute intensity were assessed using indirect calorimetry. All study outcomes were assessed before (PRE) and following (POST) 12 weeks of ET or RT. Statistical analyses with Statistical Analysis System (SAS) using marginal models to determine the main effect of time and training (RT or ET) on study outcomes. Post hoc analyses were adjusted for multiple comparisons using the Bonferroni adjustment with a set at 0.05. **RESULTS:** No differences between study outcomes were present between RT and ET. At POST, as compared to PRE, there were no differences in RMR ($n=15$; POST: 1496.25 ± 266.66 vs PRE: 1452.30 ± 150.34 kcal/day; $p=0.722$), exercise energy expenditure ($n=6$; POST: 228.85 ± 89.77 vs. PRE: 246.98 ± 67.38 kcals; $p=0.695$) or acute 10 minute post-exercise energy expenditure ($n=6$; POST: 14.25 ± 2.67 vs. PRE: 16.39 kcal/day; $p=0.237$). **CONCLUSIONS:** When the energy expenditure of exercise training is matched, 12 weeks of either ET or RT do not distinctly alter energy expenditure before, during, or after an acute bout of walking exercise in sedentary postmenopausal women with obesity and prediabetes.

TP45: THE INFLUENCE OF ESTROGEN AND PROGESTERONE ON HEART RATE VARIABILITY ACROSS TWO MENSTRUAL CYCLES

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BACKGROUND: Cardiac autonomic activity quantified by heart rate variability (HRV) has been proposed to alter across the menstrual cycle (MC), however, most prior research fails to confirm MC phase using female sex hormones. Therefore, the purpose of this study was to examine the relationship between changes in estrogen (E2) and progesterone (P) with resting HRV in women throughout the MC. **METHODS:** Naturally cycling females ($n=20$; age=21±3yrs, ht=163.0±4.5cm; mass= 63.2±11.4kg) collected daily saliva and resting HRV across two MC. Saliva was assayed for free E2 and P while HRV was collected in a supine position using a heart rate monitor and a phone application. During each MC, a blood draw was performed at the laboratory 5-8 days following a positive ovulation test and assayed for serum P. Ovulation was confirmed using a combination of ovulation tests, serum P, and salivary P profiles. Anovulatory cycles ($n=6$) were excluded from analysis and 18 of the 20 participants completed collection across both MC, therefore a total of 32 cycles were analyzed. HRV analysis was performed on the cleanest 5-min of each segment where the root mean square of successive R-R intervals (rMSSD), high frequency (HF), and sample entropy (SampEn) was assessed. All sex hormones and HRV metrics were log transformed (ln), and mixed-

effects models were used to examine the relations between P and E2 on HRV. Model parameters included an interaction term of day (based on ovulation) with salivary E2 and P, respectively. Linear and quadratic time (i.e., day) were examined. RESULTS: An ANOVA revealed a quadratic term (x^2) was appropriate for the model with $\ln rMSSD$ ($p < 0.05$) but not $\ln HF$ or $\ln SampEn$ ($p > 0.05$). A main effect of E2 and P was observed for $\ln SampEn$ ($E2 = -2.97e^{-02}$, $p = 0.01$; $P = 1.619e^{-02}$, $p = 0.03$) but not $\ln rMSSD$ ($E2 = 1.79e^{-02}$, $p = 0.55$; $P = -1.62e^{-02}$, $p = 0.94$) or $\ln HF$ ($E2 = -.007$, $p = 0.88$; $P = -0.03$, $p = 0.34$). Across both MC, E2 negatively influenced $\ln rMSSD$ ($Day * E2^2 = -3.479e^{-04}$, $p = 0.03$), however, no other interaction effects were observed for E2 or P on $\ln rMSSD$, $\ln HF$, or $\ln SampEn$ ($p > 0.05$). CONCLUSION: Given the influence of E2 on $rMSSD$ across the MC, it should be measured and controlled for in females if tracking changes across time. Across the MC, HF and SampEn do not appear to be affected by either E2 or P, but both E2 and P are associated with SampEn. Further studies should confirm these findings for additional HRV metrics.

TP46: SURVEY OF THE EFFECT OF EXERCISE ON DYSMENORRHEA BETWEEN HIGH AND LOW LOAD EXERCISE GROUPS

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BACKGROUND: Women use many strategies to help alleviate dysmenorrhea which is defined as pain during menstruation; however, little is known about exercise as a potential strategy. The purpose of this study is to characterize how exercise affects menstrual pain between high and low load exercise groups. **METHODS:** The data analyzed in this study was taken from a larger survey characterizing current strategies women use to manage dysmenorrhea. 145 women (Age: 31.5 ± 8.7 yrs; Race: Asian, $n=2$, Black, $n=6$, Hispanic, $n=3$, Multiracial, $n=12$, Native American, $n=1$, No response, $n=14$, White, $n=107$) were separated into HIGH (>2000 MET-min/wk; $n=70$) and LOW (≤ 2000 MET-min/wk; $n=75$) exercise load groups. MET-min/wk were calculated based on frequency, duration, and intensity of exercise per week. Responses to the question "how does exercise impact menstrual pain" were tallied to evaluate how symptoms of dysmenorrhea were affected between high and low exercise load groups. Multiple responses were allowed for this question. Descriptive and frequencies were analyzed using Microsoft Excel. A chi-square test of independence was used to compare how exercise impacted menstrual pain between HIGH and LOW groups. **RESULTS:** For HIGH, 42.3% reported pain improvements, 5.6% reported no changes, 22.5% reported pain worsening with exercise and 29.6% reported "other". For LOW, 49.4% reported pain improvements, 7.8% reported no changes, 10.2% reported pain worsening with exercise and 32.5% reported "other". There was no significant association between exercise load and menstrual pain between HIGH and LOW groups ($X^2 = 4.12$, $df=3$, $n=148$, $p=0.250$). **CONCLUSIONS:** Results suggest that there was no significant difference in how exercise impacted menstrual pain between individuals who are high or low load exercisers. However, more research should be done to determine how exercise intensity within an individual exercise bout affects dysmenorrhea.

TP47: TEN WEEKS OF RESISTANCE EXERCISE DOES NOT IMPROVE OBJECTIVE SLEEP MEASURES IN YOUNG BLACK WOMEN

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BACKGROUND: Black Americans exhibit poorer sleep quality (e.g., duration and efficiency) than any other ethnic group in America. Importantly, poor sleep is associated with incident cardiometabolic risk factors and disease states, such as obesity, type II diabetes, and heart disease. Although long-term resistance exercise (RE) has been associated with improved sleep quality, its effects in young Black women have been understudied. Therefore, the purpose of this study was to assess the differences in sleep quality before and after a 10-week RE intervention in young Black women. **METHODS:** Fourteen young Black women (22.7 ± 3.6 yrs) participated in a 10-week, supervised (biweekly) RE training intervention. At pre- and post-testing visits, self-reported sleep quality was assessed by the Pittsburgh

Sleep Quality Index (PSQI) scored 0 [better] to 21 [worse]. Objective sleep duration and efficiency were measured using Phillips Actiwatch Spectrum PLUS accelerometers (worn on the dorsal side of the wrist) during a pre-training familiarization period and week 10 of the RE program. Participants wore the devices for a minimum of a 5-day observation period (5.92 ± 1.25 days). Three women did not meet this requirement, and data were not included for analysis. Statistical analyses included paired-samples t-tests for normally distributed variables and Wilcoxon signed-rank test for non-normally distributed variables to detect pre- to post-intervention differences for all variables. RESULTS: The PSQI global scores trended towards significance for improved sleep quality ($n = 14$; pre = $5.5 \pm .85$ vs. post = 4.7 ± 1.2 , $Z = -1.774$, $p = .076$). There were no differences in objectively measured sleep duration ($n = 11$; pre = $7.00 \pm .60$ hrs vs. post = 6.96 ± 1.06 hrs, $t(10) = .139$, $p = .892$) and efficiency ($n = 11$; pre = 87.35 ± 4.87 vs. post = 86.68 ± 5.60 , $t(10) = .43$, $p = .68$). CONCLUSION: These preliminary data indicate that a 10-week RE intervention tended to improve self-reported sleep quality despite no differences in objectively measured sleep in young Black women. Future interventions, in larger cohorts, should consider incorporating theory-based behavioral practices targeting sleep wellness, in addition to RE, to help improve sleep in Black women.

TP48: THE EFFECTS OF MATERNAL PERINATAL EXERCISE ON INFANT NEUROMOTOR OUTCOMES

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Purpose: Aerobic exercise during pregnancy has been well established as safe and effective for both mother and infant. Few studies have examined the effects of different exercise modes during pregnancy on infant outcomes. The purpose of this study is to examine the effects of exercise mode during pregnancy on 1-month infant neuromotor outcomes. Methods: Pregnant women were recruited and randomized to either aerobic (AE), resistance (RE), combination (CE), or control (CON) groups. Participants completed 150 min each week of supervised activity. After delivery, 1-month infant neuromotor skills were assessed using the Alberta Infant Motor Scales (AIMS) and Peabody Developmental Motor Scales, 2nd Edition. ANOVAs were used to compare differences between exercise groups; data was stratified by pre-pregnancy BMI (healthy weight, HW vs. overweight-obese, OO) and infant sex (M, F). Regressions assessed predictors of 1-month neuromotor outcomes. Results: Groups were similar in maternal, neonate, and 1-month descriptors. Trends for improved subscores included: AE and RE in Prone ($p=.20$); CE in Sitting ($p=.11$); RE in Standing ($p=.20$) relative to controls. In females (F) from Healthy Weight (HW) women, all exercise types had increased gestational age ($p=.03$), AE and CE had greater Stationary ($p=.17$) subscores; in males (M) of HW women, all exercise types had greater Sitting ($p=.02$) subscores. In F from OO women, AE had greater total AIMS score ($p=.20$), while AE and RE had greater Stationary ($p=.02$) Locomotion ($p=.06$) subscores, as well as GMQ ($p=.05$) scores; in M of OO women, all exercise with increased height ($p=.03$) and weight ($p=.02$), RE with greater Prone ($p=.03$) and Standing ($p=.04$) subscores, with greater total AIMS ($p=.04$) scores. Controlling for other factors, we found significant predictors of 1-month neuromotor scores. Reflex scores were predicted by maternal exercise attendance, pre-pregnancy activity, fitness level, ethnicity, infant sex and body fat. Stationary scores were predicted by exercise mode, pre-pregnancy activity, baby BMI. GMQ was predicted by maternal exercise mode, race, delivery type, pre-pregnancy activity, BMI, and 1-month body fat. Conclusion: Maternal exercise mode or attendance, and infant body fat influences 1-month neuromotor skills. There are differences in 1-month neuromotor outcomes based on infant sex as well as maternal pre-pregnancy BMI. Further research is needed to understand this.

Poster Presentation Sessions (P1-P299)

P1: THE EFFECTS OF COMBINING COGNITIVE AND BALANCE TRAINING ON BALANCE AND FALL RISK IN THE ELDERLY POPULATION: A PILOT STUDY

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BACKGROUND: Falls are a permeating and predominant cause of injury among the elderly population. Fall-related accidents such as fractures, traumatic brain injuries, and even death pose a significant safety hazard to aging individuals. Balance training programs have served as the pinnacle of fall prevention due to substantial evidence supporting their ability to improve strength and stability. Recent studies have shown, however, that cognitive exercises can serve as an effective additive to traditional balance training protocol. The purpose of this study is to determine whether combined balance and cognitive training is more effective in improving balance and mobility than traditional methods. **METHODS:** 30 individuals ages 60 and above with no history of musculoskeletal, cardiovascular, or neurological conditions will be recruited. Participants should be able to walk without the use of an assistive device. They will be randomly divided into 3 groups. The first group will alternate performing dual-task (cognitive+balance) training and cognitive exercises on opposing days of the week. The second group's training sessions will only consist of balance exercises and the third group will serve as the control. At baseline, mobility will be assessed with the TUG test while postural stability and sway index will be measured using the Biodex Balance System. In addition, confidence regarding balance and falls will be measured with the Falls Efficacy Scale-International (FES-I). After baseline data collection, the participants will then follow the 8-week training protocol of their assigned group. At the conclusion of the 8-week program, baseline measurements will be retested and evaluated for significant differences using the repeated measures ANOVA. **ANTICIPATED RESULTS:** It is hypothesized that combined balance and cognitive training will exhibit greater improvements in static and dynamic balance as well as in falls efficacy compared to conventional programs.

P2: EXPLORING JOINT KINEMATICS IN JUMPING AND LANDING: MARKER VERSUS MARKER-LESS 3D MOTION ANALYSIS

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BACKGROUND: In the field of human movement sciences, a marker-less motion capture system that is user-friendly and sufficiently accurate to measure human performance is needed. The feasibility study aims to validate a three-dimensional (3D) marker-less motion capture technique, while using a professional grade motion analysis system as the reference. **METHODS:** The marker based camera systems were positioned on the perimeter of the workspace. Three iOS cameras coupled with the marker-less system were arranged according to the system's recommendations. A test subject performed 6 vertical jumps on 2 different flooring systems, and joint kinematics were measured using both marker-based optical motion capture and the open-source marker-less motion capture. The differences in corresponding joint positions, estimated from the three different camera systems throughout the analysis, were presented as means and standard deviations. The 3D model reconstruction accuracy between systems was analyzed using Pearson's correlation coefficient, along with a Bland-Altman agreement analysis. Reliability of accuracy across trials was accomplished by comparing means using an analysis of variance technique. **RESULTS:** During landing, maximum knee range of motion (ROM) from the reference source ($M = 99.1$ degrees, $SD = 0.52$), the ASC system ($M = 99.8$ degrees, $SD = 0.91$), and Open-Cap ($M = 100.2$ degrees, $SD = 1.05$) were compared, where $p = .01$. The relationship between the reference system and the marker-based ASC system ($r = .98$, $p = .001$) and ($r = .97$, $p = .001$) between the reference system and the open-source marker-less system ($r = .97$, $p = .001$) was validated for accuracy. **CONCLUSIONS:** Experimental camera system accuracy was based on the output measures compared to the output measures of the reference system. The results demonstrated that, quantitatively, 3D reconstruction estimation using marker-less motion capture correctly

reproduced the movements of the participant. The studies preliminary findings demonstrate that the open-source marker-less motion capture can be used for human movement science with an error of less than 1.5 degrees, and the budget friendly ASC system demonstrated less than 1 degree of error. Future work in this area should investigate the validity of marker-less 3D motion analysis in real-world settings.

P3: KINEMATIC PREDICTORS OF INGAME FASTBALL VELOCITY IN NCAA DIVISION I BASEBALL PITCHERS

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BACKGROUND: Pitch velocity is a key measure of fastball performance in baseball pitchers. The kinematics related to ball velocity are traditionally examined in laboratory settings with marker-based motion capture systems. However, limited research exists investigating their influence on in-game performance. The purpose of this study was to identify the kinematic predictors of in-game fastball velocity in collegiate baseball pitchers. **METHODS:** Kinematic data from 57 NCAA Division I pitchers (height: 1.89 ± 0.06 m, mass: 93.1 ± 1.18 kg) were collected at 300hz using an eight-camera markerless motion capture system (KinaTrax, Boca Raton, FL). Data were processed and filtered using propriety KinaTrax software. Kinematics were measured at foot contact (FC) (stride length, shoulder rotation, shoulder horizontal abduction, and shoulder abduction), maximum shoulder external rotation (MER) (shoulder rotation and elbow flexion), ball release (BR) (elbow flexion, shoulder abduction, trunk flexion, trunk lateral flexion, and lead knee flexion). Maximum knee extension velocity as well as trunk and pelvis rotation velocity were also included for analysis. Fastball velocity was recorded using a TrackMan (Scottsdale, AZ) V3 Game Tracking unit. The average of each subject's first five fastballs thrown in a game was used for analysis. A backward multiple linear regression ($\alpha = .05$) was used to identify the kinematic predictors of in-game fastball velocity. **RESULTS:** The average fastball velocity from the cohort was 40.9 ± 1.22 m/s (91.4 ± 2.73 mph). After the backward elimination (cutoff of $p \geq 0.05$), three predictors explained 17.7% of the variance in fastball velocity ($F(3,54)=3.81$, $R^2 = .177$, $p=.014$). As fastball velocity increases by 1 m/s (2.2 mph), max lead knee angle velocity increases by $0.003^\circ/s$ ($\beta=0.003$, $t=2.46$, $p=.017$), max trunk rotational velocity increases by $0.005^\circ/s$ ($\beta=0.005$, $t=2.40$, $p=.020$), or lead knee flexion at BR decreases by 0.027° ($\beta=-0.027$, $t=-2.33$, $p=.024$), while all other variables are held constant. **CONCLUSION:** The findings show greater stride knee extension at BR, maximum stride knee extension velocity, and maximum trunk rotational velocity are predictors of in-game fastball velocity. Investigating in-game data provided similar results to those of prior laboratory studies, while a higher pitch velocity, fewer significant variables, and lower coefficient of determination were noted.

P4: EXTERNAL OBLIQUE AND INFRASPINATUS MUSCLE ACTIVITY IN CHRONOLOGICAL AND DISCORDANT BASEBALL PITCHING SEQUENCES

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INTRODUCTION: Out-of-sequence pelvis and trunk rotation are associated with increased forces at the shoulder during pitching. Assessing electromyographic (EMG) amplitudes of the involved trunk and shoulder musculature across sequence patterns throughout the pitch may reveal different levels of muscle activity. The purpose of this investigation was to examine differences in throwing-side external oblique and infraspinatus activity between chronological (CS) and discordant (DS) sequencing patterns. **METHODS:** Surface EMG data were recorded at a sampling interval of 1/1500 on the throwing-side external oblique and infraspinatus of thirty-three youth baseball pitchers ($11.9 \pm 1.7\gamma$ [range 10-15y], 1.61 ± 0.14 m, 49.4 ± 14.0 kg). Kinematic data were collected using an electromagnetic tracking system (150 Hz). Maximal voluntary contractions (MVC) of each muscle were performed for three seconds. Participants pitched five fastballs at regulation distance. Electromyographic data were processed with a root mean square calculation and normalized using the average from two peak MVCs. Sequencing patterns were determined by the order in which the pelvis and trunk segments reached their peak angular velocity. In a DS pattern, the trunk angular velocity peaked before the pelvis. Of the 33 pitchers, 16 pitchers displayed both CS and DS patterns. Muscle activation for each pitcher were time-normalized from peak knee height to follow through (0 to 100 percent) and each sequence was compared with paired T-tests

using 1-Dimensional statistical parametric mapping. **RESULTS:** Pitch speeds were not different ($t = -.11, p = .91$) between CS (24.1±4.1m/s) and DS (24.1±4.2m/s) sequences. Across the pitching movement, mean muscle activity between CS and DS differed the most at 76% of the pitch for external oblique (15 vs 11 %MVC) and 97% of the pitch for infraspinatus (56 vs 48 %MVC), respectively. Yet, no significant differences were observed for external oblique ($t < 3.8, p > .05$ 0-100%) and infraspinatus ($t < 3.9, p > .05$ 0-100%) between sequences across 100 percent of the pitch. **CONCLUSIONS:** Approximately half of the pitchers in this sample displayed both sequencing patterns highlighting intra-pitcher variability in pelvis and trunk kinematics. While DS can increase shoulder kinetics, additional work assessing muscle activation patterns and pitching sequences is needed to further understand the control and execution of the pitching movement.

P5: VALIDATION OF THE KINEMATIC KNEE SLEEVE FOR MEASURING JOINT ANGLE CHANGES IN ACTIVE YOUNG ADULTS

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BACKGROUND: Electric goniometers (EG) are a valid and reliable method of measuring joint angle changes during human movement. However, EG can be costly and impractical for use outside of laboratory settings. Therefore, an advanced textile sensor, the Kinematic Knee Sleeve (KITT), was developed to track exercises and human movements. However, the KITT has not been previously validated against a standard criterion. Thus, the purpose of this study was to validate the KITT against an EG during a series of lower body exercises in active college-aged adults. **METHODS:** Following a five-minute warm-up on a stationary bike, participants ($n = 9$, age = 21 ± 1.3 yrs, body mass = 60.7 ± 2.8 kg) were fitted with the KITT on their left leg and an EG on the lateral joint line of their right knee. Participants then completed 6 exercises (squat jump, countermovement jump, broad jump, box jump, box drop, lateral hop) in a randomized order. A total of 3 sets of 8 repetitions was completed per exercise, with the exception of lateral hops, which consisted of 3 sets of 5 repetitions performed on each leg. Paired sample t tests were used to analyze differences in knee flexion values between the EG and KITT during the lower body exercises. **RESULTS:** No significant differences were found in knee flexion values between the EG and KITT during squat jumps, countermovement jumps, broad jumps, box jumps, box drops, or lateral hop exercises ($p \geq 0.05$). **CONCLUSIONS:** The KITT is an accurate device for measuring knee joint angle changes during lower body exercises and is effective for use outside of a laboratory. The KITT can be utilized during rehabilitation, practice, or game settings for measuring and monitoring knee angle range of motion.

P6: MEASUREMENT ERROR OF SIGNAL PROCESSING METHODS TO ESTIMATE VERTICAL CENTER OF MASS DISPLACEMENT DURING BIPEDAL HOPPING

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BACKGROUND: Double integration of the vertical ground reaction force (GRF) signal allows the estimation of center of mass (COM) displacement in various movement tasks. However, defining the integral of the vertical GRF signal over an extended time results in compounding error causing signal drift, which prohibits an accurate estimation of COM displacement. In this study, we compared measurement error of different signal processing methods to estimate vertical COM displacement from the vertical GRF during bipedal hopping. **METHODS:** Fifteen adults (age: 24±6 y; mass: 71.6±14.0 kg; height: 171.4±7.6 cm) completed 5, 10 and 15 consecutive bilateral hop trials on a force platform recording at 1000 Hz while vertical COM position was recorded using a 3D motion analysis system at 200 Hz. Vertical COM displacement was estimated from the vertical GRF in three ways: 1) double integration without additional signal processing, 2) double integration with linear detrending, and 3) double integration with cubic spline detrending. Vertical position from the motion analysis system was then used to compute root-mean-square error (RMSE) of each signal processing method and was compared using a 3 (method) × 3 (hop test) repeated measures ANOVA ($p < 0.05$). **RESULTS:** The cubic spline detrending method had significantly less cumulative RMSE ($p < 0.01$; 0.018±0.006) than double integration (0.913±0.945) and linear detrending methods

(0.075±0.084). Linear detrending for 10 hops ($p < 0.01$; 0.062±0.038) and 15 hops ($p = 0.002$; 0.135±0.119) had significantly greater RMSE compared to cubic spline detrending (10 hops: 0.016±0.006; 15 hops: 0.018±0.006), but not for 5 hops ($p = 0.057$; linear detrending: 0.028±0.017 vs. cubic spline detrending: 0.020±0.006). Double integration had significantly greater RMSE for all hop tests ($p < 0.01$; 5 hops: 0.151±0.126; 10 hops: 0.651±0.353; 15 hops: 1.938±0.919) compared to linear detrending (5 hops: 0.028±0.017; 10 hops: 0.062±0.038; 15 hops: 0.135±0.019) and cubic spline detrending methods (5 hops: 0.020±0.006; 10 hops: 0.016±0.006; 15 hops: 0.018±0.006). **CONCLUSION:** Cubic spline detrending had the smallest RMSE when compared to the double integration and linear detrending methods. We recommend cubic spline detrending of the vertical GRF signal should be used to minimize measurement error when estimating vertical COM displacement during bipedal hopping.

P7: EFFECTS OF LEAD LIMB AND JUMP HEIGHT ON VERTICAL GROUND REACTION FORCES DURING DROP JUMPS

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BACKGROUND: The drop jump (DJ) is a commonly used exercise for training lower body propulsion and power. Previous literature has shown that drop influences vertical ground reaction force (vGRF) and temporal characteristics. Whether the lead limb, dominant (DOM) versus nondominant (NDOM) - effects vGRF and temporal characteristics remains unknown. The purpose of this study is to evaluate the effect of lead limb and drop heights on average vGRF, impulse, initial ground contact time, and ground off time. **METHODS:** 24 physically active males (24.2±2.1 yrs, 1.78±.06 m, 79.4±9.4 kg) with six or more months resistance training experience completed eight DJs from four drop heights (30, 45, 60, 75cm). Participants alternated between using DOM and NDOM as the lead limb (4 trials each) for the drop phase. Upon landing with each foot on adjacent force plates, participants immediately performed a maximal effort vertical jump. The recorded vGRF, normalized to body weight (BW), under the DOM and NDOM feet were used to compute vGRF average (AV), impulse (IMP), initial ground contact time (IGCT), and ground-off time (GOT) DOM-NDOM differences. Lead limb and height orders were randomly assigned for each participant. Height by lead limb repeated measures analysis of variance were conducted for each measure, followed by post hoc trend analyses (ordinal height) and pairwise comparisons (nominal limb). **RESULTS:** IGCT demonstrated a significant height by lead limb interaction ($P < .001$). Post hoc comparison of significant linear height trends within each lead limb demonstrated that as DJ height increased, the DOM lead limb ($P < .001$, $d = .90$) deviation from symmetry was significantly different ($P < .001$, $d = .91$) than the NDOM lead limb ($P = .001$, $d = -.76$) trend towards more symmetry. Despite the height and lead limb influence on IGC, only significant limb effects were revealed for vGRF AV (D: .04±.10BW, ND: -.09±.09BW, $P < .001$, $d = 1.3$) and IMP (D: .03±.04BWs, ND: -.02±.04BWs, $P < .001$, $d = 1.3$). There were no statistically significant GOT findings ($P > .120$). **CONCLUSIONS:** Asymmetry in the vGRF AV and IMP favored the lead limb and was unaffected by DJ height. Future research should consider a more comprehensive analysis of vGRF characteristics, such as loading rate and peak vGRF, as well as joint kinematic and kinetic patterns.

P8: EVALUATION OF THE CRANIOVERTEBRAL ANGLE IN STANDING VERSUS SITTING POSITIONS

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BACKGROUND: The effects of body position on craniovertebral angle (CVA) values in young adults with varying degrees of head posture is unclear due to a paucity of studies with this focus. Research is needed to assist health and fitness professionals in their decision making when assessing the CVA in this population. The purpose of this study was to examine the effects of standing versus sitting body position on the CVA in young adults without pathology; and to investigate whether mean differences between positional CVA measures in subjects with severe forward head posture (FHP) are distinct from age-matched controls with normal head posture. **METHODS:** Ninety-eight young adults (68 women, 30 men; 20.12±2.05 y) without pathology (OVERALL; $n = 98$) volunteered for the study; those with a CVA > 53° were also included in a normal posture group (NORM; $n = 14$); those with a CVA < 45° were also included in a severe FHP group (SEV;

n=15). CVA assessments were conducted in standing and sitting conditions. RESULTS: Mean difference comparison of change in mean CVA between conditions revealed significantly ($p < 0.05$) higher CVA values in the standing condition (OVERALL: $50.0 \pm 5.2^\circ$; NORM: $56.6 \pm 2.7^\circ$; SEV: $41.2 \pm 3.2^\circ$) compared to the sitting condition (OVERALL: $47.8 \pm 5.7^\circ$; NORM: $55.9 \pm 2.8^\circ$; SEV: $39.0 \pm 4.0^\circ$). Mean difference comparison of between-group change in mean CVA between conditions revealed greater CVA change ($p < 0.05$) in the SEV group ($2.2 \pm 2.1^\circ$) versus the NORM group ($0.8 \pm 1.2^\circ$). CONCLUSIONS: Sitting CVA values may be lower (indicating greater FHP) than standing CVA values in young adults without pathology. Differences between standing and sitting CVA measures may be greater in young adults with severe FHP compared to peers with normal head posture.

P9: KINEMATIC PREDICTORS OF HORIZONTAL AND VERTICAL RELEASE ANGLE FOR DIVISION I BASEBALL PITCHERS.

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BACKGROUND: A pitcher's ability to locate the ball is a critical component of their performance. Research has shown that projection angle has the greatest influence on a throw's location at target, yet limited literature exists regarding the relationship between release angles and kinematics. This study aimed to investigate kinematic predictors of vertical (VRA) and horizontal (HRA) release angles during Division I collegiate baseball games. **METHODS:** Kinematic data for seventy-seven Division I collegiate pitchers ($1.88 \pm 0.06\text{m}$; $91.6 \pm 9.2\text{kg}$) were recorded using an 8-camera markerless motion capture system (KinaTrax Inc., FL, USA; 300 Hz). Ball flight metrics were collected with a Trackman V3 Game Tracking stadium unit. Kinematic and ball metric data were averaged for each pitcher, and variables exhibiting a significant relationship with VRA or HRA were included in two forward stepwise regressions ($p = .05$). VRA included 20 independent variables, whereas HRA included 15. **RESULTS:** Seven variables accounted for 69.4% of the variance in VRA ($R^2 = .694$; $F_{7,69} = 22.362$; $p < .001$). Trunk lateral flexion at foot contact (FC) ($\beta = -0.031$) and maximal external rotation (MER) ($\beta = 0.037$); shoulder abduction angle at MER ($\beta = -0.020$); displacement of the center of mass (COM) in the anterior-posterior direction at ball release (BR) ($\beta = 2.137$); elbow pronation at BR ($\beta = -0.012$); ball velocity ($\beta = -0.223$); and the timing of maximal knee extension velocity relative to BR ($\beta = .005$) were all significant predictors (all $p < .05$). For HRA, pelvis tilt ($\beta = 0.078$) and COM velocity in the medio-lateral direction at FC ($\beta = 1.164$), and shoulder abduction angle at MER ($\beta = 0.045$) were all significant predictors (all $p < .05$), accounting for 43.2% of the variance ($R^2 = .432$; $F_{3,69} = 18.531$; $p < .001$). **CONCLUSION:** Multiple kinematic factors appear to be key determinants of ball release angles during baseball pitching. By understanding the biomechanics associated with these release conditions, it is possible to determine which variables might be manipulated to improve ball projection towards target. For example, trunk lateral flexion might be used to alter VRA, whilst increasing shoulder abduction at MER may be used for either VRA or HRA.

P10: EFFECTS OF ACUTE VIRTUAL REALITY EXPOSURE ON DYNAMIC POSTURAL STABILITY

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BACKGROUND: Postural instability and the inability to regain balance during slip-induced events are the leading causes of falls on the same level in occupational environments. With the growing popularity of virtual reality (VR), individuals have the potential to be immersed in a realistic environment, exposing themselves to fall-risk hazards without the risk of injury real-world exposure may cause. Therefore, the purpose of this study was to compare lower extremity joint kinematics of the slipping leg during real and virtually generated slip-induced events. A secondary purpose was to investigate dynamic postural stability following acute exposures to real (REAL) and virtual (VR) environmental conditions. **METHODS:** A total of 14 healthy participants' [7 males, 7 females; age: 23.46 ± 3.31 years; height: 173.85 ± 8.48 cm; mass: 82.19 ± 11.41 kg; shoe size (men's): 9.03 ± 2.71] knee and ankle joint kinematics were compared during exposure to both REAL and VR environments. Participants then completed a series of Timed-Up-And-Go (TUG) variations (standard, cognitive, manual) at the beginning of data collection, then following exposure to each environment. Environmental exposure was selected in a counterbalanced order to prevent an order effect. Knee and ankle

joint kinematics were analyzed separately using a 2×3 repeated measure ANOVA to compare environments as well as gait types at an alpha level of 0.05. TUG variations were also analyzed separately using a 3×3 repeated measures ANOVA to compare TUG variations and environment. RESULTS: No significant differences were observed for knee or ankle joint kinematics between environments or gait types. There were also no significant interactions between environments and gait types. However, significant differences were observed for TUG-C following VR environmental condition ($p = 0.027$). Post hoc comparisons revealed significantly lower times for TUG-C following VR exposure ($p = 0.029$). No significance was observed for TUG-S or TUG-M. CONCLUSION: Based on the current findings, the lack of significance in lower extremity joint kinematics, as well as the improvement in TUG-C performance following acute VR exposure to slip hazards, demonstrate the potential effectiveness of VR as a means of fall prevention training for occupational populations.

P11: INVESTIGATION OF LUMO-PELVIC RHYTHM IN PEOPLE WITH HIP PAIN

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BACKGROUND: Prior studies have shown that aberrant lumbopelvic coordination (LPC) patterns could indirectly suggest alterations in neuromuscular control of trunk motion as well as altered lumbar joint loading. The effects of low back pain (LBP) on LPC have been previously studied yet despite the high incidence of LBP in those with hip-related pain (60%), the combined impact of LBP and hip pain (i.e. spine hip syndrome) on LPC is not well understood. Thus, the main objective of this study is to assess the LPC during a lumbar flexion/extension task in subjects with no hip pain, hip pain and concomitant LBP and hip pain. It is expected that this study will provide insight into the LPC that is associated with combined hip pain and LBP and will aid in developing interventions to optimize LPC to reduce LBP in people with concomitant hip and low back pain. **METHODS:** The data used in this study will consist of adults with no prior history of spinal or lower extremity surgery, BMI $< 35 \text{ kg}\cdot\text{m}^{-2}$ and will be derived from our current on-going research studies. These adults will be divided into three groups: 1) asymptomatic, healthy controls 2) hip pain 3) LBP and hip pain. The presence of hip pain and LBP will be self-reported by each participant and the Hip disability and Osteoarthritis Outcome Score (HOOS) survey and the self-report Numeric Rating Scale will be used to assess severity of hip and low back pain, respectively. A 3D gait analysis was performed of each participant while performing seven continuous repetitions of trunk flexion and extension at a self-selected speed while keeping their legs extended. A custom written MATLAB algorithm will be developed and used to assess peak thoracic, pelvic, and lumbar angles, thoracic, pelvic and lumbar range of motion and the lumbar-thoracic ratio (peak thoracic - peak pelvic/peak thoracic) measure. An ANOVA, with necessary adjustments for covariates, will be used to assess between-group differences in biomechanical outcomes with $\alpha = 0.05$ and multiple testing corrections performed as needed. **ANTICIPATED RESULTS:** It is hypothesized that the participants with hip pain and concomitant hip pain and LBP will exhibit altered LPC patterns compared to the control group. These data will help clinicians understand the potential role of the lumbar spine in development of LBP in those with hip pain and aid in developing interventions to treat people with hip-spine syndrome.

P12: EFFECT OF WALKING ON A SELF-PROPELLED VERSUS MOTORIZED TREADMILL ON COGNITIVE PERFORMANCE DURING DUAL TASKING

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Background: Dual tasking is the simultaneous performance of two tasks. Results of studies evaluating simultaneous treadmill walking and performance of a cognitive task are mixed, with some suggesting cognitive performance decrements, some showing increased fall risk, and others eliciting improvement in cognition. Self-propelled treadmills (SPT) lack a motor and rely on the user to propel the belt forward. These treadmills are gaining in popularity because their use elicits a greater physiological response than a traditional motorized treadmill (MT). However, how use of a SPT might impact dual tasking is unknown. Thus, the purpose of this study was to evaluate change in cognitive performance from baseline, seated conditions when using a SPT vs MT and simultaneously performing cognitive tasks. **Methods:** n=12 college age adults (21.0 years, 70.6 kg, 159.7 cm tall) visited the lab on two occasions during which they completed serial 7 subtractions, which required counting backward from a 3-digit number

by 7's for 2 minutes, and a word recall task, requiring recall of as many words as possible from a 75 word list they viewed for 3 minutes. Participants completed cognitive tests while seated and self-selected their preferred walking speed on the MT during a baseline visit. During the second visit, participants completed both cognitive tests under 3 conditions: MT walking at preferred speed, SPT walking at the matched preferred speed, and SPT walking at a self-selected unmatched speed. Repeated measures ANOVA was used to compare cognitive performance among the conditions. Results: There were no significant differences in serial 7 or word recall performance among any of the conditions, including no differences from seated performance ($p > 0.05$). The dual task cost, calculated as (dual task value - single task value) / single task value *100 was calculated to compare cost of gait vs cognitive changes, and dual task cost for cognition was significantly less than for gait ($p < 0.05$) though there were no differences in cost between the three treadmill conditions ($p > 0.05$). Conclusions: Collectively these data suggest that cognition improves when dual tasking compared to single tasking regardless of type of treadmill used.

P13: KINEMATIC DIFFERENCES BETWEEN FASTBALL NON-STRIKES AND STRIKES DURING DIVISION I BASEBALL GAMES

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BACKGROUND: Approximately 8.2% of all plate appearances in Major League Baseball in 2022 resulted in the batter being walked to first base. Since walks can be detrimental to a pitcher and their team's success, identifying possible causes is important. This study sought to investigate whether in-game kinematics differed between pitches that resulted in a walk (BB: base on balls), and those that resulted in a strikeout (SO). **METHODS:** In-game kinematic data were collected on Division I collegiate baseball pitchers using an 8-camera markerless motion capture system (Kinatrax Inc., FL, USA; 300 Hz). Concurrently, ball metric data were recorded for all pitches (TrackMan Baseball, Scottsdale, AZ). A preliminary analysis identified 17 pitchers (1.88 ± 0.04 m; 91.7 ± 5.7 kg) who threw both a fastball that resulted in a BB, and a SO (not including swinging strikeouts) in the same game. Nineteen kinematic parameters commonly identified in literature, along with vertical and horizontal plate locations, and ball velocity were compared for BBs and SOs using paired-samples t-tests. Where kinematic variables were included for multiple time points, Bonferroni corrections were applied to adjust for multiple comparisons ($p = .017$). **RESULTS:** T-tests revealed significantly more shoulder horizontal adduction (arm leading the trunk) at maximal external rotation (MER) ($3.7 [\pm 6.5]$ vs $1.6 [\pm 7.4]$ °; $t = 2.689$, $p = .016$), and greater horizontal plate deviation (left of the strike zone) ($-0.20 [\pm 0.31]$ vs $0.03 [\pm 0.23]$ m; $t = 2.391$, $p = .029$) for BBs. Additionally, ball velocity was significantly quicker for SOs ($40.9 [\pm 1.2]$ vs $40.7 [\pm 1.1]$ m.s⁻¹; $t = 3.248$, $p = .005$). **CONCLUSIONS:** With the exception of horizontal shoulder adduction at MER, kinematics were similar for BBs and SOs. Although variability (standard deviations) was comparable for all variables, the dispersion in plate location was not. The noticeable difference in horizontal strike zone location between BBs and SOs suggests that pitchers may change their intended target when the likelihood of a walk is increased. Though this could be a strategy employed to increase the difficulty of being hit for a run (by throwing the ball away from the batter), it ultimately appears to be detrimental to their performance. Therefore, it may be more beneficial for pitchers to utilize the same target location to increase their chances of throwing a strike.

P14: DIFFERENCES IN THROWING PHASE DURATIONS BETWEEN FAST AND SLOW TRANSFER TIMES IN YOUTH BASEBALL CATCHERS

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BACKGROUND: Transfer time in baseball catching is the duration of time from receiving a pitch until the ball is released for a throw to second base. While transfer time is vital to a catcher's success, research in baseball catching has mainly focused on the kinematics influencing throw velocity, rather than the duration of transfer time. Therefore, the purpose of this study was to compare the duration of throwing phases between fast and slow transfer times in youth baseball catchers. **METHODS:** Kinematics of twenty-one youth catchers (12 ± 3 yrs, 52.7 ± 14.8 kg, 1.57 ± 0.15 m) were recorded and analyzed using an electromagnetic motion capture system (100Hz). Transfer

time for the throwdown consisted of three phases: start phase (movement initiation to stride foot contact), arm-cocking phase (stride foot contact to maximum shoulder external rotation), and acceleration phase (maximum shoulder external rotation to ball release). Two repeated measures MANOVAs were used for within-subject comparison for the fastest and slowest trials for each participant. The first analysis (TT) compared the total time (sec) spent in each phase of the event, while the second analysis (PT) examined the percentage of time spent in each phase of the event. **RESULTS:** Significant within-subjects differences were observed for the fast and slow trials in the TT analysis ($F_{3,18} = 6.20$, $p = .004$). Follow-up univariate analysis for TT showed the start phase being significantly quicker ($F_1 = 15.33$, $p < .001$) for fast trials (0.77 ± 0.24 s) compared to slow trials (1.17 ± 0.49 s). Remaining phases presented no differences in the TT analysis ($p > .514$). The PT analysis also revealed significant differences between the fast and slow trials ($F_{2,19} = 9.80$, $p = .001$). Follow-up univariate analysis for the PT test revealed that in the fast trials the start phase was significantly shorter (75.9 ± 7.7 vs 81.9 ± 6.9 %; $F_1 = 12.23$, $p = .002$), whereas the arm-cocking (18.63 ± 6.4 vs 14.35 ± 5.5 %; $F_1 = 8.95$, $p = .007$) and acceleration phases (5.5 ± 2.2 vs 4.2 ± 2.0 %; $F_1 = 19.82$, $p < .001$) were longer. **CONCLUSION:** Fast trials resulted in less time spent in the start phase compared to slow trials. The percentage of total throw also varied between fast and slow trials with cocking and acceleration phases taking up larger percentages of time for fast trials. Considering these findings, catchers should focus on decreasing the time of their start phase to optimize their performance.

P15: CAN A GENERIC STRENGTH TRAINING PROGRAM IMPROVE BALANCE: A CASE STUDY

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BACKGROUND: In the United States, falls lead to approximately 50 billion dollars a year in medical costs. Additionally, over 44,000 deaths were directly attributed to falls in 2021. This study aimed to investigate whether a generic free-weight strength training program could improve balance in a community-dwelling older adult, potentially reducing the likelihood of future falls. **METHODS:** The participant was a 68-year-old male college professor with multiple comorbidities who reported performing no exercise in the last five years. The participant was assessed using the 10-meter walk test (10MWT), 30-second sit-to-stand test, mini-Balance Evaluation Systems Test (mini-BESTest), Berg Balance Scale (BBS), and five-repetition maximum (5RM) for box squats, deadlift, and bench press. The participant completed a 6-week generic free-weight strength training program, followed by a reassessment of all outcome measures. **RESULTS:** The participant increased gait velocity on the ten-meter walk test by 0.16 m/s from the pre-test to the post-test. An increase of 0.13 m/s equals a substantial change of minimally clinically important difference, and an increase of 0.10 m/s is a substantial change in responsiveness. The participant's mini-BESTest score increased from 23 out of 28 to 27 out of 28, achieving the minimum detectable change of 4. The participant's BBS score increased from 51 out of 56 to 55 out of 56. The score increase to 55 places the participant at the mean score for community-dwelling 60-69-year-olds. The increase of 4 points is above the minimal detectable change of 3.3 points. **CONCLUSIONS:** In this study, a 6-week generic free-weight strength training program improved balance in a sedentary 68-year-old male with multiple comorbidities. The results potentially demonstrate that this type of strengthening program may be used as a means of fall prevention in the older adult population. Future research should examine the long-term benefits of free-weight strength training on balance and use a larger sample size to increase the generalizability of the findings.

P16: EXAMINATION OF SAGITTAL ANKLE KINEMATICS IN COMPRESSIVE NON-SLIP SOCKS ON DIFFERENT SURFACES

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PURPOSE: Non-slip hospital socks were implemented to reduce slips in clinical settings. However, these socks have not kept pace with the developments of sock enhancements. This study was conducted to investigate differences in maximal plantarflexion and mean sagittal plane kinematics while walking in compressive non-slip socks across common surfaces used in clinical settings. **METHODS:** Twelve female participants (age 22 ± 2 years; height 1.68 ± 0.04 meters; weight

73.68 ± 15.30 kilograms) completed three walking trials at a self-selected pace for each condition. In randomized order, they walked across either linoleum or rubber surfaces. Data was collected through Vicon and exported to Visual3D for processing. A paired sample t-test analyzed maximal plantarflexion and maximal sagittal angular position during the stance phase. RESULTS: No significant differences were found between maximal plantarflexion ($t(11) = 0.43, p = 0.67$) and mean sagittal plane kinematics ($t(11) = 0.17, p = 0.87$).

CONCLUSION: The main finding of this study showed that there is no significant difference in sagittal plane ankle kinematics while wearing compressive non-slip socks on rubber and linoleum surfaces. The lack of differences between conditions indicates that common surfaces in clinical settings do not elicit alterations in sagittal ankle gait mechanics, regardless of friction variability. Future studies comparing different types of non-slip socks should be considered to determine which non-slip sock produces optimal walking biomechanics within clinical settings without changing gait kinetics.

P17: THE IMPACT OF DIFFERENT SOUNDS AND NOISES ON STATIC AND DYNAMIC POSTURAL STABILITY

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BACKGROUND: The visual, vestibular, and somatosensory-proprioceptive systems are responsible for afferent information to maintain postural stability. Postural stability can be impacted by sounds that cause disturbances and perturbations to the vestibular (inner ear organ responses) and the visual (acute oculomotor responses) systems. The purpose of the study was to assess the impact of different types of sounds and noises on both static and dynamic postural stability. METHODS: A total of 20 participants (12 females & 8 males; age: 21.35±1.79 years; height: 170.7±9.3 cm; mass: 66.725±14.1 kg) were tested using the Limits of Stability (LOS) on the BTrackS™ balance plate and a Timed-Up-and-Go (TUG) tests, when exposed to four different sounds and occupational noises in a randomized order with a no sounds (NS) control performed initially [construction noise (CN), white noise (WN); sirens (SR), and nature sounds (NA)]. The sounds and noises were delivered through an over-the-ear Bluetooth headphones with an intensity range of 70-80 dB and had 5 minutes of rest in between each sound/noise condition. Center of pressure (COP) total sway area (cm²) from the LOS and time to completion of TUG (seconds) were analyzed using a one-way repeated measures of analysis of variance at an alpha level of 0.05. RESULTS: Significant differences between the sounds and noises was observed for TUG [$F(4,76)=9.683, p<0.001; \eta_p^2=0.338$] but not for LOS [$F(4,76)=1.013, p=0.406; \eta_p^2=0.051$]. Pairwise comparisons for significant main effect for TUG revealed that NS demonstrated significantly slower time to completion compared to CN, WN, SR, but not NA. CONCLUSIONS: Findings suggest that the different sounds and noises did not impact static postural stability during LOS that involved voluntary excursion of COP, while maintaining the same base of support (BOS). However, during dynamic postural stability with changing BOS during TUG walking, exposure to noises of CN, SR, and WN, demonstrated a faster time to completion, compared to no sounds or nature sounds. This may be attributed to anxiety induced by the noise immersion and perception of sounds, compared to calm nature sounds, and no sounds. Findings can aid in better understanding the impact of different occupational noises on postural stability and emphasize the need for better noise protection and reduction in loud work environments.

P18: THE EFFECTS OF ELASTIC BANDS ON JOINT ANGLE KINEMATICS IN FORWARDS AND BACKWARDS SHUTTLE SPRINTS

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BACKGROUND: Elastic bands are used as a training modality to help improve different aspects of an individual's ability to sprint. It is important to ensure that the specificity of the exercise is understood so that proper use and application of elastic bands training can be applied. The purpose of this study was to compare the ankle, knee and hip joint kinematics during forward and backward shuttle sprints with the addition of resistance or assistance bands compared to without elastic bands. METHODS: Eight college and high school aged (19.9±3.5 yrs), competitively active female soccer players completed forward and backward 10m shuttle sprints while elastic bands provided either assistance or resistance. Additional forward/backward sprints were

completed with just body weight (BW). The order of sprint direction and load were randomized between participants. Following a familiarization period, participants were outfitted with electromagnetic receivers (feet, shanks, thighs, pelvis) and two synchronized foot switches. Two sets of 8 sprints under each condition were completed. At the sprint midpoint (5m), dominant limb ankle, knee, and hip angular distance (AD) during stance phase were computed and statistically analyzed with a joint by condition by direction analysis of variance. RESULTS: With a statistically significant 3-way interaction ($P<.001$), separate joint by condition interaction contrasts for each direction were conducted. For forwards sprints, resistance prompted significant reductions in knee AD compared to BW ($P=.001, d=3.6$) and assistance ($P=.013, d=2.2$) whereas assistance ($P=.012, d=1.5$) and resistance ($P=.001, d=2.9$) caused a reduction in hip AD compared to BW; there were no significance changes in ankle AD ($P>.115$). For backwards sprints, load did not significantly impact AD (interaction: $P=.382$; main effect: $P=.141$). Post hoc of a significant joint main effect ($P<.001$) revealed knee AD to be significantly greater than ankle ($P=.003, d=1.3$) and hip ($P<.001, d=1.9$); additionally, ankle AD was significantly greater than hip ($P<.001, d=2.8$). CONCLUSION: These results show that the AD changes may prompt a change in exercise specificity when using elastic bands to train in the forwards direction. However, based on the lack of statistically significant results, the use of elastic bands to train in the backwards direction does not seem to have an impact on the specificity of the exercise.

P19: ALTERED TOTAL JOINT MOMENT OF THE HIP DURING WALKING IN PEOPLE WITH MARFAN SYNDROME

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BACKGROUND: Marfan syndrome (MFS) is an inherited connective disorder that is associated with muscle weakness and ligamentous laxity. Despite documented ligamentous laxity and muscle weakness, the implications of altered musculoskeletal function on the high rate (46%) of self-reported hip pain in the MFS population is not well understood. Assessment of the hip joint loading patterns that occur in individuals with MFS may provide an understanding of this population's high risk of developing hip pain. Therefore, the purpose of this study was to assess hip joint loading during walking that may help to explain the presence of hip pain in individuals with MFS. METHODS: Thirteen individuals with MFS and thirteen asymptomatic controls were used in this cross-sectional study. Participants underwent 3D gait analysis while walking at the average level ground walking speed (1.35 m/s) for males and females. Using a custom written MATLAB script, the total joint moment (TJM) of the hip joint, was calculated as the square root of the sum of the square of the internal sagittal, frontal, and transverse plane moments, at each frame of the stance phase (initial contact to toe-off). The corresponding sagittal, frontal, and transverse plane moments at the peak TJM in the first and second half of the stance phase were extracted and their percent contribution to the peak TJMs was calculated. Between-group differences in peak TJMs, moments at the TJMs and the corresponding percent moment contributions to the hip TJMs were assessed using an analysis of covariance, adjusting for age, with $p<0.05$ used for statistical significance. RESULTS: Compared to the control group, the MFS group exhibited a 1.2x larger first peak TJM ($p=0.031$) and a 1.5x larger first peak abduction moment ($p=0.024$). Although no differences were observed in the second peak TJM, the MFS group exhibited a 1.2x larger abduction moment ($p=0.021$) compared to the control group. CONCLUSIONS: Higher abduction moment at the first and second peak TJM in the MFS group may contribute to altered total hip joint loading and may be associated with the high rate of hip pain in MFS. Future work will include a larger sample size as additional TJM-related parameters were underpowered to detect a statistical difference. Research Support: The Marfan Foundation, NIH (KL2-TR001996, K01-AG073698, & K01-HL149984)

P20: TECHNICAL VIDEO ANALYSIS OF ELITE AMERICAN FOOTBALL ATHLETES DURING VERTICAL JUMP

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BACKGROUND: A player's performance in the National Football League (NFL) combine can greatly affect when they are drafted, and therefore can affect their contracts and signing bonuses. Vertical jump is one of six different non-position specific drills that prospective NFL players

complete at the NFL combine and is highly associated with biomechanics and other performance measures. Therefore, this study aimed to determine the techniques that lead to a higher vertical jump. METHODS: Two researchers independently reviewed videos of 50 different players performing a vertical jump and came to a consensus on the following variables: whether the athletes rocked back on their heels prior to jump, where they landed with respect to their take-off, whether their feet came off the ground during the countermovement, if their knee flexed in the air, and if their knee flexed greater than 45 degrees while in the air. These factors were investigated using an Analysis of Variance (ANOVA) with an alpha level of 0.05. Each factor was treated as an independent variable in a separate one-way ANOVA, with normalized vertical jump height as the dependent variable. RESULTS: The ANOVA results revealed that both 'Feet came off ground during countermovement' ($p = 0.01$) and 'Rock back on heels' ($p = 0.03$) had a significant effect on the normalized vertical jump height. However, 'Where did they land?' ($p = 0.3$) and 'Knee Flexion in Air' ($p = 0.51$) did not show a significant effect. CONCLUSION: The significant difference with whether an athlete's feet came off the ground and whether they rock back on their heels suggest that preparatory actions during the countermovement phase can influence the outcome of the vertical jump. Future studies will investigate whether these findings can be applied to training a higher vertical jump and if they coincide with a larger population than just elite athletes.

P21: EFFECTS OF SEX AND LIMB ON ISOKINETIC QUADRICEPS CONCENTRIC TO HAMSTRINGS ECCENTRIC WORK RATIOS

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BACKGROUND: Several mixed isokinetic ratios of eccentric knee flexor (KF) peak torque (PT) to concentric knee extensor (KE) PT have demonstrated to aid in predicting hamstring injury. As PT is based upon the single maximal value recorded through a range of motion, considering the sustainability of PT production through the ROM might provide additional insight by measuring the average work values. PURPOSE: To explore mixed average work per repetition ratios (AWPRR) between test velocities, limbs, and sexes. METHODS: Following a standardized warm up, 20 healthy and physically active women (23.3 ± 3.5 years) and 20 men (25.3 ± 3.0 years) performed concentric (c60 and c240 degrees-s⁻¹) and eccentric (e30 and e120 degrees-s⁻¹) knee flexion and extension protocols using both the dominant and non-dominant limbs. The order of limb and test mode were randomized. The average work for each repetition from each set was used to create three eccentric hamstring to concentric quadriceps ratios: e30/c240, e120/c240, and e30/c60. A limb, by sex by ratio analysis of variance was used for statistical analysis. RESULTS: While there were no significant limb or sex effects on the work ratios based on the interactions and main effects ($P > .296$), there were significant differences between the ratios ($P < .001$). Post hoc analyses revealed the e120-c240 ($107.3 \pm 28.9\%$) to be significantly greater than e30-c60 ($P < .001$, $d = .78$) and e30-c240 ($P < .001$, $d = .60$). Additionally, the e30-c60 ($85.8 \pm 18.9\%$) was significantly greater ($P = .001$, $d = .26$) than the e30-c240 ($78.1 \pm 21.7\%$). CONCLUSION: AWPRR were similar between the limbs and sexes in healthy individuals. This provides clinicians with some additional preliminary criteria for potential injury screening and rehabilitation discharge (i.e., conducting bilateral comparisons, and unilateral ratios). The ratio differences revealed are consistent with the eccentric and concentric force-velocity relationships. Future research is suggested to consider the efficacy of AWPRR for hamstring injury and reinjury risks.

P22: INFLUENCE OF ONSET MOVEMENT THRESHOLD ON PHASE DURATION DURING THE COUNTERMOVEMENT JUMP

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BACKGROUND: A primary concern in the vertical jump literature involves the methods used in the analysis of force-time data obtained during the jumping tasks. When analyzing this data, the first decision that needs to be made is the onset movement threshold that is used. Previous investigations have examined the use of different onset movement thresholds in the squat jump and isometric mid-thigh pull tasks, finding that the use of 5 times the standard deviation of the weighting phase provided the highest level of reliability and maintained a large portion of the force-time data. Thus, this investigation sought to compare different onset movement thresholds on temporal variables of the countermovement jump (CMJ).

METHODS: 11 female collegiate volleyball athletes participated in this investigation. Participants completed two maximal effort trials. Each trial was separated by thirty seconds. All trials were performed on a portable force platform sampling at 1000 Hz. Each trial was analyzed using each onset movement threshold. A within-subject repeated measures analysis of variance was used to compare four thresholds reported in the literature. RESULTS: Statistically significant differences between thresholds for time to take off were seen ($f(3,30) = 9.76$, $p < 0.001$). The use of 10 N threshold produced the greatest time to take off (991.95 ± 192.12 ms) which was statistically higher than all other thresholds. A 5% threshold had the lowest time to take off (834.14 ± 90.50 ms) and was statistically lower than all other thresholds. Similarly, statistical differences were present in unweighting phase duration ($f(3,30) = 8.97$, $p < 0.001$). 10 N threshold produced the greatest unweighting phase duration (468.05 ± 165.42 ms) which was statistically higher than all other thresholds. 5% threshold had the lowest unweighting phase duration (313.86 ± 44.45 ms) which was statistically lower than all other thresholds. No statistical differences were present in braking duration ($f(3,30) = 0.48$, $p = 0.70$) and propulsive duration ($f(3,30) = 1.37$, $p = 0.27$). CONCLUSIONS: This investigation found supporting evidence that the use of low absolute threshold values produced the greatest durations, while the use of a relative threshold produced the shortest durations. Thus, researchers and practitioners should use caution selecting onset movement thresholds as this can greatly impact interpretation of temporal variables derived from data in the CMJ.

P23: COMPARISON OF INSTABILITY DEVICES ON MEASURES OF SINGLE LIMB POSTURE SWAY PARAMETERS

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BACKGROUND: Single limb balance training is an integral part of both the prevention and rehabilitation process of lower extremity injuries. Practitioners use instability devices to provide a progressive overload to an individual during single limb balance training sessions. Previous investigations have shown that when using instability devices differences may or may not exist in postural sway parameters during use depending on the specific devices being assessed. Thus, this investigation sought to examine differences between a commonly used foam pad and a novel instability device (block) in measures of postural sway. METHODS: 22 healthy individuals with no history of lower extremity injury and neurological disorders participated in this investigation (age 21.66 ± 0.74 years, height 167.07 ± 10.74 cm, body 67.76 ± 13.45 kg). Participants performed three conditions of single limb static balance on a force platform sampling at 120 Hz. Each condition contained three 20 second trials separated by thirty seconds. The mean center of pressure (CoP) values of the three trials in each condition were then compared using a within-subjects repeated measures analysis of variance. RESULTS: Statistically significant differences were seen in sway area between conditions ($f(2,42) = 5.28$, $p = 0.009$), with the control (9.64 ± 4.53 cm) being significantly lower than both the foam pad ($13.05 \text{ cm} \pm 4.25 \text{ cm}$) and block (12.33 ± 3.37 cm). Statistically significant differences were seen in CoP path length between conditions ($f(2,42) = 5.52$, $p = 0.007$), with the control (67.51 ± 9.49 cm) being significantly lower than both the foam pad ($74.36 \text{ cm} \pm 9.76 \text{ cm}$) and block (76.38 ± 14.84 cm). Maximal medial-lateral CoP displacements were significantly different between conditions ($f(2,42) = 6.24$, $p = 0.004$). Lower displacements were seen in the control (1.39 ± 0.20 cm), which was statistically different from both foam pad (1.59 ± 0.24 cm) and block (1.53 ± 0.25 cm). Maximal anterior-posterior CoP displacements were not significantly different between conditions ($f(2,42) = 1.50$, $p = 0.23$). CONCLUSIONS: This investigation provides supporting evidence that different instability devices may provide similar changes in postural sway parameters in comparison to control conditions. The novel block instability device used in this investigation may be used in a similar fashion to the traditional foam pad in both prevention and rehabilitation settings based on no differences being found between the two devices.

P24: CORRELATIONS IN BASEBALL PITCHING KINETICS DURING A FASTBALL PITCH WITH SINGLE-LEG SQUAT KNEE VALGUS.

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Introduction: The kinetic chain principle considers the body as a system of rigid links that allows for force distribution and energy

transfer between segments. However, breaks within the kinetic chain caused by movement contraindications like dynamic knee valgus, can disrupt force transfers and increase injury susceptibility. Movement assessments such as the single-leg squat can assess the entire kinetic chain including knee motion. Knee valgus observed during the single-leg squat has been linked to knee valgus in the baseball pitching motion. Previous literature has determined that weakness in the kinetic chain during the baseball pitching motion increases injury susceptibility among baseball pitchers. This kinetic chain disruption caused by knee valgus during the fastball pitch could affect energy transfer from the proximal segments of the kinetic chain to the more distal segments in the upper extremity. Therefore, the purpose of this study is to use the single-leg squat to investigate the relationship between knee valgus in the single-leg squat and maximum shoulder internal rotation torque and maximal elbow varus occurring during the baseball pitching motion. Methods: Data is currently being collected on a group of Division II baseball pitchers. Once consent is signed, participant will be hooked to an electromagnetic motion capture system and digitized. Participant will perform three single leg squats on their non-dominant leg. Peak values of knee valgus during all three trials will be collected between 45 degrees of knee flexion during the descent and 45 degrees during the ascent and averaged for analysis. Next participants will perform three overhand, fastball pitches with their dominant pitching arm. Peak shoulder internal rotation and peak elbow varus will be recorded during the pitching motion. Depending on normality of data, either a Pearson-product moment or Spearman-rank order correlation will be used to analyze data relationship using JASP 0.10.2. Expected results and conclusion: We expect that knee valgus seen in the single-leg squat will show moderate to strong correlation with peak shoulder internal rotation and peak elbow varus torque.

P25: USING RESISTANCE TRAINING TO EVALUATE IMPROVEMENTS IN DEPRESSIVE SYMPTOMS IN COLLEGE STUDENTS

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BACKGROUND: While research about the relationship between mental health and exercise has been studied, there has been little research into the effects of resistance training on mental health. People enjoy many ways to exercise and given the current literature, most studies have focused on aerobic exercise instead of resistance training. Additionally, autonomously working out (e.g., self-selected exercises) opposed to planned workouts (e.g., prescribed exercises) has shown more improvement in mental health. Finding more types of exercise that improve mental health allows for greater outreach and improving the mental health of more individuals. The purpose of this study was to evaluate the effectiveness of resistance training in improving depressive symptoms. **METHODS:** We plan to recruit about 20 male and female participants from Elon University who have not consistently done resistance training (2 times a week for the past 3 months). Through a four-week intervention, participants will perform either a planned workout program or an autonomous workout program three days per week where an exercise log will be kept. The Borg Rating of Perceived Exertion (RPE), Feeling Scale (FS), and Felt Arousal Scale (FAS) will be self-reported before, during, and after the workouts in the exercise log. Additionally, participants complete the Warwick-Edinburgh Mental Wellbeing Scale and the Depression, Anxiety, and Stress Scale-21 (DASS-21) to evaluate their mental health before the study began, two weeks in, and after the four weeks. A Repeated-Measures Multivariate Analysis of Variance will be used to determine if there are significant differences in mental health over time (pre, during and post intervention). **ANTICIPATED RESULTS:** We hypothesize that both groups will show improvements in mental health following the intervention, but the autonomous resistance training group will show greater signs of improvement in their depressive symptoms and overall mental health throughout the four-week intervention compared to the planned workout group. We still think that the group that has been prescribed a specific workout program will see an improvement, but it will not be as large as the autonomous group.

P26: EXPLORING MISALIGNMENT OF SLEEP-WAKE RHYTHM AND ITS IMPACT ON STRESS IN HIGH SCHOOL SENIORS

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Background: Previous studies have found that approximately 60% of young adults suffer from poor sleep quality. Poor sleep has been associated with higher stress levels and mental illness. Higher stress levels and mental illness have been associated with alterations in the sleep-wake cycle. The term social jet lag refers to the concept of one's midpoint in sleep changing on weekends relative to weekdays. Social jet lag is directly associated with changes in sleep-wake rhythm. The time of one's senior year of high school is a transitional time in one's life as students are preparing to go to college, and this is linked to psychological stressors and behavioral changes such as sleep schedule changes. Therefore, the purpose of this study was to evaluate the effects of sleep-wake rhythms, social jet lag and changes in perceived stress in high-school seniors. **Methods:** This cross-sectional study recruited 84 high school seniors, (69% female), (18±1 years), (body mass index 24±5 kg/m²). Perceived stress was assessed using a 10-item Perceived Stress Scale (PSS-10) during participants' high school senior year. The sleep-wake pattern was assessed using Actigraph GT9X Link accelerometers, worn for 7 consecutive days and a sleep log. Social jet lag was determined by finding the difference between the midpoint of sleep on weekdays compared to weekends and divided into three groups <1h, 1-2h, ≥2h. **Results:** PSS-10 was not significantly correlated with the change in sleep midpoint, although it was related separately to the average sleep midpoint on weeknights (r=0.28, p=0.012) and on weekends (r= 0.29, p=0.009). In addition, there was no significant difference (p=0.32) observed between PSS-10 and the social jetlag groups (<1h, 1-2h, ≥2h). **Conclusion:** Social jetlag did not influence the difference in perceived stress levels. However, participant stress levels tended to be higher when they go to bed later on both weekdays and weekend days. This does not necessarily imply that going to bed later causes greater stress, as it could be the other way around. **Grant Information:** Funding for this project was provided by the National Heart, Blood, and Lung Institute of the National Institutes of Health under award number R15HL159650 and through Elon University's Undergraduate Research Program.

P27: LISTEN, BREATHE, MOVE - A PILOT WORKSHOP FOR INFORMAL/FAMILY CAREGIVERS

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INTRODUCTION: Informal caregivers (ICG) have been noted to experience decreased physical and psychological well-being due to the complex demands of their care duties. The purpose of the study is to investigate the acceptability and feasibility of a novel intervention, which involves combined evidence-based yoga and music therapy techniques for guided breathing and relaxation of ICG of adult care receivers. **METHODS:** Participants engaged in a one-time virtual integrated yoga and music therapy intervention conducted in Summer 2023. The intervention began with music-assisted guided breathing for 5 minutes, which was led by an undergraduate music therapy student. The intervention then transitioned into the yoga portion, which was led by a kinesiology student. The yoga portion consisted of guided flexibility exercises, with modifications as needed, for 20 minutes. To end the workshop, the music therapy student completed music-assisted relaxation with verbal meditation for 10 minutes and both students educated participants on how to use yoga and music therapy at home. Participants completed pre-post test session measures including demographics and the Feeling Scale. **RESULTS:** Participants (N = 14) were 59.2 ± 10.5 years, 71.4% White, and 100% Female. Prior to engaging in the integrated yoga and music therapy session, participants' Feeling Scale score was 2.6±1.2; after the session the score increased to 4.2±1.1 (p < 0.00). **CONCLUSION:** Findings from the novel intervention suggest that a single bout of an integrated yoga and music therapy session may increase ICGs' overall positive feelings. Despite the novelty of the intervention, there are areas for future research. The small sample size of this pilot study makes it difficult to draw broad conclusions about the effectiveness of the intervention, thus future interventions should attempt to increase sample size for generalizability. This study also focuses on a single-session workshop, which may not capture the long-term effects of the intervention. Therefore, future research should utilize a long-term intervention with multiple sessions for ICGs, which may improve ICG's overall well-being. If successful, this intervention has the potential to improve ICGs' quality of life and well-being and potentially their care recipients' quality of life as well.

P28: A BIOPSYCHOSOCIAL PERSPECTIVE POST ACL SURGERY: WHEN AN EXERCISE SCIENCE STUDENT AND CLIENT ARE ONE

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BACKGROUND: The number of ACL injuries has increased sharply over the last 20 years with 250,000-300,000 cases annually. Exercise Science (ES) practitioners often work with clients post ACL injury and surgery, but no studies illuminate the Psychosocial (PS) factors informing critical aspects of client management. The goal of this case report is to describe biological, psychological, and social factors associated with ACL injury through the lens of a 21-year-old female Exercise Science student who experienced 3 ACL reconstructions.

METHODS: The history included a PAR-Q, review of systems, health history, Lower Extremity Functional Scale (LEFS), Tampa Scale for Kinesiophobia (TSK) and the SF-36 quality of life assessment. Fitness assessments included posture, gait, range of motion (ROM), strength, balance, coordination, proprioception, and motor control. An ACL MD protocol was followed for ROM, strength, brace wear, proprioception, and patellofemoral mobility. Anticipated return to sport was approximately 9 months. Due to the lack of insurance coverage, management consisted of 0 MD follow-up visits, 4 PT sessions and an independent home program with self-directed management.

RESULTS: At 18 weeks post-surgery, assessment indicated a significant delay in recovery. Deficits included: ROM 10% with 6/10 pain, strength 50%, balance 30%, proprioception 10%, motor control 55%, coordination 35%, LEFS score 50%, TSK and SF36 33%. Numerous PS factors played a crucial role delaying recovery and were responsible for 90% of the non-compliant behavior. These factors included fear, lack of time, embarrassment by inability to workout normally, worrying about monopolizing gym space and equipment, lack of external accountability, stress and anger associated with insurance complications, as well as frustration and dejection not meeting the protocol timeline. Effective practitioner PS communication strategies yielded several "breakthroughs", reversed discouraging emotions and lead to hope and internal motivation which resulted in improved compliance and functional performance.

CONCLUSION: The aim of this case report was to illustrate the importance of addressing PS factors in ES. This case offers non-exercise interventions that drastically impacted behavior for a client extremely knowledgeable in exercise. To provide best practice, exercise science professionals must be sensitive to PS factors and possess effective behavioral strategies to truly enhance our clients' quality of life and meet societal needs.

P29: DIFFERENCES IN PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR AMONG COLLEGE STUDENTS BY SEX AND AREA OF STUDY

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Purpose: Roughly 30% of college students do not meet physical activity (PA) guidelines and many students report high levels of sedentary behavior (SED). Limited data alludes that PA differences can vary by class level, gender, age, and living facilities. However, focusing on different areas of study among college students potentially provides insight on differences in PA and SED behaviors among students. The examination of college students' PA and SED behaviors according to area of study may lead to a more targeted approach for PA promotion and SED reduction on the university campus. Therefore, purpose of this study was to explore differences in PA and SED among college students by sex and area of study. **Methods:** Male (n=23; 19.87±1.5yo) and female (n=60; 19.7±1.3 yo) college students were assessed for PA and SED over 7 days via accelerometry using the ActiGraph GT9X and activPAL3, respectively. Two-way ANOVAs assessed differences in PA and SED according to area of study (Education, Engineering, Arts & sciences, Business/public affairs/journalism, and other), sex (Male and Female), and the interaction of these two factors. **Results:** On average, students engaged in 64.0±21.9min/day of moderate-intensity PA, 8.8±9.2 minutes/day of vigorous-intensity PA, and 7.6±1.5 hours/day of SED. There were no significant differences in moderate-intensity PA by area of study (p=0.636), sex (p=0.601) or the combination of these factors (p=0.507). Vigorous-intensity PA however, was higher among males in Education (32.5±4.5min/day) and Engineering (16.4±3.2min/day) compared to females in those areas of study (6.9±2.2 and 5.7±3.2, respectively). There were no significant differences in SED by area of study (p=0.286), sex (p=0.363), or the interaction of these factors (p=0.498). **Conclusion:** Moderate-intensity PA and SED did not differ by area of study, sex, or any combination of these factors. However, males in Education and Engineering compared to females in the same area of study, showed a higher level of vigorous PA per day. More research may be required using more representative samples to see if any type of PA or SED differs by sex or area of study. For vigorous PA,

more targeted health promotion messaging can be displayed in these areas of campus in order to help promote more PA and ultimately a healthier lifestyle for those who reported less vigorous PA per day.

P30: EFFECTS OF INGESTED COLORED SOLUTION ON SELF-PACED RUNNING PERFORMANCE

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Background: The effect of color usage in marketing and consumer behavior has been widely studied, and most evidence suggests the ability of color to influence emotion and behavior. Previous research has shown that mouth rinsing with a colored (pink) non-caloric, artificially sweetened mouth rinse resulted in improvements in self-selected running speed in healthy, habitually active participants when compared to rinsing with a clear solution. Fluid consumption during exercise is important for performance, but whether the color of the fluid, when volume is controlled, influences exercise performance is not known. Thus the purpose of this study was to examine the effects of ingestion of a colored solution (pink, brown, and control) on self-selected running speed and distance traveled in healthy, habitually active college-age males and females. **Methods:** Males and females who regularly participated in at least 3 days/week of moderate to vigorous intensity activity, including running as a regular part of their exercise regimen, were invited to participate. Participants (20.6±1.3 yrs; 68.1±3.4 in, 159.2±25.3 lbs) visited the laboratory on three occasions and were told that the purpose of the study was to investigate hydration levels; thus, they provided a urine sample for evaluation of hydration level at the beginning of each visit to reinforce the blinding to the true purpose of the study. Participants then performed a 2-min warm-up at self-selected speed on the Woodway Curve 3.0 treadmill, which allows the user to control the speed of the belt. After the warm-up, participants were given 2 minutes to consume an 8 ounce bottle of the colored water and were then instructed to cover as much ground as possible during a 10-min run; order of trials (pink, brown, clear) was counterbalanced. At the 5-min mark, participants straddled the treadmill belt and consumed another 8 ounces of colored liquid and then completed the trial. Total distance covered, average speed, and rating of perceived exertion (RPE) were recorded, and visual analog scales were used to assess feelings of thirst, pleasure, and enjoyment. One way ANOVA was used to compare the three trials, with $\alpha=0.05$. **Results:** There were no significant differences among groups for total distance covered, average speed, or RPE (p<0.05). Likewise, there were no differences in perceived enjoyment, pleasure, or thirst (p<0.05). **Conclusions:** These data indicate that consumption of colored fluid does not impact running performance or perception of performance in recreationally active, college-age adults.

P31: EXPLORING THE IMPACT OF MOVEMENT ON MOOD

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BACKGROUND: Practitioners need sustainable unmedicated methods to assist with the improvement of mood and mental health. Mental health is associated with mood and emotions. Mood is the accumulation of dynamic emotions at a given time. Movement may be a tool for people to be able to control emotions that lead to a negative mood state. Emotions like fear, anger, happiness, and sadness are affected by the different motor behaviors and elements. Happier movements are correlated with rising, jumping, and rhythm movements. Sad movements are correlated with slumped, head down, and closed posture movements (Shafir et al., 2016). Movements done daily are voluntary and are used as a coping strategy to tend to our needs, creating emotional resiliency (Tsachor & Shafir, 2017). Adolescents feel better and more energized after incidental activity such as climbing stairs (Koch et al., 2020). Adults who participate in physical activity are in a better mood daily than those who do not (Tsuji et al., 2020). We believe performing specific movement patterns will have a positive impact on the participants mood states. **METHODS:** Twenty-three participants were recruited through email and social media and completed a Qualtrics survey. An incentive of a drawing of a \$25 gift card was done. Participants completed a pre- and post-survey consisting of screening, demographics, current physical activity level, emoji scales, and a movement sequence. The survey was set so that it would not advance to the post- movement questions until the 10-minute video was completed. Timing for amount of seconds spent in the survey was recorded to ensure response validity. **RESULTS:** A dependent-samples t-test was performed on the pre- and post- scores. The difference was not significant, $t(22) = 1.43, p = .08$. A χ^2

Goodness of fit revealed significant differences in participants' ratings of the impact of the video. $\chi^2 (2, N = 23) = 15.22, p < .001$. This was a large effect, Cramer's $V = .57$. **CONCLUSIONS:** Adding a few specific movement patterns could positively impact mood states. Certain movements and postures can create positive feelings and experiences that can help mood. People can set aside a few minutes to positively impact their mood states. Movement patterns are not intense and do not require a warmup because of the low impact. Future research should incorporate more subjects, diverse populations, and a more reliable and accessible platform.

P32: THE IMPACT OF EXERCISE AUTONOMY ON VIRTUAL REALITY ENHANCED TIME TRIAL PERFORMANCE

Brooke Butler, Andrew Moore. *Augusta University, Augusta, GA.*

Title: THE IMPACT OF EXERCISE AUTONOMY ON VIRTUAL REALITY ENHANCED TIME TRIAL PERFORMANCE **Authors:** Butler Brooke; Moore Andrew **Institution:** Augusta University **BACKGROUND:** Virtual reality (VR) has been used as a tool in many professions to teach, train, and simulate different environments with the goal of improving performance. Exercise autonomy, or choice, has resulted in improved performance in exercise sessions and skill development. It is unknown if exercise autonomy benefits carry over with the use of a VR exercise simulation in which an avatar controlled by the exerciser moves through and engages with a unique animated environment. The aims of this study were to determine if including participant autonomy of a VR environment would impact (a) exercise time trial performance and (b) physiological and perceptual responses to the time trial. **METHODS:** Healthy participants ($N=20$; 9 men/11 women; age=22.91±7.18 years) completed two 1500m time trials on a Concept 2 rowing ergometer in a randomized counterbalanced order under the following conditions: choosing the VR environment that was displayed (VR_{choice}) and having the VR environment selected at random (VR). Time, heart rate (HR), rating of perceived exertion (RPE), attentional focus, and affective valence were collected every 300m. Remembered pleasure and total completion time were collected after each time trial. Using SPSS version 29, paired-samples t-tests and repeated-measures ANOVAs were performed to analyze the effects of condition and distance on completion time, HR, RPE, affective valence, attentional focus, and remembered pleasure as appropriate. Bonferroni adjusted post hoc tests were used to maintain an alpha level of .05. **RESULTS:** The main findings were that there was no difference in finishing time between VR (468.63±94.75 s) and VR_{choice} (473.57±98.91 s), $p=.339, d=0.13$. There was no significant main effect of condition or interaction effect between condition and distance for the remaining variables. There was a large, non-significant effect of condition on affective valence which was higher in VR_{choice} (1.95±1.69) than in VR (1.53±2.21), $p=.052, \eta^2 = .204$. **CONCLUSIONS:** During a 1500m time trial using a VR program, the option to choose the specific virtual environment did not impact performance or physiological and perceptual variables. Affective valence was higher for some subjects when they were able to choose their environment, though this was not the case for the sample as a whole. Future studies should examine the factors which contribute to individual responses to VR enhanced exercise.

P33: FEASIBILITY AND ACCEPTABILITY OF PAIN COPING SKILLS TRAINING (PCST) FOR CHEMOTHERAPY-INDUCED PERIPHERAL NEUROPATHY (CIPN)

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BACKGROUND: Chemotherapy-Induced Peripheral Neuropathy (CIPN) affects 50-75% of patients who have received chemotherapy, often persisting for years following treatment. In addition to painful and debilitating symptoms, CIPN leads to functional/psychological impairment, increased healthcare spending, and decreased quality of life. CIPN is complex, difficult to diagnose and treat, and poses a heavy burden on patients and providers. Therapies designed to target pain processing and enhance coping such as pain coping skills training (PCST) programs have shown promise for management of pain in various populations, including those with CIPN. However, face to face PCST is underused in healthcare due to high costs, low therapist availability, and transportation requirements. PainTRAINER (an 8-week self guided, cognitive behavioral therapy informed internet-delivered PCST program) was developed to address these barriers. The purpose of this research is to conduct a pilot trial examining the feasibility and acceptability of PainTRAINER among patients with CIPN. We also will assess its preliminary efficacy for reducing pain severity and pain

interference, as well as the relationship between pain outcomes and spirituality. Though spirituality is known to play an important role in pain management, the use of spirituality practices are underutilized and further study is warranted to direct future pain intervention efforts. **METHODS:** We will conduct a single group prospective pilot trial with CIPN cancer survivors. Participants ($n=26$) will complete one 45-minute module per week during the 8-week PainTRAINER intervention, learning new cognitive and behavioral pain coping skills each week. Feasibility will be assessed based on ability to recruit, engage, and retain participants; the Acceptability E-Scale will assess acceptability of the intervention following completion. Pain severity and interference (PROMIS measures) and the Brief Multidimensional Measure of Religiousness and Spirituality will be assessed at baseline and post-intervention. **ANTICIPATED RESULTS:** We hypothesize that PainTRAINER will be feasible and acceptable among patients with CIPN, and will demonstrate preliminary efficacy for reducing pain severity and interference. We also hypothesize a positive relationship between spirituality and improvement in pain outcomes, such that higher levels of spirituality will predict greater improvement in pain.

P34: MENTAL TOUGHNESS EXPLAINS ROWING PERFORMANCE: A MIXED MODEL ANALYSIS.

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BACKGROUND: In the quest to enhance rowing performance, coaches and athletes are seeking ways to gain a competitive edge. One potential catalyst that has emerged in this pursuit is the concept of mental toughness (MT). Despite its potential significance, the sport of rowing has remained notably underrepresented in MT research, predominantly relying on cross-sectional study designs. Collegiate rowing, a sport demanding both physical and mental prowess, employs the 2K time trial as a pivotal benchmark for evaluating rowers' performance. Therefore, the purpose of this study was whether MT is a significant factor in explaining 2K rowing performance utilizing a repeated subjects' design. **METHODS:** Drawing from an observational and hypothesis-generating framework, a total of 12 Division II female collegiate rowers participated in this study. They completed the Mental Toughness Index (MTI) on four occasions preceding their respective 2K time trials, integrated into their annual performance evaluation. Analysis employed a linear mixed model utilizing the GAMLj module in Jamovi version 2.4.8, with a significance level set at $p < 0.05$. MT was considered a fixed factor, while athlete, MT, and Athlete*MT interaction served as random factors to account for possible individual variations. **RESULTS:** Analysis revealed three mixed models in which MT was found to be significant and negatively related to 2K performance: Model #1, MT with Athlete Intercept: $F_1 = 7.58, p = 0.009, \beta = -0.93, 95\%CI [-1.58, -0.27], p = 0.009$; Model #2, MT with MT Intercept: $F_1 = 5.88, p = 0.019, \beta = -0.98, 95\%CI [-1.77, -0.19], p = 0.019$; and Model #3, MT with Athlete and MT Intercept: $F_1 = 5.34, p = 0.029, \beta = -0.81, 95\%CI [-1.50, -0.12], p = 0.029$. **CONCLUSIONS:** Collectively, these models demonstrate the significance of MT in explaining rowing performance, whether considered independently, accounting for athlete-specific differences, or factoring in the baseline level of MT. Findings suggest the potential practical application of MT-oriented interventions within rowing. However, it is essential to acknowledge the study's small sample size. Future investigations should explore larger participant cohorts and delve deeper into the impact of MT interventions on the dynamics of rowing performance.

P35: THE EFFECT OF MINDFULNESS TRAINING ON MUSCULAR ENDURANCE PERFORMANCE, MINDFULNESS, AND MENTAL TOUGHNESS

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BACKGROUND: Mindfulness training, increasingly popular among performance-based populations such as athletes, equips individuals with strategies to manage both mental and physical stress by altering their perception of stressful events. Increased mindfulness has been associated with elevated levels of mental toughness, a valuable trait involving how well an individual copes with stressors. While mindfulness training has resulted in increased aerobic endurance performance, it has not been investigated in a similar exercise

modality, muscular endurance. Additionally, both mindfulness and mental toughness may be valuable in highly fatiguing and stressful activities, such as muscular endurance performance. The purpose of this study is to examine the effect of a mindfulness meditation on muscular endurance performance, mindfulness, and mental toughness. **METHODS:** A total of 24 male and female participants between the ages of 18 and 30 will be recruited for participation in this study. This study will use a quasi-experimental design with randomized conditions. All participants will complete two sessions, a week apart, of three sets of planks. The planks will go until volitional exhaustion and will be separated by 30 seconds of rest. The first session will include baseline assessments of mindfulness and mental toughness and the repeated planks. The second session will randomly allocate participants into a mindfulness meditation group and an audiobook group. Participants will complete the assigned activity, each lasting 5 minutes, before completing a series of three planks. Mindfulness will be assessed using the Toronto Mindfulness Scale (TMS) and mental toughness will be assessed using the Mental Toughness Index (MTI). The TMS and MTI will both be administered at baseline and after each experimental condition to detect changes due to mindfulness meditation. Additionally, the TMS will be administered before both experimental conditions to detect how stable mindfulness is between sessions. Immediately following each plank, RPE will be assessed. A 2X2 repeated measures ANOVA will be used to determine differences in muscular endurance, mindfulness, and mental toughness between groups. **ANTICIPATED RESULTS:** It is hypothesized that mindfulness meditation will positively impact muscular endurance, mindfulness, and mental toughness.

P36: DOES CO-SLEEPING WITH A DOG INFLUENCE DOG OWNERS' SLEEP QUALITY OR PA LEVELS?

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Background: In the U.S., 45% of households own dogs, and many allow their dogs to share their beds. However, findings on the influence of co-sleeping with dogs on the sleep quality and daily physical activity (PA) of dog owners remain mixed. Therefore, this study aimed to investigate how human-dog co-sleeping influences sleep quality and PA in dog owners. **Methods:** Adults who are a primary caregiver of a dog (at least 6-months old) were recruited for an online survey which asked about human demographics, sleep quality using the Pittsburgh Sleep Quality Index (PSQI; higher scores indicate worse sleep quality), and PA. Demographics included race, sex, age, and number of dogs in the household. Participants reported their weekly PA frequency (days with at least 30 minutes of PA sufficient to raise their breathing rate). Participants were categorized as "co-sleepers" if they shared their bed with their dogs at least 5 d/wk and as "non-co-sleepers" if their dogs slept in the bedroom but not in the bed or in a different room. Independent t-tests compared sleep quality and PA across the two groups. **Results:** Participants (n=301, age = 35±13 years) were primarily white (92%) and female (86%). Most participants (60%) owned only one dog and 46% of participants reported co-sleeping with a dog. There was no significant difference in the numbers of active days reported by co-sleepers (3.9±2.0 d/wk) and non-co-sleepers (4.0±2.2 d/wk, $p=.10$). Global PSQI scores did not significantly differ between the groups (6.6±3.3 vs. 6.0±3.2, $p=.58$). Sleep efficiency scores were significantly higher for those who co-slept than those who did not (.76±.96 vs. .48±.79, $p=.01$). Sleep duration scores trended higher for those who co-sleep than those who did not (1.2±.46 vs. 1.2±.51, $p=.065$). **Conclusion:** The lack of significant distinction in PA levels may suggest that disturbances caused by co-sleeping with dogs do not notably affect daytime PA. Co-sleepers exhibited significantly lower sleep efficiency compared to non-co-sleepers, indicating potential disruptions in their sleep patterns, possibly related to interactions with their dogs during the night. As dog interactions are suspected to be a factor affecting sleep efficiency, a study monitoring the behavior of both humans and dogs during the night, looking at factors like movement, noise, and comfort, may be insightful in viewing how co-sleeping with dogs affects PA and sleep patterns. **Funding:** Funded by the University of South Carolina Magellan Scholars Grant

P37: COMPARISON OF PARTICIPANTS' REPORTED TIMING OF ECOLOGICAL MOMENTARY ASSESSMENTS OF PHYSICAL ACTIVITY WITH SURVEY METADATA

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BACKGROUND: Event-based Ecological Momentary Assessment (EMA) is a method used to capture an individual's experience of physical activity (PA) in a proximal context, often using smartphones to complete internet-based surveys. This method is contingent on participants' compliance in reporting their momentary states. The purpose of this analysis is to explore the alignment between participants' reported survey time and time-stamped survey meta-data. **METHODS:** In the parent study, participants completed a pre-activity survey (PreS) and a post-activity survey (PostS) for all purposeful PA performed over 10-weeks. Retroactive surveys (RetroS) could be initiated when momentary reporting was not possible. In addition to reporting total PA duration, PreS and PostS items allowed participants to indicate the timing of their report relative to the start and finish of the PA session (immediately/within 10-min, within 10-30-min, more than 30-min from start/finish). The survey software provided the date and time of each survey initiation and completion. Basic frequency and descriptive statistics were conducted to summarize the proportion of PreS and PostS reports completed more than 30-min outside the activity session and RetroS. Of the momentary reports, the expected timeframe for reporting (ET; activity duration plus time lags indicated in participant-reported descriptions of PreS and PostS completion) was compared to the meta-data timeframe of PreS to PostS completion to determine degree of alignment. **RESULTS:** Of the 229 PA bouts reported by 8 participants, 42% were documented using RetroS (mean time lag following PA = 8.61±7.12 hours). Of the 137 sessions documented using PreS and PostS, 24% indicated survey completion more than 30-min outside of the PA session (all specific to PostS; mean time lag = 5.24 ±3.04 hours). Alignment between participant-reporting timing and meta-data was noted in 92.3% of the 104 sessions characterized by PreS and PostS completed within 30-min of PA session start and finish. **CONCLUSION:** In this sample, less than half of the sessions were documented with reasonable proximity. When relying on participant-initiated reports to yield insight into target behavioral events (PA), it may be prudent to examine research results with and without non-momentary data. If impactful, loss of momentary event-contingent PA data should be accounted for in participant recruitment and study duration.

P38: INVESTIGATING THE RELATIONSHIP BETWEEN BODY COMPOSITION, PERCEIVED STRESS, AND LIFE SATISFACTION IN MARCHING BAND MEMBERS

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BACKGROUND: Collegiate marching bands involve a diverse and distinct subpopulation of college-aged individuals. This group is often overlooked in health research, apart from contributions of marching band activities on physical activity levels (Sharp et al., 2007; Cowen, 2006). As important mental and physical health indicators, additional investigation is needed to explore the associations between body composition, stress, and life satisfaction in marching band participants. This study examined the association between adiposity and psychosocial well-being in marching band members. **METHODS:** Anthropometry (height, weight, waist circumference (WC)) was assessed according to standard procedures. Dual-energy X-ray absorptiometry (DXA) determined body composition. Two measures of psychosocial well-being were assessed: Satisfaction with Life Survey (SWLS) and Perceived Stress Scale (PSS). Correlation analyses were used to examine the relationships between all variables, while multiple regression analysis was used to consider the influence of body composition and stress (PSS) on SWLS. **RESULTS:** 27 participants, consisting of 17 females and 10 males, with an average age of 20[JS1] .0±1.4, were included in the study (color guard, drumline, and other marching band members). Average body weight was 76.5±18.6 kg, body mass index was 26.5±6.0 kg/m², and mean body fat % was 31.6±12.0. The average SWLS score was 26.4±4.2, and PSS was 22.8±4.87. PSS and SWLS were inversely associated ($r=-0.61$, $p<0.05$) but not associated with body fat. SWLS was also inversely associated with BMI ($r=-0.44$ and -0.48 , respectively, $p<0.05$). Regression analyses showed that PSS significantly predicts SWLS ($\beta=-0.54$, $p<0.05$). This relationship remained unchanged when considering body fat percentage as an additional predictor. **CONCLUSIONS:** This study investigated the influence of body composition and stress on marching band members' psychosocial health. A significant correlation was observed between the perceived stress levels of marching band members and their overall life satisfaction. Body composition did not change this relationship. Further

research is required to better understand this relationship and its potential impact on stress screenings and interventions in the future.

P39: EXAMINING THE RELATIONSHIP BETWEEN A DIGITAL MENTAL HEALTH LITERACY PROGRAM AND STUDENT ATHLETE MENTAL HEALTH

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BACKGROUND: Student athletes experience unique stressors that increase their risk for mental health problems. These mental health concerns can lead to poor athletic performance and increase their risk factors for substance abuse, eating disorders, suicidal ideations, depression and anxiety. According to the National Alliance on Mental Illness, 22.3% of student athletes are at risk for depression, 12.5% are at risk for anxiety, and 8% are at risk for low self-esteem. Universities are prioritizing their student athletes' mental health through initiatives, such as pre-season mental health screenings and mental health literacy campaigns. Research is needed to understand how these campaigns influence mental health outcomes. The purpose of this study is to better understand the relationships between student athlete mental health outcomes and engagement with a digital mental health literacy platform. **METHODS:** During Spring 2024, all in-season athletes at a Southeastern university will receive the Sharpen AthleteTM and PerformeaXTM program. The program combines a peer-focus, mental health literacy program (Sharpen AthleteTM) with computerized adaptive mental health screenings (PerformeaXTM). For eight-weeks, athletes will receive weekly mental health literacy content and a prompt to complete the screening via their mobile devices. The screenings will assess for suicidality (CAT-SS), depressive symptoms (CAT-DM), and anxiety symptoms (CAT-AX). Each screening will take about five minutes to complete. The Sharpen AthleteTM mental health literacy program content will include content tailored for athletes on how to cope, heal, thrive, and navigate various mental health related issues. For athletes who consent to sharing their data for research purposes, I will collect weekly Sharpen AthleteTM content engagement, measured as unique page views and mean time (mins) spent on a module. I will also collect the screening categories (i.e. low, intermediate, severe). Frequencies, means, and standard deviations will be used to describe the outcome variables by sport. Point Biserial Correlation will be used to examine the relationship between weekly Sharpen AthleteTM content engagement (unique page views and mean time spent in a module) and PerformeaXTM screening categories. **ANTICIPATED RESULTS:** It is hypothesized that there will be a correlation between Sharpen AthleteTM content engagement and mental health screening scores.

P40: ADVANCING THE SELF-VERIFICATION THEORY IN FEMALE ROWERS THROUGH THE LENS OF MENTAL TOUGHNESS: IMPLICATIONS FOR POSITIVE SPORT PSYCHOLOGY

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BACKGROUND: In Positive Psychology (PP), Mental Toughness (MT) and Self-Verification (SV) concepts are linked to individual well-being. MT is critical for sports success; yet, its role in female rowing is underexplored. SV theory suggests people seek confirmation of their self-views, offering insights into athlete-coach dynamics. Earlier pioneering research from our group in MT and SV among female rowers showed athletes sought self-view-aligned associations. Therefore, the purpose of this study was to enrich the emerging literature in understanding SV's theory applicability in PP and MT's role in female rowing. **METHODS:** Division II rowers ($n = 12$) completed the Mental Toughness Index (MTI) prior four in-season 2K races. Athletes self-evaluated their MT, provided responses on MTIs reflecting the perspectives of both their Head and Assistant coaches, and indicated their preferred coach for interaction. To assess differences between the preferred Zacharias Papadakis¹ collaborator coach and the coach whose perceived MTI scores closely matched the athletes' self-assessments, four chi-square tests were conducted using Jamovi version 2.4.8, with a significance level of $p < 0.05$. Similarity in MTI scores was evaluated by identifying the smallest absolute difference between coach and athlete scores. In cases of equal differences, preference was determined based on the smallest absolute difference relative to the maximum possible MTI score. **RESULTS:** The McNemar paired-samples test conducted for each of the four trials ($\#1^{st} x^2 = 0.1,$

$p = 0.7$; $\#2^{nd} x^2 < 0.001, p = 1$; $\#3^{rd} x^2 = 0.2, p = 0.7$; $\#4^{th} x^2 < 0.001, p = 1$) indicated no significant differences between the preferred coach for collaboration and the coach selected based on SV theory. **CONCLUSION:** These findings provide additional support for the relevance of MT and SV in the context of female rowers. Specifically, in terms of MT, this study demonstrated that athletes' choices for collaboration with coaches did not significantly differ from the coaches expected based on SV theory in four distinct instances. This research contributes to a deeper understanding of the potential implications of SV theory in Positive Sport Psychology and underscores the significance of comprehending how self-views can impact relationships in sports contexts.

P41: EXAMINING COLLEGE STUDENTS' MENTAL HEALTH OUTCOMES BASED ON EXERCISE ENVIRONMENT PREFERENCES

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Background: Exercise has been recognized as a coping mechanism that can help college students cope with daily stressors. Recent studies highlight a need to explore potential differences in physical and behavioral health outcomes based on indoor versus outdoor exercise preferences. Additionally, previous studies did not focus on the mental health aspects of college students in relation to their exercise environment preferences. The purpose of this study is to examine the relationship between mental health and exercise preferences for college students. **Methods:** A 19-question survey will be emailed to all enrolled students at a university in the southeast United States. A follow-up reminder email will be sent one week later. In total, the survey will be open for a one month window. The survey will include the following measures: (a) Godin Leisure-Time Exercise Questionnaire will be included to measure one week exercise volume and to classify participants as active, moderately active, or insufficiently active, (b) Positive Mental Health Scale will be used to record self-identified positive mental health, (c) five items will ask about exercise behaviors and environment (indoor, outdoor, or both) preferences, (d) seven items will ask questions about race, gender identity, age, student major, grade point average, student athlete status, and student classification. Participant characteristics will be described using means, standard deviations, and frequencies. If sufficient power is reached (sample of $N = 176$), we will use two ANCOVAs to examine Positive Mental Health scale differences between indoor and outdoor exercisers, while controlling for (1) student athlete status and (2) weekly physical activity status, separately. We will also use Chi-squared analysis to examine group differences in exercise environment preferences for student athlete status and weekly physical activity status. **Anticipated Results:** Previous studies suggest additional research is needed to make strong conclusions about the relationship between exercise environment and mental health. However, there is evidence in support of outdoor exercise and positive influences on mental health. As such, we hypothesize that after controlling for student athlete status and exercise volume, students who prefer outdoor exercise will have higher Positive Mental Health Scale scores.

P42: SOLDERING ON: ADDRESSING PHYSICAL ACTIVITY AND MENTAL HEALTH IN MILITARY POPULATIONS (A SURVEY STUDY)

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BACKGROUND: Because of the stigmatization of mental health in the military, military populations tend to focus less on supporting their mental health, despite Military service making individuals 5 times more likely to develop major depression, and 15 times more likely to develop PTSD than the general population. The purpose of this study is to evaluate the perception of mental health and help-seeking behaviors in military populations, and to ultimately use this data to create effective low-stigma intervention, decreasing negative symptoms of mental health.

METHODS: 70 Veteran, Active Duty, and Military Reserve Members of the U.S. Military completed an anonymous online survey regarding mental health as measured by Patient Health Questionnaire-9 (PHQ-9) and General Anxiety Disorder-7 (GAD-7) and physical activity behaviors and preferences including the Godin Leisure-Time Physical Activity Questionnaire.

RESULTS: Given the sample (45 Male, 22 Female, 3 non-binary or gender non-conforming), 10% scored within the "moderately active" and 80 % scored within the "active" category on the Godin scale. According to the questions regarding physical activity preference, the most popular activity that participants expressed interest in were

jogging/ running (71%) and resistance training (RT) (70%), while the least popular activities were aerobic exercise at home (23%) and exercise videos (11%). Using the PHQ-9, it can be concluded that from this sample, 14% of individuals exhibited moderate to severe anxiety, while 22% of individuals exhibited moderate to severe depression. There is a negative correlation between strenuous physical activity and sleep-disturbance/anxiety (-.097 and -.023, respectively). The sample was highly physically active despite the prevalence of mental health issues. 90% of individuals agreed/strongly agreed to the statement "exercise has a positive impact on my mental health", and 93% to the statement "I feel happier after I exercise."

CONCLUSIONS: Since most forms of mental health interventions are stigmatized, especially in military populations, it is important to focus on de-stigmatized interventions, such as exercise, to combat mental health issues. Based on the high preference for RT and its preliminary negative correlations to sleep disturbance and anxiety, future studies should combine group therapy/aerobic and RT intervention for Military Members to improve mental health.

P43: BIOPSYCHOSOCIAL VARIABLES AND CHANGES IN PERCEIVED STRESS OF STUDENT-ATHLETES: A PROPOSAL
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BACKGROUND: Student-athletes are required to meet the demands of academics and athletics, resulting in perceived stress. This stress may be affected by stage of the academic year and modulated by biopsychosocial variables such as personality. The purpose of this study is to determine if an athlete's personality affects changes in perceived stress during an academic year. **METHODS:** 200 student-athletes will be given a set of surveys at week four of the semester, then again during the last week of the semester. A Big Five Personality test (IPIP-NEO-120) will be given to determine openness, conscientiousness, extraversion, agreeableness, and neuroticism. Participants will also be asked to report repeated patterns of physical activity and the amount spent within the activity each week. Cohen's Perceived Stress Scale survey will also be given. Regression analysis will be used to determine relationship between change in stress values and the Big 5 personality. **ANTICIPATED RESULTS:** We hypothesize that the big 5 trait of neuroticism will be associated with an increased stress score throughout the semester.

P44: DOES DOG OWNER EQUAL DOG WALKER: CHARACTERISTICS OF DOG OWNERS WHO DO (& DON'T) WALK THEIR DOGS

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Background: One in two households in the US own a dog. Dog owners tend to engage in more physical activity (PA) than non-dog owners. However, there are dog owners who engage in little to no activity, including not walking their dogs. Therefore, the purpose of this study was to explore human/dog characteristics that predict dog walking among dog owners. **Methods:** Dog owners (>18 yrs and a dog(s) primary caregiver) were recruited to participate in an online cross-sectional survey. Participants reported their demographics in addition to the breed, size/weight, age, and energy level of their dog(s). They also reported the average number of days they engaged in at least 30 minutes of PA per week and dog walking mins/wk (average d/wk * mins/walk * number of walks/d). Linear regression was used to explore the association of human demographics and minutes spent dog walking. Additionally, Pearson's Correlations examined the associations between the dogs age, weight, energy levels with minutes spent dog walking. **Results:** Dog owners (n=319) from 38 US states (majority from SC (34.2%), PA (11.3%), and OH (9.4%)) completed the survey. Dog owners were 34.9±13.1 yrs old, 86% female, 92% White, with a BMI of 26.9±6.1 kg/m². The majority of participants owned 1 (60.5%) or 2 (30.1%) dog(s). Dog owners engaged in ≥30 minutes of PA on 3.9±2.0 d/wk. On average, they walked their dog(s) 202.2±193.8 mins/wk, with 12.5% of dog owners not walking their dogs at all, 28.2% walking < 3 d/wk, and 59.2% walking their dog(s) 4-7 d/wk. A lower BMI (p=0.02), more days engaged in 30 minutes of PA (p<0.001), owning less dogs (p=0.037), and male sex (p=0.02) were predictive of higher dog walking mins/wk. More dog walking mins/wk were associated with younger dog age (p=0.002) and higher dog energy levels (p=0.007). Human age (p=0.83) and dog weight (p=0.31) were not associated with dog walking mins/wk. **Conclusion:** Dog owners with lower BMI, fewer dogs, engaged in regular PA, and male accumulated more mins/wk of dog walking. Additionally, having a younger dog and a dog with higher

energy levels was associated with more dog walking. Exploring additional factors (i.e., environmental, intrapersonal) is critical to best understand dog walking behaviors among dog owners, importantly among inactive dog owners or those who do not walk their dog(s).

P45: THE EFFECT OF DISC GOLF ON PHYSICAL AND PSYCHOLOGICAL WELL-BEING

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BACKGROUND: In the past five years, disc golf has grown exponentially in its media attention and popularity. Disc golf is like traditional golf in that it involves periods of walking interspersed by brief periods where an object is being advanced towards a goal. These brief, goal-oriented moments can be thought of as distractions towards exercise. Enjoyable distractions from exercise can further enhance the already positive influence exercise has on mood. It may be that the distraction that throwing a disc provides may enhance the psychological benefits over non-distracting exercise and, thus, increase the likelihood for continuing the behavior. The purpose of the proposed study will be to assess the psychological and physical health benefits of disc golf and compare those to a more traditional form of physical activity. **METHODS:** We will recruit college-aged individuals with and without prior disc golf experience. The study will consist of 2 conditions (disc golf and walking) taking place over consecutive weeks. Each condition will take place across the same days of the week to attempt to control for differences in step counts across different days of the week. Conditions will last 3 days with days 1 and 3 being purely observational with experimental manipulation occurring on day 2. Day 2 for the disc golf condition will consist of 9 holes of disc golf and day 2 for the walking conditioning will consist of a matched amount of PA (steps) recorded during the disc golf condition. Physical activity (steps) will be measured all 3 days of each condition via a triaxial accelerometer along with positive and negative affect using the Positive and Negative Affect Schedule (PANAS). Additionally, session RPE and outdoor physical activity enjoyment and will be queried using the Physical Activity Enjoyment Scale (PACES) 15 minutes following the cessation of exercise. Heart rate will be collected continuously and averaged to compare internal loads between conditions. **ANTICIPATED RESULTS:** It is hypothesized that PA levels in both conditions to be similar across all days, with disc golf having better PACES and PANAS scores when compared to the walking condition.

P46: TAPING TECHNIQUES AND THEIR EFFECTS ON MUSCLE ACTIVATION AND ENERGY EXPENDITURE

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BACKGROUND: KT Tape is an elastic version of traditional training tape. There is limited research done to on the effects of KT-Tape compared to its predecessor, athletic training tape (AT-Tape), and traditional techniques for application that solely focus on stability. Based on its adhesive and elastic properties, KT-Tape may have the ability to affect muscle activation and energy expenditure if applied differently than traditional techniques. Altering these physiological variables may ultimately affect oxygen consumption and stamina during running. The primary purpose of this study is to determine if KT-Tape applied in a non-traditional spring method effects oxygen consumption and muscular activation when compared to not using tape, as well as traditional methods of application using KT-Tape and AT-Tape over the knee during running. **METHODS:** Participants will consist of healthy adult recreational runners. HR and RPE will be assessed during all activity. Participants will be instructed to perform a warm-up no longer than 5 minutes. Preferred speed (PS) will be obtained from runners using an average speed of 3-bouts of a blind speed procedure. Participants will then perform four separate, 6-minute runs at PS, each with a separate condition: Control (No Tape); Traditionally Applied KT-Tape; Traditionally Applied AT-Tape; & Non-traditional Spring Application of KT-Tape. During steady state running at PS oxygen consumption and muscle activation will be acquired. Additionally, EMG of the rectus femoris (RF) and biceps femoris (BF) The order of conditions will be counterbalanced to account for order bias. A repeated measure ANOVA will be used to assess for differences in variables between conditions. Alpha level will be set at 0.05.

ANTICIPATED RESULTS: It is hypothesized that oxygen consumption and muscle activity will differ between conditions. Specifically, spring taping technique will aid in muscle recruitment and activation of the biceps femoris. This passive assistance will have a larger effect on muscle recruitment of the BF than the resistance would compromise that of the RF. This manipulation of the H:Q ratio, a natural muscle imbalance, may subsequently reduce oxygen demands of the lower extremity muscles during running. Alternatively, it may not be possible to affect energy expenditure this way as the same energy saved will be required to overcome the resistance during the opposite action at the knee.

P47: EFFECTS OF BADMINTON ON UNILATERAL STATIC BALANCE FOR YOUNG ADULTS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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BACKGROUND: The purpose of this study was to examine the effects of an inclusive badminton intervention on static, unilateral balance in young adults with intellectual and developmental disabilities (IDD) and typical developing (TD) young adults. **METHODS:** 8 participants (4 IDD-BADM and 4 TD-BADM) participated in a 12-week inclusive badminton intervention, with the other 8 participants as matched controls (4 IDD-CONTR and 4 TD-CONTR) (74.19kg ± 9.8kg, 171.96cm ± 5.4cm; 21.7 ± 1.8 years of age). The study followed a repeated measures design (pre, mid, post) before the intervention, at 6 weeks, and after 12 weeks. Static balance conditions included eyes open unilateral, dominant leg (1LEO) (10s) on a force plate. Center of pressure (COP) sway variables included: average anterior/posterior (A/P) displacement (in), average medial/lateral (M/L) displacement (in), average 95% ellipsoid area (EA) (in²), and average velocity (AV) (ft/s), average length (in). Post-hoc comparisons were performed using a Greenhouse-Geisser correction with $p < 0.05$. The badminton group followed the Special Olympics Badminton Skills protocol and was designed as a bi-weekly 50-minute, inclusive adapted badminton class, including 24 sessions. **RESULTS:** A significant group x time interaction was reported for IDD-BADM for average COP displacement in the A/P direction during 1LEO. Post-hoc comparisons revealed greater decreases in COP displacement, or improvements in balance performance, from pre-test to post-test for the badminton intervention group ($p = 0.036$) while IDD-CONTR increased COP displacement, or had decreases in balance performance, from pre-test to post-test. Badminton players constantly shift their center of gravity (COG) outside and within their base of support while performing quick, unilateral upper limb movements. This shift of the COG with asymmetrical upper body movements challenges and trains the postural control system by integrating and organizing differing sensory information while utilizing a feedforward process for quick response times. No significant main effects for time, group, nor significant group x time interactions were found for average displacement in the M/L direction, 95% ellipsoid area, average velocity, or average length for the other groups. **CONCLUSIONS:** An inclusive, adapted badminton program could be an alternative balance training program for individuals with IDD.

P48: ANALYSIS OF AN ABBREVIATED FUNCTIONAL MOVEMENT SCREENING

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BACKGROUND: The Functional Movement Screen (FMS) is a valuable tool that can be used to examine the stability and mobility of joints during different movement patterns. The original deep squat with the overhead position of the dowel rod and elevation of the heels potentially masks underlying joint issues within the trunk and hips. Additionally, it is an unnatural position for a typical task that involves squatting. The modification via inclusion of the front rack position and keeping the heels flat on the floor allows for a more potentially applicable movement-based scoring of the squat pattern. The purpose of this exploratory study was to determine if there is a significant difference between the original FMS Deep Squat Screen (DSv1) and a modified Deep Squat Screen (DSv2). **METHODS:** Thirty-nine healthy college aged participants (female: n=14; male: n=25) were recruited to complete the current IRB-approved (Study No. 2023-049) protocol.

In brief, participants reported to the Human Performance Laboratory, completed informed consent, and a health history screening to ensure no current or prior major orthopedic problems to preclude participation. Participants then completed the (DSv1) and a novel (DSv2) in which the dowel rod is placed in the front-rack position instead of the overhead position and the heels are not elevated on the FMS board. **Statistical Analysis:** Due to the ordinal nature of the FMS scoring criteria, Friedman's analysis of variance was used. Post-hoc analysis to determine differences in the testing measures was conducted using Wilcoxon sign-ranks' analysis. **Results:** Friedman's analysis demonstrated a significant difference between V1 and V2 of the FMS Deep Squat movement pattern ($p < 0.001$). Post-hoc analysis revealed a significant difference in mean score for Deep Squat Version 1 (1.89) and Deep Squat Version 2 (1.15). 74% of participants (n=29) recorded one score higher using DSv1 relative to DSv2.

DISCUSSION: The results of this exploratory study indicated a significant difference between the DSv1 scores compared to the DSv2 scores. The potential reason for this difference may be due to removing the overhead shoulder position, as well as keeping the feet flat on the ground. This modification better reflects a real squat pattern and potentially assists in better identifying stability issues within the trunk and hips.

P49: MUSCLE ACTIVITY OF THE PRIMARY ANKLE STABILIZERS IN SOCCER PLAYERS PERFORMING A DYNAMIC BALANCE TEST.

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BACKGROUND: Ankle sprains comprise 30% of all soccer injuries and can lead to long term issues like chronic ankle instability (CAI). Current research examining the impact of muscle activity of the tibialis anterior (TA) and the medial gastrocnemius (MG) on the risk of developing CAI is limited. The purpose of this research was to determine the impact that muscle activity of the lower extremity muscles has on stability and injury risk in soccer players. **METHODS:** Twenty-Three Division 1 National Collegiate Athletic Association (NCAA) women's soccer players performed a validated dynamic balance task, the Y-Balance Test (YBT), while muscle activity of the primary ankle stabilizers in the sagittal plane (TA and MG) were measured using surface electromyography (EMG). For the task, participants balanced on one leg, then reached as far as possible with their other leg on a sliding block, and then returned to the starting position. The participants performed the task in three directions: anterior (ANT), posteromedial (PM), and posterolateral (PL). EMG readings from the TA and MG for each reach distance were recorded and normalized to the participant's maximum isometric voluntary contraction (MVIC) for that muscle. A series of paired samples T-tests were conducted to analyze potential differences in mean muscle activity for the TA and MG for each of the three reach directions. **RESULTS:** The left TA had a significantly lesser amount of mean muscle activity in both the anterior (ANT) ($t = 2.929$, $p = 0.008$) and posteromedial (PM) ($t = 2.356$, $p = 0.028$) reach directions. In the ANT direction, the participants had a mean muscle activity of 23.19 ± 10.10% for their left TA and 32.60 ± 15.40% of their MVIC for their right TA. In the PM direction, they had a mean muscle activity of 25.82 ± 12.77% for their left TA and 32.96 ± 15.28% for their right TA. In both directions, players displayed significantly better muscle activity for the left leg than the right. No significant differences were found for the other analyses. **CONCLUSIONS:** Female soccer players in this study displayed significantly better muscle activity in the TA for their left leg, (the non-dominant leg for all but one participant) in the ANT and PM directions. This may be attributed to the players using their left leg to plant and stabilize their body while they kick the ball with their right leg.

P50: USE OF PEAK AND MEAN FORCE VALUES IN THE DETERMINATION OF INTERLIMB ASYMMETRIES DURING THE COUNTERMOVEMENT JUMP

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BACKGROUND: The countermovement jump (CMJ) is commonly used in the assessment of an individual's neuromuscular abilities and used in the determination of force asymmetries during dynamic tasks. The increased use of the assessing force production between left and right sides appears to be based on its potential to reflect previous injuries and predicting future injuries. Previous investigations have used peak or mean force values obtained during the CMJ using dual force plate configurations prior to calculating symmetry indexes. Thus, the

purpose of this investigation was to examine the agreement between the two methodologies in both identifying dominant limbs and the value of the symmetry index. **METHODS:** 13 collegiate male basketball players from one NCAA Division I program participated in this investigation (age 22.34 ± 1.04 years, height 187.62 ± 8.03 cm, body mass 88.99 ± 13.82 kg). Data was collected at the beginning of the fall training period. Participants completed three maximal effort trials. Each trial was separated by thirty seconds. All trials were performed on the dual force platforms sampling at 2400 Hz. Each trial was categorized as being either left or right dominant using both peak and mean propulsive force values. Additionally, the bilateral asymmetry index (BAI) was calculated for each trial. The percentage of agreement between peak and mean methods was calculated as well as the kappa coefficient across all trials. The mean BAI index for each participant was calculated using both peak and mean force. Paired sample test were then conducted to compare BAI values across methodologies. **RESULTS:** The two methods displayed an agreement of leg dominance in 71.79 % of trials with a kappa coefficient of 0.592 (95% CI, 0.345 to 0.839), $p < 0.001$ indicating moderate agreement between methods. Statistically significant differences were seen BAI values when using different methods with the mean values being greater (6.38 ± 5.11 vs 9.99 ± 8.72 , $p = 0.05$). **CONCLUSIONS:** The current investigation found that though moderate agreement was present between methodologies, approximately 28% of trials had disagreement in limb dominance. Furthermore, the symmetry index calculations appear to be impacted through the use of peak or mean force values. This is critical to both practitioners and researchers when examining interlimb asymmetry values and that these two methods not be used interchangeably.

P51: THE RELATIONSHIP BETWEEN POSTURAL SWAY AND DYNAMIC REACTION IN BLIND PEOPLE USING AN AUDITORY STIMULUS

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BACKGROUND: We live in an everchanging environment, whereby dynamic postural reaction time, the ability to adapt to environmental changes quickly and efficiently, is vital to overall safety. Visual cues influence human balance; however, without visual feedback, blind people must rely on their sensory feedback differently when responding to a stimulus. The purpose of the study was to investigate the relationship between standing postural sway and reaction time tasks using an auditory stimulus. **METHODS:** Five blind people with an average age of 29 and BMI of 30.9 participated in the study. Complex auditory (stimulus presented as "left", tap "right" foot) reaction time tasks were performed with participant's eyes open (EO). Reaction time (initiation of stimulus to start of physical movement), movement time (initiation of physical movement to completion of task) and overall response time (initiation of stimulus to completion of task) were calculated using the anterior-posterior (AP) center of pressure (COP) data for each task. The start of the response was determined at the instance the COP exceeded the mean three-standard deviations. The response end was determined based on a 10-N cut-off applied to the vertical ground reaction force used to detect the foot tap. In addition, COP was recorded during 30-seconds of quiet standing under two conditions: EO and eyes closed (EC) 30-second. Peak deviation z-scores and counts of COP exceeding two standard deviations (2STD) of the mean were calculated for EO and EC conditions. Pearson correlations were computed to assess the relationship between performance (i.e., reaction, movement, and overall response times) of the reaction task and 1) COP peak sway deviation z-scores and 2) the counts COP during EO and EC quiet standing. The significance level was set at 0.01. **RESULTS:** There were no significant relationships between COP deviation z-scores during EO and EC standing conditions and reaction, response, or movement time (all $p > 0.01$). Counts of COP exceeding 2STD during EO was very strongly correlated to reaction time ($r: 0.98$, $p = .001$). **CONCLUSION:** Only reaction time, specifically COP in the medial lateral direction, was significantly correlated to postural sway. This may be due to postural reaction time tasks commonly being initiated in the medial-lateral direction. However, given the rare population, more research is necessary to better understand this relationship.

P52: A DOUBLE-BLIND, PLACEBO-CONTROLLED ASSESSMENT OF THE INFLUENCE OF CAFFEINE ON STATIC BALANCE IN HEALTHY ADULTS

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BACKGROUND: Balance is important for daily human function and is one common diagnostic for neurological health and injury, such as concussion. Caffeine has been shown to affect human function and possibly balance at high doses in some individuals. The purpose of this research is to investigate the effects of a moderate caffeine dose on a commonly-used, diagnostic static balance protocol in healthy adults. **METHODS:** The college institutional review board approved this research and 22 adults (10 men, 12 women; average age of 29.78 years) completed the Stability Evaluation Test (SET) and modified Clinical Test of Sensory Interaction and Balance (mCTSIB) using the Neurocom Balance Master under caffeine (200mg) and placebo conditions in a repeated measures, placebo-controlled, double-blind experimental design. **RESULTS:** According to repeated measures ANOVA, there were no significant postural sway velocity (balance) main effects by caffeine condition for the SET ($F = 0.015$, $P = 0.903$) or mCTSIB ($F = 0.577$, $P = 0.458$). Combined postural sway velocity for all SET conditions for the caffeine condition was 2.370 ± 0.183 deg/s and for the placebo condition was 2.351 ± 0.175 deg/s. Combined postural sway velocity for all mCTSIB conditions for the caffeine condition was 0.627 ± 0.350 deg/s and for the placebo condition was 0.643 ± 0.370 deg/s. We found significant postural sway main effects by foam, stance and eye condition. We also noted significant ANOVA between participants' differences for age, but not for sex. **CONCLUSIONS:** Caffeine (200 mg) does not have significant influence on static balance as measured by the SET and mCTSIB in healthy adults as assessed in our study. The results of this investigation may inform practitioners of the importance of controlling caffeine intake prior to balance assessment and individuals as to the effects of caffeine on balance for daily activities

P53: COMPARING BIOMECHANICS OF BASEBALL SWINGS WITH ABOVE AND BELOW-AVERAGE EXIT VELOCITIES

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Background: Exit velocity (EV) is a measure of the speed with which a baseball leaves a baseball bat immediately after a batter makes contact during the swing. It is commonly used to assess power and hitting performance in college and professional baseball. However, few studies have examined if hitting biomechanics are better in hitters with higher EVs. Therefore, this study examined differences in swing biomechanics for hitters with above vs. below-average EV. **Methods:** All data were collected and published freely online by The OpenBiomechanics Project performed by Driveline Baseball. Eighty-seven male participants (age 19.98 ± 2.11) of varying skill levels (12 high school, 66 college, 4 independent league, 5 minor league) performed four to nine swings. During each swing, a K-Motion hitting vest and multiple high-speed cameras coupled with fifty-five markers recorded data relating to bat and body movements. The swing with the highest EV was used for analysis. The average EV of the data set was calculated (94.77 ± 6.20 mph), and participants were then grouped into above and below-average categories ($n = 54$ above average, $n = 33$ below average). An independent samples t-test compared body mass, height, age, bat weight and length, launch angle after contact, distance hit, pitch angle, and maximum bat, hand, upper arm, pelvis, torso, and center of gravity velocities between groups. **Results:** Body mass ($p < 0.001$), height ($p = 0.017$), bat weight ($p = 0.001$), bat length ($p = 0.001$), maximum bat speed ($p < 0.001$), and hand speed ($p = 0.038$) were all greater for the above-average group. No other significant differences existed ($p < 0.057$). **Conclusions:** These results suggest that hitters with an above-average EV are heavier, presumably with more muscle mass, use larger bats, and have faster bat and hand speed during the swing. Based on the greater body mass and bat size, it is possible one of the main factors separating above versus below-average hitters could be greater muscle mass and strength, rather than swing mechanics, both of which aid to increase movement velocity. However, kinetic and kinematic variables during baseball should be further studied in conjunction with measures of muscle mass and strength to better understand the differences between above versus below-average hitters.

P54: EFFECTS OF UNILATERAL LOWER LIMB SUSPENSION AND SLEEP RESTRICTION ON BALANCE AND MOTOR UNIT RECRUITMENT

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EFFECTS OF UNILATERAL LOWER LIMB SUSPENSION AND SLEEP RESTRICTION ON BALANCE AND MOTOR UNIT RECRUITMENT

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BACKGROUND: Unloading and sleep restriction - two common stimuli experienced during space flight - independently impair balance and recruitment of anti-gravitational muscles such as the soleus. Unilateral Limb Suspension (ULLS) simulates the impact of spaceflight on musculoskeletal function, but effects on balance are unclear. The examination of balance in astronauts assumes paramount significance within the realm of space exploration, as it underpins crucial facets encompassing their safety, mission efficacy, and holistic well-being.

OBJECTIVE: To investigate the interactive effects of sleep restriction and ULLS on balance regulation and lower extremity motor unit recruitment. **METHODS:** Healthy, active participants (18-50y M and F) will use forearm crutches and a modified shoe (Brooks Revel 5) with a 5cm rocker-style stack for continuous ambulation over a 13-day period while maintaining their regular daily activities. This protocol aims to unload the left leg under free-living conditions. After a 10d lead-in period, subjects will be randomly assigned to either adequate (21:00-0:600) or restricted (01:00-0:600) sleep for the final 3d of the study. Balance assessments including: 1) single-leg stance (15s) with eyes open and closed in both the shod and unshod conditions and 2) a simulated fall from a 30cm platform will be conducted before and after ULLS using force plates (VALD). Sway area and time to stabilize will be primary outcome measures. High density surface EMG (hdEMG) of the soleus and tibialis anterior will be decomposed into individual motor unit action potential trains (MUAPTs, Delsys NeuroMap) during balance tasks. MUAPT outcomes include amplitude, duration, firing frequency, and inter-pulse-interval. **ANTICIPATED RESULTS:** We hypothesize that ULLS and sleep restriction will independently and additively impair balance, with a more pronounced effect when both factors are combined. We expect an increase in center-of-pressure sway area in the left leg after ULLS, especially in the sleep-restricted group. Based on preliminary data, we anticipate increased firing frequency and reduced inter-pulse-interval in response to both sleep restriction and ULLS, while the amplitude and duration of MUAPTs remain unchanged. This predicts a noticeable rise in firing frequency after ULLS, amplified in the sleep-restricted group.

P55: ASSESSING HAND PRECISION WITH A HAPTIC PEN: IMPACT OF SHAPE SIZE ON DRAWING ACCURACY

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BACKGROUND: Haptic pens can now be used to collect electronic data for drawing and writing tasks. This approach can be used to develop hand precision exams for rehabilitation settings. In this preliminary study, we assess hand precision by having participants attempt to trace circles of varying sizes. **PURPOSE:** Have participants use a haptic pen to trace circles of varying sizes and determine if there are significant differences in error scores (between small and large circles). **METHODS:** Seventeen healthy control subjects participated in the study (23.53±4.03 yrs). Participants drew using the dominant hand while sitting at a desk in a standard office chair. The forearm was harnessed to the desk to decouple elbow and shoulder movements; therefore, a participant could only move the wrist to complete tasks. A haptic pen (Touch, 3D Systems, USA) was used to trace existing paths of 1 large circle (D=6.5 cm) and three small circles (d=2.5 cm). The total circumference of three smaller circles was equal to the circumference of the larger circle. For data analysis, the error scores were assessed at 1° intervals. Specifically, at each degree, a line was established from the perimeter of the circle to the participant's traced circle. The error was defined as the distance (along the line) from the circle and the participant's trace. The overall error score for large circle was the mean of the 360 individual error scores, and the overall error score for the small circles was the mean of the error scores (for the three smaller circles). A dependent t-test was used ($\alpha=0.05$) to determine if there were significant differences in error scores between the large and small circles. **RESULTS:** Participants had broad ranges of error scores for the large circle (7.0mm to 65.8mm) and small circle (7.0mm to 39.9mm). Five of the 17 participants had very small error scores (< 20mm) for both circle sizes. The dependent t-test revealed no significant difference ($p=0.10$) in overall error scores between the large circle (2.55±0.17mm) and small circle (1.84±0.11mm).

CONCLUSION: Tracing ability was highly variable among the control participants. Changing the dimension of the circle did not significantly change the error scores for the group. This suggests that there was a

similar degree of difficulty for the two circle sizes. Future studies should thoroughly assess reliability for circles (of varying sizes) and learning effects.

P56: THE ASSOCIATION BETWEEN ANKLE RANGE OF MOTION AND ANAEROBIC SPRINT TEST PERFORMANCE IN AMERICAN PROFESSIONAL SOCCER

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BACKGROUND: Soccer is an intermittent and high intensity sport which demands a high level of aerobic and anaerobic activity. The Running Anaerobic Sprint Test (RAST) is a common test performed to evaluate anaerobic power and capacity. Previous research in youth soccer players has suggested that functional measurements may not determine physical performance well. However, it is unknown how functional measurements such as ankle range of motion (ROM) influence the RAST test in professional soccer players. Thus, the purpose of this study was to examine the relationship between static ankle ROM and anaerobic relative peak power. **METHODS:** Fifteen male United Soccer League (USL1) players completed the testing. The RAST was performed outdoors following the warmup phase of a preseason practice. This test consisted of six max 35 m sprints with 10 seconds of passive recovery between each sprint. Relative peak power was calculated for each player. Static dorsiflexion ROM was obtained for both the dominant and nondominant limbs using the weightbearing lunge test. Bivariate correlations were used to assess the relationship between power and ROM with an a priori alpha level of 0.05.

RESULTS: Bivariate correlation results suggested a significant inverse relationship between peak power and the dominant limb ROM ($p = 0.003$, $r = -0.67$) and the nondominant limb ($p = 0.009$, $r = -0.61$). These analyses suggest that as dorsiflexion ROM increases, relative peak power decreases in both the dominant and nondominant limbs. **CONCLUSIONS:** The current findings corroborate previous research on elite youth soccer players. Previous reports provide little evidence of association between functional movement screen scores and physical performance. Indeed, our findings show that more ankle ROM was associated with decreased power during the RAST. Further, previous studies correlated high ankle stiffness with increased ground reaction forces, velocity, and efficiency in sprinting. This may explain the inverse relationship we observed. Sports science teams should work with coaching staffs in an attempt maximize anaerobic power, while also minimizing injury risk.

P57: DORSIFLEXION AND TOP SPEED IN AMERICAN PROFESSIONAL SOCCER AT PRESEASON AND MIDSEASON

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BACKGROUND: Throughout matches and training sessions, soccer players can run anywhere from one to seven miles with up to sixty high intensity efforts. This physical demand over the course of a season can often lead to overuse, a known contributor to tight musculature. In soccer, the posterior musculature of the shank is of concern due to the consistent rapid eccentric and concentric actions that assist players in reaching top speed. This repetitive motion may contribute to a reduction in dorsiflexion range of motion (ROM) throughout a competitive season, which has been preliminarily investigated. The purpose of this study was to investigate changes in dorsiflexion and top speed measures from preseason to midseason, and the relationship between top speed and dorsiflexion. **METHODS:** Twenty male United Soccer League (USL1) players were tested for dorsiflexion ROM at the preseason and midseason time points. The Weight Bearing Lunge Test was used to evaluate dorsiflexion ROM with values recorded in cm. Top speed was tracked through GPS technology at every training session and match. Preseason was defined as organized training sessions and matches that did not contribute to club points. Midseason was defined as all training sessions and matches starting at match one to the first half of the season. The top speed for each week was recorded and averaged for each player. Paired samples t-tests were used to identify differences in dorsiflexion and top speed measures from preseason to midseason. Bivariate correlations were used to investigate the relationships between variables. Significance for all testing was set a priori at $p \leq 0.05$. **RESULTS:** There was a significant difference between preseason dorsiflexion and midseason dorsiflexion in the dominant limb (8.9±2.75cm vs. 8.21±5.57cm,

$p=0.05$). No other differences were observed and there were no significant relationships between top speed and ROM ($p>0.05$).
CONCLUSIONS: Results of the current study support what other investigators have observed from pre to post season, that dorsiflexion decreases with competitive soccer play. The decreased dorsiflexion at midseason compared to the scores at preseason suggest it may be beneficial to monitor dorsiflexion throughout the season to mitigate injury risk, independent of performance measures such as top speed. Given the lack of relationship observed, dorsiflexion may not influence top speed in professional soccer players.

P58: AXIAL PAIN FOLLOWING AN OUTPATIENT MINIMALLY INVASIVE DECOMPRESSION SPINE SURGERY

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INTRODUCTION: Lumbar spinal stenosis (LSS) is traditionally treated with an open approach to decompressive laminectomy with or without facetectomies (LFD). Traditional treatments, while being commonly accepted and arguably being a successful treatment may result in unintentional iatrogenic spinal instability, which may result in follow up surgical interventions for stabilization. The concern is the impact of the treatment on the normal anatomical structures and function of the spine. Surgical decompression of LSS is one of the most common minimally invasive surgeries (MIS), resulting in significantly greater improvements in functional outcomes and quality of life metrics with surgical intervention compared to conservative medical management. The concerns of unintentional impact on normal anatomical function and its impact on postoperative axial pain are an important factor in surgical success and patient outcomes. Axial pain has been defined as pain from the nuchal to the periscapular or shoulder region. Research has yet to pinpoint the underlying mechanisms and specific surgical intervention which may be the major cause of axial pain. The current study investigates changes in axial pain following a MIS LFD between patients with high ($\geq 60\%$) and low ($< 60\%$) axial pain prior to the procedure. **METHODS:** 500 primary lumbar MIS LFD patients were evaluated. Patients with axial pain $\geq 60\%$ accounted for 247 and axial pain $< 60\%$ accounted for 253. Estimated blood loss (EBL), number of intraoperative and postoperative complications up to 30-days out (NOC), length of surgery (LOS), VAS and ODI preoperatively and 12-months postoperatively were collected. **RESULTS:** Both cohorts experienced significant differences in VAS and ODI from preoperative to postoperative time points. The pre-to-post delta in VAS for the $< 60\%$ cohort was greater than the delta in the $\geq 60\%$ cohort (2.96 vs. 2.29) ($p<0.05$). The same was observed for the ODI when comparing deltas in the $< 60\%$ and $\geq 60\%$ cohorts (12.12 vs. 8.64) ($p<0.05$). The average EBL was 48.01 ml and the LOS averaged at 61.17 min. **CONCLUSIONS:** Based on the sample, patients with $< 60\%$ axial pain will experience greater relief than patients with $\geq 60\%$ axial pain when undergoing MIS. Results also indicate that patients who underwent MIS reported less pain and disability postoperatively than preoperatively, experiencing shorter operative times, lower complication rates, and minimal average EBL.

P59: DOES DISTANCE RUNNING HIP EXTENSION STYLE IMPACT THE OVERALL KINEMATICS?

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BACKGROUND: In distance running, stride rate has received a lot of attention. Many studies focus on separating runners into groups based on their stride rate, however, stride rate seems to not be a style of running, rather a byproduct of different running styles. Hip kinematics are not often used to create such groups, in this study, we use the hip to determine what groups to separate runners into and determine if this affects knee kinematics and stride rate. **PURPOSE:** Compare runners who extend the hip after toe-off to runners who cease hip extension at toe-off and determine if there are significant differences in overall kinematics. **METHODS:** The participants were 20 Division I cross-country runners (19.5 \pm 1.2 years; 40+ miles per week). For the data collection, participants ran 3 minutes on the laboratory treadmill at an 8-minute/mile pace (data collected at 3-minutes). The motion-capture data was collected at 200Hz using 6 Vicon Bonita motion-capture cameras and 3DGAIT software. Ten strides were used to generate average plots (normalized to 101 data points) for the hip and knee motion in all three planes. The 10 plots were averaged to generate an overall waveform for the hip and knee in each plane. The joint motion, in each plane, was determined by calculating the range

of each waveform. One-way ANOVAS were used to test for significant differences among the three planes ($p=0.05$). Bonferroni post-hoc analysis was used for follow-up testing. **RESULTS:** The group of runners who pulled the hip forward at toe off (11.23 $^{\circ}$ \pm 7.67 $^{\circ}$) were consistent with how fast the knee was pulled forward as well (27.18 $^{\circ}$ \pm 12.12 $^{\circ}$). While the group who extended the hip past toe-off (17.05 $^{\circ}$ \pm 6.4 $^{\circ}$) were also consistent on how far back the knee went before coming forward (11.88 $^{\circ}$ \pm 3.34). There was a significant difference when looking at what runners pulled their knee forward and which ones did not ($p=0.001$). For the hip, the result approached a significant difference when looking at how far back the runners extended it ($p=0.08$). Stride rate was significantly greater ($p=0.002$) in runners who did not extend the hip past toe off (176spm $^{\circ}$ \pm 10steps) in comparison to the runners who did extend past toe-off (162spm $^{\circ}$ \pm 4.14). **CONCLUSION:** the amount of motion the hip has in the sagittal plane is directly correlated to the amount of motion the knee has in the sagittal plane. Stride rate also is significantly greater if the hip is pulled back immediately.

P60: DISTANCE RUNNING PELVIS KINEMATICS: SOCCER VS. CROSS-COUNTRY RUNNERS

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DISTANCE RUNNING PELVIS KINEMATICS: SOCCER VS. CROSS-COUNTRY RUNNERS. C. Reasonover¹, J.T. Wight^{1,2}, S. Doherty¹, N. Arciniegas¹, G. Holtrop¹, and G.G.A. Pujalte². ¹Jacksonville University, Jacksonville, FL 32211. ²Mayo Clinic, Jacksonville, FL 32224

BACKGROUND: Soccer players complete substantial distance running during practice and games. However, soccer player distance running kinematics have received minimal attention in the research literature. In this preliminary study we compare soccer players to distance runners and focus on pelvis kinematics. **PURPOSE:** Compare distance running kinematics for college cross-country runners and soccer players and determine if there are significant differences total pelvis motion and stride-to-stride variability. **METHODS:** Participants were 26 Division I cross country runners (15 males, 11 females), and 25 Division I soccer players (15 male, 10 female). Participants completed their preferred warm-up and then ran 3 minutes at an 8-minute/mile pace. Six Vicon Bonita cameras and 3DGAIT software were used to collect kinematic data (200 Hz). Ten strides were used to generate average plots (normalized to 101 data points) for the pelvis motion in the three planes. The 10 plots were averaged to generate an overall waveform for the pelvis in each plane. The total pelvis motion was determined by calculating the range of the waveform. Stride-to-stride variability was determined by calculating the standard deviation across the 10 strides. Dependent t-tests were used to test for significant differences between the runners and soccer players ($p=0.05$). **RESULTS:** For total pelvis motion in stance, there was no significant difference ($p=0.28$) between the runners (13.52 $^{\circ}$ \pm 4.94 $^{\circ}$) and soccer players (12.05 $^{\circ}$ \pm 4.55 $^{\circ}$). For stride-to-stride variability, there was a near significant difference ($p=0.08$) for the sagittal plane. For stride-to-stride variability, there was no significant difference ($p=0.61$) for the frontal plane. For stride rate, there were no significant difference ($p=0.58$) between the runners 82.38 \pm 5.18 steps/min) and soccer players (83.27 \pm 3.02 steps/min). **CONCLUSION:** We compared college runners to soccer players and did not reveal any significant differences in pelvis kinematics and stride rate. These preliminary findings suggest that soccer players may use similar overall kinematics despite the training discrepancies (limited weekly volume of distance running).

P61: COMPARISON OF WALK RATIO, STEP LENGTH, AND CADENCE BETWEEN INDIVIDUALS WITH FEMORACEBULAR IMPINGEMENT SYNDROME AND HEALTHY CONTROLS.

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Background: Femoracebular Impingement Syndrome (FAIS) involves hip-joint abnormalities (cam-type, pincer-type, or mixed-type) and intra-articular injuries, resulting in distinct spatiotemporal parameter differences compared to healthy individuals. Specifically, analyzing the walk ratio (step length/cadence) can reveal gait mechanics affected by hip-related pain. **Methods:** We enrolled 25 individuals with FAIS (age=31.0 \pm 9.2 years, 60% female, BMI=26.1 \pm 4.7 kg/m²) and 14 healthy controls (age=28.1 \pm 9.1 years, 64% female, BMI=26.3 \pm 3.4

kg/m²). Spatiotemporal gait parameters, including walk ratio, step length, and cadence, were collected using an electronic gait mat (GAITRite; Franklin, NJ). Participants completed walking trials at self-selected preferred and fast paces (2 trials each). Independent samples t-tests assessed differences in walk ratio, cadence, and step length between FAIS and healthy controls, with Cohen's *d* effect sizes interpreted as small=0.2, medium=0.5, and large=0.8. **Results:** At the preferred walking pace, the FAIS group had a higher walk ratio compared to controls (0.68±0.09 vs. 0.62±0.07 cm/steps/min; *p*=0.04, *d*=0.7). At a fast-walking pace, while there were no differences in walk ratio between groups (0.67±0.1 vs. 0.61±0.07; *p*=0.10), a medium effect size was evident (*d*=0.6). Examining the components of the walk ratio separately, no differences in cadence were found between groups at preferred (113.63±18.37 vs. 124.78±15.47 steps/min, *p*=0.08) and fast paces (131.23±17.49 vs. 138.78±6.88 steps/min, *p*=0.24). However, small-to-medium effect sizes were observed (*d*=0.6 and 0.4, respectively). Similarly, there were no differences in step length between groups at preferred (76.32±11.93 vs. 76.92±9.86 cm, *p*=0.88) or fast paces (86.53±10.93 vs. 84.45±10.24, *p*=0.594), resulting in negligible-to-small effect sizes (*d*=0.05 and 0.2, respectively). **Conclusions:** Our findings highlight compensatory mechanical and behavioral differences in walk ratio, especially cadence, attributable to hip-related pain. These results can guide future studies on spatiotemporal gait parameters in FAIS and support walk ratio as a marker of improved gait function after clinical intervention.

P62: THE Y-BALANCE TEST AS A MEASURE OF DYNAMIC STABILITY AMONG COLLEGIATE AMERICAN FOOTBALL PLAYERS

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BACKGROUND: The Y-Balance Test (YBT) is a commonly used technique for the rehabilitation of lower extremity injuries. It is a dynamic balance tool that requires an individual to balance on one leg and reach in three separate directions (anterior, posteromedial and posterolateral) in a controlled manner. Previous research has reported that lower reach distances may increase the risk of a lower extremity injury. Therefore, the aim of this study was to measure these reach distances in collegiate American football players prior to the start of a season and again at the midpoint of the season to examine potential differences in the two time points and between healthy players and those that sustained a lower extremity injury during the season. **METHODS:** Participants reported to the laboratory for testing on two separate occasions, once in the preseason in late July and again at the midseason in early November. Testing involved the participants balancing on their right leg and reaching out with their left leg on a sliding block as far as possible, then returning to the starting position. This was completed for all three reach directions. Composite scores from the test were generated by first normalizing the reach distances to an individual's leg length, then by adding the three reach directions together, dividing the result by three times the leg length, and then multiplying the outcome by 100. Participants self-reported any lower extremity injuries that occurred while playing football between the two testing sessions. A 2 (group: injured and healthy) x 2 (time: pre- and mid-season) repeated measures ANOVA was conducted to analyze differences in composite scores. **RESULTS:** There was not a significant interaction between group and time (*F* = 2.126, *P* = .179). There was not a significant main effect for time (*F*= 2.839, *P* = .126) (preseason mean composite score = 93.13 ± 7.30 cm; midseason mean composite score = 89.59 ± 11.95 cm). There was no significant main effect for group (*F*= 1.882, *P* = .203) (healthy mean composite score = 87.42 ± 7.74 cm; injured mean composite score = 94.64 ± 9.38 cm). **CONCLUSIONS:** Although no significance was found between the groups, it is still important to practice ongoing monitoring and targeted interventions to enhance lower extremity stability in collegiate football players during the season. A larger sample size should also be included in future studies.

P63: 3D MOTION ANALYSIS OF SINGLE LEG SQUAT WITH ASSOCIATION TO HIP STRENGTH AND ANKLE DORSIFLEXION
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BACKGROUND - When the human body is in motion, the transfer of energy and force occurs in a series as a kinetic chain, such as in a kicking motion where the trunk, hip, knee, and ankle are working

together to produce one task. Thus, when an impairment occurs at one point along the chain, it will impact the proximal and distal segments in the series. Besides the kicking motion, another example of a functional movement is the single leg squat (SLS). For the SLS to be successful, the need for adequate hip strength and adequate knee and ankle range of motion (ROM) is imperative. Previous literature has found a correlation between hip strength and ankle range of motion deficits. However, there has been limited research regarding a correlative study utilizing a 3D motion analysis system, specifically examining hip strength and ankle ROM during a SLS. The primary purpose is to assess and correlate the knee flexion angle during a SLS to hip strength and ankle ROM in a generally healthy population. The secondary purpose is to determine if there is a correlation between hip strength and ankle ROM. **METHODS** - Seventy-five participants, aged 18-40, will be recruited for this study. Participants must be in good health and capable of performing a SLS determined by a screening process. Participants must have no previous history of lower extremity musculoskeletal surgery or a current lower extremity injury. Each participant will be asked to participate in one session, examining ankle dorsiflexion ROM, hip extensor strength, hip abductor strength, and knee flexion angle during a SLS. Ankle dorsiflexion ROM will be measured using a smartphone inclinometer app (iHandy level). Hip extensor and abductor strength will be measured using an externally fixated handheld dynamometer. The SLS will be 3D motion analyzed using the VSTPro™ video analysis device. Data will be analyzed using a one-tailed correlation statistical test. **ANTICIPATED RESULTS** - The following positive correlations are anticipated: (a) hip abductor strength and SLS depth (knee flexion angle); (b) ankle dorsiflexion ROM and SLS depth (knee flexion angle); and (c) hip abduction and hip extension strength and ankle dorsiflexion ROM.

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P64: EXPLORING THE TEST-RETEST RELIABILITY OF MARKERLESS MOTION CAPTURE FOR OUTDOOR WALKING

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BACKGROUND: Markerless motion capture is a rapidly advancing technology and has been tested indoors and proven reliable. However, there are no studies that have tested a portable markerless motion capture system outdoors and out of the lab setting. The purpose of this study is to determine test-retest reliability of knee kinematics using a portable markerless motion capture system during a walking test in healthy adults. **METHODS:** Twenty-one participants (6M, 15F, age=23.11 ± 1.89 years, height = 167.17 ± 7.89 cm, mass = 69.85 ± 23.11 kg) performed two walking tests each separated by a minimum of five days. Participants were instructed to walk at their comfortable walking pace, which was recorded at the beginning of their trials. Eight trials were recorded within 5% of their recorded walking pace. Videos were recorded using 8 video cameras (OptiTrack Prime Color, Corvallis, OR. Natural Point Inc.) at 60hz. After collection, video data was exported and reduced in a markerless motion capture software (Theia3D, Kingston, Ontario). The maximum and minimum knee flexion and extension and knee abduction and adduction angles during the first 50% of stance phase were collected for data analysis. Test-retest reliability was calculated with intraclass correlation coefficients (ICCs) between testing time 1 and time 2. Reliability was interpreted as excellent (>0.90), good (0.90-0.75), moderate (0.75-0.50), and poor (<0.50). Precision was calculated with the standard error of measurement (SEM). **RESULTS:** ICC and SEM demonstrated good reliability and precision for peak knee flexion (ICC=0.859 (0.722,0.931), SEM=1.84). Reliability and precision were moderate for knee extension (ICC=0.732 (0.506, 0.864), SEM=1.23). Reliability was moderate for knee abduction (ICC=0.547 (0.547,0.757), SEM=1.47) and knee adduction (ICC=0.576 (0.273, 0.775), SEM=1.62). **CONCLUSION:** Our results suggest that sagittal plane movements like knee extension and flexion demonstrate good to moderate reliability, however, they can still improve. Movements in the frontal plane are less reliable than the sagittal plane. Possible solutions to improve reliability would include more cameras or positioning in a different pattern enabling a better view of the knee joint. Artificial Intelligence (AI) may need improvements, and future research should continue to investigate reliability and precision as improvements are made.

P65: DISTANCE RUNNING KINEMATIC ASYMMETRIES: SOCCER PLAYERS VS. CROSS-COUNTRY RUNNERS

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BACKGROUND: Soccer players and other rotational athletes can develop lower body asymmetries related to kicking, throwing, etc. It is unclear if asymmetries influence running kinematics in a predictable manner. In this pilot study, we compare soccer players to distance runners to determine if soccer players tend to have more asymmetric distance running kinematics. **PURPOSE:** Assess running asymmetries during stance and swing for the hip and knee (sagittal plane) and determine if there are significant differences between college cross-country runners and soccer players. **METHODS:** 11 women's soccer players from Division I college soccer players and 11 college cross-country runners. (18.91±1.54) Six Vicon Bonita cameras and 3DGAIT software were used to collect kinematic data (200 Hz). Participants completed their preferred warm-up and then ran 3 minutes on the treadmill (8 minutes/mile). Ten strides were used to generate average stance and swing joint angle plots (normalized to 101 data points). The waveforms were compared for the right and left leg and average difference scores were calculated (to determine the bilateral differences). Dependent t-tests were used to test for significant differences between the runners and soccer players (p=0.05). **RESULTS:** For knee stance, there was no significant difference (p=0.14) between the runners (3.31°±1.13°) and soccer players (5.25°± 3.99°) For knee swing, there was no significant difference (p=0.39) between the runners (4.16°± 6.32°) and soccer players (.81°±4.26°). For hip stance, there was no significant difference (p=0.37) between the runners (.08°±1.77°) and soccer players (18°±3.56°). For hip swing, there was no significant difference (p=0.64) between the runners (4.99°±3.69°) and soccer players (.32°±2.72°). **CONCLUSION:** There were no significant group differences in running asymmetries. However, we did have individuals with bilateral differences of 10+ degrees at both the hip and knee. It is important to determine if bilateral differences are relevant to running injuries.

P66: VERTICAL LEG STIFFNESS VARIATIONS OBSERVED DURING A NINE-MILE TRAINING RUN

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BACKGROUND: Muscle-tendon stiffness has been previously studied in association with muscle performance, joint stability, and risks of injury. Given the role of leg stiffness for force absorption during running, it is possible that muscle fatigue could induce changes in leg stiffness thereby reflecting a change in injury risk potential. The purpose of this study was to examine changes in single (SL) and double (DL) leg vertical stiffness during a nine-mile training run. **METHODS:** Eight healthy runners (4 females), void of current lower extremity injuries, had recently completed a half/full marathon, and were currently training one distance run (≥9mi) per week completed a 9-mile run. The run was split into three 3-mile loops. SL and DL vertical leg stiffness was assessed at baseline, and after competing miles 3, 6, and 9 by having participants hop in place at self-selected frequencies while vertical ground reaction forces (vGRF) were recorded. Three outcome measures were computed from the vGRF, vertical leg stiffness, hop frequency, and vertical total body center of mass (vTBCM) displacement. Separate hop mode (SL, DL) by time analyses of variance were conducted. Significant time effects were examined using post hoc trend analyses. **RESULTS:** Relative to baseline, the training run prompted a significant 16.5% (2.2±3.0 kN/m) increase in vertical leg stiffness (P=.045) with a concurrent significant 18.9% (-.036±.025m) decrease in vTBCM displacement (P=.014). Only linear trends were statistically significant for both vertical leg stiffness (P=.046, d=.683) and vTBCM displacement (P=.009, d=1.1). While the training run induced significant increases in hop frequency (DL:.51±.34Hz, SL:.25±.35Hz), with both DL (P=.003, d=.1.4) and SL (P=.038, d=.80) showing significant linear increases, the effect on DL hop frequency was significantly greater than SL (P=.020, d=1.0). While DL vertical leg stiffness was significantly greater than SL (P=.002, d=.92), vTBCM displacement (P=.002, d=.64) was significantly greater for SL than DL. **CONCLUSIONS:** These study results demonstrate that the increase in vertical leg stiffness induced with the training run can be explained by an increase in hop frequency and concurrent decrease in vTBCM displacement. It is likely that the increased stiffness is secondary to changes associated with muscle fatigue that occurs during a long-

distance run. Future studies should examine which muscles are responsible for the stiffness changes identified in the current study.

P67: EFFECTS OF BADMINTON ON BILATERAL STATIC BALANCE FOR YOUNG ADULTS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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BACKGROUND: The purpose of this study was to examine the effects of an inclusive badminton intervention on static, bilateral balance in young adults with intellectual and developmental disabilities (IDD) and typical developing (TD) young adults. **METHODS:** 8 participants (4 IDD-BADM and 4 TD-BADM) participated in a 12-week inclusive badminton intervention, with the other 8 participants as matched controls (4 IDD-CONTR and 4 TD-CONTR) (74.19kg ± 9.8kg, 171.96cm ± 5.4cm; 21.7 ± 1.8 years of age). The study followed a repeated measures design (pre, mid, post) before the intervention, at 6 weeks, and after 12 weeks. Static balance conditions included eyes open, bilateral stance (EO) (20s) on a force plate. Center of pressure (COP) sway variables included: average anterior/posterior (A/P) displacement (in), average medial/lateral (M/L) displacement (in), average 95% ellipsoid area (EA) (in²), and average velocity (AV) (ft/s), and average length (in). Post-hoc comparisons were performed using a Greenhouse-Geisser correction with p < 0.05. The badminton group followed the Special Olympics Badminton Skills protocol and was designed as a bi-weekly 50-minute, inclusive adapted badminton class, including 24 sessions. **RESULTS:** Significant group x time interactions were reported for IDD-BADM for average velocity and average length. Average velocity post-hoc comparisons revealed greater decreases in COP average velocity for IDD-BADM pre-test to post-test (p= 0.030), improving in balance performance when compared to IDD-CONTR. Similar results were reported with greater decreases in average length from pre-test to post-test (p =0.028) where IDD-BADM continued to improve balance measurements when compared to IDD-CONTR. In badminton, constant shifting of the center of gravity with asymmetrical upper body actions challenges and trains the postural control system by continuously integrating and organizing sensory information. Even though dynamic balance movements were utilized, static balance, like during the EO condition, was also being challenged during the intervention. No significant main effects for time, group, nor significant group x time interactions were found for average displacement in the A/P or M/L directions and 95% ellipsoid area for the other groups. **CONCLUSIONS:** An inclusive, adapted badminton program could be an alternative balance training program for individuals with IDD.

P68: COMPARING LOCALIZED AND WHOLE-BODY VIBRATION ON GAIT KINEMATICS: A PILOT STUDY

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BACKGROUND: The use of whole-body vibration is a long-standing modality for recovery via the stimulation of the proprioceptive pathways and increased muscular activation. Vibration has expanded into other realms such as sports medicine and the sports performance industry; however, there is minimal knowledge on comparing localized compression vibration (LCV) with whole body vibration (WBV) regarding gait kinematics. The purpose of this study is to determine the effects of localized and whole-body vibration on walking speed (WS) and cadence (CAD). **METHODS:** Six male and female participants (22.33±2.88 yrs, 174.43±7.63 cm, 75.91±13.68 kg) volunteered to participate in this study and completed a within-subjects design. WBV and LCV were assessed to see the influence of different modalities of vibration on gait kinematics. A work to rest ratio of 1:1 through five rounds was completed in between sets of walking and ta 3D motion capture system was used to obtain gait. CAD and WS were assessed at baseline and following each intervention. Baseline was re-established following a washout period prior to the second intervention. Paired samples t-tests were conducted to examine differences between variables. **RESULTS:** There was a significant difference in between Pre and Post LCV WS (1.29±.13 vs. 1.34±.14, p=.00), however there were no significant main effects noted between Pre and Post WBV CAD (p=.08), Pre and Post WBV WS (p=.32) and Pre and Post LCV CAD (p=.48). **CONCLUSION:** These results suggest that vibration can help to increase cadence and gait speed. Post WBV saw an average increase in WS and Cad but was not significantly different from the Pre WBV. Therefore, using LCV to alter

gait kinematics may help to increase muscular and neural activation while potentially limiting future injuries. Continued data collection will be needed to support an increase in sample size further investigate these changes.

P69: INFLUENCE OF IN-GAME SITUATION ON BALL RELEASE PARAMETERS IN DIVISION 1 COLLEGE BASEBALL PITCHERS
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BACKGROUND: Success at high competition levels often hinges on performing well during high pressure (leverage) situations. Advanced baseball analytics enable teams to quantify the pressure of in-game situations, and markerless motion capture makes it possible to capture in-game biomechanical data. Research suggests consistent pitch release parameters improve performance across a season. Therefore, this study aimed to compare fastball release parameters and pitch velocity in college baseball pitchers between in-game high and low Leverage Index (LI) situations. **METHODS:** In-game markerless motion capture data (300Hz) for fifty-six NCAA Division 1 baseball pitchers (1.89 ± 0.1 m; 92.7 ± 8.9 kg) were analyzed. Pitch velocity and hand position (relative to the middle of the pitching rubber) in the anterior/posterior, superior/inferior, and medial/lateral directions at ball release were analyzed. Play-by-play data were scrapped for LI components (score, innings, outs, and baserunners) and matched to the appropriate pitch. LI is an estimate of in-game pressure that measures the potential change in win expectancy and is calculated as the sum of the weighted change in win probability divided by the average win probability added per swing. Each pitcher's highest and lowest LI fastball pitches were used for within-pitcher comparison. A one-way repeated measures multivariate analysis of variance (RM-MANOVA) determined if release parameters and pitch velocity differed between high and low LI situations ($\alpha = .05$). **RESULTS:** Descriptive statistics (high LI mean \pm SD vs. low LI mean \pm SD) for the parameters analyzed are as follows: LI (2.8 ± 1.6 vs. 0.4 ± 0.5), pitch velocity (40.45 ± 3.2 vs. 40.54 ± 1.4 m/s), anterior/posterior hand position (1.72 ± 0.1 vs. 1.73 ± 0.1 m), medial/lateral hand position (0.52 ± 0.2 vs. 0.47 ± 0.2 m), and superior/inferior hand position (1.79 ± 0.2 vs. 1.82 ± 0.2 m). The RM-MANOVA revealed no significant differences in release parameters between high and low LI pitches ($F_{4,52} = .322$, $p = .862$). **CONCLUSION:** While prior research identified a relationship between consistency in the release position and season long performance, these release parameters are not influenced by high or low pressure (leverage) situations. Additional comparisons of high and low leverage situations, as determined by LI, should include analysis of additional kinematics, ball flight metrics, and ball/strike outcomes.

P70: RELATIONSHIP BETWEEN DROP JUMP METRICS AND SPRINT PERFORMANCE IN NCAA DIVISION I SOFTBALL ATHLETES

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BACKGROUND: Previous research has examined drop-jump variables with sprint performance, typically within a sprinting athletic population. The purpose of this analyses was to examine correlation between drop-jump reactive strength index (RSI) and 20-meter sprint performance in Division I softball athletes ($n=23$). **METHODS:** Two drop jumps and 20-meter sprints were performed weekly. Two drop jumps were performed from a 15-inch box onto the VALD ForceDeck and two 20 m sprint times were recorded using Brower Laser timers. The best of the two efforts for both were used for analysis. A simple correlation was performed with Cook's D examining potential outliers. Weekly there was a common outlier from one athlete that contradicts previous research in other athletic populations. Simple linear regression correlations were performed utilizing R-studio for statistical analyses of overall and weekly. **RESULTS:** Overall team analysis ($n = 150$) showed a moderate correlation between RSI and 20m sprint time ($r = 0.53$, $p < 0.001$) with a weekly range of -0.48 - 0.82 . When removing the individual outlier ($n=143$) in the linear regression, there was a slight increase the strength of correlation ($r = -0.61$, $p < 0.001$) with a range of -0.56 - 0.81 . Similarly for peak power relative to bodyweight with all data points, there was a moderate correlation overall with weekly analysis correlation ranging from -0.56 - 0.81 and overall correlation $r = -0.57$ ($p < 0.001$). The last variable investigated was concentric mean power relative to bodyweight, which also showed a weekly moderate correlation ranging from -0.48 - 0.81 and overall moderate correlation with 20m sprint time ($r = -0.50$). There was a

moderate correlation between RSI and the 20m sprint time ($r = -0.64$, $p < 0.001$), a strong correlation peak power relative to body weight and sprint time ($r = -0.72$, $p < 0.001$) and a moderate correlation between concentric mean power relative to bodyweight and sprint time ($r = -0.62$, $p = 0.001$). **CONCLUSIONS:** There is evidence to suggest drop jump performance moderately correlates with 20 m sprint time in softball athletes. Future research should examine if an increase in drop jump performance coincides with improvements in 20m sprint time.

P71: OBSTRUCTIVE SLEEP APNEA IN NCAA FBS FOOTBALL OFFENSIVE LINE PLAYERS

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BACKGROUND: The importance of quality sleep on health and wellness is widely known. Obstructive sleep apnea (OSA) is a common cause of poor sleep for individuals who are male, obese, and have a large neck circumference. These physical characteristics are advantageous in American football players who occupy offensive line positions on the field: guard, center, tackle, and tight end. OSA is defined as having five or more disturbances per hour during sleep. This project looked to discover if the selected participants had OSA based on overnight sleep studies. **METHODS:** Sleep quality data of NCAA FBS football offensive line players ($n = 7$; mean \pm SD age = 20.42 ± 1.40 years, height = 76 ± 0.833 inches, mass = 294.43 ± 27.59 lbs) was collected during individual diagnostic home sleep studies performed with a Type III portable system (Alice NightOne). Oxygen saturation (SpO2) and pulse rate were monitored using a pulse oximeter. Thoracoabdominal respiratory effort was recorded by a respiratory inductive plethysmography (RIP) belt. Apnea was defined as cessation of airflow for at least 10 seconds (2 respiratory cycles) in the presence of continuous respiratory movement. Hypopnea was defined as an abnormal respiratory event lasting at least 10 seconds with at least a 30% reduction of thoracoabdominal movement or airflow as compared to baseline, and with at least 4% oxygen desaturation or an arousal. Apnea-Hypopnea Index (AHI), the average combined apnea and hypopnea episodes per hour, was recorded for all participants. Participant self-report sleep quality was collected post-sleep study. **RESULTS:** All seven participants were found to have mild OSA. Moderate OSA was found in 2 out of 7 participants (29%). Six of the seven participants (86%) reported a normal night's sleep after the study. The other participant reported restlessness and fragmented sleep. **CONCLUSION:** Sleep disorders are a common occurrence in large individuals. Athletes who play offensive line positions on football teams should be considered at-risk for a sleep disorder due to their size, even if they do not perceive any sleep quality problems. It would be advised for those individuals to have their sleep assessed to promote better performance, and more importantly, improve general well-being.

P72: NON INVASIVE LOAD MONITORING IN FEMALE DIVISION I COLLEGIATE GYMNASTS

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BACKGROUND: Collegiate women's gymnastics is an intense, monotonous, and injury-prone sport. Gymnasts are subjected to substantial physiological and psychological stress. Evaluation of external training loads via accelerometry and the associated internal loads through subjective ratings of stress are commonplace in field sports but are absent in collegiate gymnastics. Thus, the purpose of this study was to quantify external and internal preseason training loads in a NCAA Division I women's gymnastics team, while also attempting to determine their usefulness and practicality. **METHODS:** Eighteen women from the same NCAA Division I team volunteered over four preseason training periods (general prep 1 (GP1), general prep 2 (GP2), specific prep 1, SP1, and specific prep 2 (SP2)). External load was quantified with Catapult Sports accelerometers where Player Load (PL), Player Load per minute (PL/min), and Inertial Movement Analysis (IMA) were specifically examined via repeated measures ANOVA. The Short Recovery-Stress Scale (SRSS) was completed daily by all participants along with a 100-mm visual analog scale (VAS) for both ratings of sleep and total soreness to calculate Pearson's r coefficients between all internal and external load metrics. **RESULTS:** PL, PL/min, and IMA were significantly correlated with one another ($r = .551$ to $.986$, $p < .001$ for all measures). Mental stress was highly associated with an athlete's perception of total stress ($r = .843$, $p < .001$). Physical stress was the strongest predictor of soreness ratings ($r = .460$, $p < .001$). Mental recovery had the strongest correlation with overall recovery ($r = .809$, $p < .001$). PL during GP2 was higher

than SP1 (642.1 ± 17.7 vs. 574.2 ± 15.2 , $p = 0.019$) and SP2 (522.4 ± 17.0 , $p < 0.001$), while SP1 was greater than SP2 ($p = 0.012$). There were significant correlations between external and internal load measures. **CONCLUSIONS:** External and internal load monitoring may individually be valuable in women's collegiate gymnastics despite not showing a consistent association with each other. Future research should evaluate the effects of academic major, menstrual cycle influence, and nutritional approach within this population. Subjective ratings of stress, recovery, sleep, and soreness offer key insights for monitoring collegiate gymnasts, however, accelerometry's practicality is yet undetermined when considering the cost to benefit ratio of these measures.

P73: PREDICTING HIT BALL OUTCOMES IN DIVISION I COLLEGIATE BASEBALL PLAYERS

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BACKGROUND: Modern-day technology continues to challenge long-held beliefs on the performance aspects of baseball. **METHODS:** Three classes of independent variables (anthropometric, in-game situation, technique-based) were collected from 1,922 batting outcomes and 230 players to predict the likelihood of a batting outcome producing a hit from Atlantic Coast Conference baseball games during the 2021 season. Anthropometric measurements entailed player's heights and weights. In-game situation included batter side, same side, ahead count, and pitch type. Technique-based variables measured by radar (TrackMan; Scottsdale AZ) included exit speed (ExSp), launch angle (LA), batted ball distance (BBD), and hang time (HT). Batting outcomes, with 0 = no hit and 1 = hit, was the dependent variable. A binary logistic regression analysis was conducted with an $\alpha = 0.05$ to denote statistical significance. **RESULTS:** Independent variables provided a good fit ($\chi^2(10) = 522.358$, $p < 0.01$) and correctly predicted almost three-fourths of batting outcomes. Height (Wald = 4.176, $p < 0.05$), ExSp (Wald = 4.675, $p < 0.05$), LA (Wald = 25.053, $p < 0.01$), and BBD (Wald = 193.597, $p < 0.01$) had significant positive associations with batting outcome. HT (Wald = 218.399, $p < 0.01$) had a significant negative association with batting outcome. **CONCLUSIONS:** TrackMan provided four significant independent variables. Anthropometry's contribution to batting performance is modest, while in-game situation's influence was non-significant. Results contradict long-held beliefs of their importance that began with the sport's inception.

P74: SELF-OBJECTIFICATION IN COLLEGIATE FEMALE ATHLETES

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Self-objectification is the psychological process in which individuals view themselves as an object made up of parts for evaluation and is an important factor to consider in body image research. High values placed on physical appearance can adversely affect female body image and therefore negatively impact mental health. The sporting context provides a unique environment for female athletes to view their bodies. Despite competing in a domain that should celebrate the body's functionality, female athletes are subject to comparing themselves to society's feminine, slender body ideal. Higher values placed on physical appearance are associated with negative mental health outcomes and lower quality of life.

PURPOSE: To assess the importance collegiate female athletes place on appearance and functional based attributes.

METHODS: Female college student athletes between the ages of 18-25 years were recruited to take an online survey. Data collected included demographics (e.g., age, race, sport) and body image, including the Self-Objectification Scale. The Self-Objectification Scale ranges from -36 to 36 with higher values demonstrating a greater emphasis on appearance and lower values representing a greater emphasis on competence.

RESULTS: Participants ($N=67$; 20.6 ± 1.9 years, 82% White) represented nine different sports including track and field (23), softball (7), lacrosse (10), cross country (3), soccer (5), dance (11), volleyball (6), swimming and diving (1), and tennis (1). Scores from the Self-Objectification Scale showed that female athletes had a greater emphasis on appearance related attributes (5.37 ± 24 ; range -36-36). **CONCLUSIONS:** Female athletes appreciate appearance related factors of body image more than competence related factors despite participating within a sector that requires physical competencies unrelated to outward appearance. Due to the negative outcomes that

result from self-objectification and the wide spread of the collected data, more research is warranted among the athletic population. Future research should explore how self-objectification differs between sport types to reveal which athletes are more at risk for objectifying themselves. Additionally, future interventions should look at ways to promote body functionality over appearance in athletic and physically active female populations.

P75: THE EFFECT OF SQUAT DEPTH IN TRAINING ON JOINT ANGLE SPECIFIC VERTICAL JUMP

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BACKGROUND: Previous studies have investigated the impact of squat depth in training on vertical jump, but study into the use of specific joint angles is still needed. Explosive sports such as basketball and football often require athletes to jump out of shallow joint angles. Understanding training within these shallow joint angles is critical to enhancing athletic performance. The purpose of this study was to see how training squats from different depths impacts vertical jump height from different joint angles. **METHODS:** 56 resistance trained athletes completed a five-week training program. They were randomly assigned to one of four groups. Each group performed their regular training with either full (FU), half (HA), or quarter (QU) depth front squats. The fourth group performed squats with progressively decreasing depth throughout the five weeks. At baseline, countermovement jump (CMJ), squat jump (SJ), and squat jump from 140 degrees (SJ 140) were tested using a Vertec. After the five-week training protocol, baseline jump tests were repeated for each jump condition. **RESULTS:** Regardless of group, there was a time-dependent increase in vertical jump height approaching significance from baseline to post-test (21.81 ± 0.545 to 22.51 ± 0.496 inches; $p = 0.051$). The PR group demonstrated a significant increase in the SJ 140 jump when compared with the other groups (21.65 ± 4.58 to 23.19 ± 3.41 inches; $p = 0.038$). No other significant time- and group-based differences were found between groups for any other jump. **CONCLUSION:** Trained athletes may benefit from incorporating squats from sport specific depths, specifically, progressing through squat depths. Coaches should consider incorporating squats from sport specific angles into strength and conditioning programs for athletes required to jump during competition.

P76: THE EFFECT OF A MEDICINE BALL WORKOUT ON EXIT VELOCITY IN BASEBALL HITTING

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BACKGROUND: The purpose of this study was to determine the effect of medicine ball workouts on exit velocity for baseball players while hitting. Exit velocity is the speed of the baseball after it has been hit by the bat. A higher exit velocity typically leads to more success for a hitter in baseball. **METHODS:** Fourteen collegiate baseball players were recruited for this study. Baseline exit velocity measurements were collected using a tee, baseball, the same bat for all subjects, and a pocket radar. To ensure accurate exit velocity measurement, the pocket radar was set up in front of the subjects so that they were hitting the baseball toward the pocket radar. Subjects were then randomly assigned to two groups; one group performed 3 medicine ball specific workouts per week for five weeks, while the control group continued normal training. Post-intervention measurements of exit velocity were taken for both groups after the training period had concluded. The total increase, percent increase, and overall average increase in exit velocity from the first test to the last test was recorded. One-way ANOVA testing was performed to determine significant changes over time and between groups. **RESULTS:** At baseline, there was no significant difference between groups. Regardless of group, there were timepoint based increases in exit velocity (84.96 ± 5.76 mph to 89.57 ± 4.11 mph, $p < 0.001$). The workout group significantly increased exit velocity compared with the control group (mph increase: 6.57 ± 2.149 ; 2.857 ± 2.544 ; $p = 0.012$). **CONCLUSION:** This study demonstrated that medicine ball workouts are effective for increasing baseball exit velocity during hitting activities. Despite overall increases in exit velocity for both groups over time, the data suggest incorporating medicine ball workouts with rotation-specific training has a significant effect on a hitter's exit velocity compared with normal training activities.

P77: DOES ANAEROBIC SPEED RESERVE AND REPEATED SPRINT ABILITY EFFECT SOCCER PERFORMANCE WHILE IN FATIGUE

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Background: The purpose of this study was to examine the relationship between anaerobic speed reserve (ASR) and repeated sprint ability (RSA) and whether they impact technical performance in fresh vs fatigued soccer players. **Methods:** Five male varsity collegiate soccer athletes were recruited for this study. Data collection was divided into 2 sessions, performed on different days with at least 48 hours between. Session one consisted of a VO₂max test performed on a treadmill. Maximum aerobic speed (MAS) was determined as the fastest speed completed during this test. Maximum sprint speed was determined in session two using timing gates while the subjects sprinted for 30 meters. Anaerobic speed reserve was then calculated through the difference between maximum sprint speed and maximum aerobic speed. Session two focused on the performance of soccer technical drills when athletes are fresh and fatigued. All drills were performed twice, once at the beginning of the session and again after fatiguing activities. The drills consisted of short passing, long passing, dribbling, shooting, and finishing. All of them were scored through their success rate, except the dribbling drill which was scored by the fastest times registered. The fatiguing activities consisted of a maximum sprint speed test and a repeated sprint ability test. Data were compiled and evaluated for statistical significance via bivariate correlation analysis using SPSS 28 software to determine the effects of ASR and RSA in soccer performance. **Results:** ASR and RSA were not found to be directly correlated ($R = -.009$, $p = .988$). MAS was correlated with VO₂max but negatively correlated with ASR ($R = .964$, $p = .008$; $R = -.908$, $p = .033$; respectively). **Conclusions:** Although ASR may serve as a good indicator of general fitness, this study did not support ASR being a good indicator for RSA. Additionally, while ASR and RSA may measure an athlete's capability to combat and delay fatigue, they are not necessarily a mandatory requirement for soccer performance, at least on a technical level.

P78: COACH-DIRECTED WORKLOAD MANAGEMENT IMPROVES EXTERNAL WORKLOAD BUT NOT INJURIES IN COLLEGIATE MEN'S SOCCER

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BACKGROUND: External workload is the amount of physical work performed, calculated as acute chronic workload ratio (ACWR) and categorized as low, sweet spot, overreaching, and high based on ACWR values. ACWR represents a state of fatigue over preparation and values outside the sweet spot reportedly increase injury risk. Workload management (WM) is the application of workload data to adjust training to maximize performance and minimize injury risk. The purpose was to determine if the number of injured players and team average workload is related to a WM strategy decided upon and implemented by the coaching staff in a Division I men's soccer program. **METHODS:** Global positioning system variables (total distance, sprint distance, power plays, work ratio, and player load) and injuries requiring medical attention and loss of participation, were collected for 46 participants (height=178.9±5.8cm, mass=75.2±6.22kg) over two consecutive competitive seasons (2021-22). Rolling average ACWR (RAACWR) and exponentially weighted ACWR (EWACWR) were calculated for each external workload variable for individual participants and as team weekly averages. Season 1: variables were analyzed but WM was not applied. Season 2: variables were analyzed and individual and team data were reported to the coaches who made WM adjustments. In both seasons, the number of times the team's average RAACWR and EWACWR variables were categorized as "sweet spot" and the number of injured participants were counted and compared using Chi Square Tests of Independence. **RESULTS:** There was a relationship between the number of RAACWR sweet spot variables and seasons, $\chi^2(1, 85) = 4.0$, $p = 0.046$, with 60% (27/45) in 2021 and 80% (32/40) in 2022. There was a relationship between the number of EWACWR sweet spots variables and seasons, $\chi^2(1, 125) = 12.0$, $p < 0.001$, with 29% (19/65) in 2021 and 60% (36/60) in 2022. There was no relationship between the number of injured players and seasons, $\chi^2(1, 46) = 0.35$, $p = 0.55$, where 35% (8/23) and 48% (11/23) of the players were injured in seasons 2021 and 2022, respectively. **CONCLUSIONS:** Workload differed between seasons, however, this did not translate to a difference in the number of injured players. The coaching staff effectively applied the workload data to manage external demands and theoretically benefit participant

physical performance over time. Further studies examining WM implementation strategies are needed.

P79: RELATIONSHIP BETWEEN VO₂MAX, TIME TO EXHAUSTION, AND POSITIONAL PLAY IN NCAA DIII MALE SOCCER PLAYERS.

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Soccer consists of repeated bouts of high-intensity efforts that occur during a 90-minute match. Although soccer is a team sport, each position has separate physiological demands. Thus, each position should undergo individual analysis to determine the physiological demands and requirements for elite performance. However, there is a lack of literature regarding positional differences in NCAA DIII Male Soccer Athletes. **PURPOSE:** To assess potential physiological differences related to positional play in DIII male soccer players. **METHODS:** Eighteen (3 forwards, 6 midfielders, 6 defenders, and 3 goalkeepers) NCAA DIII male soccer players completed a maximal treadmill GXT. Max values of VO₂, Ventilation (VE), Heart Rate (HR), Ventilatory Threshold (VT), and Time to Exhaustion (TTE) were collected and statistically analyzed. The values were compared between groups. A One-Way MANOVA was used to evaluate the positional differences between forwards, midfielders, defenders, and goalkeepers with significant differences occurring at a p -value ≤ 0.05 . For the 18 subjects, a bivariate correlation ($p \leq 0.05$) was performed for all performance variables. **RESULTS:** No significant differences were found between the groups [VO₂max($F = 1.374$, $p = 0.292$), HRmax($F = 0.636$, $p = 0.604$), VEpeak ($F = .966$, $p = 0.436$), TTE($F = 1.489$, $p = 0.261$), VT($F = 1.415$, $p = 0.280$)]. Also, a significant moderately high correlation occurred between VO₂max and TTE. No other significant correlations were found between VO₂ and other variables. VE had a significant moderately negative correlation between height and weight. No significant correlations were found for HRmax and VT. **CONCLUSION:** The results were not significant between groups, but this is believed to be due to the sample size of each group. The results have practical application as there were differences between the positions. The differences indicate that the various positions may require different physiological stimuli thus suggesting that coaches should consider training athletes from a positional perspective instead of a generic team training protocol. Future research may need to evaluate larger sample sizes of various positions to fully understand the exact demands of each field position which will help determine specific training programs for various soccer team positions.

P80: PHYSICAL DEMANDS OF A COLLEGIATE WOMEN'S TENNIS TOURNAMENT

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BACKGROUND: Knowledge of internal and external competition workload parameters can be used to influence preparatory training sessions. However, descriptive information pertaining to the demands of a collegiate women's tennis tournament have yet to be reported. The purpose of this study was to describe and compare singles and doubles match loads acquired from a three-day collegiate women's tennis tournament. **METHODS:** Nine players (19.7 ± 2.1 years, 170.2 ± 7.0 cm, 62.0 ± 8.2 kg) from a Division-1 women's tennis team participated in the study. Mean and peak heart rate were recorded with Bluetooth chest-belt heart rate monitors. Movement parameters were recorded with wearable Global Positioning System devices (10 Hz) and included total duration, peak speed, mean speed, total distance, and distance covered in each speed zone (Zone 1 = 0 - 1.5 m/s; Zone 2 = 1.5 - 3 m/s; Zone 3 = 3 - 4 m/s; Zone 4 = 4 - 5.5 m/s). Parametric (reported as mean ± standard deviation) or non-parametric (reported as median [inter-quartile range]) pairwise comparisons were used for analyses. **RESULTS:** Mean (161.6 ± 8.6 vs. 151.5 ± 11.2 b·min⁻¹) and peak heart rate (191 ± 6.8 vs. 184.8 ± 7.3 b·min⁻¹) were higher for singles versus doubles matches ($P < 0.05$). Total duration (90 [54] vs. 37 [11] min), total distance (4023 [2253] vs. 1545 [620] m), and peak speed (5.6 ± 0.5 vs. 4.9 ± 0.6 m/s), but not mean speed (0.7 ± 0.1 vs. 0.7 ± 0.1 m/s), were higher for singles versus doubles matches ($P < 0.05$). Lastly, all distances covered in Zone 1 (2768 [1625] vs. 1159 [459] m) through Zone 4 (48 [64] vs. 0 [16]) were higher for singles versus doubles matches ($P < 0.05$). **CONCLUSIONS:** Singles match demands were more intensive than doubles match demands. Cardiovascular and movement data reported herein provide novel insight into the demands of women's collegiate

tennis and may influence preparatory conditioning strategies that are specific to competition.

P81: EFFECT OF IMPLEMENTATION OF AN INJURY PREVENTION PROGRAM IN AN NCAA DIVISION I MENS BASKETBALL TEAM

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EFFECT OF IMPLEMENTATION OF AN INJURY PREVENTION PROGRAM IN AN NCAA DIVISION I MENS BASKETBALL TEAM BACKGROUND: An NCAA Division I men's basketball program initiated an injury prevention program that focused on mobility, stability, and balance in coordination with normal weight training. The purpose of this study was to determine the effects of an injury prevention program over the course of 8 seasons by comparing injury rates 4 years prior and 4 years after the injury prevention program (IPP) initiation. **METHODS:** Injuries and games missed due to injury were recorded for the 4 years after implementation of the IPP. For the 4 years prior to the IPP, injuries and games missed due to injury were identified and counted. Seasons and roster sizes were normalized by calculating player availability percentages based on total games played each season multiplied by the number of players on the roster to give the total possible number of possible games. Player availability percentages for each season were divided into pre and post IPP groups and run through a t-test comparison. The number of injuries that caused missed games were calculated for pre and post IPP groups and run through a t-test comparison. **RESULTS:** Over a four-year span prior to IPP implementation, the mean games missed due to orthopedic injury was 56.2 per season, with a mean number of injuries causing missed games per season of 3 orthopedic injuries. The four post IPP seasons had a mean number of games missed due to orthopedic injury of 2.5 with a mean injury rate causing missed games per season of 1 injury. Player availability over the course of each season for pre and post IPP seasons was 89.5% and 99.5% respectively. Comparison of the 4 pre and 4 post IPP seasons through a t-test comparison showed that the injury prevention program had a statistically significant (p less than 0.05) effect on games missed due to injury (p 0.03), the number of injuries that caused missed games (p 0.0498), and the percentage of player availability across each season (p 0.036). **CONCLUSIONS:** An injury prevention program based in fundamentals of balance, stability, and mobility integrated completely through an entire basketball pre, post, and off-season and executed in coordination with a strength and conditioning program can reduce games missed due to injury and increase availability of players available for competition the course of a season.

P82: DIFFERENCES IN EXTERNAL OBLIQUE MUSCLE ACTIVATION DURING AN OVERHAND LACROSSE SHOT AMONG COLLEGIATE FEMALES

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Introduction: The sport of women's lacrosse has four positions: attack, midfield, defense, and goalkeeper. Each position has different objectives whether it is to score points by placing the ball in the opposing team's net, to enter both offensive and defensive zones and assist in transitioning the ball between zones, to clear the ball back their team's offensive zone, to prevent the ball from entering the net by blocking shots. The difference in positional objectives may cause differences in rotational power since attackers and midfielders shoot more often than defenders and goalies. The purpose of this research is to examine differences in muscle activation about the external oblique during shooting in attackers, midfielders, defenders, and goalies. **Methods:** Nine ($n = 4$ attack, 1 midfield, 3 defense, 1 goalie) injury-free NCAA Division II women's lacrosse players (mean \pm SD: age, 21.62 \pm 1.64 years; height, 168.97 \pm 9.53 cm; weight, 68.03 \pm 9.95 kg) participated in this study. After granting consent and completing health history forms, an electromyography sensor was applied on the non-dominant side external oblique and manual muscle testing performed to establish baseline maximum voluntary isometric contraction data to which all other external oblique EMG data was normalized. Participants then completed a three-minute wallball warm-up and three warm up shots for acclimation to the stick. Participants then completed five game-speed overhand shots with the dominant hand. To account for the Hawthorne effect, external oblique muscle activity from trials two through four were averaged and used for analysis with JASP 0.10.2. **Results:** A Kruskal-Wallis analysis of variance (ANOVA) revealed no significant difference in contralateral external oblique activation during a dominant side overhead lacrosse shot among positions, $\chi^2(3, N = 9) = 2.31, p = 0.510$. **Discussion:** While no significant difference was observed among this population,

the observed difference in marginal means suggest that further research is needed to understand external oblique activation among lacrosse positions. Limitations to this study include a small sample size, position distribution, athlete effort during shooting and manual muscle testing, and individual shot mechanics. Future studies should look to perform a study among larger sample sizes with equal position distribution examining external oblique muscle activity and overhead shot kinematics.

P83: TOO FAT TO FLY: BODY COMPOSITION AND VERTICAL JUMP PERFORMANCE IN BASKETBALL ATHLETES

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Background of Study: Both vertical jump performance and body composition have been shown to distinguish between levels of competition in basketball athletes. While previous investigations have demonstrated relationships between body composition and vertical jump height using various measurement techniques, limited data has been presented using gold standard measurements for both body composition and vertical jump performance. The purpose of this study was to evaluate the relationship between absolute measures of body composition and vertical jump performance using gold standard measurements in collegiate male basketball athletes. **Methods:** 14 male Division I collegiate basketball athletes participated in this investigation (age 22.42 \pm 1.05 years, height 187.89 \pm 7.83 cm, body mass 89.47 \pm 13.49 kg). With a PVC dowel (<1.0 kg) placed across the upper back in a high bar squat position, participants completed 3 countermovement jumps separated by 30 seconds of rest. All jump trials were performed using a force platform, sampling at 2400 Hz. Absolute and relative measures of total and appendicular body composition were analyzed using DXA. All testing was performed on the same day at the beginning of the final training block of the off-season. Pearson Product Moment Correlations were used to determine the relationship between jump performance and body composition measures. **Results:** Large negative relationships ($r = -0.55 - -0.67, p < 0.05$) were seen between total body lean and fat mass, lower extremity lean and fat mass, and reactive strength index modified (RSImod) values. Large positive relationships ($r = 0.55 - 0.64, p < 0.05$) were present between absolute values of lean and fat mass and time to take off. Though not significant, large negative relationships were seen between lower extremity absolute mass values and jump height ($-0.51, p = 0.06$). No significant relationships were seen between braking and propulsive force production and measures of body composition. **Conclusions:** The novel findings of this investigation are in regard to the relationship between absolute mass values and time to take off. This in combination with the findings of the inverse relationship between jump height and mass values, explains the significant negative relationship between body composition and RSImod.

P84: COMPARISON OF HIGH AND LOW PERFORMERS IN THE COUNTERMOVEMENT JUMP AMONGST FEMALE COLLEGIATE VOLLEYBALL PLAYERS

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BACKGROUND: Recent studies have compared countermovement jump (CMJ) performance in high and low performers of the task. These previous investigations have used reactive strength index modified (RSImod) as the outcome variable determining high and low performers. Findings include that both jump height and time to take-off, the two components in the RSImod equation, were different between groups. Limited data currently exist in examining the subphases of the CMJ in these high and low performing groups. Thus, the purpose of this investigation was to examine differences in high and low performers in the CMJ as determined by RSImod in a sample of collegiate female volleyball athletes. **METHODS:** 28 collegiate volleyball athletes participated in this investigation (age 20.29 \pm 2.90 years; height 180.70 \pm 7.71 cm; mass 83.00 \pm 16.01 kg). Data was pooled from pre-season CMJ testing over the course of three seasons as a part of their routine athlete monitoring program. Each participant completed three jump trials with a dowel rod placed on their upper back. All trials were collected using a portable force platform sampling at 1000 Hz. Thirty seconds rest was given between each trial. Determination of group assignment was based on having a RSImod greater or less than the median value of the sample. Independent

sample t-tests were used to compare groups. RESULTS: High performing group displayed significantly greater jump height (34.40 ± 4.09 vs 28.11 ± 3.79 , cm $p < 0.001$), and shorter time to take-off (809.05 ± 83.81 vs 916.95 ± 80.69 ms, $p = 0.002$). The high performing group also demonstrated shorter durations in both the braking (164.79 ± 23.40 vs 206.73 ± 28.06 ms, $p < 0.001$) and propulsive (292.08 ± 36.48 vs 327.01 ± 27.25 ms, $p = 0.008$) phases. Mean braking force was significantly greater in the high performing group (525.06 vs 428.23 ± 103.99 N, $p = 0.03$) with no statistical difference seen in the propulsive phase (637.54 ± 77.00 vs 584.61 ± 91.20 N, $p = 0.11$). CONCLUSIONS: This investigation supports previous findings in that both jump height and time to take off are different between high and low performing groups as determined by RSImod. Additionally, this investigation provides insight into the difference between groups residing predominantly in the braking phase with significant differences in both force and durations between groups. Thus, the high performing group utilizes a more effective braking strategy during the countermovement to then create a greater jump performance.

P85: COMPARISON OF REACTIVE STRENGTH INDEX MODIFIED ACROSS DIVISION I FEMALE SPORTS

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BACKGROUND: The countermovement jump (CMJ) is an exercise commonly used to monitor an individual's neuromuscular abilities. Previous investigations have compared vertical jumping abilities across sports using the reactive strength index modified (RSImod). RSImod is the ratio of jump height and time to take off during the CMJ task. These investigations have revealed that differences in RSImod have been primarily a result of differences in jump height as time to take off were not different from each other. However, these comparisons have been conducted in sports that have different levels of exposure to the vertical jump task during the sport itself. Thus, the purpose of this investigation was to examine RSImod values across three women's sports that have limited vertical jump exposures. METHODS: 54 collegiate female athletes from three sports (soccer = 29, softball = 15, and golf = 11) participated in this investigation. Data was collected from preseason CMJ testing for each sport as part of their athlete monitoring program. Prior to completing testing, each participant completed a standardized dynamic warm up. Each participant completed three maximal effort trials. Each trial was separated by thirty seconds. All trials were performed on the same portable force platform sampling at 1000 Hz. The mean of the three trials was calculated for each variable. A one-way analysis of variance was performed for each variable of interest. RESULTS: Statistically significant differences were seen in RSImod ($f(2,54) = 4.30$, $p = 0.02$), with golf (RSImod = 0.22 ± 0.04) being significantly lower than both soccer (RSImod = 0.30 ± 0.07) and softball (RSImod = 0.32 ± 0.13). Similarly, jump height displayed statistically significant differences between groups ($f(2,54) = 8.08$, $p < 0.001$). Golf had the lowest jump height (0.20 ± 0.02 m), which was statistically different from both soccer (0.25 ± 0.04 m) and softball (0.25 ± 0.04 m). No statistical differences were seen in time to take off ($f(2,54) = 0.29$, $p = 0.75$) and countermovement depth ($f(2,54) = 0.84$, $p = 0.44$) between the groups. CONCLUSIONS: This investigation provides support for previous findings regarding differences between sports with both RSImod and jump height. As temporal variables such as time to take off show no significant differences between sports, this suggests that differences in jump performance are driven by force production capacities between sports.

P86: COMPARISON OF COUNTERMOVEMENT JUMP PERFORMANCE BETWEEN NCAA AND NAIA BASEBALL ATHLETES

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BACKGROUND: The countermovement jump (CMJ) is commonly used in the assessment of an individual's neuromuscular abilities. Previous investigations have demonstrated that CMJ performance differences across levels of competition in several sports. Specifically, jump height and reactive strength index modified (RSImod) have been shown to be variables that can be used in talent identification for membership of regional and national team membership in several sports. As the use

of the CMJ as an assessment has increased across a variety of sports, exploring differences in level of competition is important to further understand normative data within a given sport. Thus, the purpose of this investigation has to explore CMJ performance across competition levels of collegiate baseball athletes. METHODS: 77 collegiate baseball players from one NCAA Division I team ($n=43$) and one NAIA baseball program ($n=34$) participated in this investigation. Data was collected at the beginning of the fall training period for each team. Participants completed three maximal effort trials. Each trial was separated by thirty seconds. All trials were performed on the same portable force platform sampling at 1000 Hz. The mean of the three trials was calculated for each variable. Independent sample t-test were performed for each variable of interest. RESULTS: Statistically significant differences were seen between competition levels with higher values in the NCAA group for both jump height (0.52 ± 0.07 vs 0.41 ± 0.10 cm, $p < 0.001$) and RSImod (0.59 ± 0.11 vs 0.45 ± 0.13 , $p < 0.001$). Additionally, NCAA group had greater propulsive mean force (1002.43 ± 140.51 vs 862.69 ± 191.41 N, $p < 0.001$). No statistical differences were present in the time to take-off (899.36 ± 120.36 vs 937.03 ± 102.46 ms, $p = 0.15$) and countermovement depth (0.43 ± 0.08 vs 0.43 ± 0.06 cm, $p = 0.83$) between groups. CONCLUSIONS: This investigation provides support for previous findings regarding differences between levels of competition within a sport having differences in both jump height and RSImod. With no differences seen in time to take off and countermovement depth differences in competition level can be explained in force production differences in the propulsive phase.

P87: DIFFERENCES IN TRAINING LOAD IN PROFESSIONAL SOCCER PLAYERS BETWEEN PRE-SEASON AND IN-SEASON

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BACKGROUND: The pre-season's training goal is to prepare the athletes for the competitive season which involves training and competition loads. A daily training session may include periods of physical preparation (Phase 1), technical preparation (Phase 2), tactical application (Phase 3), and competition simulation (Phase 4). Organizing training sessions into specific phases allows analysis of daily training objectives. Sport coaches and performance coaches can ensure all training goals are addressed during the training week prior to matchday. PURPOSE: The aim of this study is to analyze the training load differences in phases of practice between two time periods during a competitive season. METHODS: 20 male professional soccer players were monitored using GPS equipment during 44 training sessions over two periods, pre-season ($n=22$) and in-season ($n=22$). Training load was calculated as a team average and did not include goalkeepers. Performance metrics of interest include duration (D), total distance (TD), high-metabolic load distance (HMLD), number of accelerations (#A), number of decelerations (#D), number of sprints (#S) and total loading (TL). An independent t-test analysis was used to compare training load metrics during phases 1-4 during two time periods; confidence intervals were set at 95%. RESULTS: Phase 3, was significantly different between time periods in TD ($t(41) = 2.036$), HMLD ($t(41) = 2.086$), #A ($t(41) = 2.073$), #D ($t(41) = 2.819$), and TL ($t(41) = 2.067$). Phase 1 was also significantly different between time periods in #D ($t(26.135) = 2.800$). Phase 3 training loads were higher in pre-season compared to in-season, TD ($1082.47\text{m} > 768.83\text{m}$), HMLD ($186.31\text{m} > 124.76\text{m}$), #A ($15.02 > 9.82$), #D ($12.93 > 6.94$), and TL ($18.45 > 13.00$). Phase 1 #D were higher in pre-season ($5.09 > 1.96$). CONCLUSION: Significant differences compared between time periods were found, predominantly in the tactical application phase. Training sessions appear to result in lower levels of training load during in-season, this may be due to the nature of in-season competition (or matches) compared to pre-season friendlies. The differences in training load may be a result of increased amounts of coaching between staff and players.

P88: CHANGES IN COUNTERMOVEMENT JUMP PERFORMANCE ACROSS THE PRESEASON AND SEASON IN DIVISION I BASKETBALL PLAYERS

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BACKGROUND: Basketball is a physically demanding sport that requires players to compete in repeated bouts of sprinting, jumping, and lateral shifting. Between practices, games, and strength and

conditioning sessions, there are numerous repeated bouts of maximal and submaximal exertion which accumulate over a season, potentially increasing player load. Recently, the countermovement jump (CMJ) has been utilized to monitor athletic performance and player readiness in various sports. Thus, it stands to reason that examining changes in CMJ performance throughout a season may provide insight into maximizing athletic performance and mitigating fatigue. The purpose of this study was to examine the changes in CMJ performance across a preseason and season in Division 1 basketball players. **METHODS:** A sample of $n=10$ Division 1 basketball players completed regular CMJ assessments throughout the preseason and season (August through April). Players completed CMJ assessments twice per week, and data were averaged across all attempts within each month. Metrics taken were jump height (JH), reactive strength index (RSI), peak relative propulsive power (PRPP), peak relative propulsive force (PRPF), and braking rate of force development (BRFD), which are commonly used to assess CMJ performance. Repeated measures ANOVAs assessed month-to-month changes in CMJ metrics. **RESULTS:** JH increased from August to September ($p=0.012$) and plateaued from September to April ($p\geq 0.139$). RSI was the same from August to September ($p=1.000$), decreased from September to October ($p=0.005$), plateaued from October to March ($p=1.000$), and increased from March to April ($p=0.010$). PRPP, PRPF, and BRFD remained the same from August to April ($p\geq 0.238$). **CONCLUSIONS:** The present results suggest that commonly assessed CMJ performance metrics (JH and RSI) may be sensitive to changes across a preseason and season for Division 1 college basketball, while force-derived metrics (PRPP, PRPF, and BRFD) may be less sensitive to these changes. Thus, consistent monitoring of JH and RSI may provide information regarding performance improvements and/or decrements in Division 1 basketball players, particularly when examining changes from preseason (August and September) to season (October and onward). Nevertheless, future studies should consider further examination of CMJ metrics to better understand the usefulness of the CMJ to monitor performance in basketball players.

P89: BODY MASS (BM) AND HYPERTENSION (HTN) IN DIVISION I AFRICAN AMERICAN (AA) FOOTBALL ATHLETES IN PREPARATORY PERIOD

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INTRO: Obesity is shown to be a common risk factor for the development of hypertension (HTN). Repetitive bouts of exercise training (endurance and/or strength) has been shown to reduce fat mass along mean arterial pressure (MAP) respectively through the preparatory period of football with a focus on resistive training. **PURPOSE:** To investigate the relationship between body fat percentage and hypertension (HTN) in AA Division I Football athletes during the preparatory period. **METHODS:** Seventy Division I football players were tested after the pre-season: Age (20.2 ± 1.6 yrs), Ht (183.1 ± 10.7 cm), mass (BM $103.3\text{kg}\pm 21.7$ kg) and (FFM 84.0 ± 13.6 kg), body fat percent ($18.9\pm 9.3\%$), resting heart rate (RHR 67.4 ± 9.5 bpm). A stepwise logistic regression model was created to determine if non-blood pressure biometric data collected on the players could predict hypertension status. Players had their height, blood pressure, resting heart rate, and body mass recorded by trained professionals. Height measured using a stadiometer. Normotensive MAP is defined by the 2018 American Heart Association Executive (>90). Prior to taking BP, athletes sat for ~ 5 min. Blood pressure (BP) along with RHR were measured using an automated sphygmomanometer. Body composition was evaluated using bioelectrical impedance. **RESULTS:** 35/70 or 50% of the athletes were coded as meeting the AHA diagnostic criteria of hypertension (HT). A significant logistic regression model ($\chi^2 = 15.67$; $p < 0.01$) existed with BM being the sole significant predictor of hypertensive status. The model explained 27% (Nagelkerke R^2) of the variance in hypertensive status and correctly classified 75.8% of cases ($n = 70$). The logistic regression equation was $\text{Logit}(\text{HT}) = -5.20 + 0.05(\text{kg})$. Results indicate that one kilogram increase in BM would increase the likelihood of hypertensive by 5% (95% CI: 2-8%). No other biometric variable predicted hypertensive status in this population. **CONCLUSION:** Hypertension amongst our sample (50%) exceeded all known frequency reported in the literature (3%). Increased BM may be a risk factor for developing hypertension. Fat mass and fat free mass may not be reliable predictors of cardiovascular disease in Division I AA

athletes. Further testing is needed to determine the mechanisms responsible for the prevalence of HTN in our Football athletes.

P90: METHODOLOGIES AND UTILITY OF MUSCLE BONE RATIO IN PREDICTING PERFORMANCE IN ELITE FOOTBALL PLAYERS

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BACKGROUND:

Quantifying the link between an athlete's body composition (BC) and frame size (FS) to performance can lead to greater efficacy in training, performance development, and injury risk management. An example is the Muscle Bone Ratio (MBR). Two methods exist in measuring BC and FS in athletic populations, and thus calculating MBR: 1) dual X-ray absorptiometry (DXA), and 2) kinanthropometric (KA) measurements. This study explored 1) the validity of DXA and KA methods in determining MBR, and 2) MBR correlation to NFL Combine performance metrics in elite American football players. **METHODS:** Elite American football players attending Exos Combine programs (2021-2023) were assessed through DXA and KA methodology. Performance data included Max Broad Jump (cm), Max Bench Reps, and 0-40 yard sprints (s). Bland-Altman statistical analysis and linear regression using Concordance Correlation Coefficient (CCC) were conducted for method comparison in lean mass (kg), bone mass (kg), and MBR. The utility of MBR to performance was assessed through regression analysis and support vector machines (SVM). Principle Component Analysis (PCA) and agglomerate hierarchical clustering (AHC) were conducted for all BC, FS, and performance variables for possible MBR replacements.

RESULTS:

285 athletes were assessed, 120 of which had complete DXA, 112 complete KA, and 159 complete performance data. Lean mass comparison resulted in a mean difference of $+30.60$ (kg), CCC of 0.2 ($p < 0.05$). Bone mass comparison resulted in a mean difference of -6.68 (kg), CCC of 0.03 ($p < 0.05$), with distinct negative systematic differences between methodologies. MBR comparison resulted in a mean difference of $+15.59$, CCC of 0.00 ($p > 0.05$). MBR to performance resulted in no distinct relationship and no statistically significant correlations at $p > 0.05$. PCA revealed 84% of BC/FS variance can be described in the first three dimensions, with lean mass (kg), bone mass (kg), and femur breadth (cm) being the largest contributors. AHC consistently linked PCA results to performance variables.

CONCLUSIONS:

DXA and KA methods of quantifying BC and FS are systematically different, and cannot be used interchangeably. MBR had no significant correlation to performance, revealing flaws in utility within highly variant elite athletic populations such as American football. Further investigation would be required to develop and validate a new metric using PCA and AHC results.

P91: RELATIONSHIP BETWEEN COUNTERMOVEMENT JUMPS AND RACE PERFORMANCE IN FEMALE CROSS-COUNTRY ATHLETES: A PRELIMINARY STUDY

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BACKGROUND: Competitive running is associated with stress and overuse injuries. The historic monitoring method utilized by competitive runners has been weekly mileage often to quantify workload. However, other aspects play a role in athletes' workload that weekly mileage fails to account for. Countermovement vertical jumps (CMJ) have previously been used to monitor explosive power in athletes and have been included as one aspect of a weekly monitoring program for elite middle- and long-distance runners. This preliminary study aimed to assess running performance in conjunction with CMJ performance in female collegiate distance runners. **METHODS:** Division I cross-country (XC) runners ($n=12$) performed weekly CMJ testing prior to team mandated strength training. In total, 3 CMJs were performed on the VALD ForceDeck each session to examine the following variables: jump height, concentric peak velocity, peak power/bodyweight, reactive strength index modified (RSI-mod), eccentric rate of force development, eccentric rate of force development asymmetry, concentric impulse asymmetry. On two separate days in-season, runners competed in a XC meet on the same course. Spearman's rank order correlations were performed to examine the relationship for race time and CMJ performance, and a net change in performance and CMJ variables. **RESULTS:** When

examining race time and CMJ variables, a moderate correlation with jump height ($\rho = -0.44$; $p = 0.04$) and concentric peak velocity ($\rho = -0.44$; $p = 0.04$) was observed. For the net change analysis, there was a moderate non-significant relationship between change in race time and change in eccentric rate of force development asymmetry ($\rho = 0.62$, $p = 0.08$). All other variables for both overall and net change Spearman rank correlation analysis were weak (<0.39) and non-significant ($p > 0.05$). **CONCLUSIONS:** There is evidence to suggest CMJ performance moderately correlates with race time. Future research is needed to examine this relationship to performance further with an increased sample size.

P92: RELATIONSHIP BETWEEN PERCEIVED RECOVERY AND PERFORMANCE OUTCOMES AMONG LAW ENFORCEMENT ACADEMY CADETS

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BACKGROUND: Law enforcement cadets are subjected to physically demanding training, high-stress simulations, and exposure to traumatic scenarios during an academy. Neglecting aspects of recovery can result in severe consequences to their mental, physical, and occupational readiness. Therefore, the purpose of this investigation was to examine the association between self-perceived recovery score (PRS) parameters and the relationship between the aggregate PRS versus the change in health and performance outcomes throughout a law enforcement training academy. **METHODS:** 52 law enforcement cadets (43 males, 15 females; Age: 26.2 ± 6.4 yr) completed an online recovery survey each morning during the 11-week academy. Questions assessed perceived recovery via Likert scale (1=worst, 10=best) regarding sleep quality, stress level, soreness, and energy level. Health indicators (i.e., sleep duration, body mass, waist circumference, blood pressure) and performance tests (i.e., long jump, T-drill, push-ups, 500m row, 30:15 Intermittent Fitness Test) were conducted pre- and post-academy. The 4 recovery metrics were summed to create an aggregate daily PRS, which was averaged within cadets across the academy, and subsequently the sample's global median value was used in the analysis. Spearman's correlations assessed relationships between recovery and relative and absolute change in health and performance variables. Significance was set to $p < 0.05$. **RESULTS:** Median PRS was 29.5 (interquartile range: 26.1-33.0) with recovery metric scores of 7 (IQR: 6-8) for sleep quality, 8 (IQR: 8-9) for soreness, 8 (IQR: 6.8-9) for stress, and 7 (IQR: 5-8) for energy. Lesser soreness was associated with greater energy levels ($r = 0.31$, $p < 0.05$), and lower stress ($r = 0.57$, $p < 0.001$). Better sleep quality was associated with greater perceived energy ($r = 0.84$, $p < 0.001$) and less stress ($r = 0.27$, $p < 0.05$). PRS and individual recovery subscales were not correlated to health or performance changes ($p > 0.05$). Cadets averaged 6.96 ± 0.60 hr of sleep per night. A positive correlation was observed between hours of sleep and PRS ($r = 0.28$, $p < 0.05$) and sleep quality ($r = 0.38$, $p < 0.05$). **CONCLUSION:** Although cadets perceived to have recovered adequately, they reported insufficient sleep duration (i.e., < 7 hours per night). Training academies are encouraged to evaluate recovery metrics and implement feasible regeneration strategies to enhance health, safety, and performance.

P93: METABOLIC RESPONSES TO ENDURANCE EXERCISE ANCHORED TO VIGOROUS RATINGS OF PERCEIVED EXERTION

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BACKGROUND: Recommendations for cardiorespiratory endurance (CE) exercise prescription are based on vigorous ratings of perceived exertion (RPE), percentages of maximal heart rate (HR_{max}) or volume of oxygen consumption (VO_{2max}). These intensities are then extrapolated to a power output (P) or velocity. Previous work has demonstrated dissociations of the metabolic responses when exercise is anchored to a constant RPE (RPE-clamp) due to alterations in P to maintain the designated perceptual intensity. However, the specific metabolic responses during vigorous RPE-clamp exercise ($RPE = 14-17$) are unclear, and it is unknown if the resulting responses are within the recommended range for improvements in CE ($64-90\% VO_{2max}$). This study examined the metabolic (VO_2) and P responses to RPE-clamp exercise at RPE 14 (RPE_{14}) and RPE 17 (RPE_{17}). **METHODS:** Twenty-one participants (Age = 22 ± 3 yrs; Height = 175.0 ± 9.5 cm; Mass = 73.7 ± 16.1 kg) performed a graded exercise test to determine

VO_{2max} and peak power output (PP), followed by trials to exhaustion, or up to 60 minutes, at RPE_{14} (time to exhaustion [T_{Lim}] = 60.0 ± 0.0 min) and RPE_{17} ($T_{Lim} = 59.5 \pm 2.3$ min) on a cycle ergometer. VO_2 and P were normalized to their respective values at PP at each 10% of T_{Lim} .

RESULTS: The two-way repeated measures ANOVA indicated there were significant RPE by time interactions ($p < 0.05$) for VO_2 and P. Follow-up analyses and Bonferroni-corrected, pairwise comparisons indicated that $RPE_{17} VO_2$ ($65 \pm 8\% VO_{2max}$ [means \pm SD reflect responses across entire trial]) and P ($52 \pm 12\% PP$) were greater than RPE_{14} ($61 \pm 4\% VO_{2max}$; $48 \pm 7\% PP$) from 0-20% and 90% T_{Lim} ($p < 0.001-0.022$). In addition, VO_2 peaked at 10% T_{Lim} for both RPE_{14} and RPE_{17} , followed by significant decreases after 30% and 20% T_{Lim} , respectively. P significantly decreased after 10% T_{Lim} and plateaued after 50% T_{Lim} for both RPE_{14} and RPE_{17} . Qualitatively, the VO_2 at RPE_{14} and RPE_{17} were above the recommended prescription guidelines from 10-20% and 0-40% T_{Lim} , respectively. **CONCLUSIONS:** RPE-clamp exercise at RPE_{17} , but not RPE_{14} , elicited a vigorous VO_2 intensity for at least 20 minutes, meeting the current guidelines for improvements in CE. However, the VO_2 and P at RPE_{14} and RPE_{17} converged by the end of trial, which suggests afferent feedback and efferent feedforward inputs regulate exercise intensity at a theoretical sensory tolerance limit that should be considered by researchers and practitioners.

P94: METABOLIC RESPONSES DURING ENDURANCE EXERCISE ANCHORED TO VIGOROUS HEART RATES

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BACKGROUND: To improve cardiorespiratory fitness, exercise prescription is often based on percentages of the maximum heart rate (HR_{max}) or oxygen consumption rate (VO_{2max}) that reflect vigorous intensities ($77-95\% HR_{max}$, $64-90\% VO_{2max}$). Adjustments in power output (P) are required during constant HR exercise which results in metabolic rate decreases. This study examined the metabolic (VO_2) and P responses during constant HR trials (77, 86, and 95% HR_{max}) within the vigorous intensity range. **METHODS:** Fourteen men (mean \pm SD, age = 25.6 ± 4.5 yrs) performed a cycle ergometer graded exercise test to determine VO_{2max} , HR_{max} , and peak power output (PP). Responses were recorded during three constant HR trials at 77% HR_{max} (138.9 ± 8.4 b \cdot min⁻¹; time to exhaustion [T_{Lim}] = 56.0 ± 10.1 min, range = $25.33-60.0$ min), 86% HR_{max} (155.3 ± 9.5 b \cdot min⁻¹; $T_{Lim} = 44.2 \pm 19.0$ min, range = $13.7-60.0$ min), and 95% HR_{max} (171.1 ± 10.2 b \cdot min⁻¹; $T_{Lim} = 9.7 \pm 7.5$ min, range = $2.0-26.7$ min) to exhaustion or up to 60 min. VO_2 and power (P) were normalized to their respective values at PP in 10% intervals of T_{Lim} . Two-way repeated measures ANOVAs and t-tests with a Bonferroni corrected alpha were used for comparisons across time ($p < 0.005$) and among HR trial intensities ($p < 0.017$) for VO_2 and P. Mean values for VO_2 across time were qualitatively compared to the corresponding vigorous ranges for each HR trial. **RESULTS:** There were no time by intensity interactions, but there were main effects for time and intensity for VO_2 and P ($p < 0.05$). The VO_2 (77% $HR_{max} = 56.7 \pm 3.8$, 86% $HR_{max} = 68.1 \pm 4.3$, 95% $HR_{max} = 91.1 \pm 3.3\% VO_{2max}$) and P (77% $HR_{max} = 50.4 \pm 6.4$, 86% $HR_{max} = 60.4 \pm 7.0$, 95% $HR_{max} = 77.5 \pm 5.7\% PP$) responses were significantly lower for 77% HR_{max} relative to 86% HR_{max} and 95% HR_{max} , and 86% HR_{max} was lower than 95% HR_{max} . Across time, both VO_2 and P significantly decreased relative to the initial values from 10%-100% T_{Lim} . The mean VO_2 responses fell below the recommended VO_2 range for vigorous exercise at 10% of T_{Lim} for 77% HR_{max} , and at 90% of T_{Lim} for 86% HR_{max} . The mean VO_2 responses remained above the recommended VO_2 range for vigorous exercise until 70% of T_{Lim} for 95% HR_{max} . **CONCLUSIONS:** Only the 86% HR_{max} trial resulted in a vigorous VO_2 that was sustained for at least 20 min to meet the current guidelines. To ensure the required metabolic stimulus is met, practitioners and researchers should consider the dissociation between HR and VO_2 responses during constant HR exercise.

P95: ACCURACY AND EFFICIENCY OF DIRECTLY OBSERVED CADENCE: THE SKYROCKET STUDY

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BACKGROUND: The criterion measure for determining cadence (steps/min) is direct observation, where steps are counted manually in real-time (original count) and often video recorded for verification purposes. The Consumer Technology Association (CTA) has recommended that at least two researchers review all video footage to recount and verify accuracy of the original count. This

recommendation was made without a clear understanding of the magnitude of deviation potentially associated with direct observation and original counting. It also did not consider how much time, and associated personnel costs, may be required to implement the recommended reviewing and recounting process. **METHODS:** The SKYRoCKeT Study is a five-year, NIH-funded R01 study that aims to assess cadence and physical activity intensity in 6-20-year-olds. The study is composed of three lab visits with up to 23 distinct 5-minute activity bouts conducted across each of 360 participants. To evaluate accuracy, a single researcher reviewed and recounted video recordings from 45 activity bouts. The formula for mean absolute percentage deviation ($MAPD = 1/n \sum |(\text{recount} - \text{original})/\text{original}| \times 100\%$) was applied, where n was the total number of activity bouts conducted. To evaluate the time, it would take one full-time (40 hours/week) researcher to perform a single round of reviews/recounts, the 23 possible activity bouts were multiplied by a 5-minute bout duration for the study total of 360 participants. **RESULTS:** It took less than four cumulative hours to review/recount the 45 activity bouts for this analysis, and the MAPD indicating potential deviation between the original count and the review/recount was 0.56%. It would take one full-time researcher 17.25 weeks, or approximately 4 months, to complete a single round of recounts for all possible activity bouts implemented in this study. This time and personnel requirement would be doubled if the CTA recommendation was enacted as intended. **CONCLUSIONS:** Although video recording activity bouts is prudent as a redundant backup strategy, the MAPD value calculated herein was less than 1%, making mandatory and all-inclusive systematic reviewing/recounting processes potentially unnecessary and an inefficient use of resources. These data-driven findings are useful for planning and organizing future research projects. **Grant or funding information:** NIH NICHD - R01HD105768

P96: EXAMINING THE TEST-RETEST RELIABILITY OF A SIT TO STAND POWER TEST IN INDIVIDUALS WITH CANCER

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BACKGROUND: It is well documented that individuals with cancer experience pronounced reductions in physical function and muscle strength as a consequence of cancer treatments. However, it is being increasingly recognized that muscle power can also be substantially affected, which is important given the role of lower body power in fall prevention in older adults. Unfortunately, current tests of muscle power are timely and expensive, prohibiting their routine use in oncology settings. The identification of quick and inexpensive tests of lower body muscle power could provide greater insight into changes in skeletal muscle quality from cancer treatments. Therefore, the purpose of this study was to assess the reliability, measurement error and minimal detectable change of a sit-to-stand power test in individuals with cancer. **METHODS:** 22 individuals with cancer completed two sit-to-stand power tests, each separated by 7-10 days. The test-retest reliability was assessed using intraclass correlation coefficient (ICC). The standard error of measurement (SEM) and minimal detectable change (MDC) were also calculated. All analysis were performed using R. **RESULTS:** The majority (95%) of participants were female, with 79% previously treated for breast cancer. Characteristics of participants were age: 64 ± 8 yrs, height: 65 ± 3.1 in, and weight: 80.2 ± 35.40 kg. The ICC for the sit-to-stand power test was 0.86 (95% CI: 0.72-0.94), demonstrating strong test-retest reliability. The SEM was 240.43 and the MDC was 666.44. **CONCLUSIONS:** Our results indicate that the sit-to-stand power test reliable measure of lower body muscular power in individuals with cancer. Therefore, this test could be considered as a quick and inexpensive method of tracking changes in lower body power in oncology care. Further, our measures of SEM and MDC can provide researchers and practitioners value when interpreting changes in this assessment in individuals with cancer.

P97: GREATER ERROR IN TORQUE AND MUSCLE EXCITATION AT HIGHER SUBMAXIMAL INTENSITIES

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GREATER ERROR IN TORQUE AND MUSCLE EXCITATION AT HIGHER SUBMAXIMAL INTENSITIES Caitlyn M. Meehan, Katie G. Kennedy, Sydney R. Fleming, Ryan J. Colquhoun. *University of South Alabama*
BACKGROUND: The purpose of this investigation was to compare the accuracy of muscle excitation and torque production at 25, 50, and 75% of perceived maximum effort in males and females. **METHODS:** Twenty-four trained males and females ($n=12$) completed a familiarization and an experimental visit separated by at least 48

hours. During the experimental visit, participants were seated in an isokinetic dynamometer with their dominant leg attached to the arm of the dynamometer at 90° of knee flexion. Muscle excitation was assessed via a surface EMG sensor was placed on the *vastus lateralis* (VL). Following a brief 5-minute warm-up on a cycle ergometer, subjects completed 3 separate 3-5 second warm-up contractions at 25, 50, and 75% of their perceived maximum voluntary isometric contraction (MVIC) strength. No feedback of any kind was provided to the subjects. Peak torque (PT) and EMG amplitude of the VL (VL_{AMP}) were calculated during the highest 500 ms window of each repetition and averaged across the 3 repetitions at each intensity. The average PT and VL_{AMP} were normalized to MVIC and expressed as the percent error from the target (i.e., 25%, 50%, 75% MVIC) to examine the accuracy of the variables (nPT_{ERROR} and nVL_{ERROR} , respectively). Only data from the experimental visit was used in the analysis. Separate 3 (intensity) \times 2 (sex) repeated measures ANOVAs were run for each dependent variable. Alpha was set a-priori at 0.05 and all data was analyzed in SPSS. **RESULTS:** There were no significant interaction effects for either nPT_{ERROR} ($p=0.564$) or nVL_{ERROR} ($p=0.343$). However, there were main effects for intensity for both variables ($p<0.001$ for both). Post-hoc analyses indicated that, when collapsed across sex, participants displayed significantly more negative nPT_{ERROR} and nVL_{ERROR} at 75% (nPT_{ERROR} : $-29.6\% \pm 16.7\%$; nVL_{ERROR} : $-30.3 \pm 16.5\%$) when compared to both 25% (nPT_{ERROR} : $-2.4\% \pm 13.2\%$; nVL_{ERROR} : $-2.9 \pm 11.3\%$; $p<0.001$ for both) and 50% (nPT_{ERROR} : $-19.1 \pm 14.4\%$; nVL_{ERROR} : $-18.1 \pm 14.1\%$; $p<0.001$ for both). Additionally, both nPT_{ERROR} and nVL_{ERROR} were significantly more negative at 50% when compared to 25% ($p<0.001$). **CONCLUSIONS:** Our results suggest that participants displayed more accurate peak torque and muscle excitation in the vastus lateralis at lower submaximal intensities and the amount of error increased with increases in perceived effort. Importantly, biological sex does not appear to influence this relationship.

P98: IMPACT OF AN ACADEMY TRAINING PROGRAM ON AEROBIC AND ANAEROBIC PERFORMANCE AMONG LAW ENFORCEMENT CADETS

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BACKGROUND: Law enforcement requires adequate fitness levels to optimize occupational readiness. Law enforcement academies are responsible for developing a foundation of physical readiness by targeting relevant biomotor abilities, such as anaerobic and aerobic endurance. However, there is limited research evaluating the effectiveness of academy physical training (PT) programs to improve these outcomes. Therefore, the purpose of this study was to assess the efficacy of a law enforcement PT program on anaerobic and aerobic endurance in cadets. **METHODS:** 58 cadets (43 males, 15 females; Age: 26.2 ± 6.4 yr; Height: 175.0 ± 10.2 cm; Body mass: 90.3 ± 24.5 kg) completed the 30:15 Intermittent Fitness Test (30-15 IFT) and timed 500 m row as measures of aerobic and anaerobic capacity, respectively, prior to and at the completion of an 11-week training academy. The PT program was designed by a certified strength and conditioning practitioner. Specifically, cadets completed 5 sessions per week composed of circuit resistance training, mobility exercises, plyometrics, and interval running. Paired samples t-tests, effect size (Cohen's d), and relative change scores ((% change = $\text{posttest} - \text{pretest} / \text{pretest} \times 100$) were used to compare pre vs. post-academy changes in performance outcomes. Significance was set to $p < 0.05$. **RESULTS:** The PT program significantly improved 30-15 IFT ($t(57) = -11.96$, $p < 0.001$; $d = -1.57$; MD: 1.04 ± 0.66 s, 5.3% increase) and 500 m row performance ($t(57) = 6.81$, $p < 0.001$; $d = 0.89$; MD: -8.6 s, 6.4% decrease). **CONCLUSION:** These data indicate that an 11-week PT program elicited desirable aerobic and anaerobic fitness responses among law enforcement cadets. Law enforcement training academies are encouraged to employ certified strength and conditioning practitioners to design and implement appropriate PT programs to enhance cadet readiness.

P99: FAT FREE MASS INCREASES REGARDLESS OF TRAINING VOLUME AFTER EIGHT WEEKS OF RESISTANCE TRAINING

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BACKGROUND: The purpose of this investigation was to examine changes in fat mass and fat free mass following four and eight weeks

of high- and low-volume, structured resistance training. **METHODS:** Twenty-six resistance-trained males (n=14) and females (n=12) participated in supervised, structured resistance training three times weekly for eight weeks. Participants were randomly allocated to either a high- (HV; M/F=7/7) or low-volume (LV; M/F=7/5) training group completing four (LV) or eight (HV) sets per exercise each week of the following exercises: bench press, overhead press, lat pulldown, horizontal row, leg press, and Romanian deadlift. The final set of each exercise was completed to failure. Participants' fat mass (FM) and fat free mass (FFM) were recorded via dual x-ray absorptiometry (DEXA) prior to (PRE), at the midpoint of (MID), and following (POST) the eight weeks of training. All testing was completed following an eight hour fast and at least 48 hours after exercise. Separate 2 (group) × 3 (time) repeated measures ANOVAs were used to examine FM and FFM. Post-hoc corrected t-tests were conducted to examine significant effects, and the alpha level was set a-priori at 0.05. **RESULTS:** There were no significant interaction (p=0.189) or main effects (p=0.473-0.776) for FM. There was no significant interaction effect for FFM (p=0.294); however, there was a significant effect for time (p=0.012). Post-hoc analyses indicated that, when collapsed across group, FFM was greater at both MID (p=0.003; 53.39 ± 14.24 kg) and POST (p=0.022; 53.42 ± 14.02 kg) when compared to PRE (52.68 ± 14.02 kg). There was no significant difference between MID and POST (p=0.915). Additionally, there was no significant effect for group (p=0.372). **CONCLUSIONS:** Our data indicate that, regardless of training volume, participants increased FFM and experienced no changes in FM following eight weeks of structured, progressive resistance training. Additionally, the present data suggest that this increase in FFM occurred primarily in the first four weeks of training, independent of group. Due to the similarity of FFM changes between groups, these data suggest that even a minimal dose of resistance training three times weekly can effectively increase FFM in a similar time-course to higher volume resistance training in trained males and females.

P100: SEX-BASED COMPARISONS OF ISOMETRIC AND ISOKINETIC HAMSTRINGS-TO-QUADRICEPS RATIO AND MUSCLE SIZE

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BACKGROUND: Hamstrings-to-quadriceps ratio (HTQ) can provide unique information regarding muscle development, training habits, and injury risk, particularly of the knee. As females are typically more prone to knee injuries than males, examining sex-based differences in HTQ may provide insight to the mechanisms causing these differences. The purpose of this study was to compare HTQ during leg extension and flexion contractions in females versus males. **METHODS:** Twenty-seven females and males (mean±95% confidence interval, n=14 females, age=24±4yrs; n=13 males, age=25±6yrs) participated. Ultrasound images quantified quadriceps, hamstrings, and thigh muscle cross-sectional area (CSA). Peak torque (PT) was taken from maximal voluntary isometric contractions (MVICs) and isokinetic leg extension and flexion contractions from 60-300°·s⁻¹. HTQ was calculated by dividing hamstrings CSA by quadriceps CSA and PT from leg flexion by PT from leg extension for all contractions. Independent samples t-tests examined differences in CSA and HTQ from CSA. Mixed-factorial ANOVAs examined differences in PT and HTQ from PT. **RESULTS:** Males had larger quadriceps, hamstrings, and thigh CSA, and isometric and isokinetic PT than females for leg extension and flexion across velocity (p<0.001). There were no sex-based differences in the HTQ from CSA or PT across velocity (p>0.109). For both groups, leg extension PT decreased from MVIC to 300°·s⁻¹ (p<0.035). For the females, leg flexion PT was the same from MVIC to 60°·s⁻¹ (p=1.000), decreased from 60 to 180°·s⁻¹ (p<0.002), and plateaued from 180 to 300°·s⁻¹ (p>0.071). For the males, leg flexion PT decreased from MVIC to 300°·s⁻¹ (p<0.025). For both groups, HTQ increased from MVIC to 60°·s⁻¹ (p<0.001), then plateaued from 60 to 300°·s⁻¹ (p=1.000). **CONCLUSIONS:** Both groups had similar patterns of response for leg extension PT and HTQ across velocity, though leg flexion PT for females remained constant from moderate to fast velocities. Thus, factors other than quadriceps and hamstrings muscle size and strength may be responsible for the potential sex-based difference in knee injury risk. Worth noting, among these recreationally-trained participants, HTQ across velocity was <0.59, below the generally recommended ratio of 0.67. It may be beneficial for both females and

males to prioritize hamstrings strengthening exercises, as HTQ of <0.67 tend to be associated with greater knee injury risk.

P101: EXAMINATION OF SEX DIFFERENCES IN FATIGABILITY AND ELECTROMYOGRAPHIC RESPONSES DURING SUSTAINED, MAXIMAL, ISOMETRIC LEG EXTENSION

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BACKGROUND: Despite advances in our understanding of the mechanisms related to neuromuscular performance and fatigability, there remains a paucity of knowledge regarding sex-related differences and subsequent mechanisms related to exercise performance. This study aimed to examine sex-related differences in fatigability and patterns of normalized surface electromyographic amplitude (sEMG AMP) responses during fatiguing, maximal, bilateral, isometric leg extension muscle actions. **METHODS:** A sample of 20 recreationally active males (n = 10) and females (n=10) performed baseline maximal voluntary isometric contraction (MVIC) testing, followed by a sustained MVIC of the leg extensors until a 50% reduction in force was achieved. Rate of force loss and sEMG AMP for the vastus lateralis on the dominant limb were examined using linear mixed effect models. Specifically, responses were compared between two models where time (continuous) was treated linearly, or as a raw second-order polynomial. **RESULTS:** The mean ± standard deviation for pre-test force was 193.8 ± 34.4kgf and 142.5 ± 40.2kgf for the males the females, respectively. Statistical analysis revealed that there were differences in the rate of force loss between males and females (β [CI 95%] = 0.53 kgf·s⁻¹ [0.04, 1.02]; t = 2.123; p = 0.034), indicating that males (β [CI 95%] = -1.54 kgf·s⁻¹ [-1.91, -1.17]) experienced a greater rate of reductions in force compared to females (β [CI 95%] = -1.01 kgf·s⁻¹ [-1.34, -0.69]). However, sEMG AMP responses revealed parallel linear decreases between males and females (β [CI 95%] = -0.008 %MVIC [-0.01, -0.005] t = 4.202; p < 0.001). **CONCLUSIONS:** There are two commonly proposed hypotheses for differences in rate of force loss between males and females; 1) differences in muscle mass, and 2) differences in activation patterns. In accordance with previous data, our data suggest that the differences in rate of force loss may be explained by differences in muscle mass, since differences in rate of force loss were not accompanied by differences in sEMG AMP, a common proxy measure for activation. In addition, greater absolute forces have been shown to increase demand for muscle oxygen, resulting in greater occlusion due to increased compression of tissue. Therefore, it is possible that the absolute force generated by males may have contributed to the differences observed in rate of force loss between males and females.

P102: COMPARING FITNESS DATA OF CADETS IN SOUTH CAROLINA TO THE GENERAL POPULATION: A PILOT STUDY

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BACKGROUND: To prepare for physically challenging environments, it is expected that military personnel achieve higher levels of physical fitness than the general population. The recent COVID-19 pandemic impacted physical activity levels among many of America's youth, and thus, new recruits may be entering military service with lower fitness levels. It is also unknown how fitness levels of army cadets in upstate South Carolina compare to the general population. Therefore, the purpose of this pilot study was to compare anthropometric and fitness variables of army cadets from upstate South Carolina to data from the general population. **METHODS:** A sample of 22 United States Army cadets (17.5 ± 1.3 y, female n = 7) from the Spartanburg, SC area completed measurements of body fat percentage (BF), hand grip strength (HGS), vertical jump (VJ), and height and weight to calculate body mass index (BMI). Body fat, BMI, and HGS of the cadets were compared to age-matched adults from the National Health and Nutrition Examination Survey (NHANES) and norms from the American College of Sports Medicine (ACSM). Vertical jump data was compared to previous research conducted among young adults. Data were analyzed using t-tests. **RESULTS:** There were no significant differences in BMI, HGS, and VJ between the cadets and the general population data. However, the cadets displayed significantly lower BF than the NHANES group (23.13 ± 6.57 vs. 28.46 ± 11.74 %, p = .0012). When analyzed separately, female cadets had a significantly lower BMI than the female NHANES group (22.88 ± 3.25 vs. 26.58 ± 7.72 kg/m², p = .024). Female cadets also had significantly lower BF than the female NHANES group (22.93 ± 6.46 vs. 37.57 ± 7.26 %, p < .0001). Male

cadets had significant lower VJ performance compared to data from young males (18.67 ± 3.82 vs. 22.2 ± 3.5 in., $p < .001$). When compared to norms from the ACSM, 63.6% ($n = 14$) of cadets were classified as Overweight or Obese, 59.1% ($n = 13$) of cadets had Very Poor or Poor BF, and 27.3% ($n = 6$) cadets had Poor HGS.

CONCLUSIONS: United States Army cadets from upstate South Carolina may have similar overall anthropometric and fitness values to those of the general population. However, female cadets may exhibit lower BMI and BF, and male cadets may exhibit lower VJ performance. A larger study may be warranted to verify these findings.

P103: CORRECTIVE EXERCISE AND ITS EFFECTS ON TITLEIST PERFORMANCE INSTITUTE SCORES IN NCAA DIVISION II GOLFERS

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BACKGROUND: The Titleist Performance Institute (TPI) movement screen is an examination that evaluates physical capabilities contributing to golf performance, such as core control, upper/lower body dissociation, and posture. Hypothetically, improved TPI scores could result in fewer swing faults. This is significant because improvements in strength and mobility, along with fewer swing faults, could lead to making more consistent contact with the ball. Although some research exists examining Functional Movement Screen (FMS) and athletic performance, there is a lack of research on TPI and golf performance. This study aims to determine if implementing TPI movement correctives will elicit improvements in overall TPI scores after four weeks of intervention. **METHODS:** Eight male and eight female NCAA Division II golfers were recruited for this study. Subjects were randomly divided into an intervention or control group. The intervention group (IG) included eight subjects (four male and four female golfers). The control group (CG) included eight subjects (four male and four female golfers). IG performed one exercise for core control, upper body dissociation, and lower body dissociation three days per week. CG did not receive any intervention to enhance the study's validity. After four weeks, all athletes completed a post-intervention TPI movement screen. The research team will compare pre- and post-intervention TPI scores to determine if the intervention was effective. **ANTICIPATED RESULTS:** It is hypothesized that corrective exercise will enhance golf-specific strength, flexibility, and mobility. Therefore, TPI scores will improve after four weeks of intervention.

P104: VALIDITY AND RELIABILITY OF COMMONLY USED SELF-REPORT PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR INSTRUMENTS AMONG COLLEGE STUDENTS

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BACKGROUND: Self-report instruments are commonly used to assess physical activity (PA) and sedentary behavior (SED) among college students, yet limited evidence exists comparing instruments to determine which provide the most valid and reliable estimates in this cohort. The purpose of this study was to assess the validity and reliability of several commonly used self-report PA and SED instruments among college students. **METHODS:** Students ($n=98$; 70% female; 19.8 ± 1.4 yrs) completed the Global Physical Activity Questionnaire (GPAQ), International Physical Activity Questionnaire-Long Form (IPAQ-L) and Short Form (IPAQ-S), Godin Leisure Time Exercise Questionnaire (GLTEQ), Sedentary Behavior Questionnaire (SBQ), and SIT-Q on 2 occasions separated by 7-8 days. Participants wore devices at the waist (ActiGraph GT9X Link) and on the thigh (activPAL3) to objectively assess PA and SED, respectively, over the 7-8 days between administrations of the self-report instruments. Intraclass correlation coefficients were calculated to assess test-retest reliability. Concurrent validity was assessed using Spearman's rho to compare responses from the second administration of the instruments to the associated variables from the devices. Mean absolute error (MAE) was calculated for variables from self-report instruments using the devices as the comparison. **RESULTS:** For total PA (METmin/wk), reliability was highest for IPAQ-L and IPAQ-S (both $ICC=0.63$). IPAQ-S showed the highest reliability for moderate- to vigorous PA ($ICC=0.74$). Reliability for SED was highest from the SBQ ($ICC=0.83$). For MVPA, validity was highest for GPAQ ($p=0.390$) and lowest for IPAQ-L ($p=0.256$). For SED, validity was highest for IPAQ-L ($p=0.284$) and lowest for SBQ ($p=-0.149$). MAE for MVPA and SED was lowest for IPAQ-L (208.4 min and 1.9 hr, respectively). **CONCLUSIONS:** Overall, reliability was moderate to good and validity was poor for the self-

report instruments, which aligns with results from previous investigations in general adult populations. Researchers seeking to assess PA and SED among college students should be aware of the differences in reliability and validity among the most commonly used self-report instruments. It is suggested that researchers determine the most important outcomes for their specific research question (e.g., total PA, MVPA, etc.) and select an instrument that will provide the highest level of validity and reliability for those metrics.

P105: FAT-FREE MASS AND HANDGRIP STRENGTH IN NJCAA ATHLETES BASED ON SELF-REPORTED STRENGTH TRAINING

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BACKGROUND: Strength training is an important component of health as it can impact body composition and continued functional ability. This is particularly important to athletes as they constantly participate in physically demanding activities. Self-reported survey data are important tools used to assess physical activity. Seven-day recall of physical activity has been shown to be a valid and reliable measure. The purpose of this study was to compare fat-free mass (kg) and dominant handgrip strength (kgf) between those who self-reported strength training (SRST) in the last seven days and those who did not (NST). **METHODS:** 15 traditional-aged (18-25y), full-time female NJCAA student-athletes (13 soccer players and 2 volleyball players) at a rural, commuter-based, predominantly two-year university, were recruited during the pre-season. Surveys inquiring about basic demographics and self-reported physical activity were collected. Height (cm), weight (kg), and body composition (fat-free mass, tetrapolar bioelectrical impedance analysis, RJL Systems Quantum X) were measured. Athletes indicated their dominant hand and handgrip strength was measured (Jamar handgrip dynamometer). Participants were divided into two groups based on whether they self-reported strength training in the last seven days (SRST, $n=6$ and NST, $n=9$). Independent sample t-tests were used to determine if significant differences between the groups existed. The significance level was set at $p < 0.05$. **RESULTS:** There were no significant differences between groups in fat-free mass (SRST= 41.58 ± 2.40 kg v. NST= 42.66 ± 3.25 kg, $p=0.266$) or average dominant handgrip strength (SRST= 31.16 ± 3.50 kgf v. NST= 33.43 ± 3.98 kgf, $p=0.139$). **DISCUSSION:** Although increased fat-free mass and handgrip strength are related to strength training, there were no significant differences between the two groups. This study relied on self-reported frequency of strength training with no indication of the intensity or duration. The handgrip strength values fall within the normative handgrip range (18-19y= 32.5 kgf, 20-24y= 32.0 kgf), indicating that the lack of difference may be a result of this apparently healthy population of physically active young adults. These data are preliminary from a larger multifaceted study. Additional participants may strengthen the results as the sample size increases.

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P106: ASSESSMENT OF BRAIN FUNCTION AND SOCCER PENALTY KICK PERFORMANCE IN COLLEGIATE SOCCER PLAYERS

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Assessment of Brain Function and Soccer Penalty Kick Performance in Collegiate Soccer Players

ToniAnn Brezina, Pradeep Vanguri

Nova Southeastern University **BACKGROUND:** The purpose of this research study is to assess National Collegiate Athletic Association (NCAA) men's and women's soccer players brain function while taking penalty kicks wearing an electroencephalogram (EEG) band and a heart rate monitor. An EEG is a device used to assess brain activity and will record four types of brain wave activities: alpha, beta, theta, and delta. Heart rate data provides additional insight during strenuous activity. Minimal research exists on EEG and soccer penalty kicks, but multiple published studies discuss high activity in the beta wave along with a low heart rate indicating a focused but relaxed state. **METHODS:** NCAA Division II soccer players included in this study will use the EEG device and heart rate monitor before testing begins. Measuring the heart rate provides further insight into stress the player is experiencing during the penalty kick. Each penalty kick will be from the same distance throughout the experiment, but the shot location and order in where the participants kick will be randomized. Each participant will take approximately 5-10 repetitions to each shot location. Data from the EEG are stored in the Wave Recorder app and the heart rate data will be stored in the E4 Realtime app. Data will be

analyzed using hierarchical linear modeling. **ANTICIPATED RESULTS:** Results from this study will reveal beta waves as the most prominent during assessment, as they are incorporated in problem solving or performing mentally challenging tasks. Gamma waves may also be prominent during cognitive function and heart rate data will reveal relaxed athletes prior to the penalty shot. Additionally, some correlation may exist between experienced players versus less experienced taking players.

P107: INVESTIGATING THE IMPACT OF A BRIEF, HIGH-INTENSITY EXERCISE BREAK DURING PROLONGED GAMING ON ESPORTS PERFORMANCE

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BACKGROUND: Previous research shows that mental fatigue leading to decreased cognitive functioning may occur after 2 hours of continuous activity. This decline could be detrimental to esports athletes who may play for 3 or more hours at a time. Use of a moderate-intensity exercise break following 1 hour of gaming did not improve cognitive functioning more than continuous play. Increases in blood glucose levels are typically related to increases in cognitive functioning. Therefore, research should be done to investigate the relationship between glucose levels and cognitive function during long-duration gaming and how the use of an active exercise break may impact this relationship. The purpose of this study was to investigate the impact of low-volume, high-intensity exercise during continuous gaming on esports performance compared to a passive break and to determine the relationship glucose levels and fatigue may have on cognitive function both with and without exercise. **METHODS:** Twenty subjects completed a familiarization trial before returning to the lab having fasted for 3 hours. Pre-measurements including blood glucose, perceptual fatigue, eye tracking, and accuracy and speed using the aim training platform, AimHero, were conducted. The participants played Apex Legends for 2.5 hours before completing either 4 minutes of exercise followed by 5 minutes of rest and a measure of exertion, or a 9-minute break in the control condition. After another 2.5 hours of gaming, participants completed the post-tests. Participants returned for the second trial after at least 24 hours. **RESULTS:** The main finding was a significant increase ($p < 0.001$) in fatigue in both conditions over 5 hours with a significantly greater ($p=0.007$) decrease in pupil diameter in the control condition (con= -0.225 ± 0.210 , ex= -0.149 ± 0.166 mm) but with no differences in glucose (con= 94.05 ± 9.33 , ex= 98.30 ± 10.05 mg/dL, $p=0.356$) or perceived fatigue (con= 5.18 ± 1.69 , ex= 4.47 ± 2.05 , $p=0.719$) between conditions. However, there was no consequential decrease ($p > 0.05$) in aiming accuracy or speed in either condition. **CONCLUSION:** The findings suggest that long-duration gameplay results in increased levels of fatigue but may not result in decreased game performance when a break is taken, despite whether the break is active or passive, but an exercise break may alleviate the increase in physiological fatigue.

P108: GENEACTIV ACCELEROMETER CUT POINTS FOR ADULTS WITH DOWN SYNDROME

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BACKGROUND: Accelerometer cut-points specific to adults with Down syndrome (DS) may improve the measurement of physical activity and sedentary behavior in this population. The purpose of the study was to generate cut-points for sedentary behavior and moderate and vigorous PA for adults with DS based on raw acceleration data from a GENEActiv hip accelerometer. **METHODS:** Thirty-five adults with DS (age 35 ± 8 years; 19 men) performed 17 tasks each lasting 6 min: sitting; watching a movie; playing app on tablet; drawing; standing; folding clothes; vacuuming; sweeping; moving a box; basketball; soccer; fitness circuit; dancing; walking at the preferred speed and at 0.8 and 1.4 $\text{m}\cdot\text{s}^{-1}$; and running. Oxygen uptake was measured with portable calorimetry (K5, Cosmed). One metabolic equivalent (MET) was operationalized as VO_2 during sitting allowing for determination of METs during each task. A GENEActiv accelerometer worn on the non-dominant hip was used to determine the Vector Magnitude of raw acceleration data. Vector Magnitude cut-points for sedentary behavior (≤ 1.5 METs while sitting) and for moderate (3.0-5.9 METs) and vigorous (≥ 6 METs) physical activity were determined with Receiver Operating Characteristic (ROC) curves. Classification performance was evaluated with the area under the ROC curve. Youden's index was

used to identify optimal cut-points maximizing sensitivity and specificity. **RESULTS:** Area under the ROC curve was: (a) sedentary behavior (0.94; 95% CI: 0.92 - 0.96); (b) moderate physical activity (0.85; 95% CI: 0.82 - 0.87); and (c) vigorous physical activity (0.79; 95% CI: 0.71 - 0.87). Vector Magnitude cut-points were: (a) sedentary behavior $\leq 160 \text{ g}\cdot\text{min}^{-1}$ (sensitivity 1.00; specificity 0.81; Youden's index 0.81); (b) moderate physical activity $\geq 320 \text{ g}\cdot\text{min}^{-1}$ (sensitivity 0.96; specificity 0.65; Youden's index 0.61); and (c) vigorous physical activity $\geq 1211 \text{ g}\cdot\text{min}^{-1}$ (sensitivity 0.58; specificity 0.87; Youden's index 0.45). **CONCLUSIONS:** ROC models for sedentary behavior and moderate and vigorous physical activity intensity based on raw acceleration data for a hip-worn GENEActiv accelerometer have acceptable classification accuracy in adults with DS. Funding: NIH Grant R15HD098660

P109: VALIDITY AND RELIABILITY OF THE TAKEI HAND DYNAMOMETER

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BACKGROUND: Grip dynamometry is a reliable and efficient measure of maximal voluntary grip strength. The Jamar Hydraulic Hand Dynamometer (Jamar) is the reference standard for handheld dynamometry but has limitations in design such as the analogue display. The Takei Hand Grip Dynamometer (Takei) is comparable in cost and features digital output. This double-blinded cross-sectional study aimed to examine the reliability and validity of the Takei compared to the Jamar in healthy adults. **METHODS:** Thirty adults (age= 28.2 ± 5.1 years, male= 53%) participated in two sessions 1-3 days apart with 3 trials of maximal grip force production for each hand and device. Test-retest reliability (TRR) for both devices was assessed comparing the mean of the trials per hand over the two sessions using intraclass correlation ($\text{ICC}_{3,k}$). Minimal detectable change at 95% CI (MDC_{95}) and standard error of measurement (SEM) were calculated. Concurrent validity was examined with the 2nd session averages using Pearson's correlation. Bland-Altman plots and linear regression assessed proportional bias between the devices. **RESULTS:** TRR of the Takei was excellent for the dominant hand (DH) ($\text{ICC}_{3,k} = 0.979$; $\text{SEM} = 1.34 \text{ kg}$; $\text{MDC}_{95} = 3.73 \text{ kg}$) and nondominant hand (NDH) ($\text{ICC}_{3,k} = 0.998$; $\text{SEM} = 0.43 \text{ kg}$; $\text{MDC}_{95} = 1.19 \text{ kg}$). TRR of the Jamar was excellent for the DH ($\text{ICC}_{3,k} = 0.971$; $\text{SEM} = 1.69 \text{ kg}$; $\text{MDC}_{95} = 4.68 \text{ kg}$) and NDH ($\text{ICC}_{3,k} = 0.974$; $\text{SEM} = 1.79 \text{ kg}$; $\text{MDC}_{95} = 4.96 \text{ kg}$). Correlations between the dynamometers were significant for DH ($r = 0.999$; $P < 0.001$) and NDH ($r = 0.999$; $P < 0.001$). Bland-Altman plots showed agreement for DH (mean difference: -0.052 kg ; limits of agreement: 0.72 to -0.83 kg) but showed slight increasing variability with increasing force production for NDH (mean difference: -0.837 kg ; limits of agreement: 0.16 to -1.84 kg). Linear regression revealed proportional bias for NDH ($p < 0.001$) but not for DH ($p > 0.05$). **CONCLUSIONS:** The Takei can accurately measure hand grip strength compared to the Jamar in young, healthy adults. The concurrent validity and linear regression results indicate interchangeability between the dynamometers only for the DH. The ability of the Takei to accurately measure grip strength in this population may allow rehabilitation professionals, athletic coaches, and athletic trainers an affordable digital tool to measure DH grip strength to gain information concerning athletic performance, injury prevention, and general strength.

P110: THE EFFECTS OF ASTAXANTHIN SUPPLEMENTATION ON MARKERS OF SUBSTRATE OXIDATION RATES AND PERFORMANCE IN MIDDLE AGE FEMALE CYCLISTS

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BACKGROUND: Aging is a progressive decline in cellular function and is strongly associated with cardiometabolic diseases such as cardiovascular disease, certain cancers and dementia. An estimated 47 million Americans have cardiometabolic disease and progressing age (≥ 40 years) is considered a major risk factor. Astaxanthin (AX), a carotenoid pigment produced by a microalgae, is one of nature's most powerful antioxidants that has the unique ability to access both the aqueous and lipid portion of a cell. Astaxanthin may offer several cardiometabolic protective benefits such as increasing fat oxidation rates and improving endurance performance. The purpose of this study is to assess the impact of 4-weeks of AX supplementation on markers of substrate oxidation rates and 10-km time trial (TT) performance in middle-age female cyclists. **METHODS:** This study will implement a between-group, double-blind design with subjects visiting the lab on three occasions: 1) $\text{VO}_{2\text{peak}}$ and familiarization, 2) baseline testing

(PRE), and 3) post-supplement testing (POST). Twenty-five training and older female cyclists (≥ 40 y) will be recruited to participate in this study. Following collection of preliminary measurements and completion of the VO_{2peak} and the familiarization sessions, subjects will complete two experimental trials before and after supplementation which will consist of a graded exercise test (GXT), followed immediately by a 10-km TT. The GXT will consist of subjects cycling at 40% of their max wattage (W_{max}) obtained during the VO_{2peak} session, and each stage will increase by 5% for 5 min per stage until each subject has obtained 65% of their W_{max} (6 stages total). Expired air will be collected continuously throughout the GXT by a Parvo metabolic system and used for the calculation of fat and carbohydrate oxidation rates. Subjects will then have their metabolic headgear removed and immediately complete a 10-km TT, with time to completion as the dependent variable of interest. Following PRE-testing, subjects will be stratified to groups based on their 10-km TT performance and receive either AX (12mg/d⁻¹) or a placebo (PLA) supplement to ingest daily for 4-weeks. Statistical analysis will include a 2-way repeated measures analysis of variance (RMANOVA) for each dependent variable at their respective timepoint. Additionally, effect sizes (Cohen's *d*) will be calculated and reported to provide interpretation of meaningful differences. **ANTICIPATED RESULTS:** Our hypothesis is that astaxanthin will improve markers of fat oxidation rates and 10-km TT performance in older, trained female cyclists.

P111: NO BENEFIT OF INGESTING A LOW-DOSE KETONE MONOESTER SUPPLEMENT ON COGNITIVE PERFORMANCE IN TRAINED FEMALES

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BACKGROUND: β -hydroxybutyrate is one of three substrates that the brain can preferentially oxidize for meeting energetic demands. Ketone monoesters (KME) allow for the rapid elevation in circulating β -hydroxybutyrate levels without following a low-carbohydrate diet or prolonged fasting and some past work with KME have shown potential to mitigate cognitive decrements in states of fatigue, but no studies have yet been conducted in a female cohort. **METHODS:** Following a familiarization session and a baseline session without a mental fatiguing protocol (MF), 12 trained females completed two experimental sessions, consisting of a battery of cognitive tests (psychomotor vigilance test (PVT), task-switching, incongruent flanker) performed before (PRE) and after (POST) MF. In a counter-balanced crossover design, a ketone monoester (KME, ~188 mg·kg⁻¹ body mass) or non-caloric placebo (PLA) were ingested before MF. Markers of cognitive performance (speed and correct responses per second), blood β -hydroxybutyrate, glucose, and lactate, and subjective markers of perceived cognitive load and fatigue were collected at PRE and POST. **RESULTS:** KME ingestion significantly increased blood β -hydroxybutyrate ($P < 0.001$; ~1.8 mM), decreased glucose ($P < 0.001$; ~0.6 mM), and attenuated a ~34% rise in lactate at POST compared to PLA ($P = 0.04$). MF significantly increased perceived cognitive workload and fatigue for both experimental trials in comparison to the control ($P < 0.05$) but did not impair any of the cognitive variables assessed (all $P > 0.05$). Although ingestion of a KME increased perceptions of cognitive performance compared to PLA (KME, 7.8 vs. PLA, 5.5; $P = 0.05$), no differences were observed between groups for markers of cognition. **CONCLUSION:** Although changes in blood markers mimic those observed in past KME investigations, compared with PLA, KME ingestion did not affect cognitive performance following a MF protocol in trained females.

P112: THE EFFECT OF ASTAXANTHIN ON THE PREVENTION OF COGNITIVE DECREMENTS FOLLOWING A MENTAL FATIGUE PROTOCOL

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BACKGROUND: Astaxanthin (AX) is a carotenoid found in marine species and is a popular dietary supplement due to its unique ability to cross the blood-brain barrier. It appears that AX may preserve aspects of cognition during periods of cerebral stress (such as cognitive fatigue or in the development of neurodegeneration), provided AX's ability to support and maintain mitochondria function, specifically within the

brain. Therefore, the purpose of this study is to examine the effect AX has on markers of cognitive performance following a mental fatiguing protocol in recreationally active females. **METHODS:** Participants will include 30 recreationally active females (18-39 years) and will utilize a double-blinded, between-design, with participants reporting to the laboratory on four separate occasions. All trials will consist of a battery of baseline and post-mental fatigue cognitive assessments (psychomotor vigilance test (PVT), task switching, incongruent flanker). Additionally, either a battery of mentally fatiguing tasks (color multi-source interference task (CMSIT), Rapid visual information processing task (RVIP), time load dual back task (TLDB)), or a time-matched control will be utilized in between pre and post-testing. Following trial 2, participants will be randomly assigned to ingest either AX (12 mg/day⁻¹) or a matched placebo for 6-weeks prior to reporting back to the laboratory for repeat post-testing. **ANTICIPATED RESULTS:** It is hypothesized AX will mitigate decrements to cognitive performance following mental fatigue in recreationally active females. **Funding:** This study is funded by AstaReal USA.

P113: PERSONALIZED HYDRATION STATUS IN RECRUITS DURING FIRE SCHOOL

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INTRODUCTION: Dehydration is a major issue in firefighters as reports show that over 90% of firefighters are continually dehydrated. Many firefighters begin their shift in a dehydrated state which is further exacerbated by firefighting events. There have been multiple techniques utilized to assess in-field hydration status including nude body weight changes, urinary measures, and more recently saliva osmolality. When assessing hydration status with saliva osmolality, it may be important to determine a personalized optimal hydration osmolality zone for each individual rather than general reference ranges due to human complexities. Therefore, the purpose of this study was to compare personalized and reference range hydration status categorizations in recruits going through a 12-week Fire School. **METHODS:** This study assessed hydration status via a saliva osmolality meter (MX3 Hydration) for 10 recruit firefighters (9 male, 1 female) going through an intensive 12-week Fire School. Prior to starting hydration assessments, the recruits followed a one-day hydration protocol based on body mass and then tested for their personalized optimal hydration value. Daily hydration results were then categorized based on their personalized zone. For the purpose of this study, subjects were either classified as "hydrated" or "dehydrated", with dehydrated collapsing the categories "mildly dehydrated", "moderately dehydrated", and "severely dehydrated." A binomial logistic regression analysis was completed to determine if hydration status evaluated using the reference range could be used to predict hydration status evaluated with a personalized range for each person's salivary osmolality score. SPSS version 29 was used with an alpha level of .05. **RESULTS:** The logistic regression model was not significant, $\chi^2(1) = 0.103$, $p = .749$, Nagelkerke $R^2 = .014$, and the two evaluation methods agreed for 60% of cases. **CONCLUSION:** Testing for hydration status using a salivary osmolality device provides useful information, but interpretation of the results varies widely based on the evaluation method. Using raw scores and a reference table to assess dehydration misclassified $\geq 40\%$ of firefighter recruits according to their hydration status when the device had undergone personalized calibration. Data will continue to be collected on the next recruit class to increase power.

P114: DETERMINING HYDRATION STATUS: RELATIONSHIP BETWEEN BODY MASS AND SALIVARY OSMOLARITY ASSESSMENTS IN FIRE RECRUITS

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DETERMINING HYDRATION STATUS: RELATIONSHIP BETWEEN BODY MASS AND SALIVARY OSMOLARITY ASSESSMENTS IN FIRE RECRUITS
BACKGROUND: Hydration status in firefighters is commonly assessed by changes in body mass during working shift and/or urine specific gravity. However, these measures may not provide actual hydration status as beginning of shift body mass cannot indicate if a subject is currently dehydrated and urine tests are only accurate for the first morning urine, which usually occurs prior to the work shift. Saliva osmolality is a measure of hydration status that can now be tested onsite with a meter, which will allow firefighters to know if they are dehydrated when they first arrive on shift, a common occurrence.

Therefore, the purpose of this study was to compare body mass and saliva osmolarity assessments of daily hydration status in recruit firefighters over a 6-week period. **METHODS:** 10 recruit firefighters attending an intensive 12-week Fire school had measures of salivary osmolarity via a meter (MX3 Hydration) and body mass measured at the beginning and end of each working shift for the first 6 weeks (a total of 27 days). Salivary osmolarity is a measure of the concentration of particles in the saliva, with a higher value indicating a more dehydrated state. Acute body mass changes (i.e. within the same day) typically reflect fluid changes, with a decrease in body mass indicating a more dehydrated state. Change scores (end of day - beginning of day) in osmolarity and body mass were computed for each day and then averaged for the 6-week period. The correlation between the average change in saliva osmolarity and average change in body mass was analyzed via bivariate correlation in SPSS version 29. **RESULTS:** The relationship between average change in salivary osmolarity (-1.14 ± 7.64 mOsm) and average change in body mass -0.39 ± 1.11 was positive, moderate, and not significant ($r(10) = .349, p = .324$). **CONCLUSION:** Change in body mass and change in salivary osmolarity methods of measuring hydration status produce results which are not related to one another leading to different assessments of, and directions for achieving, hydration. The two measurements were expected to be inversely related because a decreased body mass should correspond to an increase in salivary osmolarity (i.e. reduced hydration status). The moderate positive relationship observed emphasizes the need to implement sophisticated and valid methods to test hydration status. Data collection is ongoing to further investigate this relationship.

P115: OUTDOOR LEISURE, PHYSICAL ACTIVITY, AND EATING HABITS AMONG COLLEGE STUDENTS: AN OBSERVATIONAL STUDY

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BACKGROUND: Engagement in physical activity, outdoor leisure, and healthful eating habits are imperative for overall well-being. The purpose of the investigation was to examine physical activity, outdoor leisure, and eating habits to further our efforts in the Exercise is Medicine On-Campus (EIM-OC) initiative. **METHODS:** College students ($n = 173$) were recruited and completed a confidential online self-reported survey consisting of four questionnaires: Physical Activity and Outdoor Leisure Questionnaire, Barriers to Outdoor and Physical Activities, Motivators to Outdoor and Physical Activities, and the Eating Attitudes Test (EAT-26). **RESULTS:** The Physical Activity and Outdoor Leisure questionnaire ($n = 120$) responses revealed 86% of students were aware of the health benefits associated with physical activity. Despite awareness of the benefits, only 65% reported meeting the aerobic physical activity guidelines each week (150 min-wk⁻¹ of moderate-intensity or 75 min-wk⁻¹ of vigorous intensity exercise). Responses indicated 65% of students participated in at least 20 minutes of outdoor physical activity and 56% spent time outdoors at least 2-3 times each week. Lack of time, weather, and exposure to outdoor pests were the top reported barriers to participation in outdoor leisure. Students reported their top motivators were stress reduction, keeping physically fit, and getting away from the usual demands. EAT-26 responses revealed 13% of students presented with a score of 20 or higher, indicating a high level of concern about problematic eating behaviors. No significant differences were observed between students majoring in exercise science when compared to other majors ($p = 0.174$). However, disordered eating was significantly greater in students who were not athletes ($p = 0.022$). **CONCLUSIONS:** Students demonstrated a reasonable level of awareness regarding the advantages of adhering to physical activity guidelines. However, there remains a significant scope for enhancing their compliance with these recommendations and allocating more time to outdoor leisure activities. Furthermore, the noteworthy occurrence of disordered eating habits among non-athletic students is a cause for concern, suggesting a potential necessity for comprehensive on-campus educational initiatives aimed at promoting healthy eating patterns across all student populations.

P116: THE EFFECTS OF NON-STIMULANT PRE-WORKOUT COMBINED WITH EXOGENOUS CAFFEINE AND KETONE SUPPLEMENTATION

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BACKGROUND: A primary goal of pre-workout nutrition and supplementation is to optimize fueling and sympathetic nervous system (SNS) activity. While mixed evidence exists, caffeine and sports supplements marketed as 'pre-workouts' purportedly increase the SNS drive and therefore performance of the athlete. Prior research has demonstrated the significant fueling and potential buffering effects of exogenous ketone supplements (KET). The purpose of this study is to determine the effect, if any, of a multi-ingredient PRE and KET supplement on peak and mean power output. **METHODS:** A single-blind randomized crossover design will be used with one baseline session and three additional testing days. We plan to recruit 25 biological male and female participants weighing 60-100 kg who train 3 or more days per week. Participants will consume a 5 mg/kg dose of caffeine on one testing day. The non-stimulant pre-workout and exogenous ketone doses will be standardized to 10 and 20 grams respectively. After measuring height and weight, a thirty-minute dose attenuation period will be followed. Then, participants will be asked to perform two max-effort vertical jump tests on an electronic vertical jump platform. Following a brief rest, participants will then complete a four-rep consecutive vertical jump test. After a two-minute rest period, participants will complete a 5x10s Wingate cycle test against a resistance equal to 7.5% of their body weight. Capillary blood sampling will be performed via finger stick with an automated lancing device to measure glucose, ketone, and lactate concentrations. Samples will be collected upon arrival, after dose attenuation, and at each rest interval throughout exercise. Heart rate will be recorded using a Polar H10 HR monitor continuously during the entirety of the testing session. Blood pressure will be recorded upon arrival, thirty minutes after dosing, after the third cycling trial, and during cooldown to ensure safety. Results will be analyzed for normalcy and assessed using repeated measures analysis of variance (ANOVA) to determine significant differences in performance. Post-hoc analysis will be completed if any significant main effects or interactions are observed. **ANTICIPATED RESULTS:** It is hypothesized that the caffeine and ketone supplementation group will maintain both greater peak and mean power throughout exercise.

P117: THE EFFECT OF ASTAXANTHIN SUPPLEMENTATION ON SUBJECTIVE MARKERS OF MUSCLE SORENESS IN WOMEN.

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BACKGROUND: Strenuous exercise involving eccentric muscle actions induces skeletal muscle damage, resulting in delayed onset muscle soreness (DOMS). Antioxidant supplementation, such as astaxanthin (AX), may alleviate muscle injury following intense exercise. While previous research in males demonstrated that AX ingestion can reduce subjective measures of DOMS and possibly enhance aspects of endurance performance, to date, no studies have yet been conducted in a female only cohort. Therefore, the purpose of this study is to investigate the effect of AX supplementation at 12 mg/day-1 for 6-weeks on markers of physical performance and subjective markers of DOMS in females. **METHODS:** Participants will include 30, recreationally-active and healthy females (18-39 years), and the protocol will use a double-blinded, between-design (AX vs. placebo). Participants will complete four trials, with trials 1 and 3 designed to induce muscle damage (EIMD), consisting of a one-repetition maximum test (1RM) for leg-press, followed by five sets of ten repetitions at 65% of 1RM. Trials 2 and 4 will test exercise performance and will be conducted 48 h post-EIMD. Trials 2 and 4 will consist of sets at 65%, 70%, and 75% of 1RM to failure, with total repetitions completed included as our markers of physical performance. Subjective markers of DOMS will be collected using a visual analog scale and an algometer to test muscle tenderness 24, 36, & 48 h post EIMD. **ANTICIPATED RESULTS:** It is hypothesized that AX will reduce the subjective feelings of DOMS while possibly enhancing total repetitions completed due to a reduction in DOMS during trials 2 and 4. **FUNDING:** This study is funded by AstaReal USA.

P118: ACUTE DIETARY NITRATE SUPPLEMENTATION AND COLD PRESSOR TEST CARDIOVASCULAR RESPONSES IN YOUNG WOMEN

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BACKGROUND: Research specific to acute nutritional interventions that alter cardiovascular responses to stress in young women, is

lacking. Beet root juice (BRJ) is highly concentrated with dietary nitrate which is a precursor to the compound nitric oxide (NO). NO is a potent vasodilator and has vascular health implications. The purpose of this study was to investigate the influence of acute BRJ supplementation on cardiovascular responses to a cold pressor test (CPT) in young women. **METHODS:** 17 (aged 18-23) women completed this placebo-controlled, counter-balanced, crossover protocol. Participants completed 3 laboratory visits (familiarization & 2 experimental). Experimental visits differed in the BRJ formula; whereby the placebo had nitrate removed by the manufacturer. Heart rate (HR), blood pressure (MAP = 1/3 SBP + 2/3 DBP), and rate pressure product [RPP = (HR-SBP)·0.01] were monitored immediately prior (pre), after (post), and during a 4-minute recovery window following a CPT. A mixed-model, linear regression with fixed factors of time (post, 1-min, 2-min, 3-min, 4-min) and treatment (placebo vs. experimental) were used to explore mean differences in dependent variables (MAP, HR, & RPP). Additionally, pre-measures of HR, MAP, and RPP were used as covariates to account for daily variation. Sidak adjustments were implemented if pairwise comparisons were warranted ($\alpha \leq 0.05$). **RESULTS:** Regression results revealed no interaction (all $p > 0.26$) nor main effect of treatment (all $p > 0.40$) for HR, MAP, or RPP. However, as expected, there was a main effect of time (all $p < 0.001$); whereby minute 0 was higher than minutes 1, 2, 3, and 4 during the recovery window for HR (adjusted mean \pm SE; 0-min = 84 ± 1.4 bpm, 1-min = 74 ± 1.4 bpm, 2-min = 75 ± 1.4 bpm, 3-min = 76 ± 1.4 bpm, 4-min = 76 ± 1.4 bpm) and RPP (adjusted mean \pm SE; 0-min = 116 ± 2.0 au, 1-min = 87 ± 2.0 au, 2-min = 83 ± 2.0 au, 3-min = 82 ± 2.0 bpm, 4-min = 83 ± 2 au) but no differences in other pairwise comparisons ($p > 0.05$). Furthermore, MAP (adjusted mean \pm SE; 0-min = 107 ± 1.5 mmHg, 1-min = 88 ± 1.5 mmHg, 2-min = 82 ± 1.5 mmHg, 3-min = 80 ± 1.5 mmHg, 4-min = 80 ± 1.5 mmHg) for minutes 0 and 1 were higher than minutes 2, 3, & 4 (all $p < 0.001$) with no differences in other pairwise comparisons ($p > 0.05$). **CONCLUSIONS:** BRJ did not influence cardiovascular reactivity following a cold pressor test when compared to placebo.

P119: EFFECTS OF PRE SLEEP CASEIN INTAKE ON ATHLETES RECOVERY ACCORDING TO WHOOP BAND DATA

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BACKGROUND: Casein, a slowly digested protein, and whey, a quickly digested protein promote muscle protein synthesis and have been shown to enhance recovery. Muscle protein synthesis increases throughout the night when taking a casein protein supplement before sleep compared to nothing or a placebo. The hypothesis is that pre-sleep protein ingestion will show a higher recovery rate than baseline recovery recorded before taking the supplement. A secondary hypothesis is that a higher recovery rate will be seen during the 2 weeks of pre-sleep casein consumption than during the pre-sleep whey consumption. **METHODS:** The participants are NCAA Division 2 collegiate athletes from the volleyball swimming and golf teams who wear Whoop bands. They will be randomly selected forming two groups for the experimental phase. One group will consume a pre-sleep casein drink for a duration of 14 days, while the other group will consume a pre-sleep whey protein drink. The subjects will have a 7-day washout period, ingesting neither whey nor casein before sleep. After this period, they will consume the other drink for an additional 14 days. The participants will be blinded with respect to the type of protein they are ingesting. Additionally, anthropometrics, food records, sleep questionnaires, training schedules, and stress questionnaires will be completed by participants and analyzed by research personnel to ensure habitual routines are maintained within the parameters of normal collegiate athletic performance cycling. Recovery data from the Whoop bands will be collected and dependent t-tests will be analyzed to determine differences in recovery between no protein, casein, and whey protein ingestion. **ANTICIPATED RESULTS:** Based on preliminary results that are still being analyzed, the participants ingesting the pre-sleep casein showed a higher recovery compared to the participants ingesting the pre-sleep whey protein. The data is still being analyzed for the first hypothesis.

P120: SURVEY OF THE EFFECTS OF EXERCISE ON MENSTRUAL PAIN BETWEEN YOUNGER AND OLDER PREMENOPAUSAL FEMALES

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BACKGROUND: Primary dysmenorrhea (PD), or menstrual pain, can be disruptive to all areas of a woman's life. While exercise is recommended to help manage PD, this may differ by age and exercise type. The purpose of this study was to explore how exercise effects menstrual pain and which exercises improve pain, between younger and older premenopausal women. **METHODS:** The data for the current study was taken from a larger survey study of women with self-reported menstrual pain (n=129; Age: 31.7±8.9yrs; 65.9% white; 68.7% from the United States). Participants were separated into two premenopausal age groups, younger (18-29 years old; n=71) and older (30+ years; n=58). Responses to the multi-response question, "how does exercise impact your menstrual pain?" were evaluated. Those who indicated having pain with exercise were asked to indicate pain severity on a 0-10 scale. Those who indicated pain improvements with exercise were asked which exercises improved their pain. Descriptives and frequencies were analyzed using Excel. **RESULTS:** In younger women (92 total responses), 14.1% reported pain with exercise (mean pain: 4.9±2.1), 6.5% reported no pain, 38% reported pain improving, 17.4% reported pain worsening, 15.2% reported no change in pain, and 8.7% reported "other". Moderate-intensity aerobic was most reported for improving pain (30.4% of 79 responses), followed by low-intensity aerobic (22.8%), strength/resistance training (17.7%) and yoga/Pilates (11.4%). In older women (75 total responses), 17.3% reported pain with exercise (mean pain: 6.1±1.7), 4% reported no pain, 33.3% reported pain improving, 9.3% reported pain worsening, 29.3% reported no change in pain, and 6.7% reported "other". Low-intensity aerobic and yoga/Pilates were most reported for improving pain (25.5% each of 55 responses), follow by strength/resistance training (20%) and moderate-intensity aerobic (18.2%). **CONCLUSION:** Based on percentages, 38% of younger and 33.3% of older women reported pain improved, while 32.6% and 38.6% reported worsening or no change with exercise, respectively. Low to moderate-intensity aerobic exercise and yoga/Pilates seemed to be most beneficial for pain improvement in both age groups, followed by strength/resistance training. Future research should take life stage, exercise experience, and exercise preference into consideration when observing the effects of exercise on PD.

P121: CANNABIDIOL'S (CBD) IMPACT ON INFLAMMATION, PERFORMANCE, AND PERCEIVED RECOVERY FOLLOWING DAMAGING SQUAT PROTOCOL

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BACKGROUND: The benefits of resistance training (RT) are well established. Many Americans fail to meet the weekly American College of Sports Medicine RT guidelines. Muscle soreness, which commonly follows RT, may contribute to this behavioral trend. Muscle damage from RT results in elevations of circulating myoglobin (MB) and pro-inflammatory interleukin 6 (IL-6) and interleukin 10 (IL-10). While Non-steroidal anti-inflammatory drugs may relieve discomfort associated with RT, they can impair the protein remodeling necessary for muscular improvement. Cannabidiol (CBD), a legal cannabinoid lacking psychotropic effects, is associated with analgesic and anti-inflammatory properties. This has resulted in theories suggesting that CBD supplementation may reduce muscle soreness and enhance recovery following strenuous exercise. However, the benefits of CBD remain inconclusive in humans. The purpose of this study is to determine the impacts of CBD on markers of inflammation, physical performance, and perceived recovery following exhaustive RT. **METHODS:** Fifteen healthy, recreationally active participants aged 18-45 will be recruited. This double-blind, repeated measure (RM), crossover design has participants perform a damaging squat protocol under a placebo, low dose (2mg/kg), and high dose (10mg/kg) of CBD. The protocol consists of 4 sets of 4-second eccentric back squats loaded with 60% of the participant's weight. The first two sets will be performed until failure with sets three and four matching the repetitions completed from set two. Before and after each protocol, circulating IL-6, IL-10 and MB will be obtained via venipuncture. Performance variables, vertical jump (VJ), perceptual recovery status (PRS), and max bar velocity (MBV), will be collected pre and post (24, 48, & 72hr). Participants will be given a 1-week washout period between each supplementation condition. The effects of CBD will be determined using a 3 (condition) x 4 (time) RM ANOVA model for blood markers, VJ, PRS, and MBV. Measurement outcomes will be correlated with PRS to identify if CBD influences the correlation strength. **ANTICIPATED RESULTS:** CBD supplementation, of either dose, may reduce markers of inflammation, improve perceived recovery, and protect physical performance from decrements following

exhaustive RT. Grant: College of Health and Human Services at Western Kentucky University

P122: THE EFFECT OF THIRST ON SLEEPINESS AND VISUOMOTOR REACTION TIME

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Many individuals do not consume an appropriate amount of fluid. This low fluid intake leads to increased levels of thirst and hypohydration. The sensation of thirst influences areas of the brain that are associated with reaction time performance. Additionally, low fluid intake often results in elevated levels of arginine vasopressin, which exacerbates mood and alertness decrements. The purpose of this study was to determine the effect of fluid intake and thirst perception on perceived sleepiness levels and visuomotor reaction time. College age males ($n = 12$; age = 21 ± 1 yr) participated in this randomized, counterbalanced, cross-over study. Participants completed three visits with different conditions: 1) euhydrated and received no fluid throughout the trial, 2) following 12-hour fluid restriction and received no fluid throughout the trial, and 3) following 12-hour fluid restriction and received 200 mL during the trial between two reaction time tests. Upon arrival, all hydration was assessed via urine specific gravity and urine color. Participants also recorded thirst sensation at various time points throughout the trial. Participants rated their level of perceived sleepiness and completed central vision and peripheral vision reaction time tests on the Dynavision twice throughout each trial. Sleepiness was not different between trials ($p > 0.05$). Thirst sensation was significantly higher at the start of the hypohydrated trials than the euhydrated trial. Thirst sensation was significantly lower following the 200 mL of fluid intake in the hypohydrated trial ($p < 0.05$). Central and peripheral vision reaction time was improved following fluid intake in the hypohydrated condition ($p < 0.05$) but not in the other two trials. Thirst sensation, independent of hydration status, appears to diminish reaction time performance.

P123: RELATIVE VALIDITY OF GENERATIVE ARTIFICIAL INTELLIGENCE VERSUS WEIGHTED FOOD RECORD FOR QUANTIFICATION OF CALORIC INTAKE

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BACKGROUND: Developing accurate and efficient methods of estimating caloric intake may result in improved health outcomes. Generative artificial intelligence (AI) is becoming more accessible to the public and may be a helpful way for people to estimate nutritional intake. The purpose of this study was to assess the accuracy of publicly available AI for estimating caloric intake. **METHODS:** Dietary consumption ($n=39$) was analyzed using both weighed food record (WFR) and generative AI. Meals were weighed using a food scale and then caloric intake calculated using the USDA nutrition database. The same meals were also described to generative AI (ChatGPT 3.5, Open AI) based off the program's prompts to receive a caloric estimation for the meal. The differences between the WFR versus AI were assessed by a paired t-test on SPSS 28. Agreement between the two methods was assessed using Bland-Altman analysis. Linear regression analysis was used to assess proportional bias between WFR and AI. **RESULTS:** Paired t-test showed no significant difference between WFR and AI ($t = 1.59$, $p = 0.120$, $\beta = 0.06$). Bland-Altman analysis showed a mean difference between estimates of caloric intake were $-373g$ to $484g$. Linear regression demonstrated there is no significant proportional bias ($R^2 = 0.024$, $p = 0.343$). **CONCLUSION:** This analysis supports the possible use of generative AI as an accessible assessment tool for estimating caloric intake. Users will have to determine the acceptable limits of agreement for their usage and goals. As AI tools improve and validity is established, AI may be useful for approachable quantification of nutritional intake.

P124: EFFECTS OF FAT FREE MASS LOSS ON SYSTOLIC BLOOD PRESSURE IN DIVISION 1 COLLEGIATE ATHLETES

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In relation to blood pressure (BP), moderate to vigorous load intensity resistance training has been shown to maintain or increase Fat Free Mass (FFM) and decrease BP. In addition, some research suggests an inverse relationship between FFM and BP. Recent research suggests

that athletes may fail to reach their recommended daily calorie intake could contribute to FFM loss. However, it is less understood how FFM loss affects systolic blood pressure and hypertension risk within the African American (AAM) collegiate football players. Purpose: The purpose of this study is to investigate the relationship between FFM loss and systolic BP in AAM Division 1 football players. Methods: Seventy male football players were tested: Age: 20.3 ± 1.5 yrs, HT: 184.1 ± 8.7 cm, BM: 104.3 ± 1.5 kg, BF%: 18.3 ± 1.1 %, FFM: 84.6 ± 0.4 kg). Height was measured using a standing stadiometer while resting BP was assessed following a ≥ 5 minute resting period using an automated sphygmomanometer cuff. High BP was defined as (>120 - <130 mmHg Systolic BP and <80 mmHg Diastolic BP) according to AHA guidelines, prior to weight and body composition assessment. Statistical analysis included Spearman's correlations and paired sample t tests were used to determine the relationship between FFM loss and SBP over the preparatory period. Results: Our analysis indicated a significant difference in FFM (-1.9 ± 3.6 kg, $p < 0.01$) over the time period, and a difference of (0.6 ± 4.1 kg, $p < 0.01$) of body mass was lost during the same time period. During preparatory, a moderate relationship ($r=0.45$, $p < 0.05$) was observed between SBP and FFM loss. 27/57 (47%) athletes were hypertensive in preparatory whereas 30/57 (53%) were hypertensive in the competitive season despite no significance ($p > 0.05$). During the competitive season, a nonsignificant, weak, positive correlation ($p = 0.09$, $r = 0.24$) existed between FFM and Systolic BP. 19/57 (33%) athletes experienced BP increase after preseason. Conclusion: Despite the negative weak relationship between FFM loss and high SBP observed ($r=-0.05$, $p=0.75$) between the two time points, there was a 6% increase in athletes with hypertension. Although there was a weak correlation between high BP and FFM loss over the two testing periods, there were still multiple athletes who were affected by weight fluctuations and high BP.

P125: THE IMPACT OF SUPRAMAXIMAL WALKOUTS ON SUBSEQUENT BACK SQUAT PERFORMANCE

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BACKGROUND: Post-activation performance enhancement (PAPE) involves the use of voluntary muscle contractions (i.e., conditioning stimulus) to improve subsequent muscular performance. Supramaximal walkouts are a variant of conditioning stimuli commonly used by strength athletes, yet data on the efficacy of this approach are lacking. The purpose of this study was to determine the influence of performing supramaximal walkouts on subsequent heavy back squat performance. **METHODS:** Five resistance-trained (1RM back squat $\geq 1.5 \times$ body weight) males (age 21.4 ± 1.5 y, body fat $16.2 \pm 9.9\%$, 1RM back squat 2.26 kg/BW) completed two trials separated by a minimum of 72 h in a randomized, counterbalanced, crossover study design. Each trial consisted of a general dynamic warmup and a more specific barbell warmup followed by a single back squat repetition at 92.5% 1RM (PRE). Five min after PRE, participants unracked and walked out of the rack with either 110% 1RM (SMW) or 30% 1RM (CON) for a 10 s isometric hold. After a 5 min rest, three back squat repetitions at 92.5% 1RM (POST1, POST2, POST3) were completed with 5 min rest between each repetition. Participants were instructed to complete PRE, POST1, POST2, and POST3 with maximal concentric velocity. Rating of perceived exertion (RPE), average (P_{avg}) and peak power (P_{peak}), average (V_{avg}), and peak velocity (V_{peak}), and surface electromyography (sEMG) amplitude of the vastus lateralis and gluteus maximus were measured during each repetition. Data were analyzed using two-way analysis of variance (ANOVA) with walkout x time as the two factors. **RESULTS:** The average load of CON and SMW were 61.8 ± 8.7 kg and 227.3 ± 32.6 kg, respectively. Significant main effects of time were found to decrease P_{peak} ($p = 0.04$), P_{avg} ($p < 0.001$), V_{avg} ($p < 0.001$), and GM sEMG ($p = 0.04$). There were no main effects of walkout ($p \geq 0.24$) or interaction effects ($p \geq 0.34$) observed for any of the variables. **CONCLUSIONS:** These data suggest performing SMWs at 110% neither potentiates nor impairs subsequent back squat performance, indicating they may be a strategy that can be utilized to improve confidence under load without detriment in a strength-based program.

P126: MUSCULAR AND CARDIORESPIRATORY FITNESS IN 18-20-YEAR-OLDS

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BACKGROUND: Low levels of physical activity and high levels of sedentary behavior are generally associated with decreased overall muscular fitness (MF) and cardiorespiratory fitness (CRF) in young adults. However, it is unclear whether reduced lower body MF is associated with lower peak performance on a VO_{2Peak} test. This study assessed whether MF, as well as the relative reason (muscular fatigue and cardiorespiratory factors) for terminating a VO_{2Peak} test are associated with CRF, controlling for sociodemographic and anthropometric characteristics. **METHODS:** Data were collected from 30 young adults 18-20 years of age (37% female, 47% Non-Hispanic White, body mass index (BMI) = 24.3 kg/m²). MF was assessed as standing broad jump (SBJ) distance (cm). CRF was assessed as the highest value of milliliters of oxygen used in one minute per kilogram of body weight [mL/kg/min] during a graded VO_{2Peak} treadmill test. After completing their VO_{2Peak} test, participants rated the relative extent (0-100 scale) to which muscular fatigue or cardiorespiratory factors affected their decision to terminate the test. A score of 0 meant that participants stopped primarily because their legs were tired, and a score of 100 meant that participants stopped primarily because they were out of breath or their heart was beating hard/fast. Linear regression analysis assessed the relationship between VO_{2Peak} (response), SBJ (explanatory variable), and self-reported reasons using the relative scale for terminating the VO_{2Peak} test (explanatory variable). All analyses controlled for sociodemographic (sex, race/ethnicity) factors and BMI as additional covariates. **RESULTS:** Results showed a significant positive association between SBJ and VO_{2Peak} ($\beta = 0.18$, $p = 0.001$). No other covariates were found to be significant. There was no significant association between the relative extent to which muscular fatigue or cardiorespiratory factors attributed to the decision to terminate the VO_{2Peak} test and VO_{2Peak} ($\beta = 0.09$, $p = 0.16$). **CONCLUSIONS:** The ability to jump 1 cm further was significantly associated with 0.18 mL/kg/min increased VO_{2Peak} controlling for all other covariates. Self-reported reasons for terminating the VO_{2Peak} test did not significantly explain VO_{2Peak} . Future assessments should consider alternative tests of MF and muscular fatigue including tests of maximal strength performance and/or muscular endurance.

P127: EFFECTS OF UNILATERAL LOWER LIMB SUSPENSION OF THE QUADRICEPS STRUCTURE AND FUNCTION

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BACKGROUND: Muscle unloading such as bed rest or space flight decreases strength and cross-sectional area of anti-gravitational muscles, such as the quadriceps. Muscle anisotropic properties - assessed by diffusion tensor imaging (DTI) - correlate with muscle fiber type and contractile function. **PURPOSE:** To assess the changes in quadriceps' size, anisotropy, and function following unilateral limb suspension (ULLS). **METHODS:** ULLS is the gold-standard ground-based analog for ambulatory simulation of muscle unloading where one limb is unloaded and the contralateral limb acts as an internal (loaded) control. Healthy, physically active subjects (18-50y M and F) ambulate using forearm crutches and shoes (Brooks Revel 5) modified with a 5cm rocker-style stack (R side only) for 13d under free-living conditions to unload the left leg. Bilateral interpolated twitch (60° knee flexion) is completed before and after 13d ULLS to assess maximal voluntary contractions and electrically-evoked twitch. DTI of the quadriceps is conducted at the end of the study to assess Physiological Cross-Sectional Area (PCSA), Fractional Anisotropy (FA), Mean Diffusivity (MD), Axial Diffusivity (AD), and Radial Diffusivity (RD). **RESULTS:** To date, 3 subjects have been enrolled in the study (1 complete, 1 dropped, 1 in progress) and data collection is ongoing. Data for one subject (20y F) are as follows. Compared to the loaded limb (R), quadriceps PCSA of the unloaded limb (L) was lesser (R: 58.28 v. L: 53.37). Each anisotropic property was adjusted by relative percent of total quadriceps PCSA and summed; all were greater in unloaded limb (L). FA (R: 0.178 v. L: 0.184), MD (R: 1.49 v. L: 1.53), AD (R: 1.80 v. L: 1.86), and RD (R: 1.33 v. L: 1.34). Maximal Voluntary Isometric torque was 20% lesser in the unloaded limb (R: 228.4 v. L: 183.1 Nm). Interestingly, Peak twitch torque increased for both the loaded (pre: 47.9 v. post: 60.5Nm) and unloaded limbs (pre: 44.0 v. post: 64.0Nm), but this effect was greater for the unloaded limb. Electromechanical delay was lesser following unloading in both the loaded (pre: 27.0 v. post: 24.7ms) and unloaded (pre: 25.0 v. 23.0ms) limbs. Time to peak twitch tension was not appreciably altered in either the loaded (pre: 100.7 v. post: 98.0ms) or unloaded (pre: 102.5 v. post: 100.1ms) limbs. Rate of Torque Development

increased in both the loaded (pre: 1064.0 v. post: 1300.5Nm/s) and unloaded (pre: 949.6 v. post: 1405.7Nm/s) limbs. **CONCLUSIONS:** ULLS induces voluntary weakness which may be due to impaired muscle recruitment since contractile performance during electrically evoked twitch appears to be greater following unloading. Faster rates of torque development and greater peak twitch torque, as well as changes in anisotropic properties are consistent with a slow-to-fast fiber type change that occurs with prolonged unloading.

P128: THE EFFECTS OF FATIGUE ON KNEE VALGUS ANGLES DURING FUNCTIONAL TASKS

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BACKGROUND: As supporting musculature fatigues, generalized knee laxity increases, specifically dynamic knee valgus (DKV), which results in risk of musculoskeletal injury. While there is moderate research on how fatigue affects DKV in athletic populations, there is a gap in the literature relating to the general, untrained population. The purpose of this study was to determine the effect fatigue has on the DKV angle in untrained populations. **METHODS:** A sample of 31 subjects (age 22.29±2.47 years; 58% female) performed a drop vertical jump (DJV) test from a 30 cm plyometric box in front of the VST Pro™ system by VirtuSense Technologies, measuring the DKV angles (in degrees). The DJV test was performed before and after completion of a fatigue protocol which included wall sits, squats, and vertical jumps. Participants were considered fatigued once reached a 15% decrease of their pre-fatigue max vertical jump height, as measured with the Vertec Vertical Jump device standard protocol. Pre- and post-fatigue measurements were analyzed with paired t-tests. **RESULTS:** Results indicated a statistically significant difference in DKV angles for both the right lower extremity (RLE) (-1.18±2.26, $p=0.007$) and left lower extremity (LLE) (-1.19±2.2; $p=0.005$). In males, there was a statistically significant difference in comparing the LLE (-1.40±1.08; $p<0.001$) pre- and post-fatigue knee valgus angles, however there was no statistically significant difference in the RLE (-.7879±1.59; $p=0.103$). In females, results indicated no statistically significant difference in pre- and post-fatigue DKV angle for the LLE (-1.03±2.76; $p=1.32$) but did find statistical significance in the RLE (-1.46±2.65; $p=0.031$). **CONCLUSIONS:** The results of our study suggest quadriceps fatigue may not play as large of a role in the increase of DKV angles as the fatigue protocol within the procedures primarily biased quadriceps muscles. Although there was a statistically significant change in DKV angles in the RLE and LLE of all participants, it did not surpass the minimal detectable change for DKV measured by the VST Pro™, but it was above the level of the standard error measurement of 1 degree. Additional research should investigate the comparison of a quadriceps versus hip musculature fatigue protocol. **GRANT OR FUNDING INFORMATION:** Funding received from Western Kentucky University, College of Health and Human Services Quick Turn-Around Grant (QTAG)

P129: EXAMING THE EFFECTS OF EXTERNAL VS INTERNAL CUEING IN THE 505 CHANGE OF DIRECTION DRILL

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BACKGROUND: Research has shown beneficial results of using an external focus of attention when completing athletic movements. When an athlete is asked to focus externally, this contributes to motor behavior happening automatically. Previous literature has focused predominantly on examining external and internal cueing in accuracy, balance, and jumping events. However, there appears to be a void in the literature when it comes to performance testing for change of direction (COD). Therefore, the purpose of this study was to compare the impact that focusing attention externally, focusing attention internally, and no focus of attention has on COD finishing times. **METHODS:** Thirty highly fit collegiate subjects completed a total of 15 trials in the 5-10-5 COD drill. Subjects were asked to read a set of instructions that would induce an external (EXT) or internal (INT) focus of attention, while the control (CON) condition would induce no specific attention condition. Subjects completed five drills of the control and returned to the lab 48 and 96 hours later and completed the EXT or INT set of instructions in a counterbalanced order. A one-way repeated measures ANOVA was used to calculate the differences between EXT, INT, and CON. The alpha level was set at $p \leq 0.05$. **RESULTS:** Since sphericity was not met, the Greenhouse Geisser was used for our

within-subjects effect. A significant difference of time was found overall between the three conditions ($F(1.286,30) = 32.530, p < .001$). A post hoc pairwise analysis with Bonferroni adjustment revealed a significant difference between all three groups. EXT ($5.049, \pm .077$ s) was significantly ($p < .001$) different vs CON ($5.201, \pm .082$ s) and significantly ($p < .002$) different vs INT ($5.087 \pm .081$ s), while INT was significantly ($p < .001$) different vs CON. Of note, the effect size was large (partial eta squared = .529). **CONCLUSION:** The results suggest when subjects directed their attention EXT, faster COD times did occur as compared to INT and CON conditions, while INT produced faster times than CON. Therefore, it could be suggested that sporting coaches consider implementing external cueing with their athletes to achieve success when performing movement-related tasks. Future studies may be needed to assess the impact that external vs internal cueing has on other agility and change of direction tests such as T-drill, Z-drill, Y-shaped, etc.

P130: AGREEMENT BETWEEN MOTION TRACKING AND VIDEO ANNOTATION FOR BARBELL KINETICS DURING HIGH INTENSITY FUNCTIONAL TRAINING

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BACKGROUND: High-intensity functional training (HIFT) involves vigorous multimodal circuit training, where precise tracking of pacing is nearly impossible without technological assistance. One method would include recording workouts and utilizing video annotation software (VAS) to quantify kinetics but is limited by camera quality and standardization. Secondly, 3D motion tracking systems (MTS), can provide live feedback with less procedural restrictions, but is limited to specific exercises and can fail to detect repetitions. Data loss may be avoided having VAS serve back-up when repetitions are lost. The purpose was to determine agreement between VAS and MTS for monitoring barbell kinetics during a 5-minute bout of HIFT.

METHODS: Data from eighteen HIFT-trained athletes (29.4 ± 8.4 years) was used for this study. Over a 4-week period, participants randomly repeated a 5-minute repeated circuit of 9-calorie rowing, six barbell thrusters at 43.1 kg, and three 0.61 m box jumps after consuming supplement or placebo. Workouts were recorded by tablet camera with average concentric barbell velocity (V) and power (P) during thrusters being specifically tracked by MTS PERCH. Post-exercise, VAS Kinovea was used to quantify average concentric V and P for completed thrusters. Quantified kinetics for complete sets were organized ($n = 816$). A random sample of 555 repetitions (~68%) were chosen for analysis. **RESULTS:** Though Pearson's correlations indicated positive relationship ($r = 0.33-0.49, p < 0.001$), paired samples *t*-tests revealed a significant difference in V (MTS: 1.19 ± 0.41 m/s, VAS: 1.22 ± 0.19 m/s, $p = 0.032$) but not P (MTS: 482 ± 189 W, VAS: 487 ± 111 W, $p = 0.468$). However, negative relationships were observed between the average of, and differences between, MTS and VAS for V ($r = -0.66, p < 0.001$) and P ($r = -0.54, p < 0.001$), with large coefficients of variation (CV = $1,098-3246\%$). MTS produced lower estimates of V (mean bias = -0.04 m/s, 95% C.I. = -0.74 to 0.81 m/s) and P (mean bias = -5 W, 95% C.I. = -321 to 331 W) compared to VAS, and these were not consistent across the observed range of velocities ($0.61-1.90$ m/s) and power ($181-780$ W). **CONCLUSION:** While measures of V and P estimated by MTS and VAS are related, their data cannot be used interchangeably or for imputation purposes. Compared to MTS, VAS overestimates V and P and differences are exacerbated with faster or more powerful repetitions.

P131: HORMONAL RESPONSES TO EXERCISE-HEAT STRESS AND ORAL REHYDRATION

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Background: Regulating hydration status in active individuals is essential for mitigating losses in performance and physiological function that occur with hypohydration. Many hormonal responses stimulated by physiological stressors are amplified by hypohydration and may impair central nervous system function, cardiovascular responses, perspiration rates, and increase core body temperature. This study aims to assess the cortisol, arginine vasopressin (AVP), and blood lactate (La⁻) responses to exercise-heat exposure and an oral

rehydration regimen.

Methods: Thirty-seven physically active individuals, aged 18 to 50 years ($n = 37$; $M_{\text{Weight}} \pm SD = 72.10 \pm 13.80$ kg; $M_{\text{Height}} = 172 \pm 9.54$ cm), entered a heat chamber (30°C , 45% relative humidity) and completed two, 45-minute bouts of running on a treadmill at a 2% grade. The protocol mimicked demands of a soccer match to control for extraneous variables (environment, opponent, travel, player position, etc.). During a 15-min break between treadmill bouts and at PE, participants consumed fluids equal to their total body mass loss. Venous blood was drawn from the antecubital space and was analyzed for La⁻, AVP, and cortisol at pre-exercise (PRE), immediately post-exercise (PE), and 1-hour post-exercise (PE₁). Body mass (BM) was measured at PRE, PE, and PE₁. Using a linear mixed effects model, significant main effects were followed up with post hoc pairwise comparisons using the Holm correction method.

Results: AVP showed a significant main effect of time ($p = 0.03$). Post hoc testing revealed significantly lower values at PRE (0.80 ± 0.45 pmol/L) and PE₁ (1.33 ± 0.39 pmol/L), compared to PE (3.28 ± 0.46 pmol/L, $p = 0.05$). Total cortisol had a significant main effect of time of ($p < 0.01$). Post hoc testing revealed significantly higher values at PRE (14.52 ± 1.04 µg/dL) than at PE (11.58 ± 1.05 µg/dL, $p = 0.09$), and PE₁ (9.98 ± 1.05 µg/dL, $p < 0.01$). There was a significant main effect of time for La⁻ ($p < 0.01$). Post hoc testing revealed that PRE values (1.41 ± 0.20 mmol/L) were significantly lower than at PE (2.12 ± 0.12 mmol/L, $p = 0.02$). There was a significant main effect of time for BM ($p < 0.01$). Post hoc testing revealed significantly lower values at PE (71.40 ± 2.32 kg, $p < 0.01$) and PE₁ (71.80 ± 2.32 kg, $p < 0.01$) in comparison to PRE (72.20 ± 2.32 kg, $p < 0.01$).

Conclusion: AVP was elevated significantly at PE but values normalized by PE₁. BM at PE was significantly lower than PRE, demonstrating some degree of hypohydration, while values at PE₁ were higher than PE due to the rehydration protocol. Despite an intensive exercise-heat stress protocol accompanied by significant increases in La⁻ from PRE to PE, cortisol values were significantly less at PE compared to PRE. Therefore, further research is warranted to rationalize or replicate the unexpected decrease in cortisol following exercise-heat stress.

P132: HEART RATE MEASURE AGREEMENT BETWEEN APPLE WATCH SERIES 8 AND POLARGRIT X COMPARED TO POLAR H10 SENSOR

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Heart rate (HR) measure agreement between wrist-worn devices and the chest-worn Polar H10 during non-steady-state exercise is unclear.

PURPOSE: To assess agreement between wrist-based photoplethysmography (PPG) devices (Apple Watch Series 8 [AW], Polar Grit X [PX]) compared to Polar H10 chest-worn electrocardiographic device (H10) estimated HR. **METHODS:** Following an initial visit to determine velocity at VO₂max (vVO₂max), participants ($n=10$ males, 10 females, ages 18-35) completed 2 testing days. Participants wore the PX, AW, and H10 during all exercise bouts. Day 1 consisted of two, 4-minute bouts on the treadmill at 50% and 75% of vVO₂max followed by an 8-min interval effort (30:30) at 100-120% of vVO₂max. Day 2 consisted of a high intensity functional training (HIFT) protocol comprised of 3 rounds of 5 exercises (kettlebell swings, box jumps, burpees, sit-ups, cycling sprint) with a 40:20 work:rest ratio. Agreement of average and max HR from wrist-based PPG devices and H10 were analyzed via inter-class correlation coefficient (ICC) with 95% confidence intervals. An alpha level of 0.05 was used to determine statistical significance. **RESULTS:** There were strong significant correlations for average and max HR between H10 and AW during running intervals at 50% (Average: ICC=0.99, CI=0.98-1.00; $P < 0.0001$; Max: ICC= 0.97, CI=0.91-0.99; $P < 0.0001$), 75% (Average: ICC=0.84, CI=0.62-0.94; $P < 0.0001$; Max: ICC=0.97, CI= 0.91-0.99; $P < 0.0001$) and 100% (Average: ICC=0.95, CI=0.84-0.98; $P < 0.0001$; Max: ICC=0.97, CI=0.91-0.99; $P < 0.0001$) of vVO₂max. In contrast, PX was moderately correlated with at H10 at 50% (Average: ICC=0.70, CI=0.18-0.89; $P = 0.0001$; Max: ICC=0.79, CI=0.50-0.92; $P < 0.0001$) and 75% (Average: ICC=0.50, CI= 0.01,-0.80; $P = 0.005$; Max: ICC=0.43, CI=-0.14-0.75; $P = 0.26$), but not 100% (Average: ICC=0.17, CI=-0.19,-0.56; $P = 0.19$; Max: ICC=0.24, CI= -0.18-0.63; $P = 0.14$) of vVO₂max. There was strong agreement between AW and H10 (ICC=0.92, CI =0.59-0.98; $P < 0.0001$), but not PX (ICC=0.19, CI = -0.11-0.55; $P = 0.05$), during HIFT. **CONCLUSION:** While AW shows

strong agreement across multiple exercise intensities and modalities, the PX PPG technology does not demonstrate as strong of agreement. The PX showed decreased agreement as running interval intensity increased, and poor agreement during HIFT. While the non-invasive nature, affordability, and convenience of PPG shows promise for continued growth as a daily activity assessment tool without the need for a chest strap, consumers and researchers should take this information into account when selecting a PPG device. The novel inclusion of HIFT sets this study apart and indicates the need for agreement testing across multiple exercise modalities in the field.

P133: EXAMINATION OF LIFESTYLE BEHAVIORS AND ARMY COMBAT FITNESS TEST RELATIONSHIPS IN ROTC CADETS
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Introduction: The U.S. Army's Holistic Health and Fitness (H2F) program represents a significant shift in the assessment of soldiers' well-being, moving from fitness testing as the primary measure of health. This shift acknowledges that sub-optimal lifestyle behaviors, particularly physical activity (PA), diet and sleep, have major effects on wellness and operational readiness. Notably, structured exercise is mandatory among active-duty military personnel; however, diet and sleep behaviors are not controlled. The purpose of this study was to examine modifiable lifestyle behaviors of Reserve Officers' Training Corps (ROTC) cadets, who serve as a surrogate military cohort with many similarities to active-duty counterparts. **Methods:** 44 ROTC cadets (33 male) took an online survey and the Army Combat Fitness Test (ACFT). The survey consisted of the Pittsburgh Sleep Quality Index (PSQI), Rapid Eating Assessment for Participants (REAPS) short form, and the International Physical Activity Questionnaire (IPAQ). Descriptive statistics, as medians (interquartile range), and Spearman correlation coefficients for lifestyle behaviors and ACFT scores were computed. **Results:** Median PSQI scores were 6.0 (4.5,7.0), with 33 cadets being labeled as poor sleepers, and REAPS score were 29.0 (26.5,32.0), with 6 cadets being labeled as having poor nutritional habits. Cadets participated in 270 (138.75, 405) min/week of vigorous PA, 90 (5, 240) min/week of moderate PA and 1440 (900, 2160) min/week of sitting time. All cadets met ACSM PA guidelines. ACFT total scores were 524.0 (485.25, 549.75). There were no significant correlations between lifestyle behaviors or with ACFT total scores. **Conclusion:** The lack of correlation between lifestyle behaviors and ACFT scores supports the concepts embodied in the H2F framework, emphasizing the need to move beyond relying solely on fitness assessments for evaluating the overall health of military populations. Considering that a majority of cadets reported poor sleep, it appears sensible to implement sleep education interventions, as poor sleep has been linked to reduced cognitive and physical function as well as impaired recovery. It should be noted that ROTC cadets have distinct schedules and responsibilities as full-time students. Consequently, future research should examine lifestyle behaviors from more diverse military populations, including active-duty soldiers and other military branches.

P134: TO TRACK OR NOT TO TRACK: VALIDITY AND RELIABILITY OF COMMONLY USED SELF-REPORT PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR INSTRUMENTS AMONG PA TRACKING DEVICE USERS AND NON-USERS
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BACKGROUND: Self-reported physical activity (PA) is higher among individuals who use PA tracking devices (PATs) compared to those who do not. Little is known about the relationship between PAT use and sedentary behavior (SED) or that of PAT-use and the validity and reliability of self-report instruments assessing these behaviors. The purpose of this study was to assess the validity and reliability of self-report PA and SED instruments among college student PAT users (PAT-U) and PAT non-users (PAT-NU). It was hypothesized that reliability and validity would be higher among PAT-U compared to PAT-NU because tracking may enhance recall accuracy. **METHODS:** PAT-U (n=55; 69.1% female) and PAT-NU (n=43; 72.1% female) completed the Global Physical Activity Questionnaire (GPAQ), International Physical Activity Questionnaire-Long Form (IPAQ-L) and Short Form (IPAQ-S), Sedentary Behavior Questionnaire (SBQ), and SIT-Q on 2 occasions separated by 7-8 days. Participants wore devices at the waist (ActiGraph GT9X Link) and on the thigh (activPAL3) to

objectively assess PA and SED, respectively, between administrations of the self-report instruments. Intraclass correlation coefficients assessed test-retest reliability. Spearman's rho assessed concurrent validity. Mean absolute error (MAE) was calculated for variables from self-report instruments using the devices as the comparison.

RESULTS: For total PA (METmin/wk), reliability was consistently higher for PAT-NU compared to PAT-U (ICC: 0.59-0.75 & 0.49-0.56, respectively). For MVPA, reliability was not markedly different between the two groups but for SED, PAT-U showed higher reliability than PAT-NU (ICC: 0.40-0.83 & 0.34-0.82, respectively). For MVPA, validity was consistently higher for PAT-U whereas MAE was lower for PAT-NU. For vigorous-intensity PA (VPA), validity was higher and MAE was lower for PAT-U ($p=0.265-0.295$; MAE=80.8-103.0, respectively) compared to PAT-NU ($p=-0.028-0.191$; MAE=88.9-119.4, respectively).

CONCLUSIONS: Reliability was moderate to good among both PAT-U and PAT-NU. PAT-U may be more accurate in reporting VPA, but not overall MVPA or SED, compared to PAT-NU. Researchers seeking to assess PA and SED among college students should be aware of individual-level factors, such as PAT use, that could influence the validity of self-report instruments. Specifically, these factors may influence PA and SED outcomes (e.g., MVPA, VPA, SED) differently.

P135: EXAMINING COUNTER-MOVEMENT JUMP HEIGHT USING A DIGITAL CONTACT MAT COMPARED TO FORCE PLATES
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INTRODUCTION: Jump testing is commonly used to assess return to sport for those recovering from ACL injury and repair. In a previous study, this testing method was praised as it stated vertical jump performance as more representative of a metric for knee function in healthy individuals than horizontal hop performance. Previous research has found the Just Jump system to slightly overestimate jump height while still maintaining high correlation rates with the gold standard Force Plate and only slight variations reported in the two height measurements. The purpose of this research was to assess differences in jump height using a digital contact mat (Just Jump System, Probotics, Huntsville, Alabama, USA) versus force plates (Hawkins Dynamic, ME, US). It was hypothesized that there would not be significant differences between devices given both use flight time to calculate jump height. **METHODS:** 38 high level soccer players (M: $n=18$, age (yrs)= 21.5 ± 1.6, %BF= 10.7 ± 3.5; W: $n=20$, age (yrs)= 20.9 ± 2.1, %BF= 20.4 ± 4.3) participated in this experimental study. Each participant executed power performance on a contact mat (Just Jump System, Probotics, Huntsville, Alabama, USA) and force plates (Hawkins Dynamic, ME, US). Testing measures included bilateral countermovement jumps (CMJ) and bilateral drop jumps (DJ). Participants repeated each jump twice, if the two jumps differed by greater than 10% a third jump was performed, and the best jump was used for analysis. All performance metrics were analyzed using a paired t-test and Pearson correlations between contact mat vs force plate. Statistical significance was set at $\alpha=0.05$. **RESULTS:** Significant differences in jump height were observed in CMJ and DJ ($P<0.05$) between the jump mat and force plate data with the Jump Mat data being higher on average (JM CMJ = 18.3 ± 3.2, FP CMJ = 12.3 ± 2.5; JM DJ = 18.5 ± 2.7, FP DJ = 11.6 ± 3.2). For both the CMJ and DJ, a strong correlation was found. More specifically, there was a strong positive linear relationship between the two testing methods for both CMJ and DJ ($r=0.96$ and $r=0.68$ respectively). **DISCUSSION:** The significant difference between the two testing methods paired with the strong positive relationship indicates strong reliability, albeit poor validity, of the digital contact mat compared to force plates. This means that these testing methods are not fully interchangeable in practice, as the digital contact mat continuously overestimates jump height compared to force plates. Given this, researchers should be cautious when selecting which method to use, particularly when absolute values are critical values in decision making or assessment. As for further investigations, the source of the significant difference between the two methods should be further evaluated as well as previously developed equations aimed at created a more equal comparison between devices.

P136: EFFECT OF LOW VERSUS HIGH DOSE CAFFEINE "COFFEE NAP" ON COGNITION, REACTION TIME, AND ISOMETRIC STRENGTH
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Background: Caffeine is an extensively studied stimulant that has been shown to improve alertness, reaction time, and exercise performance. Caffeine consumption immediately before a nap (i.e. a "coffee nap") has been shown to elicit improvements in cognition, but the ideal caffeine dosage is not clear. In addition, effects of coffee naps on anaerobic exercise performance are unknown. Therefore the purpose of this study was to examine the effects of high (300 mg) vs low (100 mg) dose caffeine, in combination with a 15-min nap, on cognition, reaction time, and isometric strength. **Methods:** College-age females were recruited via convenience sampling to come to the laboratory on three occasions. Participants were instructed to refrain from caffeine, nicotine, and alcohol 12-hr prior to each visit, and also instructed to refrain from vigorous exercise 24-h prior and sleep as many hours as is typical for them on each night prior to study visits. Upon arrival participants consumed three capsules that were identical in appearance: 300 mg (high), 100 mg (low), or none (placebo). Placebo capsules were filled with gluten-free corn starch. After consuming the supplement, participants waited 7.5 min, were taken to a cool dark room, and told to lie down and take a nap. After 15-min, participants were woken, waited 7.5 min, and the testing session then commenced, exactly 30 min post-supplementation. Participants first completed two trials of isometric mid-thigh pull with 2 minutes rest in between trials, then completed a Tower of London (ToL) cognitive test, and finally performed reaction time testing on a Dynavision light board. Order of the three testing sessions was counterbalanced, and supplementation protocol was double-blinded. One-way ANOVA was used to compare mean scores among the high, low, and placebo trials. **Results:** There were no statistically significant differences in ToL score, reaction time or isometric strength among the three conditions ($p > 0.05$). **Conclusions:** Neither high nor low dose caffeine in combination with a 15-min nap improved cognition, reaction time, or isometric strength in college-age females.

P137: INTER-LIMB FUNCTIONAL ASYMMETRY AFTER A FATIGUING BOUT OF EXERCISE IN HIGH-LEVEL SOCCER PLAYERS

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Fatigue, sex, and asymmetries greater than 10% between limbs are factors that influence noncontact injury rates. The purpose of this study was to investigate the effects of a fatiguing bout of exercise on strength and power inter-limb functional asymmetries in elite soccer players. **METHODS:** 38 high-level soccer players (females $n = 20$) completed the study ($M_{age} = 21.2 \pm 1.8y$). The study consisted of two visits within a week. At the first visit, participants were familiarized with the jump tests and 5-RM single-leg press was determined. At the second visit, each participant executed performance tests pre and post a 90-minute simulated soccer game on a treadmill. This protocol was developed based on prior GPS data on elite soccer players. Performance tests included single-leg press at 90 % of their 5-RM till failure, countermovement jump (CMJ), unilateral countermovement jump (SLCMJ), drop jump (DJ), and unilateral drop jump (SLDJ) on force plates. Asymmetry index was measured for SLCMJ, SLDJ and single leg press. All metrics were analyzed using a paired t-test of pre vs. post and sex comparison analysis. Statistical significance was set at $\alpha = 0.05$. **RESULTS:** Significant decreases in jump heights pre vs post were observed in the overall sample for CMJ, DJ, SLMCMJ, and SLDJ ($p < 0.05$), as well as a significant reduction in repetitions for single-leg press ($p < 0.05$). Sex-specific analyses revealed differences between males and females for these reductions. CMJ (M: $p = 0.02$; F: $p = 0.40$), SLCMJ on R leg (M: $p = 0.05$; F: $p = 0.41$), SLCMJ on L leg (M: $p = 0.02$; F: $p = 0.16$), SLDJ on R leg (M: $p < 0.001$; F: $p < 0.001$), and SLDJ on L leg (M: $p < 0.001$; F: $p = 0.004$). In addition, decreases in strength were seen in both legs in the single leg press test (M: $p = 0.002$, F: $p = 0.04$ on R leg; M: $p < 0.001$, F: $p = 0.04$ on L leg). Asymmetry indexes for SLCMJ, SLDJ, and single leg press were nonsignificant for both males and females ($p > 0.05$). **CONCLUSION:** A 90-minute exercised-induced fatigue protocol that simulated soccer physical demands decreased performance metrics of power and strength in elite soccer players. Even though fatigue was detrimental on performance for both genders, there were no significant changes in asymmetry index pre vs post. Men presented more significant changes in inter-limb asymmetries than females. More research is needed to develop a standardized method to measure inter-limb asymmetries and their influence on sports performance.

P138: CONTROL OF BREATHING ON AEROBIC AND MUSCULAR FITNESS: C-BAMF

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BACKGROUND: Compared to the training of conventional forces, US Special Operations Forces (SOF) training often includes a higher volume of aquatic-based training. In this aquatic-based training, SOF members experience hypoxia during repeated breath-holding events. This type of breath hold training is called apnea training among US SOF. It has been shown that after repeated bouts of apnea training, participants can improve their breath-holding ability, surface swimming time, and the ability to do subsurface anaerobic work. These marked improvements in aerobic and anaerobic capacity have led some to believe that there is a performance gain crossover from apnea training to other unrelated, land-based sports and endurance activities. Our study aims to examine the effects of apnea training on land-based physical performance. **METHODS:** We plan to recruit 15 male and female participants between the ages of 18 and 35. The study will consist of a baseline laboratory visit, followed by randomization into one of three conditions: an apnea-only training group (AG), a running-only training group (RG), and an apnea + running training group (ARG). These groups will complete two more lab visits over the course of six weeks. The RG will be given a customized periodized running workout program designed using baseline measures, and the AG will be given a smartphone app that builds a custom apnea-training program based on individual breath-holding ability. The ARG will be given both training programs. Physical performance assessments will include: aerobic fitness assessed from a graded exercise test, anaerobic fitness assessed using a modified Sprint-Drag-Carry (SDC), muscular strength assessed using hand grip dynamometry, and muscular power assessed using vertical jump height. These assessments will be repeated at the three and six-week mark. Results will be analyzed using a repeated measure ANOVA to assess the group differences. Additionally, multiple linear regression will be used to examine the relationship between the performance measures. **ANTICIPATED RESULTS:** It is hypothesized that the following training programs will improve aerobic and anaerobic capacity from greatest to least in rank order: 1) Apnea and running training; 2) Apnea-only; 3) Running-only training.

P139: DIFFERENCES IN COUNTERMOVEMENT JUMP EFFICIENCY WITH AND WITHOUT AN ARM SWING

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BACKGROUND: The countermovement jump (CMJ) is a common assessment used to measure jumping capabilities and overall athletic performance. Previous studies have suggested differences in CMJ performance when performed with arms akimbo, commonly used in lab settings, versus using an arm swing, commonly used in field settings. It is possible that an arm swing may not only change overall performance, but the efficiency of the CMJ. Theoretically to have the most efficient jump, peak force should coincide with force at the low position. However, it is unknown if using an arm swing during the CMJ influences the efficiency of the CMJ. Therefore, the purpose of this study was to compare the effects of arm swing (AS) and no arm swing (NAS) on force profiles and jump efficiency during the CMJ. **METHODS:** Twenty-three recreationally trained males and females (age = 23 ± 3 yrs, height = 171 ± 15 cm, body mass = 71 ± 15 kg) participated. Participants completed six total CMJs, three with AS and three with NAS, in random order. Ground reaction forces were collected during all CMJ. Force at the low position of the countermovement, peak propulsive force, and countermovement depth were taken from the CMJ. CMJ efficiency was calculated as: (peak propulsive force - force at the low position)/peak propulsive force. Dependent samples t-tests examined differences for force at the low position, peak propulsive force, countermovement depth, and CMJ efficiency between AS and NAS. **RESULTS:** There were no significant differences between AS and NAS countermovement depth and peak propulsive force ($p \geq 0.464$). NAS had greater force at the low position and better CMJ efficiency than AS ($p \leq 0.002$). **CONCLUSIONS:** The present study demonstrates the potential variability associated with an arm swing when performing the CMJ. The differences in force at the low position and jump efficiency suggest that performing the CMJ with arms akimbo may yield a more efficient CMJ. This might suggest that the AS condition has less efficient jump profiles due to the poor arm swing mechanics and potential variability in arm movement. When using the AS technique, practitioners should prioritize improving arm mechanics to

allow more efficient jumps. Future studies should consider further assessing the kinetics and kinematics of CMJs with and without an arm swing to better understand how upper-body movement influences CMJ efficiency.

P140: VALIDATION OF THE ENDURANCE INDEX

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BACKGROUND: Skeletal muscle (SkM) is a dynamic tissue that contracts when stimulated, but also adapts to repetitive use. One such adaptation improves SkM Endurance. Daily activities living employ different Skm's differently. For example, walking uses the SkM's of the quadriceps extensively but only minimally activates the bicep brachii. The Endurance Index (EI) is a tool to assess SkM endurance independent of perceived effort. Therefore, the purpose of this study was to determine whether daily physical activity patterns influence the Endurance Index in SkM's of the upper and lower appendages.

METHODS: Study participants were assessed for voluntary maximal torque with an isokinetic dynamometer and SkM endurance by accelerometer-based mechanomyography (aMMG) before and after fatiguing exercise for their dominant arm and leg. Muscle fatigue was induced in the elbow flexors and knee extensors via 50 maximal voluntary concentric contractions at 60°/sec. aMMG was assessed for the biceps brachii (BB) and vastus lateralis (VL) of the dominant limb. Surface electrodes delivered a 20 to 25 mAmps current at 6 Hz for 5 min. A 3-dimensional accelerometer fixed to the belly of the BB or VL recorded the contractions in units of gravity. These units were normalized to baseline. Data were analyzed by repeated measures ANOVA. **RESULTS:** Maximal voluntary torque decreased by 44±11% in leg extensors and by 38±7% in elbow flexors following the fatigue test (P<.05). A significant interaction (P<.05) between LimbsXPre/PostXTime indicates that the BB fatigue similarly to the VL at baseline, but contraction-induced accelerations remain depressed in the BB after fatiguing exercise when compared to the VL (BB Pre: .66±.2; BB Post: .33±.1; VL PRE: .8±.2; VL Post: .74±.4).

CONCLUSION: These data support the use of EI to assess a SkM's resistance to fatigue or endurance. Furthermore, these data provide support to determine whether the EI can detect changes in a SkM's endurance with either resistance or endurance training.

P141: PHYSIOLOGICAL RESPONSES TO DIFFERING, WORK-MATCHED HIGH-INTENSITY, INTERVAL PROTOCOLS

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BACKGROUND: High-intensity interval training (HIIT) often utilizes a square-wave approach in which work rates (WR) immediately increase and decrease from work to rest intervals. An alternative to this is a ramped approach in which WR is constantly increasing, which may better reflect the supramaximal workloads associated with some sport or exercise modalities. This study examined physiological responses to a work-matched, ramped supramaximal HIIT protocol (RAMP) and a traditional, square-wave (SQR) HIIT protocol. **METHODS:** Nine healthy, college age males (23.9 ± 6.5 yrs.; 180.7 ± 8.2 cm; 84.5 ± 13.7 kg) completed a graded exercise test (20 W/min) on the cycle ergometer to exhaustion. Peak power output (PPO) was recorded to determine WR for the HIIT protocols. On separate days, participants performed the SQR protocol or the work-RAMP protocol in a randomized order. Protocols consisted of a warmup (20 W), followed by 5 work intervals (1:1-minute exercise/recovery ratio), and a cooldown (20 W). For CON, work rate increased at the start of each work interval to 80% PPO and remained constant while for RAMP, work rate continuously increased from 20 W to 160% PPO for each 1-minute work interval. Pulmonary oxygen uptake (VO₂) and heart rate (HR) were measured continuously and averaged over the final 10 seconds of each interval (INT). Total oxygen cost (VO_{2tot}) was calculated as the VO₂ area under the curve from the start of the INT 1 to the end of INT 5. Two-way analysis of variance and post-hoc testing analyzed the mean difference between conditions at the end of warm-up (WU), and the end of INT 1, INT 3, and INT 5. Alpha level was set at p ≤ 0.05.

RESULTS: Peak WR for SQR and RAMP were 207 ± 24 W and 414 ± 48 W, respectively. VO₂ was significantly different between SQR and RAMP (p < 0.01 for all comparisons) at INT 3 (2.19 ± 0.28 vs. 2.49 ± 0.34 L/min) and INT 5 (2.39 ± 0.30 vs. 2.60 ± 0.31 L/min). HR was significantly different (p < 0.01 for all comparisons) between SQR and RAMP at all work intervals (INT 1: 131 ± 11 vs. 139 ± 14 bpm; INT 3: 147 ± 14 vs. 156 ± 15 bpm; INT 5: 155 ± 16 vs. 167 ± 16 bpm). VO_{2tot} was not different between conditions (SQR: 1596.1 ± 163.2,

RAMP: 1625.3 ± 162.0 L, p = 0.17). **CONCLUSION:** There is no significant difference VO_{2tot} between two work-matched HIIT protocols, despite significant differences in oxygen consumption and heart rate at the end of work intervals.

P142: HOME-BASED EXERCISE PROGRAM INCREASED MOBILITY AND PHYSICAL FITNESS IN INDEPENDENT LIVING OLDER ADULTS.

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BACKGROUND: Decreased mobility and physical fitness along with increased sedentary time is associated with loss of independence for older adults; regular exercise may be beneficial. However, travel and cost may be barriers to regular exercise. The purpose of this study was to determine the effects of a home-based endurance, strength, and balance exercise program on mobility and physical fitness in independent older adults. **METHODS:** Older adults were recruited from the community to participate in a home-based University of Lynchburg Active Aging Program (ULAAP) for 8-weeks. Endurance, strength, and balance exercises were prescribed using National Institute of Aging's Exercise & Physical Activity Guidelines and ULAAP's target: 150-minutes endurance, 8 strength, 8 balance exercises. Participants reported weekly progress to the program. Physical activity assessed with International Physical Activity Questionnaire (MET). Dynamic stability was tested with 4 square test (4Sq), Mobility was tested with 30s chair stand (30s) and timed up and go (TUG). Exercise capacity assessed with 6 minute walk test (6M). Strength assessed with left/right handgrip test (LHS, RHS). Each test was completed pre and post with anthropometrics (weight, height, and body mass index (BMI)). Pre and post differences were assessed using paired samples T-tests (p≤0.01). **RESULTS:** 54 participants (Age = 69.9 ± 7.1sd years, 64.9% female, Race; white=35.1%, black=56.1%, asian=3.5%) completed 88% of scheduled sessions and increased their weekly physical activity over the 8-week program (MET pre 210.8 minutes per week±106.9, post 407.8 minutes per week±137.6, p=0.000). There was no change in weight (pre 77.9kg±16.1, post 78.4kg±20.3, p=0.678), BMI pre 23.9±4.3, post 24.0±5.4, p=0.695). There were improvements in hand grip strength (RHS pre 27.1kg±16.5, post 28.6kg±16.5, p=0.000; LHS pre 26.4kg±15.9, post 29.0kg±16.1, p=0.000), mobility (30s pre 12.7s±3.0, post 13.6s±3.2, p=0.001; TUG pre 7.4s±1.5, post 7.5s±1.2, p=0.578), dynamic stability (4Sq pre 9.7s±2.6, post 8.6s±2.5, p=0.000), and total distance walked (6M pre 532.6m±104.2, post 552.4m±100.0, p=0.000). **CONCLUSION:** Our 8-week home-based endurance, strength, and balance exercise program increased regular exercise, decreased sedentary time, and improved muscular strength, mobility, dynamic stability, and exercise capacity in independent living older adults.

P143: HOME-BASED EXERCISE PROGRAM IN OLDER ADULTS IMPROVING SLEEP QUALITY AND COGNITIVE FUNCTION

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BACKGROUND: Aging is associated with poor sleep quality and reduced cognitive function along with increased sedentary time, incorporating regular exercise may reverse these effects. However, travel and cost are often barriers to older adults engaging in regular exercise. The purpose of this study was to determine the effects of home-based exercise programming on improving the sleep quality and cognitive function of independent-living older adults. **METHODS:** Older adults were recruited from area community centers to participate for 8-weeks in the home-based University of Lynchburg Active Aging Program (ULAAP). Endurance, strength, and balance exercises were prescribed using National Institute of Aging's Exercise & Physical Activity Guidelines and ULAAP's target: 150-minutes of weekly endurance, 2 days of 8 strength, and 8 balance exercises every week. Participants reported weekly progress to the research team. Physical activity (MET) and sedentary time (TSED) was assessed pre and post with the International Physical Activity Questionnaire. Sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), along with total sleep time (TST), sleep efficiency (SE), and cognitive function with the Montreal Cognitive Assessment version 7.2 (MOCA). **RESULTS:** 54 participants (Age = 69.9 ± 7.1years, 64.9% female, Race; white=35.1%, black=56.1%, asian=3.5%) completed 88% of scheduled sessions over the 8-week program. Over the 8 week program participants increased their physical activity ((MET pre 210.8 minutes per week±106.9, post 407.8 minutes per week±137.6,

$p=.000$) and decreased their sedentary time (TSED pre 31.4 ± 14.5 , post 22.7 ± 10.2 hours per week, $p=.000$) increased sleep quality and no effect on cognitive function (PSQI pre 7.2 ± 3.0 , post 5.4 ± 2.3 , $p=.000$) There was no significant change in the (MOCA pre 21.7 ± 3.1 , post 21.5 ± 2.9 , $p=.044$) increased sleep efficiency (SE pre 76.9 ± 10.7 , post 80.8 ± 7.5 , $p=.000$) there was a slight increase in total sleep time (TST pre $6.8 \pm .660$, post $7.2 \pm .617$ $p=.000$) We analyzed the effect of pre MOCA score amongst our variables and found no difference between the none (26 or more), mild (18-25), moderate (10-17) cognitive impairment groups. CONCLUSION: The 8-week home-based exercise program decreased sedentary time and increased METS per week while increasing quality of sleep, sleep efficiency, total sleep time and having no effect on cognitive function.

P144: THE RELATIONSHIP BETWEEN SERUM HYPOXANTHINE LEVEL, PHYSICAL ACTIVITY, AND AEROBIC FITNESS

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Background: Testing to determine physical activity (PA) and aerobic fitness levels is time-consuming and costly. Hypoxanthine (Hx) is a product of ATP breakdown that has been shown by previous literature to respond to exercise and indicate training adaptation. The purpose of this study is to determine the relationship between hypoxanthine concentration at rest, average daily physical activity levels, and peak fitness measures. **Methods:** $n=30$ male and females ages 18-25 will be recruited to participate. Participants will wear an ActiGraph GT9X Link accelerometer on the non-dominant wrist for three consecutive days, including one weekend day. Time spent in moderate and vigorous intensity PA will be determined using standard Freedson cut-points. Participants will then visit the laboratory for a single testing session and will be asked to refrain from exercise and caffeine consumption for 12 hours prior to the visit. Capillary blood samples will be collected at rest as well as 15 minutes after the VO₂ max test using a finger prick on the third or fourth finger with a disposable lancet. Blood will then be centrifuged, and plasma will be separated and stored until biochemical analysis. Participants will complete a VO₂max test to volitional exhaustion on a Concept 2 rowing ergometer; expired gases will be collected throughout the testing session via the Parvo metabolic system, and heart rate (HR) will be continuously monitored with a Polar HR monitor. Each test stage will last 2 minutes before increasing intensity by 50 watts and proceeding to the next stage, with starting power output of 50 Watts. Within the first 15 seconds of each stage, the participant will increase their power to the wattage instructed and will maintain the output for the remaining time of the stage; failure to maintain power output will result in test cessation. Oxygen consumption (VO₂), HR, and respiratory exchange ratio (RER) will be recorded each minute. Immediately after exercise cessation, a fingerstick will be conducted to measure lactate concentration in the blood. Repeat blood sampling for Hx will be taken at 15 minutes post-exercise. After data acquisition is complete, plasma concentrations of Hx will be determined using a commercially available enzyme activity xanthine/hypoxanthine assay kit. Correlations between physical activity, aerobic fitness, and resting and post-exercise Hx levels will be calculated. **Anticipated results:** We anticipate, based upon previous literature, that Hx levels will decrease from rest to post-exercise in all participants, but that aerobic fitness and physical activity will be positively associated with Hx levels. Further, we hypothesize that post-exercise Hx will have a stronger correlation with PA and aerobic fitness compared to resting Hx levels.

P145: RESISTANCE-TRAINED INDIVIDUALS EXPERIENCE GREATER ATROPHY STRENGTH LOSS DURING LEG IMMOBILIZATION VERSUS UNTRAINED INDIVIDUALS

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BACKGROUND: Skeletal muscle is a highly plastic tissue that responds to stimuli such as mechanical overload/resistance training (RT) or disuse/unloading. It has been demonstrated that individuals who perform RT, undergo detraining, and then re-engage in RT experience more skeletal muscle hypertrophy upon retraining than on the initial block of RT despite returning to baseline size with detraining. What is not known, however, is whether training status affects the progression of disuse-induced atrophy. Therefore, the purpose of this study was to

examine the effects of 2-weeks of lower limb immobilization on lower body strength and vastus lateralis (VL) thickness in a cohort of young, healthy previously trained (T) or training naive (UT) men and women. **METHODS:** In this study, 21 young healthy men and women ($n=10$ T; $n=11$ UT) underwent 2-weeks of left leg immobilization via a locking leg brace and crutches. Data were collected at baseline (PRE), and after the 2-week immobilization period (POST). Muscle thickness was assessed via ultrasound of the VL, while lower limb strength was determined via three repetition maximums (3RMs) of the hex bar deadlift and the seated leg press. Data were checked for normality by a Shapiro-Wilk test and analyzed via two-way ANOVAs to compare lower body strength and VL thickness pre- and post-immobilization. **RESULTS:** A two-way ANOVA for hex bar deadlift 3 RMs did not show a training status x time interaction ($P=0.566$), but did reveal main effects of training status and time ($P<0.005$) with T being greater than UT at both time points ($P<0.001$) and T decreasing from PRE to POST ($P<0.034$). A two-way ANOVA for leg press 3RMs showed a significant interaction, along with main effects of training status and time ($P<0.008$) with T being greater than UT at PRE and POST ($P<0.001$) and only T decreasing from PRE to POST ($P=0.001$). VL thickness also showed a significant interaction, along with main effects of training status and time ($P\leq 0.044$) with only T decreasing from PRE to POST ($P<0.001$) and T being greater than UT only at PRE ($P=0.014$). **CONCLUSIONS:** Trained individuals demonstrate greater losses in muscular strength and VL thickness compared to untrained individuals after 2 weeks of leg immobilization, and mechanistic research is warranted.

P146: IMPACT OF DIFFERENT PERSONAL FLOATATION DEVICES DURING A SIMULATED WORKLOAD ON PHYSIOLOGICAL RESPONSES

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BACKGROUND: Commercial fishing is one of the leading occupational sectors that lead to fatal and non-fatal injuries. Personal flotation devices (PFDs) are life-saving devices essential for commercial fishing work that includes a heavy workload. However, adoption and regular use of appropriate PFD are still not followed for various concerns such as restriction of mobility and comfort. This study aimed to assess the impact of two types of PFDs on physiological responses and perceived comfort while exposed to a simulated physical workload. **METHODS:** Ten healthy participants (7 males and 3 females; 23 ± 4 years; mass = 78 ± 14 kg; height = 176 ± 9 cm) were assessed for different measures of heart rate (HR) and perceived subjective comfort and mobility while wearing no PFD, an automatic minimalist PFD, and a traditional dual PFD while performing repeated physical workloads of lifting and placing boxes (25% of body weight) from floor to desk for 15 mins. The no PFD condition was performed first, followed by a counter-balanced order of the PFDs, with 10 minutes of rest between conditions. Resting, maximum, average, and recovery HR in the three PFD conditions were analyzed with a 3x4 repeated measures ANOVA, and perceived comfort and mobility scores from the questionnaire were analyzed using independent sample t-tests for the PFD conditions. **RESULTS:** Analyses revealed that while average and maximum HR during the workload was significantly higher than resting and recovery ($p<0.001$), significant differences between the PFD conditions were not recorded. Although not statistically significant, subjects perceived the auto PFD as more comfortable and less restrictive for mobility. **CONCLUSIONS:** Findings from the current study indicate that PFDs, regardless of the type, do not negatively impact HR responses when exposed to a physical workload. When compared, the minimalistic auto PFD was demonstrated to be more comfortable with the least mobility restriction, thus suggesting positive promotion for PFD use and adoption.

P147: THE EFFECT OF JOINT VERSUS SOFT TISSUE FLOSSING ON OVERALL PERFORMANCE IN THE LOWER EXTREMITIES

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BACKGROUND: Effective warm-up routines result in less muscle soreness post-exercise, a lower risk of injury, and an enhanced performance output ability. Existing research has shown promising effects of muscle tissue flossing, a novel method of warming up in which a latex band is used to apply pressure to a specific area in the body. The purpose of this study was to determine how active, healthy college students respond to flossing applied to both a joint as well as

soft tissue in the lower extremities, focusing on the ankle joint and calf muscle. **METHODS:** This study utilized a randomized crossover study design. Floss bands were applied bilaterally to either the ankles or calves for each of two visits and remained in place for a total of two minutes. The bands were applied at 50% tension and 50% overlap. Subjects walked around post-band removal to regain blood flow before completing each of the three outcome tests. Twenty minutes post-treatment, each of the three outcome tests were repeated. Subjects ($n=7$, 86% female, age 22.1 ± 1.9 yrs) completed tests on power (vertical countermovement jump test (VJ)), range of motion (weight-bearing lunge test (WBLT)), and balance (dynamic leap and balance test (DLBT)) that were compared between the two flossing treatment sites via paired sample t-tests. **RESULTS:** There was no significant difference in performance between the immediate post-treatment and the 20-minute post-treatment outcome measures, aside from DLBT number of right-side errors (3.1 ± 2.5 vs 2.4 ± 1.8 , $p=0.047$) and DLBT left-side time (39.00 ± 4.40 s vs 36.30 ± 3.68 s, $p=0.007$) for the ankle treatment and WBLT straight left leg ($57.6\pm 7.5^\circ$ vs $54.9\pm 6.6^\circ$, $p=0.004$) and DLBT right-side time (41.10 ± 8.38 s vs 36.00 ± 5.94 s, $p=0.042$) for the calf treatment. The calf and ankle treatment sites were equally effective for each of the outcome measures, aside from a significant difference found for the VJ immediately following removal of the floss bands in favor of the ankle site (0.44 ± 0.11 m) over the calf site (0.42 ± 0.10 m, $p<0.001$). **CONCLUSIONS:** Active college students' power, range of motion, and balance responded equally to floss band application to a joint and soft tissue area in the lower extremities. The floss band treatment may be a feasible warm-up option, especially for those looking to not increase their exercise load. Application to either the ankle joint or the soft tissue of the calf may be an option.

P148: EFFECTS OF SOUR TASTE ON ANAEROBIC EXERCISE PERFORMANCE

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Background: Previous research has shown that taste can have ergogenic effects on exercise performance. Specifically, bitter and sweet tastes activate receptors on the tongue, resulting in activation of associated brain regions and thus increased power output and decreased fatigue during exercise. Sour taste has been poorly studied, but some evidence does suggest a rapid increase in heart rate and autonomic nervous system activation as result of exposure to sour taste. Therefore, the purpose of this study is to evaluate the effects of swishing a sour tastant at varying concentrations on anaerobic exercise performance. **Methods:** Physically active adults ($n=20$) ages 18-25 years will be recruited for this study. Suitability for exercise will be determined by screening via the Physical Activity Readiness Questionnaire (PAR-Q+). Other exclusion criteria include history of upper or lower body injury within prior 6 months, known cardiovascular, metabolic, or musculoskeletal disease, or other known health conditions that might affect safety during maximal exercise. Participants will visit the laboratory on three occasions, separated by at least 48 hours. During each trial, participants will complete a 3x15 second Wingate anaerobic test (WAnT) and be fitted with a Polar heart rate monitor. A 5-min warm-up on the Monark mechanically braked cycle ergometer will be completed, at which time participants will rinse their mouth with 20 mL of one of the three solutions: very sour, sour, or control (water). The sour solutions will be made by dissolving food-grade citric acid anhydrous into 20 mL of water to form a 0.032 M solution (very sour) or 0.008 M solution (sour). Participants will then mount the Velotron electronically braked cycle ergometer and swish the prescribed solution in their mouth for 10-sec before expelling; the solution will not be swallowed. Immediately after, a 10-sec countdown phase with no resistance will be implemented, with the goal of achieving maximal pedal rate. Dropped weight for the 15-sec all out pedaling phase will be 7.5% of body weight. Each of the all-out sprints will be followed by a 2-min active recovery phase in which participant will pedal at a self-selected pace with no resistance. At the start of each active recovery set, RPE, heart rate, and fatigue index will be documented. Peak and mean power output will be obtained via Velotron software. Order of the three trials will be counterbalanced. **Anticipated Results:** Based upon previous literature examining the effects of other tastants (specifically bitter and sweet taste), we anticipate and increase in maximal and mean power output as well as a decrease in RPE in the very sour condition compared to sour and control. We also anticipate significantly better performance in sour vs control conditions.

P149: HEART RATE MEASUREMENT VIA WRIST-BASED PPG WHEN COMPARED TO POLAR 10 CHEST-BASED ECG DURING A TREADMILL VO2MAX TEST

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Background: Accurate heart rate (HR) measurements during physical activity are critical to infer clinical indications (i.e. tachycardia, cardiovascular health, etc), and are used to measure physical exertion within healthy, athletic populations. Traditional ECGs, the gold standard for HR monitoring, are difficult to use outside of a laboratory setting, while wrist-based watches using (photoplethysmography) PPG sensing are commercially available and increasing in popularity. The purpose of this study is to examine the agreement of heart rate measurement via PPG sensors compared to ECG during a VO2max test. **Methods:** Participants ($N=20$, 10 female/10 male, aged 18-35) completed a treadmill graded exercise test using the Bruce Protocol ($VO2max = 46.36 \pm 5.74$ ml/kg/min). Participants wore an Apple Watch Series 8, Polar Grit X watch, and a Polar H10 Chest Strap for the entire duration of this visit. The brand of watch on each wrist was counterbalanced for every participant. The average heart rate from each device during the graded exercise test was calculated and agreement between both wrist-based PPG devices and the chest-based ECG were analyzed via intraclass correlation (ICC) with a 95% confidence intervals (CI). An alpha level of 0.05 was used to determine statistical significance. **Results:** The Apple Watch Series 8 and the Polar H10 chest strap demonstrated strong agreement with an ICC of 0.95 (95% CI=0.88-0.98). This correlation was statistically significant ($P=<0.0001$). The Polar Grit X showed poor agreement compared to the Polar H10 with an ICC of 0.27 (95% CI = -0.20-0.56; $P=0.13$). **Conclusion:** During a graded exercise test, the Apple Watch Series 8 is a comparable heart rate monitor to the Polar H10 chest strap, indicated by the significantly strong ICC. However, the Polar Grit X watch did not demonstrate the same agreement, despite using the same PPG technology. This suggests not all wrist-worn PPG devices are created equal and consumers should take then into account when selecting a fitness or activity monitor. Future studies are necessary to determine the reliability of PPG sensing from other commercially available devices, as well as the reliability of PPG during maximal effort exercise.

P150: THE IMPACT OF LOWER BODY EXERCISE ON UPPER BODY MUSCULAR FATIGUE IN MEN AND WOMEN

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BACKGROUND: A previous research study examined the effects of lower body aerobic and anaerobic exercise performed on a Wingate bike on upper body muscular performance performed by modified pullup. This study included seventeen physically active participants (13 men, 4 women). Participants performed significantly lower in modified pullups after a prior anaerobic exercise trial compared to an aerobic trial matched on total work. Men on average did 2 fewer pullups after anaerobic lower body exercise compared to aerobic exercise. Women did 6 fewer pull ups under the same conditions. Given the low number of women who participated, we propose to examine sex differences on the effect of a lower body exercise on upper body performance. **METHODS:** We will recruit 15 men and 15 women ages 18 to 25 who are in good health and able to perform exercise to participate in the study. The study will be performed in one trial that is counterbalanced based on the order of exercises. Following a 5 min low intensity aerobic warm up, half the participants will complete as many Australian modified pullups as possible using a metronome to standardize movement time (60 bps). They will recover for 5 min and then complete the lower body exercise performing as many body weight squats as possible in 30 seconds. Participants will be instructed to squat to a depth where the knee is flexed to 90 degrees as many times as possible. Range of motion will be confirmed in real time using an electric goniometer (Etrak, Birmingham, AL) and total number of repetitions will be recorded. Immediately following the 30 seconds of lower body activity, participants will complete as many Australian modified pull-ups as possible with the metronome cadence. A target will be hung from the bar that results in the participant achieving 90 degrees flexion of the elbow when they touch the sternum to the target. Valid repetitions will be successfully reaching the target. Failure will be defined as inability to reach the target for two attempts in a row. Half the participants will perform the lower body exercise first followed by the modified pullups, recover for 5 min and repeat the

modified pullups without previous lower body exercise immediately preceding the pullup. **ANTICIPATED RESULTS:** It is hypothesized that men will better maintain upper body muscular endurance after a lower body work compared to women.

P151: THE EFFECT OF CAPSAICIN MOUTHRINSE ON RESISTANCE EXERCISE PERFORMANCE

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BACKGROUND: Studies have examined the effects of ingested capsaicin supplements on various types of exercise showing increased power output in anaerobic sprints. However, studies report side effects with the consumption of these supplements, particularly gastrointestinal tract (GI) issues. To avoid GI issues, a mouthrinse has been used with mixed results in influencing exercise performance. The purpose of this study is to examine the effects of a capsaicin mouthrinse on bench press velocity and endurance. We hypothesize a capsaicin mouthrinse will improve muscular endurance without associated GI issues. **METHODS:** The study will use a 3 visit counterbalanced design to investigate the effects barbell of the capsaicin mouthrinse on bench press velocity and number of repetitions during repeated repetitions to failure. Men 18 years and older with previous resistance training experience will be recruited to participate in three visits. All participants provide written informed consent of the protocol approved by the Samford University IRB. The first visit assesses 1RM and familiarization with the velocity trial. The second and third visit will consist of either a capsaicin mouthrinse or placebo. Trials will be separated by a 3-day washout period. For visit two and three, participants will complete a warm-up consisting of 5 repetitions at 40% 1RM and 3 repetitions at 60% 1RM with each set separated by a 2-min rest period. Participants will then be supplemented with 20 ml of either 0.06% capsaicin mouthwash (Pure Cap) or water placebo for 30 secs before spitting out the solution then immediately beginning the exercise trial. The exercise trial will consist of a 1 set x 2 reps of bench press at 75% 1RM with maximum explosive intent. A linear position transducer (Gymaware, Kinetitech Performance Technology, Australia) is attached to the barbell to assess concentric velocity (m/sec). Mean velocity will be averaged across the 2 reps. Following a 5-min rest period, participants will then complete 3 sets of reps to failure (RTF) of bench press exercises at 75% of 1RM. Each set of RTF will be separated by 2 mins of rest. Reps for each set and total reps will be recorded. All data will be analyzed using Jamovi software (Version 0.9; Sydney, Australia). Significance will be set at $\alpha = 0.05$. **ANTICIPATED FINDINGS:** It is hypothesized that peak velocity will not be affected, but that total repetitions to failure will increase during the capsaicin mouthrinse trial.

P152: EVALUATION OF A SENSOR BOARD AS A MEASURE OF VERTICAL JUMP PERFORMANCE

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INTRODUCTION: The vertical jump has been shown to be a reliable predictor of physical fitness and athletic performance. Jump height is an indicator of lower limb power output, a variable coaches may use to group their athletes and measure their performance. As such, the vertical jump performance is used across a variety professional and recreational settings as both performance and functional assessments. The vertical jump is evidently widely used as a measure of performance, however, methods for assessment can be problematic for practitioners due to the inefficiency of the equipment implemented. However, in recent years sensor board and jump mats have been developed to provide a feasible and practical method of assessment. Despite the widespread use of these devices, their validity is often called into question. The purpose of the study was to evaluate a sensor-based pressure platform (QuickBoard: Memphis, TN) as a measure of vertical jump performance against the industry gold standard. **METHODS:** Healthy, college aged students (18-30 years) were recruited for the study ($n=37$). Participants completed a single visit consisting of a standardized warm up and 5 assessments of their vertical jump. Vertical jump was measured simultaneously on the QuickBoard, Vertec, the Vicon 460 Motion Capture measurement system. Participants were equipped with 4 Helen Hayes markers on the anterior and posterior portions of the pelvis for all jumps. Pearson's correlation were utilized with an alpha set a-priori, $p \leq 0.05$. **RESULTS:** The Pearson's correlation coefficient for the sensor board and Vicon values was $r=0.81$, suggesting the there was a strong correlation between the estimates provided from the sensor board and

motion capture. The analyses further revealed a correlation between the Vertec and the sensor board of $r=0.79$. The results suggest the sensor board jump height estimates were significantly correlated ($p<0.05$) to both those recorded from the Vertec and Vicon.

CONCLUSIONS: The findings of the study suggest the sensor board records a valid alternative to the gold standard for vertical jump assessment. Clinicians and coaches could potentially utilize this tool as an alternative to the gold standard, which offers efficiency and feasibility.

P153: 2020 ARMOR: DESCRIPTIVE ANALYSIS OF BLACK-BELT AND NON-BLACK BELT TAEKWONDO ATHLETES

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BACKGROUND: Taekwondo athletes use protective body armor when competing in sparring matches. To judge sparring matches more objectively, manufacturers have integrated sensors into the protective body armor that measure strike force in real time. Electronic sensor systems were adopted by the World Taekwondo Federation as early as 2009, but there is a paucity of data characterizing performance variables for black and non-black belt athletes using electronic sensor systems. The purpose of this study is to describe 2020 Armor's performance variables strike power (PWR), stamina (STA), and reaction time (RXT) for black and non-black belt athletes and to determine if variables are statistically different between black and non-black belt level athletes. **METHODS:** Healthy black and non-black belt taekwondo athletes ($N= 23$, 21 ± 5 yrs, BMI: 28.1 ± 8.4 m/kg²) were recruited from a single taekwondo studio. Each participant completed a PWR, STA, and RXT test using a rear-leg roundhouse kick against a chest-worn 2020 Armor electronic sparring unit affixed to a stationary body opponent bag. PWR, STA, and RXT variables were recorded from the 2020 Armor system and mobile application. Differences between black and non-black belts are presented as % difference, and independent samples t-tests were used to determine statistical differences between groups. **RESULTS:** Black belts generated 9.1% greater average PWR ($P>.05$), 5.8% greater STA ($P>.05$), and 12.3% faster RXT ($P=.044$) than non-black belts. **CONCLUSION:** The 2020 Armor unit detected differences in PWR, STA, and RXT between black and non-black belts. Only RXT showed a significant difference per group. This information can be valuable for taekwondo instructors in tailoring individual training programs to address specific performance variables associated with sparring and the progression of taekwondo skills.

P154: RELATIONSHIP BETWEEN VISUAL ANALOG SCALES AND COMMONLY USED ORDINAL SCALES OF PERCEIVED THIRST AND RECOVERY

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BACKGROUND: Subjective, ordinal scales have been widely used in athlete monitoring and research settings to measure a variety of metrics. Conceptually, subjective assessment tools that employ visual analog scales (VAS) offer an alternative method to capture data with continuous variable properties. The purpose of this study was to investigate the correlation of two separate VAS to their ordinal counterparts for thirst and recovery in female collegiate-lacrosse athletes. **METHODS:** Morning measures of thirst and readiness were assessed in a sample of collegiate, female lacrosse athletes ($n=22$) over three consecutive days. Each morning, participants reported to the laboratory in a fasted state and were asked to report their current level of thirst and readiness. Thirst and readiness were assessed on a previously validated ordinal scale (thirst 1-9 and recovery 0-10) and the VAS tool. VAS scales asked the participant to mark where they fell on a spectrum line anchored by "not thirsty at all" and "very thirsty" or "not recovered at all" and "full recovered" on a 100 mm line. Spearman's Rho correlations were used to explore the relationship between VAS and ordinal measures. **RESULTS:** A total of 66 observations were collected with each participant providing scores over three days. The results of the Spearman's Rho correlations showed significant, moderately-strong to strong, positive correlations between the measures of thirst [$r_s(64) = 0.68$, $p < 0.01$] and recovery [$r_s(64) = 0.96$, $p < 0.01$]. VAS scales reported mean \pm SD of thirst = 42 ± 20 mm and recovery = 55 ± 20 mm. The median and range for the ordinal measures were, thirst Mdn = 5 (range 1-8) and recovery Mdn = 6 (range 2-10). **CONCLUSIONS:** The significant relationship between VAS and their commonly used ordinal counterparts provides

evidence of criterion validity and supports the use of VAS scales in subjective athlete monitoring and research. VAS provide useful tools for monitoring subjective feelings, minimizing potential participant confusion, while also providing the benefit of recording continuous data that affords researchers the ability to use parametric analyses.

P155: FITNESS OF THE FORCE: TACTICAL WELLNESS COLLABORATION

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Background: Police officers operate in a high-demand environment requiring them to be physically, mentally, and tactically able of handling motor vehicle accidents, robberies and foot pursuits while wearing equipment weighing over 9 kg (20 pounds). Additionally, daily duties often involve sedentary work, such as conducting car patrols, completing paperwork, interviewing individuals; high stress, long hours, and shift work that challenges quality sleep. The physically and mentally challenging nature of the job results in serious challenges for the health of law enforcement personnel. Police officers have an increased risk of musculoskeletal injury and cardiovascular disease compared to the general population. Metabolic syndrome, hypertension, and an overall sedentary lifestyle both in and out of work is common in this population. Finding ways to decrease preventable diseases in our public safety officials is imperative.

Methods: A 14 part wellness assessment was completed on 80 local law enforcement officers working for a medium sized city with limited resources, (male = 76, female=4; ages 21-65 years old) for comparison to general population norms as a first step in developing an customized wellness program.

Results: A within age groups analysis of variance (ANOVA) comparison was conducted to compare fitness scores between the age groups and compared to the population norms for those age groups. Statistical significance was found within age groups for body fat percentage (27.6 ± 7.1 , $p = 0.00049$), vertical jump power watts/kg (49.7 ± 11.1 , $p = 0.00038$), and estimated maximum oxygen consumption (VO2maximum) (ml/kg/min) (34.55 ± 6.4 , $p = 0.00064$).

Conclusions: Officer muscle strength was within/above population norms. The significant decrease of estimated VO2Max as officers age (20-30-year-olds, 36.73 ± 7.98 ; 31-40-year-olds, 33.88 ± 6.37 ; and 40 years old and over, 29.87 ± 10.93), coupled with almost 90% of officers testing below population norm indicated poor cardiovascular fitness overall. Poor cardiovascular fitness has been linked to increased mortality rates in the general population and in the law enforcement population. Together these results indicate specific mortality and morbidity concerns. Police officers should integrate a cardiovascular fitness program and consider methods such as mindfulness training to reduce the hyper-alertness that is often seen throughout the profession due job demands.

P156: ASSESSMENT OF BRAIN FUNCTION AND PUTTING PERFORMANCE IN COLLEGIATE GOLFERS

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Title: Assessment of Brain Function and Putting Performance in Collegiate Golfers

Authors: Savannah Calleja, Pradeep Vanguri, PhD, LAT, ATC

Institutions: Nova Southeastern University

Background:

The purpose of this study is to assess brain wave function of collegiate Division II golfers during putting performance using a wearable electroencephalograph (EEG), heart rate monitor and incorporating neurofeedback intervention sessions. The EEG displays a frequency and graph to display which brain waves are dominant during each phase of the putt. Furthermore, with the use of the heart monitor strapped to the individual's wrist we will be able to see the change in heart rate during each phase of the putt. Finally, the intervention session will be used to help the golfer from overthinking during the putt and reach a zone of optimal efficiency for putting.

Methods:

This study will be conducted in the following manner: participants will be male and female collegiate college student division II athlete, golfers, age ranges from nineteen to twenty-four. Data will be collected by having a baseline test and then a post-intervention test in between testing each participant will go through two to three intervention sessions where the athlete will use neurofeedback to find their zone for optimal efficiency. Each participant will complete three rounds of putting from three different club lengths: three feet (two club lengths), four and half feet (three club lengths) and six feet (four club lengths) with a one-foot circumference around the hole to ensure

accurate results at each distance the golfer will putt three times before moving on to the next putt. Each putt will be scored out of makes and misses. The criterion for makes is the golfer to have the ball in the hole on lengths three, four and half feet and getting the ball in the hole or within the circumference for a six-foot putt. While putting the individual will be wearing a portable EEG headband, wrist heart rate monitor. Participants will be asked to wait approximately eight seconds in between each putt to have accurate results and allow the individual to properly reset between each repetition.

Anticipated Results:

Based on prior research and the function of each brain wave. We should anticipate each collegiate golfer in the study to have a higher frequency of alpha waves which would result in physiological changes such as muscle relaxation, regulating breathing rate and decrease in heart rate. We should also expect to see a change in beta frequency because of its association with improved cognitive processing, reduction of worries and overthinking.

P157: PSYCHOMETRIC PROPERTIES OF A FUNCTIONAL BALANCE TEST FOR STRUCTURAL FIREFIGHTERS

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Firefighting is a dangerous occupation as more than 60,000 injuries are incurred annually by United States fire personnel. Musculoskeletal injuries associated with strain, sprain, or muscular pain are the most common type of injury on the fireground and are often induced by slip/trip/fall mechanisms. These injuries cost the United States \$1.6-5.9 billion, place overtime burden on backfill personnel, and are responsible for substantial pain and suffering. Unfortunately, there is a lack of research on applicable assessments to evaluate a firefighters' risk of slip/trip/fall injuries. Identifying a valid and reliable injury risk assessment will provide a metric to evaluate the efficacy of injury prevention interventions. Therefore, the purpose of this proposed study is to refine an existing occupationally relevant functional balance test (FBT) and establish the instrument's face validity, criterion-related validity and test-retest reliability in structural firefighters. METHODS: 30 apparently healthy career structural firefighters (Age: 18-55 yr) will be recruited from a local fire department to complete 3 testing sessions of identical procedures. 6 trials of the FBT will be performed while wearing full personal protective equipment and carrying equipment. The FBT requires the firefighter to walk on a 3.7 m plank while stepping over and bending under obstacles of standardized height as fast as possible, similar to maneuvering on a structural fireground. Time and technical errors are accounted for to produce a Performance Index score. Force plates will be used to assess criterion measures of neuromuscular function including postural sway, single-leg drop landing, and isometric mid-thigh pull assessments. Face validity will be assessed with a questionnaire inquiring about the firefighters' perception regarding the occupational relevancy of the FBT. Criterion-related validity will be assessed with Pearson Product Moment correlations between FBT vs. force plate balance outcomes. Finally, Cronbach's alpha will be used to assess the level of intra- and inter-session test-retest reliability of the FBT. The level of significance will be set at $p < 0.05$. ANTICIPATED RESULTS: It is hypothesized that the FBT will demonstrate acceptable levels of face validity, criterion-related validity ($r > 0.8$), and reliability ($r > 0.9$).

P158: HEALTH AND FITNESS CHARACTERISTICS IN FIREFIGHTER RECRUITS AT THE BEGINNING OF FIRE COLLEGE TRAINING

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BACKGROUND: In order to be accepted into a firefighter college, firefighter recruits must pass the candidate physical ability test (CPAT) and complete a basic physical with the physician of their choice. However, no specific health or fitness metrics are commonly assessed beyond these, leaving fire college instructors unaware of potential health or fitness issues in their recruit classes that could impede training. The purpose of this study therefore was to assess health and fitness characteristics in firefighter recruits during the first week of training. METHODS: 30 male recruits (age: 20.7 ± 3.8 yrs., wt.: 86.3 ± 12.3 kg, ht.: 178.8 ± 7.3 cm) were assessed for their body composition via bioelectric impedance analysis (BIA), resting blood pressure (BP), isometric mid-thigh pull (IMTP) strength, and anaerobic

power via a Wingate. Results of the assessments were summarized via descriptive statistics and where possible were compared with appropriate reference values. Correlational analyses were performed between strength, anaerobic power, and body composition variables. Significance of the correlations were determined using Fisher's transformations with significance being set at a value of $p \leq 0.05$. RESULTS: The recruits had an average BMI of 26.9 ± 3.5 with an average body fat percentage of $18.0 \pm 5.5\%$. Additionally, recruits had a measured average skeletal muscle mass (SKMM) of 40.3 ± 5.4 kg, accounting for an average of $46.9 \pm 3.06\%$ of their total body mass. 73% of the recruits had "Elevated" or higher BP readings, with 13% of recruits having a SBP of 140mmHg or greater. For IMTP, the recruits had a mean peak and average torques of 463.5 ± 72.6 Nm and 403.8 ± 66.8 Nm, respectively. For anaerobic power, the recruits had a mean relative peak power output of 8.54 ± 1.22 W/kg and mean relative average power of 6.26 ± 1.02 W/kg, both of which equate to the 30th percentile for their respective categories. Correlational analyses did not reveal any significant interactions between torque and anaerobic power measurements, however, there were significant correlations between SKMM and peak and average power, and average and peak torque ($r = 0.83, 0.79, 0.49, \text{ and } 0.46$, respectively). CONCLUSION: Based on the data collected, it would appear that the instructors may want to focus on improving the anaerobic power of their recruits and explore options for helping to reduce the resting blood pressure of the recruits.

P159: CHANGES IN HEART RATE DYNAMICS DURING A FIREFIGHTING COMPETITION

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BACKGROUND: In many sport populations, heart rate (HR) is used to quantify the physiological response of sport-specific demands. This may be a useful measure in firefighters (FF) when tracking their response to occupational tasks and can be extended into the emerging sport of FF competitions. Therefore, the purpose of this study was to monitor HR responses during a FF competition. **METHODS:** Fourteen FF (11 male, 3 female; aged 32 ± 5 y) volunteered for this study and competed in the individual category of a FF competition. FF completed a set of timed tasks in personal protective equipment, including high rise carry, hose hoist, forcible entry, hose advance, and victim rescue. HR was monitored by chest strap throughout the event, with measures of HR_{avg} for the total duration of their race, HR_{pre} immediately prior to the start, HR_{post} immediately following crossing the finish line, and $HR_{recovery}$ after one minute following completion of the race. HR_{max} was calculated by age-predicted max heart rate. Of the 14 FF, 11 FF (2 female, 9 male) collected HR data. Data are represented by mean \pm standard deviation. T-tests were run to investigate mean differences between time points, with $\alpha \leq 0.05$. **RESULTS:** Average time to complete the course was 104 ± 12 s. Average and maximum HR values were $92 \pm 3\%$ and $97 \pm 4\%$, respectively. HR_{pre} was $79 \pm 7\%$, HR_{post} was $93 \pm 6\%$, and $HR_{recovery}$ was $89 \pm 4\%$. Expectedly, HR increased significantly from pre to post ($p < 0.001$), despite a non-significant decrease from HR_{post} to $HR_{recovery}$ ($p = 0.135$). **CONCLUSIONS:** There was an anticipatory HR response as reflected in the HR_{pre} data, corresponding with a vigorous HR zone ($>75\% HR_{max}$) according to ACSM guidelines. While there was a significant increase from pre to post, HR_{avg} and HR_{post} were not significantly different ($p = 0.78$), indicating the HR response increased quickly and robustly throughout the short race and remained elevated close to maximum for the majority of the event. Despite multiple competitor strategies to incorporate active rest both within and immediately following their race, $HR_{recovery}$ did not significantly decrease from post values. Future studies should incorporate fitness assessments to further discern the magnitude of changes from rest to pre-race, and measures within each event interval.

P160: THE IMPACT OF PERSONAL PROTECTIVE EQUIPMENT ON ANAEROBIC FITNESS ASSESSMENT IN FIREFIGHTERS.

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BACKGROUND: The utilization of *personal protective equipment (PPE)* is of paramount importance in ensuring the safety and effectiveness of firefighters during emergency responses. Research has highlighted potential drawbacks associated with the use of owned PPE. A significant 12% reduction in anaerobic squat jump assessment was reported when firefighters are equipped with their PPE. This reduction in *anaerobic fitness (AF)* could have profound implications for their operational readiness. The *Physical Ability Test (PAT)* assesses firefighters' preparedness by having them wear full PPE, simulating real-world conditions that could increase anaerobic physiological strain. In contrast, using regular exercise clothing for occupational evaluations, while aligning with common tests, might limit specificity. Therefore, the purpose of this study was to analyze the impact of PPE on AF assessment. **METHODS:** Sixty-two male firefighters underwent occupational-specific AF testing, including *handgrip dynamometry (HG)*, *vertical jump (VJ)*, *Margaria-Kalamen (MK)*, and a *300-yard shuttle run (300YD)*, both with full PPE (WPPE) and without PPE (NPPE). AF measurements were adjusted for body weight (e.g., NPPE) and occupational weight (e.g., WPPE). Statistical analysis used a repeated measures design in Jamovi version 2.4.8 at a significance level of $p < 0.05$. **RESULTS:** In comparison to the NPPE condition, WPPE condition revealed a remarkable 58.7% reduction in relative HG strength, an 11% decline in relative VJ peak power, a substantial 49.3% drop in the mean power during the Margaria-Kalamen test, and an 18.3% increase in the time required for the 300-yard shuttle run ($p < 0.05$). **CONCLUSION:** Findings confirm that the use of PPE significantly diminishes anaerobic performance during specific occupational tests. This underscores the critical importance of recognizing occupational specificity in fitness assessments. Understanding how PPE impacts anaerobic fitness testing parameters has the potential to change not only testing protocols but also training regimens, aimed at enhancing the safety and efficacy of this physically demanding profession. Consequently, physical training programs tailored to augment anaerobic fitness levels should incorporate strategies to alleviate the performance decrements stemming from PPE utilization.

P161: EXERCISE BEHAVIORS OF FIREFIGHTERS COMPETING IN A FIREFIGHTING COMPETITION

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BACKGROUND: A majority of United States fire departments do not provide firefighters (FF) with basic resources to support exercise participation, which may contribute to the high prevalence of sedentary behaviors among FF. Firefighting competitions (FFC) are growing in popularity and may promote positive exercise behaviors in the Fire Service; however, limited research exists investigating such competitions. Therefore, the purpose of this study was to collect behavioral data on FF competing in a FFC. **METHODS:** FF competing in a FFC were recruited on-site to complete a digital survey inquiring about exercise opportunities and behaviors. Data were collected from 20 career FF (Age: 31.1 ± 6.1 yrs; Sex: male=16, female=4) representing nine fire departments. Survey data included exercise habits, including types, frequency, and intensity (RPE; 0-10 OMNI scale). Descriptive statistics and frequency distributions were calculated to describe data. **RESULTS:** Each of the nine fire departments reported time to exercise while on-duty was provided; however, FF from only seven departments indicated that on-duty exercise was made a high priority. 100% ($n=20$) of FF engage in exercise regularly, of which 95% ($n=19$) reported exercising while on-duty. Seventeen (85%) FF engaged in resistance training, most frequently two ($n=5$) or four ($n=5$) times per week with typical training RPE ranging between 3-8 (mode=7; $n=5$). Nineteen (95%) FF engaged in endurance training, most frequently three ($n=11$) times per week with typical training RPE between 3-8 (mode=7.8; $n=5$). The common endurance training modality was running ($n=12$), followed by cycling ($n=11$) and rowing ($n=10$). Nineteen FF participated in high-intensity functional training, with data encompassed in both resistance and endurance training questions. **CONCLUSIONS:** Fire departments should promote positive exercise behaviors by providing resources, such as qualified strength and conditioning practitioners, to support safe and effective on-duty exercise participation. Most competitors participated in a training program inclusive of both resistance and endurance training, presumably in a high-intensity functional training format. This modality of training, if scaled by fitness level, may be an

efficient way for FF to train while on-duty, and present benefits that confer to FFC and occupational performance.

P162: OCCUPATIONAL FIREFIGHTERS' READINESS: A BODY MASS INDEX AND AGE ASSOCIATION STUDY

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The National Fire Protection Association 1582 has recognized the pressing issue of obesity within firefighters. This recognition has led to the recommendation of using *body mass index (BMI)* for assessing obesity among firefighters. Astonishingly, despite a substantial 80% of firefighters falling within the overweight or obese categories, this concern has been largely overlooked in research, despite its potential to significantly impact their readiness for duty. Firefighters' readiness is evaluated through the *Physical Ability Test (PAT)*. However, as obesity rates increase with age, the utility of BMI as an indicator of firefighters' readiness remains uncertain. Therefore, the purpose of this study was to investigate the relationship between BMI and age on the PAT. **METHODS:** Sixty-two males underwent a PAT equipped with their *personal protective equipment (PPE)*. BMI categories were established following the World Health Organization's classification. To discern potential differences, linear regression analysis was conducted using Jamovi version 2.4.8, with significance level at $p < 0.05$.

RESULTS: The PAT assessments yielded no discernible age-related disparities ($F_{2,57} = 0.8, p = 0.5$). Intriguingly, the 30-39 yrs cohort, constituting 24% of the total, demonstrated the most efficient PAT performance, followed by the 40-49 yrs group, representing a mere 3% of the total participants. In contrast, the 20-29 yrs category, encompassing a substantial 73% of the participants, exhibited relatively slower PAT completion times. Furthermore, PAT scores exhibited no statistically significant discrepancies across the various BMI classifications ($F_{2,57} = 2.8, p = 0.07$). Surprisingly, the obese subgroup, constituting 24% of the participants, outperformed the overweight cohort (49% of the total), with the normal weight category (29% of the total) trailing closely behind. **CONCLUSION:** Contrary to expectations, increasing age and obesity did not appear to substantially influence the occupational readiness of firefighters when assessed through the PAT while wearing full PPE. This study challenges existing assumptions about the impact of age and obesity on firefighters' readiness, highlighting the need for a nuanced understanding of the factors influencing their performance in the demanding and critical field of firefighting.

P163: YEAR 2, IMPACT OF PROTECTIVE GEAR ON DYNAMIC BALANCE, MOBILITY, AND MOTOR CONTROL IN FIREFIGHTERS.

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BACKGROUND: A 2021 report from the National Fire Protection Association reported 22,450 firefighter injuries where 49% of non-fireground injuries were from strains, sprains, or muscular pain. This study was the second year of a three-year follow up study that measured changes in upper and lower body mobility dynamic balance and motor control using the Y-Balance Test (YBT) in firefighters wearing workout gear (PT) or personal protective ensembles with self-contained breathing apparatus (FULL). **SUBJECTS:** Seven of the fourteen firefighters who had previously participated in year one retested in year two. Subjects were from the local municipal fire department. **METHODS:** Injury surveys were given prior to testing. Dynamic balance was measured using the YBT on upper (UQ) and lower quarter (LQ). An informed consent was read and signed by all subjects in the first year and is valid over the life of the three-year study. Researchers evaluated the injury surveys for any reasons a participant should not be tested. None of the subjects reported any injuries. UQ and LQ testing took place over a period of three weeks on two separate occasions in a counter-balanced fashion. There was a two-hour window from 1400-1600 hours that subjects could come in and be tested while on duty. Composite reach scores (C) and reach distances were measured on the right (RC) and left (LC) sides. Subjects wore either workout gear (PT) or Bunker gear and SCBA (FULL). SPSS was used to identify statistical differences using paired sample t-tests, alpha set at < 0.05 . **RESULTS:** There were no injuries reported by any of the subjects. There were no statistical differences found in composite or reach scores between year 2 and year 1 in UQ. In the LQ there were statistical differences found in the posterior

medial direction in PT in both Left (L) (12.43 ± 8.24 cm, $p = 0.007$) and Right (R) (10.07 ± 5.84 cm, $p = 0.004$). There was also a statistical difference in the same reach direction on the R (10.21 ± 10.51 cm, $p = 0.042$) side in FULL. **CONCLUSIONS:** Mobility, dynamic balance, and motor control did not decrease between years 2 and 1. Data indicates an improvement in scores. Differences could be attributed to small N size, and the learning effect between year 2 and 1.

P164: RURAL FIREFIGHTER FITNESS FLUCTUATIONS: TRACKING THROUGH THE PANDEMIC

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BACKGROUND: Firefighting is a physically demanding occupation that requires a certain level of fitness to optimally perform. Limited fire departments in the United States have wellness programming, and even fewer have embedded fitness programs. **PURPOSE:** The purpose of this longitudinal study was to determine the changes in fitness among rural firefighters with an embedded fitness program.

METHODS: A cohort of 70 career firefighters from one southeastern fire department volunteered to participate in the study. The department participated in on-shift daily exercise as part of its health and wellness programming. Fitness variables were measured following the guidelines set by the National Fire Protection Association (NFPA) over time (2019-2023). The average age at the time the study started was 29.84 ± 9.77 years. A mixed models with repeated measures adjusting for age was used to estimate the trend of Fitness variables (Plank Time [PT], # Push-Ups [PU], Maximal oxygen consumption, VO_2 volume [VO₂], Isometric Mid Thigh Pull [IMP], Bench Press estimated 1RM [BP], and Countermovement Jump [CMJ]). **RESULTS:** PT decreased on average by 19.10 ± 4.87 sec ($p = 0.0002$, Effect Size [ES]=3.92) in 2020 as compared to 2019; and there were statistically significant differences for the other years. PU decreased on average by 2.07 ± 0.79 ($p = 0.011$, ES=2.62) in 2020 and increased by 7.03 ± 1.11 ($p < 0.0001$, ES=6.33) when compared to 2019. VO₂ decreased by 5.78 ± 1.15 ml/kg/min ($p < 0.0001$, ES=5.02) in 2023 as compared to 2019 with no statistically significant changes in other years. IMP decreased on average by 5.21 ± 2.92 lbs in 2020 compared to 2019 but was not statistically significant ($p = 0.079$, ES=1.78). IMP increased by 6.51 ± 3.26 lbs in 2021 compared to 2019 ($p = 0.049$, ES=2.00). This improvement was also present in 2023 (IMP increased by 8.90 ± 5.56 lbs), but was not statistically significant ($p = 0.111$, ES=1.6). CMJ decreased by 6.30 ± 1.05 cm on average ($p < 0.0001$, ES=6.00) in 2020 compared to 2019. **CONCLUSIONS:** Across a 5-year span, there were significant fluctuations in all fitness variables. Changes may be attributed to a number of factors, including the COVID-19 pandemic, changes in fitness policies, fitness incentive programming, and or employee turnover. Tracking fitness among firefighters is crucial as it allows active monitoring of changes and facilitates individualized and department-wide programming.

P165: EQUIVALENCE TESTING OF WEARABLE TECHNOLOGIES DURING TREADMILL WALKING

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BACKGROUND: Step-counting is a wide-spread feature of most contemporary technologies and can be used measure to step-based physical activity (PA) as steps/day or cadence (steps/min). The validation of wearable technologies is essential to their selection for various purposes and to interpreting their data outputs. Equivalence testing has recently gained popularity as a statistical tool to determine agreement between devices, as opposed to traditional null hypothesis testing of statistical differences. **PURPOSE:** To determine step-count criterion validity of wearable technologies during treadmill walking using equivalence testing. **METHODS:** Data for this analysis was collected as part of the CADENCE-Adults study, a laboratory-based, cross-sectional investigation. Two hundred sixty adults (52.7 ± 18.9 years, BMI 25.6 ± 3.7 , 50% women) performed a series of 5-min treadmill bouts from 0.5 to 5 mph, in 0.5 mph increments. Participants wore select wearable technologies on their waist (Yamax Digiwalker SW200 [SW200], New Lifestyles NL1000 [NL], ActiGraph GT9X [AG] and ActiCal [AC]), thigh (activPal [AP]), and ankle (StepWatch [SW]). The criterion measure was directly observed hand-counted steps (verified using video recording). Equivalence testing plots were constructed to evaluate criterion validity, with agreement between devices and the criterion, based on whether a device's mean error and

95% CI fell within a proposed equivalence zone (± 0.2 SD of the criterion step count for each speed). RESULTS: The SW200 fell within the equivalence zone at 4.0, 4.5 and 5.0 mph. The NL fell within the equivalence zone at 4.0, 4.5 and 5.0 mph. The AG fell within the equivalence zone at 3.5 and 4.5 mph. The AC displayed no statistical equivalence at any of the speeds. The AP fell within the equivalence zone for all speeds between 1.5 and 4.0 mph. The SW fell within the equivalence zone for all speeds between 0.5 and 3.5 mph.

CONCLUSION: Our findings add to a body of evidence regarding the step-count validity of wearable technologies through the use of equivalence testing across a full range of treadmill walking speeds. No device fell within the equivalence zone for all speeds tested. Of the devices tested, the SW and AP performed the best, particularly at slow to normal speeds, but with increasing error at the fastest speed tested. FUNDING: NIH-NIA-5R01AG049024

P166: ASSESSING THE RELIABILITY OF NEAR INFRARED SPECTROSCOPY AND ITS RELATIONSHIP TO ELECTROMYOGRAPHIC MEASURES DURING EXERCISE

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Background: Near-Infrared Spectroscopy (NIRS) is a relatively new non-invasive technology that measures peripheral muscle oxygenation. In order to be applied in a clinical setting, the NIRS device must be proven valid and reliable when used on a healthy, non-clinical population. This study aimed to determine the efficacy of NIRS as reliable technology in measuring human muscle oxygenation and analyzed its relationship to electromyographic (EMG) technology during acute exercise. Methods: A sample of eleven participants were recruited using established criteria. At each of the participant's two visits, separated by 6-8 days, the NIRS device was used to record TSI% (tissue saturation index percentage), while the EMG device was used to measure signal amplitude of the muscle contractions. During the first visit, each individual had their 1RM (one-repetition maximum) for a single-leg leg press calculated via a Force-Velocity test on the "My Jump Lab" application. The NIRS and EMG devices were then precisely set up on the individual's dominant leg vastus lateralis before using the single-leg leg press, set to 50% of their 1RM, until exhaustion. During the second visit the individual's simply completed the leg press exercise until exhaustion. The correlation (R2) between the NIRS and EMG data from the two separate visits was then calculated. Results: Nine total participant datasets were analyzed. With correlation values of $R2 = 0.1836$, $R2 = 0.4446$, and $R2 = 0.5287$, for TSI% during rest, TSI% change during exertion, and TSI% change during post-test recovery respectively, no significant correlation can be confidently stated between the three NIRS recordings at the two visits. However, it is important to note that the EMG values (change in root mean square throughout the exertion test) from each visit were also not correlated ($R2 = 0.3733$). Conclusion: The correlation values for the NIRS data are not high enough to confidently determine NIRS reliability. However, the EMG data also showed inconsistencies between visits despite EMG technology being recognized as a reliable measure of electrical muscle activity. This shows that the exercise protocol was not adequately controlled, and these results do not necessarily implicate invalidity of the NIRS device. Thus, further experimentation will begin next year with a revised and improved protocol that reduces participant subjectivity and other external factors.

P167: INFLUENCE OF SKIN TONE ON ACCURACY OF WRIST-WORN PHOTOPLETHYSMOGRAPHIC HEART RATE DURING EXERCISE: A PILOT STUDY

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BACKGROUND: Wearable technology that uses photoplethysmography (PPG) to estimate heart rate (HR) by measuring light reflectance at the epidermis is attractive because it is both inexpensive and noninvasive. However, higher melanin content may affect the accuracy of HR measurement from PPG by reducing the amount of light passing through the epidermis. Previous studies investigating whether subjective ratings of skin color—as a surrogate for melanin content—are related to PPG HR measurement accuracy are mixed; importantly, none of these studies used an objective assessment of epidermal melanin. The purpose of this pilot study was to investigate the association between melanin content when measured objectively and accuracy of PPG HR measurement. METHODS: Skin color was measured noninvasively in 7 healthy adults (mean \pm SD; age = 24 \pm 5

y; White, n=4; Black, n=2; Middle Eastern, n=1) using a handheld colorimeter. Individual Typology Angle (ITA $^\circ$), which is highly correlated with epidermal melanin, was calculated from colorimeter measurements and used to classify participants as having dark (ITA $^\circ \leq 10^\circ$), intermediate ($10^\circ < \text{ITA}^\circ < 41^\circ$), or light (ITA $^\circ \geq 41^\circ$) skin. Participants then cycled continuously in temperate conditions (22 $^\circ\text{C}$, 40% relative humidity) for 10 min each at 50%, 60%, 70%, and 80% of age-predicted maximal HR, respectively, followed by a 10-min seated recovery. Chest-worn HR (criterion) and wrist-worn PPG HR were recorded continuously and summarized into 30-s epochs for analysis. An *a priori* threshold for acceptable mean absolute error (MAE) between criterion and PPG HR was set at ≤ 5 bpm. RESULTS: MAE was not different ($P=0.52$) between light (0.9 ± 1.2 bpm, n=1), intermediate (1.3 ± 2.5 bpm; n=4), and dark (0.8 ± 1.6 bpm; n=2) skin tones. In this preliminary analysis, there was also no interaction between skin tone and exercise intensity ($P=0.66$ for 2-way mixed model ANOVA). Average MAE was < 5 bpm for all intensities and during recovery. CONCLUSIONS: These preliminary data demonstrate a high level of agreement between PPG HR and criterion HR across a limited sample of skin tones. A larger sample is needed to further elucidate whether epidermal melanin, represented as ITA $^\circ$, is associated with accuracy of PPG HR.

P168: EQUIVALENCE TESTING OF WEARABLE TECHNOLOGIES DURING SIMULATED ACTIVITIES OF DAILY LIVING

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Background: Step-based metrics, including steps/day and cadence (steps/min), are well established in the physical activity literature. However, there remains a need for robust criterion validation of step-counting wearable technologies across a wide range of ambulatory movements. Validation studies have typically examined device accuracy during rhythmic treadmill or overground walking, with few studies examining step-count accuracy during simulated activities of daily living (SADL). Purpose: To determine the step-count criterion validity of wearable devices during SADLs. Methods: Participants (N = 260, 52.7 \pm 18.9 years, BMI 25.6 \pm 3.7 kg/m², 50% women) from the CADENCE-Adults study, completed a series of laboratory-based SADLs, including folding laundry, vacuuming, stair stepping, and preferred pace overground walking. Participants wore devices on their waist (Yamax Digiwalker SW200 [SW200], New Lifestyles NL1000 [NL], ActiGraph GT9X [AG] and ActiCal [AC]), thigh (activPal [AP]), and ankle (StepWatch [SW]). The criterion measure was directly observed hand-counted steps (both in real-time and verified using video recording). Equivalence testing plots were generated to assess the criterion validity of each device. Unlike traditional null hypothesis testing, which seeks to determine whether there were any statistical differences between devices, equivalence testing evaluates agreement between the criterion and test device. The equivalence zone was set at ± 0.2 SD of the criterion step count for each SADL. Devices were deemed equivalent to the criterion when their mean error and the 95% CI fell within the equivalence zone. Results: On average, devices tended to underestimate (-4, -31, -28, -6 steps/min) for folding laundry, vacuuming, stair stepping, and overground walking, respectively. No devices fell inside the equivalence zone for folding laundry, vacuuming, and stair stepping. For preferred pace overground walking, only the SW and AP fell within the equivalence zone. Conclusions: No device performed well across the full range of activities; however, the SW and AP were deemed equivalent during preferred pace overground walking. Device manufacturers should aim to refine step algorithms to improve step-count accuracy across a wider range of ambulatory activities. FUNDING: NIH-NIA-5R01AG049024

P169: DETERMINING PULSE-RATE FROM WRIST PLACED ACCELEROMETRY IN CHILDREN IN ORDER TO IMPROVE ESTIMATES OF SLEEP.

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Background: Children's free-living sleep is most commonly measured via wrist-placed accelerometry. Similar to taking someone's pulse, wrist-placed accelerometry may be sensitive enough to detect pulse-rate. This may be critical because current sleep detection methods using accelerometry rely on movement alone to detect sleep. This

leads to poor detection of wake and the inability to detect sleep stages. Adding a physiological signal like pulse rate to sleep detection addresses both these limitations. The objective of this study was to estimate children's pulse-rate via wrist placed accelerometry and compare these estimates to electrocardiogram (ECG) as a gold standard. **Methods:** Participating children wore a consumer wearable (Apple Watch Series 7) and a wrist-placed research grade accelerometer (Actigraph GT9X) while undergoing an overnight laboratory-based polysomnography (PSG), including a 3-lead ECG. Raw accelerometry data from the Apple device was extracted using SensorLog, a freely available user-written application that leverages the devices' application programming interface. Actigraph data was extracted via Actilife Software. All subsequent processing was performed in MATLAB. Pulse-rate estimates from the raw accelerometry data were calculated from peak magnitude frequency in short time Fourier Transforms of Hilbert transformed jerk computed from acceleration magnitude. Heart rates from the criterion ECG were estimated from R-R spacings using R-pulse detection in normalized ECG traces. Mean absolute error (MAE) and mean absolute percent error (MAPE) were calculated to assess agreement between the accelerometry estimated pulse-rate from Actigraph and Apple and the ECG estimated heart rate. **Results:** Eighty-four 5-12-year-old children (63% male, 72% White, 66% with mild/moderate obstructive sleep apnea) participated. One child was excluded as the ECG data stream was corrupted during collection. For Actigraph MAE and MAPE were high at 39(SD=20) beats/minute and 49.0%(SD=27.4%). For Apple MAE and MAPE were much lower at 8.9(SD=6.2) beats/minute and 10.2%(SD=6.5%) **Conclusions:** Raw accelerometry data extracted from Apple but not Actigraph can be used to estimate pulse-rate in children while they sleep. Future work is needed to explore the sources (i.e., hardware, software, etc.) of Actigraph's relatively poor performance.

P170: AGREEMENT OF STEP-BASED METRICS FROM ACTIGRAPH AND ACTIPAL ACCELEROMETERS WORN CONCURRENTLY AMONG ADULTS 18-65

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BACKGROUND: Counting steps is a simple way to assess physical activity (PA) that is easily understood by the public at large. Current technology allows steps to be assessed via smartphones, various fitness trackers and wearables. The previous Physical Activity Guidelines Advisory Council recommended a move towards a steps-based PA recommendation. An improved understanding of the agreement for steps-based metrics across multiple devices is an important step towards facilitating such a recommendation. Therefore, the purpose of this study is to compare the steps measured from two research-grade accelerometers: The Actigraph (AG) and Activalp (AP), in a sample of adults. **METHODS:** Thirteen men (n = 4) and women (n = 9) aged 18 - 65 years (30 ± 15.7 years; BMI = 23.4 ± 5.1) underwent 7 days of PA assessment while wearing an AG and AP. The AG was worn on the right hip and the AP was worn on the right thigh. Paired sample t-tests were conducted to evaluate mean differences in steps per day, sedentary time, as well as peak 1-minute and 30-minute cadence. **RESULTS:** Mean moderate-to-vigorous intensity PA minutes per day achieved in all subjects measured via AG subjects was 53.0 ± 24.9. Sedentary minutes per day was greater with the AG (923.7 ± 121.8) compared to the AP (499.0 ± 106.4; P < 0.001). Total steps per day were less with the AG (9077.0 ± 3171.3) than the AP (10139.2 ± 3068.0, P = 0.007). Peak 1-minute cadence was greater in the AG vs the AP (143.6 ± 23.0 and 136.0 ± 18.0, P = 0.036). Peak 30-minute cadence did not differ between devices (131.2 ± 22.4 and 127.0 ± 15.0 for AG and AP, respectively; P = 0.25). **CONCLUSION:** Compared to the AG, the AP underestimated sedentary time and overestimated steps per day, suggesting poor agreement between two research-validated devices. More research is needed across a wide range of populations to further improve the understanding of the agreement between PA assessment devices.

P171: ASSESSMENT OF WEARABLE VERT TECHNOLOGY IN COLLEGIATE VOLLEYBALL ATHLETES

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Assessment of Wearable VERT Technology in Collegiate Volleyball Athletes Nicole Stanchfield, Pradeep Vanguri Nova Southeastern University

BACKGROUND: The purpose of this research study is to assess the use of the VERT device with National Collegiate Athletic Association (NCAA)

Division II Volleyball players. The VERT is a wearable and portable device that measures multiple variables including workload, jump performance, jump height, frequency, intensity, and impact. Previous research indicates accurate data overall on jump performance which can then be applied to player work loads and injury risk. Additionally, VERT research has shown effectiveness in developing interventions to decreasing injury and increasing vertical jump height among volleyball players. **METHODS:** NCAA Division II Volleyball players included in this study will use the VERT device for one collegiate volleyball season, including practices and games. A typical season includes between 4-5 practices in a week and 1-3 games per week. Each device will be calibrated and fitted to each player before the season begins, and then the devices will be assessed throughout the course of the season. The VERT will allow participants to practice and play as they normally would to ensure accurate results. Data from the VERT are stored in the MyVERT mobile application to show player loads during practices and games and better evaluate player performance and potential injury risk. Upon completion of the season VERT data will be analyzed using hierarchical linear modeling to review multiple variables. **ANTICIPATED RESULTS:** Based on previous research, it is anticipated that the research conducted will reveal outside and opposite side hitters have the greatest workload, jump frequency, intensity, and landing impact. More specifically, results from this study will also reveal that opposite side hitters will perform the greatest intensity of jumps and setters will perform the greatest volume of jumps. The VERT will also be able to determine the positions that perform the greatest volume of jumps reaching their maximum vertical height. After gathering the data, this will be beneficial for the future research to implement training programs and better prevent injury risk.

P172: AUTONOMIC REBOUND FOLLOWING MAXIMAL EXERCISE IN BODYBUILDERS AND RECREATIONALLY ACTIVE PARTICIPANTS

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BACKGROUND: Bodybuilding is a competitive sport that involves structured weightlifting routines and diets. The bulking phase training loads and fluctuations in caloric intake may lead to insufficient recovery and overtraining. The activity of the autonomic nervous system (ANS) plays a pivotal role in the acute and prolonged recovery from exercise and can become impaired by overtraining. Therefore, the purpose of this study was to evaluate resting ANS activity and its recovery following a maximal bout of exercise in natural bodybuilders who are in the offseason phase and compare results to recreationally active individuals. **METHODS:** 7 recreationally active (RA)(24.6 ± 2.1 yrs, 178.6 ± 9.6 cm, 81.1 ± 10.8 kg) and 8 natural bodybuilders (BB)(21.8 ± 2.9 yrs, 176.6 ± 7.2 cm, 89.3 ± 13.0 kg) volunteered for the study. Participation required one lab visit. Heart Rate Variability (HRV) was measured at rest via electrocardiogram (Finapres, NOVA), in a supine position in a dimly lit room for 10-minutes (PRE). Immediately following, participants underwent a treadmill graded exercise test. Upon completion, HRV was monitored for 45-min and analyzed in five minute segments; PRE, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, and 40-45 minutes via online software Kubios HRV Standard (version 3.5.1) for analysis of: root mean square of successive differences (RMSSD), standard deviation of normal-to-normal sinus beats (SDNN), high frequency (HF), and low frequency (LF). SPSS (version 28.0.1.1) was used, and alpha was set to 0.05. **RESULTS:** HRV data violated normality and underwent a natural log transformation (ln). A One-Way ANOVA showed no differences for any resting marker of HRV, HR, or HR recovery. No significant differences were observed between PRE, 5-10, 10-15, and 15-20 for any marker of HRV. Significant differences were observed for lnRMSSD at 20-25, 25-30, and 40-45 (p < 0.05), lnSDNN at 20-25, 25-30, 35-40, and 40-45 (p < 0.05), lnHF at 15-20, 20-25, 30-35, and 40-45 (p < 0.05), and lnLF 15-20, 25-30, 30-35, 35-40, and 40-45 (p < 0.05). **CONCLUSION:** The BB group during off-season training exhibited a depressed HRV recovery following maximal exercise when compared with recreationally trained males.

P173: ISCHEMIC VASODILATORY STIMULUS DOES NOT EXPLAIN REACTIVE HYPEREMIA DIFFERENCES BETWEEN PRE- & POST-MENOPAUSAL WOMEN

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BACKGROUND: Women remain underrepresented in biomedical research, yet it is agreed that estrogen elicits protection against diseases associated with vascular function. Post-menopausal women may be at an increased risk of disease, which has been supported by attenuated responses of reactive hyperemia (RH) seen in these individuals. Previously, women demonstrated further impairments in RH after ovariectomies. However, little is known concerning the RH responses of naturally post-menopausal women versus those with a hysterectomy. Therefore, our purpose was to identify differences in RH among three groups: pre-menopausal, hysterectomy, and natural menopausal. **METHODS:** 51 women volunteered to participate: 21 pre-menopausal, 14 post-menopausal, and 16 hysterectomy. A near-infrared spectroscopy (NIRS) device measured skeletal muscle tissue oxygenation (StO₂%) in the forearm during a vascular occlusion test. This included 3 min of rest, 5 min of ischemia, and 3 min of reperfusion. The rate of desaturation (downslope), time to maximal saturation, and maximal StO₂ (StO_{2max}) were calculated. Separate 1-way ANOVAs were performed, and a $p \leq 0.05$ was considered significant. **RESULTS:** For downslope, the 1-way ANOVA was not significant ($p=0.190$, $=0.067$), but for indices of RH (time to StO_{2max} and StO_{2max}), there were significant ANOVAs. For time to StO_{2max}, there was a significant group difference ($p < 0.014$, $=0.162$) such that premenopausal women ($43.7 \pm 18.3s$) exhibited a significantly greater time than post-menopause ($32.0 \pm 9.3s$; $p=0.012$) and hysterectomy ($31.9 \pm 7.5s$; $p=0.015$). For StO_{2max}, there was a group difference ($p < 0.001$, $=0.292$), and the pre-menopausal women ($82.1 \pm 3.1\%$) had significantly greater peak values than post-menopausal ($77.2 \pm 4.7\%$; $p < 0.001$) and hysterectomy ($78.6 \pm 2.6\%$; $p=0.005$) women. **CONCLUSION:** Although the women all experienced a similar ischemic vasodilatory stimulus (i.e., downslope), there were differences in measures of RH. These novel findings suggested that a factor other than muscle metabolic rate, perhaps vascular compliance, provoked the observed differences in the ability to rectify the ischemic insult. Notably, there were no differences between post-menopausal and hysterectomy groups. Female-focused clinical trials remain needed to determine strategies to preserve vascular function and to counteract the consequences of estrogen loss, especially trials promoting skeletal muscle.

P174: EFFECT OF KETONE SUPPLEMENTATION ON NOCTURNAL BLOOD PRESSURE AND HEART RATE VARIABILITY IN OLDER ADULTS

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BACKGROUND: More than half of American adults have high blood pressure (BP; hypertension), which is a major risk factor for cardiovascular disease (CVD), the leading cause of death worldwide. Nighttime BP is superior to daytime BP in predicting CVD-related events and lack of nighttime BP dipping (i.e., non-dipping; $\leq 10\%$ fall in BP at night) is also associated with CVD morbidities. Advancing age is associated with a decline in the autonomic regulation of BP that contributes to abnormal diurnal BP variations and hypertension. Thus, there is a critical need for effective strategies to mitigate age-related increases in BP, blunted BP dipping, and autonomic dysregulation. Ketone bodies (i.e., β -Hydroxybutyrate) have emerged as important regulators of the cardiovascular system. However, there is limited data regarding ketone supplementation and BP, particularly nighttime BP, and autonomic function in humans. Therefore, we will determine whether acute ketone supplementation reduces nighttime BP, increases BP dipping, and enhances autonomic function in middle-aged and older adults. **METHODS:** We will recruit 24 middle-aged and older adults (≥ 45 yrs, $\sim 50\%$ females) for a randomized, placebo-controlled, crossover design, acute ketone supplement study (NCT05888506). We will use 24-h ambulatory BP monitoring, electrocardiography, and actigraphy monitoring to assess nighttime BP and BP dipping (nighttime:daytime BP ratio), heart rate variability parameters (HRV, to quantify autonomic function), and sleep characteristics on two separate nights. The only difference between the nights is that 30-min prior to bed participants will ingest either a 60 ml ketone ester supplement (30g β -Hydroxybutyrate) or a taste-matched placebo. Participants will be asked to refrain from exercise, follow comparable dietary patterns, and duplicate in bed and awake times on both trial days. **ANTICIPATED RESULTS:** We hypothesize that compared with

placebo, acute ketone supplementation will reduce nighttime BP and increase BP dipping and HRV.

P175: THE EFFECTS OF REGIONAL BRACHIAL PULSE WAVE VELOCITY ON ARTERIAL OCCLUSION PRESSURE

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BACKGROUND: Blood flow restriction, the application of external compression to the proximal segment of a limb, has been combined with low-load resistance exercise or low-intensity aerobic exercise to increase muscle function and size. Applying pressure to the limb is a crucial aspect to this mode of training, as full occlusion should be avoided. It is recommended that the restriction pressure be set to a percentage of an individual's arterial occlusion pressure (AOP). Previous studies have examined several variables that contribute to the determination of AOP, predominantly blood pressure and arm circumference. The purpose of this study was to examine the effects of pulse wave velocity, an indirect marker of arterial stiffness, on AOP, while also accounting for previously-determined predictors of AOP. **METHODS:** 28 (men=9) participants visited the laboratory on one occasion. Following anthropometric measurements, blood pressure was recorded following 10 minutes of supine rest. A pulse tonometer combined with electrocardiogram (ECG) was used to record 20 consecutive pulse waves at the radial artery. The distance between the suprasternal notch and the measurement location was recorded. The average time between peak R-Wave and the foot of the pressure wave was determined, and from this, pulse wave velocity (PWV) was calculated. Three models of hierarchical linear regression were used to determine the greatest predictor of AOP: Block 1 (blood pressure, both systolic (SBP) and diastolic (DBP)); Block 2 (arm circumference (CIRC)); Block 3 (PWV). **RESULTS:** Collinearity was not violated in any of the three models. Block 1 predicted 51.0% of the variance in AOP (SBP: $\beta = .698$, part = $.690$, $P < .0005$; DBP: $\beta = .079$, part = $.078$, $P = .582$). Block 2 predicted 64.2% of the variance in AOP (SBP: $\beta = .475$, part = $.402$, $P = .003$; DBP: $\beta = .041$, part = $.040$, $P = .745$; CIRC: $\beta = .431$, part = $.364$, $P = .007$). Block 3 predicted 70.2% of the variance in AOP (SBP: $\beta = .336$, part = $.256$, $P = .034$; DBP: $\beta = -.014$, part = $-.013$, $P = .909$; CIRC: $\beta = .346$, part = $.280$, $P = .022$; PWV: $\beta = .326$, part = $.245$, $P = .042$). **CONCLUSIONS:** SBP, CIRC, and PWV all explained a statistically significant amount of the variance in the AOP measurement. This study was conducted in a young, healthy population, so additional research should be performed to confirm these results in populations with a wider variation in PWVs.

P176: HEALTH VARIABLE CHANGES OVER TIME AMONG RURAL FIREFIGHTERS

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BACKGROUND: Firefighting is a strenuous job with high stressors, some of which can be potentially traumatic and can play a significant role in the overall well-being of first responders. These jobs require high levels of physical exertion, shift work, and unstructured sleep schedules all of which can put them at risk for cardiovascular disease, musculoskeletal injury, and mental health concerns. Moreover, the data collected for this study was during the COVID-19 pandemic, which had negative impacts on these risk factors. **PURPOSE:** The aim of this study was to track the changes in health variables among rural firefighters and to determine if the pandemic had an impact on any of the variables. **METHODS:** A cohort of 70 career firefighters from one southeastern fire department volunteered to participate in this study. The department participated in daily exercises as part of its health and wellness programming during their shift. Health variables were measured following the guidelines set by the National Fire Protection Association (NFPA) over time (2019-2023). A mixed model with repeated measures was employed to estimate the trend of health variables (Body Fat [BF], BMI, Systolic and Diastolic Blood Pressure [SBP, DBP], resting Heart Rate [HR], Body Density [BD], and Abdominal Circumference [AC] while adjusting for age of the participants. **RESULTS:** A general observable trend is the deterioration in health variables during and following the occurrence of the COVID-19 pandemic and going back to the 2019 levels in 2023. More specifically, in 2020, the SBP was, on average 4.35 ± 1.73 mmHg higher in 2020 compared to 2019 ($p=0.021$). The average DBP measured in 2022 was 3.05 ± 1.49 mmHg higher compared to 2022 compared to 2019 ($p=0.045$, Effect Size [ES]=2.05). There is a statistically significant difference in rHR in for all the measurements compared to the 2019 one (2020 Difference [Δ] = $+3.73 \pm 1.61$,

$p=0.024$, $ES=2.32$; 2021 $\Delta=+8.87\pm 1.62$, $p<0.0001$, $ES=5.48$; 2022 $\Delta=+9.80\pm 1.52$, $p<0.0001$, $ES=6.45$; 2023 $\Delta=+8.14\pm 1.65$, $p<0.0001$, $ES=4.93$). AC was, on average, 2.22 ± 0.57 cm higher in 2021 compared to 2019 ($p=0.0002$, $ES=3.89$). BD decreased on average by 0.01 ± 0.002 g/cm² ($p<0.0001$, $ES=5$) in 2020 and 0.014 ± 0.002 g/cm² ($p<0.0001$, $ES=7$) in 2021 as compared to 2019. There is no statistically significant difference over time in BF and BMI.

CONCLUSIONS: When comparing current results to those found around the onset of the pandemic, the health variables of these firefighters have generally declined. Across a 5-year span, there were significant fluctuations in health variables. Changes in the health variables may have been due to numerous factors, including the pandemic, changes in fitness policies, fitness incentive programming, and employee changeover. Tracking departmental health may give insight into the internal and external influences on firefighters' health.

P177: EFFECTS OF BLOOD FLOW RESTRICTION ON PERCEPTUAL AND CARDIOVASCULAR RESPONSES WITH SHORTER CYCLES

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BACKGROUND: In cases of injury or illness, the ability to maintain physical activity and regular exercise decreases, which may reduce cardiovascular health and fitness. Blood flow restriction (BFR) has been shown to delay muscle atrophy during immobilization but does not appear to improve the vasculature when applied for 2-weeks. BFR is typically applied by inflating a cuff on the upper part of the limb and temporarily reducing blood flow. Prior to conducting a longer study, we want to determine if shortening the inflation time from 5 min to 3 min would improve perceptions during the protocol and/or effectiveness. The purpose of this study is to determine the discomfort and effectiveness of shorter inflations and more cycles than the current recommended BFR protocol. **METHODS:** Using a within-subject design, we will recruit 30 healthy male and female participants (18 - 35 years old) for this study. We will compare the cardiovascular response and perceptual response of a typical BFR protocol (BFR5) and a protocol that has more inflation cycles due to a shorter duration of inflation (BFR3). After informed consent and anthropometric measures, sensors and the BFR cuff will be secured to the dominant arm. Participants will rest supine for 5 min with their dominant arm 90 degrees from their side. Resting measures of heart rate, tissue saturation index (via near infrared spectroscopy), oxygen saturation (via pulse oximetry), and ratings of perceived discomfort will be collected in the last 30 seconds of cuff inflation. Each participant will complete 3 conditions (randomized and counterbalanced) with at least 48 hours between conditions. Arterial occlusion pressure (AOP) will be measured after resting measures. For the typical BFR condition (BFR5), there will be 5 cycles (5 min inflated/3 min deflated) at a cuff pressure of 80% AOP. For the altered BFR protocol (BFR3) there will be 7 cycles (3 min inflated/3 min deflated) at 80% AOP. During the control condition (CON) individuals will rest supine with an uninflated cuff (0% AOP). For our statistical analysis we plan to calculate three change scores (first cycle-rest; fifth cycle-rest; last cycle-rest) and compare these using a one-way Bayesian Repeated Measures ANOVA (JASP, 0.17.3). **ANTICIPATED RESULTS:** Shorter cuff inflations and additional cycles of BFR may have less discomfort and ischemia, but similar oxygen saturation and heart rate as the typical BFR protocol.

P178: EXPLORING CARDIO-MUSCULAR COORDINATION DURING EXERCISE

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BACKGROUND The heart operates in concert with skeletal muscles to facilitate movement, maintain cardiovascular homeostasis, and adapt to exercise/fatigue. However, the exact mechanisms by which autonomic regulation of heart rate variability facilitates coordination with distinct muscle fibers within muscles remain unknown. Here we investigate how cardio-muscular coordination evolves in time and respond to fatigue during a maximal squat test. **METHODS:** Thirty healthy young adults performed two maximal body weight squat tests until exhaustion. During the protocol, simultaneous recordings were taken of a 3-lead electrocardiogram (EKG Lead II) along with electromyography (EMG) signals from the following muscles: left and right vastus lateralis (LegL, LegR); left and right erector spinae (BackL, BackR). We first obtained instantaneous heart rate (IHR,

representing heart rate variability) derived from the EKG signal (Pan-Tomkins QRS detection), and decompose the EMG recordings in ten frequency bands [F1-F10], representing distinct muscle fiber types. We next quantified pairwise coupling (cross-correlation; amplitude-amplitude coupling) between the time series for IHR and all EMG spectral power frequency bands in each Leg and Back muscle. **RESULTS:** During Set 1, low [F1-F5] EMG frequency bands, associated with type-I slow muscle fibers, exhibited stronger coupling with IHR (CMEAN = 0.35; SD = 0.03) compared to intermediate/fast frequency [F6-F10] EMG bands (CMEAN = 0.20; SD = 0.02). With progression of fatigue in Set 2, a significant overall decline in coupling strength between IHR and all EMG frequency bands was observed. Notably, this decline was more pronounced between IHR and intermediate/high-[F6-F10] frequency EMG bands (98%; $p = 0.003$), representing type-IIa,b muscle fibers, compared to slow [F1-F5] bands (48%; $p = 0.02$). **CONCLUSION:** The overall stronger coupling between IHR and slow muscle fibers underscores the potentially vital role of heart rate variability in supporting the endurance-oriented function of these fibers, which rely on a steady supply of oxygen. The significant decline in coupling strength between IHR and all EMG frequency bands as fatigue progressed in Set 2 reflects the complex impact of exhaustion on cardiac and muscle function. This dynamic network approach can lead to the development of novel network-based markers to study multilevel cardio-muscular interactions.

P179: THE RELATIONSHIP BETWEEN SLEEP REGULARITY AND ARTERIAL HEALTH IN HIGH SCHOOL STUDENTS

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BACKGROUND: The prevalence of unhealthy sleep habits is linked to significant pathologies, especially cardiovascular events. Research suggests poor quality sleep and sleep irregularity may be linked to greater arterial stiffness in adults. However, little is known about the relationship between cardiovascular risk factors and sleep in adolescents. This cross-sectional study aims to investigate how sleep health affects blood pressure and arterial stiffness in high school seniors.

METHODS: This sample includes 84 high school seniors (69% female, 18±1 years of age, Body Mass Index 24±5 kg/m²). Sleep health was assessed via five key dimensions using the SATED model: satisfaction, alertness, timing, efficiency, and duration. Sleep regularity, efficiency, and duration were measured via Actigraph GT9X Link accelerometers for 7 consecutive days. Sleep satisfaction was assessed through the 19-item Pittsburgh Sleep Quality Index (PSQI). The pediatric Patient-Reported Outcomes Measurement Information System Sleep-Related Impairment (PROMIS-SRI) questionnaire was used to examine alertness. Carotid-femoral pulse-wave velocity (cfPWV) and blood pressure was measured using VICORDER® to determine arterial stiffness, systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). Multiple linear regression was used to evaluate relationships among variables with significance set at $p<0.05$.

RESULTS: SBP ($p=0.87$), DBP ($p=0.73$), and MAP ($p=0.93$) was not significantly correlated with any sleep dimensions. Sleep satisfaction ($p=0.50$), efficiency ($p=0.54$), and duration ($p=0.94$) were not significantly correlated with cfPWV. However, sleep impairment ($p=0.02$) and sleep regularity ($p=0.03$) were negatively correlated with cfPWV.

CONCLUSIONS: Greater sleep impairment and sleep regularity were associated with lower cfPWV. Individuals who maintain better sleep schedules may have lower arterial stiffness, indicated by lower cfPWV. Further analyses will be performed to explore the relationship between sleep health, cfPWV, SBP, DBP, and MAP.

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P180: STRAIN GAUGE PLETHYSMOGRAPHY AND NEAR-INFRARED SPECTROSCOPY PROVIDE MATCHING SEX DIFFERENCES IN REACTIVE HYPEREMIA

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BACKGROUND: Venous occlusion plethysmography (VOP) is the current gold standard for non-invasive measurements of forearm blood flow (FBF). Near-infrared spectroscopy (NIRS) has gained popularity

for its ability to measure oxygenation parameters. However, mixed evidence exists concerning the ability of NIRS to serve as a surrogate to VOP, especially during reactive hyperemia (RH). Therefore, our purpose was to evaluate relationships between FBF and NIRS parameters as well as potential sex differences in young adults. **METHODS:** 32 adults (16 males and 16 females, age:21±3yrs, body mass:67.7±22.4kg, height:169.8±12.3cm) volunteered to participate. A mercury in-silastic strain gauge was used for VOP and placed 5cm distal to the antecubital fossa, and a NIRS device was also attached. FBF and oxygenation measures were collected during a series of venous occlusion intervals with 50mmHg (e.g., 4s inflated, 3s deflated) applied to the upper arm immediately after a 5min period of complete brachial occlusion (250mmHg). The rate of change (i.e., slope) in FBF and each NIRS parameter (oxygenated hemoglobin [O₂Hb], deoxygenated hemoglobin [HHb], total hemoglobin [tHb], and hemoglobin difference [HbDiff]) were determined during the intervals of venous occlusion. Peak slope values were recorded within the first 30s immediately following the cuff deflation (i.e., reactive hyperemia). Pearson's correlations (i.e., adjusts variables to equal units) were performed to assess associations between VOP and NIRS, and independent t-tests were used to evaluate sex differences. A $p \leq 0.05$ was considered significant. Cohen d (d) and 95% confidence intervals of mean differences (Δ) were reported as measures of effect. **RESULTS:** Peak FBF was significantly related to O₂Hb ($r=0.399$; $p=0.024$) and HbDiff ($r=0.469$; $p=0.007$), whereas there was no association to either HHb ($p=0.943$) or tHb ($p=0.175$). There were mean sex differences such that peak FBF was significantly ($p=0.006$, $d=1.05$, $\Delta=1.82$ to 9.93) greater for the men (22.9 ± 6.2 ml · dl FAV⁻¹ · min⁻¹) than the women (17.0 ± 4.9 ml · dl FAV⁻¹ · min⁻¹). O₂Hb ($p=0.001$, $d=1.25$, $\Delta=0.19$ to 1.46) and HbDiff ($p=0.001$, $d=1.25$, $\Delta=0.31$ to 1.17) demonstrated a matching sex difference. **CONCLUSIONS:** Despite only observing moderate associations between VOP and NIRS measures, similar interpretations and effects were achieved. That is, VOP and NIRS both indicated men exhibited greater magnitudes of RH than women.

P181: PHYSICAL FUNCTION CHANGES FOLLOWING 12 WEEKS OF ANDROGEN RECEPTOR SIGNALING INHIBITORS FOR ADVANCED PROSTATE CANCER

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BACKGROUND: Cross-sectional studies indicate that men with metastatic prostate cancer (PC) using androgen receptor signaling inhibitors (ARSI) have lower physical function (PF). However, the rate of change in PF remains unclear. This observational pilot study aimed to longitudinally examine objectively measured PF in men with advanced PC initiating ARSI treatment and after 12 weeks of therapy. Additionally, changes in grip strength, muscular power, and balance were determined. **METHODS:** Men with advanced PC ($n=6$, 70 ± 9 y, 30.1 ± 3.5 kg/m² BMI) initiating ARSI completed testing at baseline and 12 weeks later. The majority (66.7%) of men were diagnosed with castration-sensitive metastatic PC. The primary outcome was PF, assessed using short physical performance battery [SPPB], timed up and go [TUG], and 400m walk. Secondary outcomes included grip strength (handgrip dynamometry), power (GymAware sit-to-stand power test mean and peak power) and balance (Sensory Organization Test composite score; somatosensory, visual, and vestibular ratios). Mean differences (MD) were calculated as 12-week follow-up - baseline. **RESULTS:** From baseline to 12 weeks of ARSI, there was a 4% improvement in 400m walk that approached significance [MD: -13 s; 95% CI (-25, -1); $p=0.082$, $d=0.88$]. However, there were no differences in PF as assessed by SPPB [MD: 0.33 points; 95% CI (-0.49, 1.16); $p=0.465$, $d=0.32$] and TUG [MD: -0.6 s; 95% CI (-1.4, 0.2); $p=0.186$, $d=0.62$]. For the secondary outcomes, there was a 9% decline in peak power [MD: -70.5 W; 95% CI (-124, -17.2); $p=0.049$, $d=1.06$]. However, there were no declines in mean power [MD: -18.7 W; 95% CI (-50.7, 13.4); $p=0.305$, $d=0.47$], grip strength [MD: -1.7 kg; 95% CI (-3.6, 0.2); $p=0.149$, $d=0.70$], or balance (composite score [MD: 0.2 pt; 95% CI (-6.2, 6.6); $p=0.961$, $d=0.02$], somatosensory ratio [MD: 1.3 pt; 95% CI (-2.4, 5.0); $p=0.512$, $d=0.29$], visual ratio [MD: 7.5 pt; 95% CI (-2.5, 17.5); $p=0.203$, $d=0.60$], and vestibular ratio [MD: 5.7 pt; 95% CI (-6.8, 18.2); $p=0.416$, $d=0.36$]). **CONCLUSIONS:** Contrary to prior cross-sectional studies, these preliminary results suggest that 12 weeks of ARSI do not adversely affect objectively measured PF. However, peak muscular power demonstrated a decline of large effect, which warrants further investigation as muscular power is closely linked with PF. Longer follow

up (i.e., 24 weeks) and larger sample sizes are required to confirm these initial findings.

P182: HEMODYNAMIC RESPONSES TO THE COLD PRESSOR TEST IN INDIVIDUALS WITH METABOLIC SYNDROME

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BACKGROUND: The cold pressor test (CPT) is widely used sympathoexcitatory stimulus, and CPT responses are known to be exaggerated in individuals with hypertension and diabetes. Surprisingly, however, the hemodynamic responses to the CPT have not been explicitly characterized in individuals with metabolic syndrome (MetS). Hence, the purpose of this study was to characterize the hemodynamic responses to cold pressor activation in individuals meeting the criteria for MetS. **METHODS:** 75 individuals were initially screened for MetS based on the National Cholesterol Education Program Adult Treatment Panel III criteria, with the addition of HbA1C >5.7% as a secondary marker of impaired glucose regulation. Of these 75 participants, 20 met the criteria for MetS, 17 completed all experiments and could be matched to control participants by age, biological sex, race, and ethnicity. Upon final analysis, one participant was excluded as an outlier (mean pressor response >3.5 standard deviations above the inclusive group mean), resulting in a final matched comparison of 16 individuals with MetS and 16 control participants. Each CPT consisted of a 2-minute baseline period, followed by a 2-minute period of ice-water hand immersion, during which heart rate and beat-by-beat blood pressure were continuously recorded via a one-lead electrocardiogram and finger-photoplethysmography, respectively. CPT responses were quantified as the peak blood pressure and heart rate responses recorded during cold-water immersion, as well as the area-under-the-curve for mean arterial pressure (MAP) during cold-water immersion (BPI; mmHg*sec). **RESULTS:** As expected, individuals with MetS had a significantly higher BMI ($p=0.001$), waist circumference ($p<0.001$), fasting blood glucose ($p<0.001$), resting systolic blood pressure ($p=0.01$), resting diastolic blood pressure ($p=0.008$), and lower HDL cholesterol ($p=0.006$) compared to control participants. However, the only significant difference observed during the CPT was an exaggerated peak diastolic blood pressure response in the MetS group ($p=0.045$). In contrast, no significant differences were observed for the peak MAP ($p=0.104$), delta MAP ($p=0.859$), or BPI responses ($p=0.114$). **CONCLUSIONS:** Based on these findings, only diastolic blood pressure responses are exaggerated during cold pressure activation in individuals with MetS, whereas systolic, MAP, and HR response are similar between groups.

P183: STRENGTH INDUCED DIFFERENCES IN VASCULAR OCCLUSION TEST RESPONSES IN MIDLIFE AND OLDER ADULTS

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BACKGROUND: Vascular occlusion tests (VOT) provide a useful index of microvascular function, which is a known predictor of cardiovascular disease (CVD). Handgrip (HG) strength has emerged as a valuable metric to assess CVD risk. However, little remains known regarding VOT responses among adults of various strength levels. Therefore, our purpose was test for differences between groups of low and high strength, as quantified by HG. **METHODS:** Fifty (50% female), midlife to older adults (64 ± 9 yr) completed a VOT (3 min baseline, 5 min occlusion, 3 min reperfusion) with a near-infrared spectroscopy device attached to the forearm. This test provided an index of skeletal muscle oxygenation (StO₂, %) during periods of reactive hyperemia (RH) and the immediate post-occlusion period of reactive hyperemia (RH) (e.g., marker of microvascular function). To describe RH, the initial (1st ten s) rate of reperfusion was calculated via simple linear regression. Additionally, the maximum value observed post-occlusion was defined as StO₂max. Participants were separated into high and low strength groups based on the 50th percentile for both sexes. That is, men and women were equally distributed into the low and high groups. Independent t-tests were used to examine mean differences, and $p \leq 0.05$ was considered significant. **RESULTS:** The high group exhibited significantly greater HG strength than the low strength group (36.1 ± 7.8 vs. 25.6 ± 5.9 kg; $p<0.001$). However, there were no differences ($p>0.05$) between the groups for baseline StO₂ (68.1 ± 4.0 vs. $65.3 \pm 6.1\%$) or rate of desaturation during ischemia (-0.103 ± 0.03 vs. $-0.118 \pm 0.03\% \cdot s^{-1}$). For RH, the stronger group demonstrated

significantly greater StO₂max (79.5 ± 3.4 vs. 77.0 ± 4.0%; p=0.019), but interestingly, the lower strength group resulted in a faster rate of reperfusion (1.83 ± 0.7 vs. 2.27 ± 0.7%·s⁻¹; p=0.032).

CONCLUSIONS: There were inconsistent RH responses between the high and low strength groups. Thus, the initial rate of reperfusion and StO₂max likely reflect different underlying mechanisms and may not be equally influenced by HG strength. Additionally, our low strength group may have been above a clinical HG strength threshold (e.g., 19 kg cut-off) such that those individuals still presented with relatively low risks. Future studies are needed to further understand HG sensitivity in qualifying CVD risks, especially as it relates to the peripheral microvasculature.

P184: THE EFFECT OF FEMALE AGING ON BLOOD PRESSURE AND SYMPATHETIC REACTIVITY DURING END-EXPIRATORY APNEA

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Background: Older females (OF) have greater cardiovascular risk and blood pressure (BP) reactivity compared to younger females (YF). In cohorts of males and females, aging augments BP reactivity and reduces sympathetic reactivity to chemoreflex stimulation. However, there is limited data on how aging affects BP reactivity to chemoreflex stimulation in females. Therefore, we tested the hypothesis that OF vs. YF would exhibit greater BP reactivity and a lower sympathetic reactivity during an end-expiratory breath-hold (EEBH; chemoreflex stimulus). **Methods:** We measured beat-to-beat BP and Modelflow-derived hemodynamics (photoplethysmography; 13 YF, 8 OF) during a two-minute rest and maximal voluntary duration EEBH. In a subset, we also measured muscle sympathetic nerve activity (MSNA via microneurography; 9 YF, 5 OF). We tested YF during the early follicular phase and OF were post-menopausal. We compared variables at rest and in response to the EEBH between groups using unpaired, two-tailed t-tests for normally distributed data and Mann-Whitney U tests for non-normally distributed data. All data are presented as OF vs. YF with mean±SD or median[IQR]. **Results:** Age (OF 66±6 vs. YF 23±2 years, p<0.001), but not BMI (OF 21.8[3.7] vs. YF 22.6[3.6] kg/m², p=0.491), was different between groups. OF had a longer EEBH duration (OF 46[28] vs. YF 29[9] s, p<0.001). At rest, mean BP (OF 99±13 vs. YF 81±4 mmHg, p<0.001), MSNA burst frequency (OF 32±9 vs. YF 9±7 bursts/min, p<0.001), and MSNA total activity (OF 802±296 vs. YF 90±121 AU, p<0.001) were higher in OF. The change in MAP (OF 27[10] vs. YF 15[13] mmHg, p=0.045) was larger in OF whereas the relative change in MSNA total activity (OF 369±182 vs. YF 1014±620 %, p=0.014) was smaller in OF during the EEBH. However, the increases in MSNA burst frequency (OF 15±7 vs. YF 16±9 bursts/min, p=0.833) during the EEBH were not different between groups. Additionally, the change in cardiac output was lower in OF (OF -0.3±0.5 vs. YF 0.2±0.3 L/min, p=0.005) but the change in systemic vascular resistance was greater in OF (OF 9.4±2.8 vs. YF 3.2±1.9 mmHg/L/min, p<0.001). **Conclusion:** The smaller relative increases in MSNA total activity during EEBH in OF suggest reduced chemoreflex sensitivity in female aging. Interestingly, these preliminary data suggest that augmented BP reactivity in OF was driven by vascular resistance despite smaller increases in MSNA during EEBH.

P185: A PRELIMINARY COMPARISON OF MUSCLE STRENGTHENING EXERCISE AND TREADMILL WALKING TO BREAK UP PROLONGED SITTING

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BACKGROUND: Cardiovascular disease (CVD) is the leading cause of death worldwide. Most Americans spend approximately half of their awake time (~8h/day) engaged in sedentary behavior, and predominantly in the form of sitting. The association of sedentary behavior with CVD has been graded moderate to strong by national and international public health agencies, yet we have scant understanding regarding effective strategies to mitigate the adverse cardiovascular repercussions of sedentary behavior. A recent study demonstrated that five minutes of treadmill walking every 30 minutes throughout the day attenuates increases in blood pressure (BP) observed with prolonged sitting. However, such a strategy may be challenging given environmental or equipment availability in the workplace. Therefore, the purpose of the present study was to compare the effects of the aforementioned treadmill walking protocol

to a time- and frequency-matched routine of bodyweight-based muscle strengthening exercises on BP responses and measures of fatigue, mood, and cognitive performance during prolonged sitting.

METHODS: We recruited five young adults (n=2M/3F, 24.2±3.4 years, 25.1±5.1kg/m²) for a randomized and counter-balanced, crossover design trial consisting of three, four-hour experimental testing sessions (Control, treadmill walking [Walk], and muscle strengthening exercises [Strength]). We measured BP and subjective fatigue every 60 min, and surveyed mood and cognitive performance before and after each trial. **RESULTS:** Mean systolic (control: 121±8mmHg, Walk: 120±7mmHg, Strength: 120±9mmHg) and diastolic BPs (control: 70±7mmHg, Walk: 68±7mmHg, Strength: 69±6mmHg) were similar among trials (ps≥0.680), and no effects of time or interactions were observed (ps≥0.391). Subjective fatigue differed among trials (p<0.001); fatigue was reduced in Walk (12.6±7.1; ps≤0.015) compared to Control (27.9±15.9) and Strength (22.6±9.6), but no differences between Control and Strength (p=0.279), or effects of time or interactions were observed (ps≥0.298). No effects of visit, time, or interactions were observed for mood or cognitive performance (ps≥0.113). **CONCLUSIONS:** These preliminary data suggest that compared with bodyweight-based muscle strengthening exercise, treadmill walking may more effectively attenuate fatigue during prolonged sitting. A larger sample is needed prior to drawing any meaningful inferences regarding comparison of Walk vs. Strength for lowering BP.

P186: ASSOCIATION BETWEEN RESTING HEART RATE VARIABILITY AND NOCTURNAL BLOOD PRESSURE IN YOUNG ADULTS

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BACKGROUND: Healthy circadian variation in arterial blood pressure (BP) is characterized by nocturnal dipping. Elevated BP or attenuated BP dipping during sleep is associated with greater risk for cardiovascular diseases. Moreover, cardiac-autonomic activity is associated with BP dipping patterns in clinical populations, but whether this relationship exists in apparently healthy adults is unclear. Therefore, the purpose of this study was to quantify associations between cardiac-autonomic activity, indexed via resting heart rate variability (HRV), and nocturnal BP characteristics in young adults. **METHODS:** Twenty-nine apparently healthy young adults (n = 13 males, 23 ± 4 yrs, 23 ± 3 kg/m², n = 16 females, 20 ± 2 yrs, 23 ± 3 kg/m²) were included in the analysis. Resting HRV was obtained in the laboratory following an overnight fast. Five-minute electrocardiographic recordings were obtained in the supine position following a five-minute stabilization period. Short-term HRV parameters of interest included the mean RR interval, standard deviation of normal RR intervals (SDNN), and root-mean square of successive differences (RMSSD). Participants left the laboratory wearing an ambulatory BP monitor on their upper arm programmed to perform recordings every 20 minutes during awake hours and every 30 minutes during sleeping hours. Self-reported bedtime and wake time were used to identify awake and asleep periods. Absolute BP dipping was quantified as awake BP minus asleep BP. **RESULTS:** In males, asleep diastolic BP (54.7 ± 4.1 mmHg) was associated with SDNN (58.7 ± 17.9 ms, r = -0.57, P <0.05) and RMSSD (60.5 ± 25.9 ms, r = -0.56, P <0.05). Additionally, systolic BP (12.1 ± 6.6 mmHg, r = 0.64) and diastolic BP dipping (22.8 ± 7.4 mmHg, r = 0.59) were associated with SDNN (Ps <0.05). No associations between any HRV and BP values were observed for females (Ps >0.05). **CONCLUSIONS:** Our findings reveal sex differences in the association between resting short-term cardiac-autonomic activity and nocturnal BP characteristics in healthy young adults. HRV is an accessible and modifiable (e.g., via aerobic exercise) biomarker that may be a useful target for young adult males to improve circadian variation in BP and reduce cardiovascular disease risk. **FUNDING:** Supported by Georgia Southern University Faculty Research Committee Research Seed Funding Award.

P187: CAN A FIVE-MINUTE VIRTUAL REALITY HEADSET INTERVENTION REDUCE BLOOD PRESSURE IN PATIENTS WITH WHITE-COAT HYPERTENSION?

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BACKGROUND: White coat hypertension (WCH) refers to patients with high blood pressure (BP) in a clinical setting but normal BP at

home. Practical approaches are needed to rapidly obtain valid BP measures from these patients. Current practice includes having patients complete 24-hour ambulatory BP monitoring (at home). This approach is time-consuming and challenging for patients and clinicians. Practical approaches are needed to help acquire valid measurements in the clinic. An intervention with great potential is virtual reality. In this pilot study, we explore the use of virtual reality (VR) headsets. This intervention may be beneficial as calming scenes can be easily displayed to patients. **PURPOSE:** Have WCH patients complete a five-minute VR intervention (calm beach scene) and determine if BP decreases significantly. **METHODS:** All participants were patients at Mayo Clinic Florida who were previously diagnosed as having WCH by their physician (11 males, 19 females, age 55+). Patients who agreed to participate arrived 15 minutes early for a previously scheduled routine appointment. All BP measures were taken with a Welch Allyn Connex 6700 Vital Signs Monitor. First, a baseline BP measurement was collected. Then, the patient rested with no intervention for five minutes before having a second standard BP measurement taken. Finally, the patient wore the VR headset for five minutes (Oculus Quest 2 with Skybox VR Video Player). The VR displayed a "calming beach scene" and BP was collected again (at five minutes). Dependent t-tests ($\alpha=0.05$) were used to test for significant differences in BP between the baseline and VR conditions. **RESULTS:** The systolic BP reduced significantly ($p<0.01$) from the first baseline measurement (154.2 ± 22.9) to the second standard measurement (147.9 ± 20.2). The BP further reduced ($p=0.01$) after the VR intervention (141.9 ± 20.2). For diastolic BP, there was also a significant difference ($p=0.18$) ($p=0.18, 0.02, 0.70$) between the baseline (84.0 ± 12.8) and standard (84.5 ± 11.8). The diastolic BP reduced significantly ($p=0.02$) after the VR intervention (82.1 ± 10.2). On five-point scale questions, 30 of 30 patients answered favorably when asked if the VR experience was "enjoyable" (4.74 ± 0.50) and 28/30 believed it could lower their blood pressure (4.13 ± 0.97). Further, only four of 30 participants reported feeling "nervous" while wearing the VR device (1.90 ± 1.16). **CONCLUSION:** The VR device appeared to quickly reduce systolic and diastolic BP by a clinically relevant magnitude. Further, the vast majority of WCH participants responded positively to the intervention. This approach appears to have the potential to improve clinical practice. Future studies should focus on optimizing this approach for patients. Specifically, exposure time and relaxation scene need to be thoroughly researched.

P188: THE RELATIONSHIP BETWEEN URINE HYDRATION INDICES AND CARDIOVASCULAR REACTIVITY TO COLD PRESSOR TEST

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BACKGROUND: The cold pressor test (CPT) is commonly used in physiological research to elicit a robust autonomic response, particularly to provoke increases in mean arterial pressure (MAP) and heart rate (HR). However, research investigating the influence of hydration status on cardiovascular reactivity to a CPT is lacking. Therefore, the purpose of this study was to examine the relationships between urine specific gravity (USG) and urine color (Ucol) with changes in HR and MAP following a CPT. **METHODS:** A total of 17 (aged 18-23) women completed this protocol which required three laboratory visits. During the first visit, participants completed a familiarization trial to experience the 60-s CPT (≈ 1.0 °C) and cardiovascular monitoring. During visits 2 and 3, after an overnight fast, the participants reported to the laboratory and provided a urine sample for USG - measured on a digital refractometer - and Ucol according to a chart ranging from 1 (lightest) to 8 (darkest). A CPT was then used to elicit a cardiovascular response for the experimental trials. HR and MAP ($\text{MAP} = 1/3$ systolic blood pressure + $2/3$ diastolic blood pressure) were measured prior (pre) to the CPT and immediately after (post) using an automated blood pressure device used in stress testing. Changes in HR (ΔHR) and MAP (ΔMAP) were calculated by subtracting the pre- from post- measures. Pearson's correlations were used to explore the direction and strength of the relationship between urine and cardiovascular-reactivity indices. Since all participants completed two visits, there were a total of 34 observations ($n = 34$). **RESULTS:** Pearson's correlations revealed USG (1.0189 ± 0.0075) was positively correlated with ΔHR (6 ± 8 bpm, $r = 0.30$) and ΔMAP (25 ± 13 mmHg, $r = 0.30$). Additionally, Ucol (4 ± 2 au) was positively correlated with ΔHR ($r = 0.28$) and ΔMAP ($r = 0.32$). **CONCLUSIONS:** Hydration indices were positively related to measures of cardiovascular reactivity following a CPT, meaning larger changes in HR and MAP were associated indices of increasing hypohydration. Hydration is often

not recorded nor reported in CPT protocols. Due to the integrated nature of the cardiovascular system's response to stressors, hydration status should be accounted for in research protocols.

P189: EFFECTS OF BLOOD FLOW RESTRICTION ON THE VASCULATURE AND TOLERABILITY DURING A 2-WEEK INTERVENTION

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BACKGROUND: Blood flow restriction (BFR) has been used to delay muscle atrophy, but it is unclear how this impacts the vasculature. The purpose of this study was to determine chronic effects of BFR on upper body vasculature. **METHODS:** 40 participants were randomized into control (CON) or BFR. For BFR, 80% of arterial occlusion pressure (AOP) was applied 5 days/week for 5 cycles (5min inflation, 3min deflation) on the dominant arm. Vascular assessments occurred at baseline (Pre), week 1 (Mid), and week 2 (Post). A cuff on the forearm was inflated ($\geq 110\%$ AOP) for 5min while brachial artery diameter and tissue saturation index (TSI, %) were continuously measured. Flow mediated dilation (FMD) was calculated as maximal artery diameter following cuff deflation minus resting diameter. TSI slope 1 ($S1$, %/s) included 60s during initial cuff inflation, $S2$ (%/s) included 15s after deflation, and area under the curve (AUC, %·s) included 180s after deflation. Acute muscle thickness changes (via ultrasound, ΔMuTh , cm) and pain (via visual analog scale, VAS, A.U.) were measured on the first and last BFR sessions. Vascular variables were compared with Bayesian RMANOVAs (BF_{10} =likelihood of the interaction model vs the null), ΔMuTh was compared with Bayesian One-way RMANOVA and VAS was compared with Bayesian paired samples T-Test. Results presented as mean \pm SD. **RESULTS:** Null model was most likely for all vascular variables. Dominant arm FMD (Pre: BFR $.03\pm.01$, CON $.03\pm.01$; Post: BFR $.03\pm.01$, CON $.03\pm.02$; $\text{BF}_{10}=.017$) was similar between conditions and time points. $S1$ (Pre: BFR $-.07\pm.04$, CON $-.07\pm.04$; Post: BFR $-.08\pm.03$, CON $-.07\pm.03$; $\text{BF}_{10}=.064$), $S2$ (Pre: BFR 1.66 ± 1.07 , CON $1.79\pm.89$; Post: BFR $1.96\pm.68$, CON $1.79\pm.78$; $\text{BF}_{10}=.016$), AUC (Pre: BFR 13330 ± 968 , CON 13348 ± 939 ; Post: BFR 13509 ± 668 , CON 13470 ± 870 ; $\text{BF}_{10}=.005$), and minimum TSI during cuff inflation (Pre: BFR 51.6 ± 9.8 , CON 51.0 ± 10.7 ; Post: BFR 50.1 ± 8.8 , CON 51.4 ± 8.1 ; $\text{BF}_{10}=.006$) were similar between conditions and time points. ΔMuTh changed with time ($\text{BF}_{10}=3.952$). First session ($-.01\pm.11$) was smaller than second ($.09\pm.14$; $\text{BF}_{10}=1.809$) and last ($.06\pm.08$; $\text{BF}_{10}=2.393$), but second and last ($\text{BF}_{10}=.319$) were similar. Maximum VAS was similar across sessions (first: 3.9 ± 2.6 , last: 3.0 ± 2.6 ; $\text{BF}_{10}=.552$) with a similar trend for mean VAS. **CONCLUSIONS:** Two weeks of BFR may be tolerable, but does not alter vasculature, muscular swelling, or become less painful in healthy untrained participants.

P190: THE EFFECTS OF SHORT-TERM EXERCISE REMOVAL ON FLOW-MEDIATED DILATION IN YOUNGER AND OLDER ADULTS

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BACKGROUND: Endothelial function is negatively associated with decreased risk of cardiovascular disease. Our lab previously demonstrated that young, active adults experience impaired endothelial function following 5 days of physical inactivity. Whether this occurs in older, active adults who may be more prone to bouts of inactivity is unknown. This study determined if endothelial function, as measured by flow-mediated dilation (FMD), was impaired in active, older adults (>55 yr.) following removal of exercise for 5 days compared to active, young adults (18-40yr.). **METHODS:** Popliteal and brachial artery FMD were measured at baseline and during days 3 (3dNOEX) and 5 (5dNOEX) of removal of exercise in 8 active, older (Age: 67 ± 2.6 yr., BMI: 27 ± 1.5 kg/m²) individuals and 8 active, young (Age: 24 ± 0.9 yr., BMI: 25 ± 1.1 kg/m²) individuals. **RESULTS:** Steps/day was significantly reduced during removal of exercise in both the young (BI: 7470.0 ± 974.7 , NOEX: 2627.6 ± 338.8) and old (BI: 6510.7 ± 604.8 , NOEX: 3188.2 ± 451.9) subjects ($p<0.05$). There were no significant main effects of age or time between older and younger subjects on popliteal artery baseline diameter (Young: 5.73 ± 0.41 mm, Old: 5.22 ± 0.41 mm) (BI: 5.49 ± 0.29 mm, 3dNOEX: 5.47 ± 0.29 mm, 5dNOEX: 5.46 ± 0.29 mm) ($p>0.05$). However, there was a main effect of time ($p=0.02$) in popliteal artery %FMD (BI: 6.44 ± 0.60 , 3dNOEX: 5.71 ± 0.60 , 5dNOEX: 5.00 ± 0.60) with day 5 being lower than baseline. No main effect of age in popliteal artery %FMD was found (Young: 6.29 ± 0.75 , Old: 5.15 ± 0.75) ($p>0.05$). Brachial artery

baseline diameter and %FMD was unaltered across age and time (baseline diameter: Young: 4.06 ± 0.21 mm, Old: 3.72 ± 0.21 mm and Bl: 3.90 ± 0.15 mm, 3dNOEX: 3.89 ± 0.15 mm, 5dNOEX: 3.88 ± 0.15 mm) (%FMD: Young: 7.06 ± 0.86 , Old: 6.16 ± 0.86 and Bl: 7.11 ± 0.72 , 3dNOEX: 6.45 ± 0.72 , 5dNOEX: 6.28 ± 0.72) ($p > 0.05$). **CONCLUSIONS:** These preliminary data suggest that %FMD in the popliteal artery is susceptible to impairments following removal of exercise, but that it is not different between older and younger subjects. Future efforts in our laboratory will aim to increase the sample size of each group to ensure that lack of differences between older and younger subjects are not merely due to the small sample size.

P191: NOVEL CALCULATION OF MODIFIED STRESS SCORE AND SYMPATHETIC-TO-PARASYMPATHETIC RATIO FROM ULTRA-SHORT TIME-DOMAIN METHODS

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BACKGROUND: The stress score (SS) and sympathetic-parasympathetic ratio (SPS) are heart rate variability (HRV) indices that have recently gained attention for monitoring autonomic balance in athletes. However, they are calculated from a Poincaré plot which is more complex than time-domain metrics such as the root mean square of successive normal-to-normal interval differences (RMSSD) or the standard deviation of normal-to-normal intervals (SDNN). Additionally, the SS and SPS are calculated from standardized procedures that require a 5-minute recording time that follows a 5-minute stabilization period. On the other hand, ultra-short (US) recordings that require only a 1-minute stabilization period followed by a 1-minute recording period have gained popularity for acquiring HRV in field settings. The purpose of this study was to determine the validity of a modified calculation of SS (SSMOD) and SPS (SPSMOD) from US recordings of RMSSD and SDNN. **METHODS:** NCAA Division-III male athletes were recruited for this study ($n = 23$, 21.43 ± 2.17 yrs.). Resting HRV was assessed via electrocardiography (ECG) with a modified Lead II electrode placement for 10 minutes while each participant assumed a supine position. Poincaré plot analysis was performed on the last 5-minutes of the ECG, with the first 5-minute segment considered as stabilization. From the plot, the standard deviation of short- (SD1) and long-term (SD2) R-R interval variability were recorded. SS was calculated by taking the inverse function of SD2 and multiplying it by 1000, whereas SPS was calculated by dividing SS by SD1. For the modified US approach, RMSSD and SDNN were calculated from a 1-minute segment of the ECG, following a 1-minute stabilization period. SSMOD was calculated by taking the inverse function of SDNN and multiplying it by 1000, while the calculation of SPSMOD came from dividing SSMOD by RMSSD. **RESULTS:** The mean \pm SD for SS was 14.74 ± 8.02 ms, for SPS was 0.55 ± 0.93 , for SSMOD was 18.56 ± 10.91 ms, and SPSMOD was 0.61 ± 1.13 . Pearson's correlation procedures showed strong and significant correlations between SS and SSMOD ($r = 0.93$) and between SPS and SPSMOD ($r = 0.98$). **DISCUSSION:** These findings support the use of a modified SS and SPS calculation from US time-domain metrics during resting conditions. Because of the field-applicability of US time-domain HRV metrics, the SSMOD and SPSMOD indices could become highly useful in monitoring athlete training load and recovery status.

P192: EFFECT OF ULTRASOUND PROBE PRESSURE AND TILT ON ARTERY SIZE MEASURES

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BACKGROUND. Artery diameter is typically measured with the ultrasound probe longitudinally (LONG) aligned. There has been recent interest in performing measures with cross-sectional (CSA) alignment to improve sensitivity and reliability measurements. However, it is unknown if pressure and tilt of the probe influence the measures differently. The purpose of our study was to examine the effect of probe pressure and tilt on measurements taken in LONG vs. CSA. **METHODS.** A blood vessel phantom was used for all measurements. At time point 1 the phantom artery was imaged in LONG with zero pressure (NP), light pressure (LP), and moderate pressure (MP). The pressure was quantified by the investigator's discretion. After pressure images were obtained, the best image of the artery in the LONG view was taken and assigned an angle of 0° . Using a digital inclinometer secured to the ultrasound probe, 2 images were taken at probe angles of 0° , 5° , 10° , and 15° . Following LONG, pressure and angle measurements were imaged using CSA. At time point 2, on a separate

day, images were repeated at the same 3 pressures and 4 different angles in both LONG and CSA. Artery diameters (cm) for LONG and artery areas (cm²) for CSA were obtained using ImageJ. Averages were calculated at each pressure and angle for LONG and CSA. **RESULTS.** The mean diameter taken in LONG across both days for NP, LP, and MP were 0.557, 0.522, and 0.475, respectively. We converted these diameters to area (A) for each pressure ($A = 0.243$, 0.214 , and 0.177). The mean CSA across both days for NP, LP, and MP were 0.218, 0.198, and 0.182, respectively. The mean diameters taken in LONG for each angle were 0.509, 0.509, 0.490, and 0.448, for 0° , 5° , 10° , and 15° , respectively ($A = 0.204$, 0.205 , 0.191 , and 0.162). The mean CSA across both days for each angle were 0.205, 0.209, 0.212, and 0.239 for 0° , 5° , 10° , and 15° , respectively. **DISCUSSION.** LONG measurements were more influenced by probe pressure and tilt compared to CSA, meaning that CSA measurements may be better suited for vascular testing protocols requiring assessments of arterial size, such as flow-mediated dilation (FMD) where the ability to detect even small changes in diameter is desired. Future studies could strengthen these findings by comparing arterial size at rest and during exercise and possibly FMD using both methods in humans.

P193: COMPARISON OF A.I. DERIVED HEART RATE VARIABILITY TO A PREVIOUSLY VALIDATED HEART RATE VARIABILITY ASSESSMENT

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BACKGROUND: Heart rate variability (HRV) has become a useful measure to assess autonomic function and is becoming a common measure provided by devices available to the consumer. One such device utilizes artificial intelligence (A.I.) to analyze and provide HRV data to the owner. Whether this device provides accurate measures of HRV is not clear. Therefore, the purpose of this study is to assess whether the HRV metrics made with the Wellue 24-hour electrocardiography device with A.I. analysis is similar to those from a well-validated method of HRV assessment. **METHODS:** Eleven individuals [age = 37.2 ± 20.7 yr.; height = 170.3 ± 9.5 cm; weight = 69.7 ± 11.3 kg; BMI = 24.1 ± 4.3] completed a 20-minute, supine resting HRV assessment while wearing both the Wellue and a Polar H10 heart rate monitor around their torso. R-R data measured by the Polar monitor was captured using the Elite HRV application and HRV analysis was performed using Kubios Standard (version 3.5.0) software. To minimize the impact of respiration on HRV, subjects breathed at a standard rate of 12 breaths per minute, utilizing a metronome. **RESULTS:** The Wellue reported a higher minimum heart rate compared to Kubios (59.3 ± 8.6 vs. 57.2 ± 8.4 for Wellue and Kubios, respectively; $P = 0.006$), a higher resting standard deviation of N-N intervals (SDNN) (70.2 ± 32.2 vs. 57.6 ± 32.4 , $P = 0.006$), a higher natural log transformed very low-frequency power (VLFlog) (7.03 ± 1.86 vs. 3.78 ± 0.86 , $P < 0.001$), and a lower baseline width of the R-R interval histogram (TINN) (32.1 ± 121 vs. 338.1 ± 141.6 , $P < 0.001$). There was no difference in the other reported HRV variables between methods. **CONCLUSIONS:** Results suggest that A.I. derived HRV via the Wellue device showed good agreement to a well-validated method of HRV assessment with some metrics, and divergent findings in other. More research with a greater sample size and across a broad range of individuals is needed to further elucidate the validity of the Wellue device.

P194: EVALUATING THE CHANGES IN AEROBIC CAPACITY VALUES DURING A COLLEGIATE MEN'S SOCCER SEASON

Jelena Obretkovich. *Liberty, Lynchburg, VA.*

EVALUATING THE CHANGES IN AEROBIC CAPACITY VALUES DURING A COLLEGIATE MEN'S SOCCER SEASON Jelena Obretkovich, Andy Bosak, Garrett Toms, Tristan Faust, Liberty University Soccer is a sport that requires players to have a well-developed aerobic system, yet during the course of a season, it is not uncommon for players' aerobic capacity to change either positively and/or even negatively. Unfortunately, limited research has been conducted that has evaluated changes in VO₂max values for soccer players during the course of a season. Having an understanding in how VO₂ values may change gives coaches the opportunity to anticipate potential changes and attempt to reduce the severity of decline. Purpose: To assess potential changes in VO₂max from preseason to postseason in NCAA DIII soccer players. Methods: Twelve NCAA DIII soccer players completed a max GXT treadmill protocol within seven days of the start (ie. Preseason = PRE) and finish (ie. Post = PST) of their playing season. Values such as VO₂max, time to exhaustion (TTE), HRmax, ventilatory threshold (VT),

Ratings of Perceived Exertion, and Body Fat Percentage (BF) were compared for the PRE and PST trials with significant differences occurring with an alpha level of $p < 0.05$. Results: Significant differences occurred between PRE and PST HRmax (191.4 + 8.3 bts/min vs 193.2 + 7.3 bts/min, $p = 0.001$), TTE (790.08 + 48.35 secs vs 768.92 + 77.82 secs, $p = 0.041$), and BF (12.37 + 4.90% vs 13.85 + 3.93%). However, no significant differences occurred between PRE and PST values of VO₂max (55.47 + 4.09 ml/kg/min vs 51.68 + 4.93 ml/kg/min), VT (72.42 + 6.30% vs 70.67 + 3.84%), and RPE (19.3 + 1.1 vs 18.8 + 2.9). Conclusion: While there were no significant differences in VO₂max from PRE to PST, there was a mean decline of 7.4% and TTE was significantly slower. Also, 7 out of 12 players had a reduction in their VO₂max values. The results of this study suggest that these athletes may have aerobically deconditioned during the season. Future studies should assess the various changes of aerobic capacity not just pre and post season, but also throughout the calendar year, including pre and post spring season soccer playing, in order to have a clearer understanding of how aerobic capacity may change during collegiate soccer player's year to year seasons (ie. freshmen to sophomore, etc.) which may help to determine what can be done to plan for these potential declines or at least reduce the severity of them.

P195: EFFECTS OF ALTITUDE ON ANAEROBIC POWER AND RECOVERY VARIABLES USING AN ATHLETIC COLLEGE POPULATION

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BACKGROUND: Altitude is known to have both negative acute and positive chronic adaptations on endurance athletes. Regarding anaerobic performance, there appear to be very few research studies that have evaluated the impact of altitude on single-bout, explosive, anaerobic activity. Therefore, the purpose of this study is to analyze the impact that altitude may have on power output, RPE, fatigue index, and recovery in an athletic collegiate population who are engaging in several high-intensity interval training (HIIT) sessions. **METHODS:** Twenty-five to 40 highly fit, college-aged subjects will be recruited for this study. Subjects will have their body fat percentage analyzed using an Inbody 770 Body Composition Analyzer and then they will complete a warmup protocol of 5 minutes of leg ergometry at an established workload of 60% of their maximal HR. Following this, in a counterbalanced order, each subject will undergo 5 trials of 15 seconds of intense leg ergometry, followed by 45 seconds of recovery, either at sea level or at a simulated altitude of 6000 feet. Ratings of perceived exertion (RPE) will be recorded after each interval, and twenty minutes post-session (ie. session RPE). Subjects will return 24-48 hours later and repeat the prior session's warmup and interval protocols. The perceived recovery status scale (PRS) will be implemented before every trial. Repeated measures ANOVA will be used to analyze maximal power output, fatigue index, and perceived exertion with an alpha level of 0.05 being utilized. **ANTICIPATED RESULTS:** We tend to believe there will be a significant difference in max power output, fatigue index, as well as perceived exertion between sea level and altitude. Due to the acute nature of this test, we do not expect there to be a significant difference in perceived recovery between the two groups.

P196: INCREASED CEREBRAL OXYGENATION DESPITE REDUCED STROKE VOLUME WITH PROLONGED LOAD CARRIAGE IN HYPOXIA

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BACKGROUND: Thoracic load carriage reduces stroke volume in normoxia; however, it is unknown whether this compromises oxygen delivery to the muscle or brain during exercise in hypoxia. Therefore, the purpose of this study was to determine the effects of load carriage on hemodynamics and oxygen kinetics during prolonged exercise in hypoxia. **METHODS:** In a single-blinded and randomized crossover design, healthy male subjects ($n=12$) performed 3 exercise tests on a treadmill consisting of the following conditions: 1) unloaded normoxic (UN: $F_{iO_2}=20.93\%$), 2) unloaded hypoxic stimulating 3,650 m (UH: $F_{iO_2}\sim 13\%$), and 3) loaded (~ 65 lb) hypoxic (LH). Exercise consisted of 45 min uphill (8%) walking at speeds individually customized to elicit an equivalent relative intensity in hypoxia ($64.0\pm 2.6\%VO_{2max}$) and absolute VO₂ across conditions (2.0 ± 0.2 L/min). Near-infrared spectroscopy, impedance cardiography, sphygmomanometry, and pulse oximetry were used to assess oxygen kinetics (i.e., muscle and cerebral oxygenated [O₂HHb], deoxygenated [HHb], and total hemoglobin [tHHb]), hemodynamics (i.e., cardiac output [Q], stroke

volume [SV], heart rate [HR], arterial blood pressure [SBP and DBP]), and oxygen saturation (SpO₂), respectively. Two-way repeated measures ANOVAs were employed with post hoc one-way ANOVAs (i.e., given interactions effects) to analyze differences between conditions ($\alpha=0.05$). **RESULTS:** In both hypoxic conditions, SpO₂ and Q were decreased and increased throughout exercise relative to UN ($p<0.05$). However, SV and HR were reduced and increased, respectively, with LH versus UH ($p<0.05$). Additionally, DBP was increased at 5 min with LH relative to the other conditions, but there were no other differences in arterial blood pressures. In muscle, hypoxia reduced O₂HHb throughout exercise relative to UN ($p<0.05$). Muscle HHb was increased until 20 min and throughout exercise with UH and LH vs. UN, respectively ($p<0.05$), with no differences between hypoxic conditions. Finally, cerebral HHb and O₂HHb were increased and decreased with UH versus UN throughout exercise ($p<0.05$). With LH, cerebral HHb was similarly elevated versus UN ($p<0.05$), but O₂HHb was similar and increased versus UN and LH, respectively, starting at 15 min ($p<0.05$). Moreover, tHHb was increased with LH relative to UN and UH starting at 15 min ($p<0.05$). **CONCLUSIONS:** Load carriage reduces cardiovascular efficiency in hypoxia. Nevertheless, muscle oxygenation is maintained while cerebral oxygenation and regional blood flow are increased relative to unloaded hypoxic exercise. This potential increase in cerebral perfusion may increase the risk for altitude illnesses. Grant or funding information: The Jackson Hope New Directions in Research grant funded this study.

P197: TELEHEALTH USE OF A NYSTAGMUS ANALYZER ALGORITHM

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BACKGROUND: Past Medical History: Patient, a 65-year-old female with a history of episodic vertigo, reported spinning sensations with the body movement to the right when she lays down or sits up from the bed. Medications: None. Allergies: None. **METHODS:** Physical Examination: A bedside clinical test revealed reports of vertigo during body movement to the right. The patient was seen for videonystagmography (VNG). The patient's VNG showed normal central ocular findings. During the Dix Hallpike maneuver right, the patient demonstrated rotatory nystagmus with the report of vertigo. Caloric tests revealed symmetric responses with no evidence of unilateral or bilateral weakness. The telehealth framework was utilized to capture video of the patient using a smartphone and uploaded on a cloud-based software application. The application had an artificial intelligence-based deep learning algorithm framework which calculated data points of the eye (i.e., nystagmus). Those data points were converted to beats per second in a graphical format and was analyzed by the physician/clinician and compared with the patient history. The interpretations were made and differential diagnosis was Benign Paroxysmal Positional Vertigo (BPPV) of right posterior semicircular canal. The physician/clinician generated a report. A separate report was generated which included the next steps of management and was sent to the patient. After a period, the patient again recorded the video and uploaded to the application. The audiologist was then able to monitor the progress and compare the diagnosis with past results. A generated progress report for the patient was sent with suggestions for the next steps of management. This biofeedback analysis assisted the audiologist in making consultation available to the people which are situated at a remote location. **CONCLUSION:** Final Working Diagnosis and Treatment included canalith repositioning, i.e., vestibular rehabilitation to move the canaloliths to halt incorrect signals for the treatment of BPPV. Outcome: Analytics from the software assisted the audiologist in making consultation available to the people which are situated at a remote location. The patient can benefit from convenient telemedicine visits, reducing travel and expenses gaining flexibility with the clinical or virtual use of the model. To some extent it can replace portions of traditional methods like electronystagmography, reducing costs and improving efficiency. Sponsor funding: Florida Atlantic University, College of Engineering and Computer Sciences; SMART Health Internal Grant, Telehealth Use of a Nystagmus Analyzer Algorithm (TUNAA).

P198: FITNESS FACILITIES AND TACTICAL OCCUPATIONS: IS IT NECESSARY TO HAVE AN ON-SITE EXERCISE FACILITY?

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BACKGROUND: Previous studies report that firefighters lacking an adequate level of physical fitness, even those classified as experts, can experience severe physiological challenge in unpredictable environmental conditions. In response, many firefighting departments spend from their limited budget to provide exercise opportunities for their members. The primary purpose was to assess if weekly exercise energy expenditure (EE) was impacted by whether or not the firefighters' department required them to perform a minimum amount of exercise per shift. The secondary purpose was to assess if EE was impacted by whether or not the firefighting department provided an on-site exercise facility or paid for a membership at a local fitness club. **METHODS:** 51 participants (46M, 5F) who are currently full-time members of career firefighting departments were sent an online survey through Qualtrics (Provo, UT) to self-report their daily exercise and nutrition habits. The survey included questions related to exercise habits over the previous two weeks as well as the exercise facilities and programs provided to the participant by their fire department where they are a registered member. These questions are from a standardized question set (National Health Interview Survey) developed and validated by the Centers for Disease Control (2012). The selected questions came from the Adult Physical Activity Questions subset, more specifically, the 1995 NHIS Year 2000 Objectives Supplement Questions Part E and Part C. The only adjustment to these questions was replacing the word "employer" with "fire department." **RESULTS:** 44 total participants completed the study. 20 participants reported that their department required exercise to be performed during their shift (ranged from 30-60 minutes) and 24 reported that exercise was not required to be completed during their shift. No significant differences in overall EE were exhibited between groups ($t = 0.637, p = .264$). 39 participants reported that their department provided an on-site fitness facility/gym to exercise in and 5 reported that their department provided a paid membership to a local health club. No significant differences in overall EE were exhibited between groups ($t = 0.933, p = .178$). **CONCLUSIONS:** Based on these preliminary results, it does not appear that on-shift exercise requirement or providing an on-site exercise facility significantly improved EE. It will be important to determine what monetary costs are being spent on buying and/or constructing an on-site exercise-specific facility versus what the cost is to provide a membership to a local fitness facility. Therefore, future studies should look closely at performing a monetary cost-benefit analysis of buying their own equipment versus paying for their members to have access to a local fitness facility.

P199: THE EFFECTS OF COOLING TOWELS ON EXERCISE PERFORMANCE AND PERCEPTUAL MEASURES

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Previous research has established that exercise in the heat and dehydration exacerbate the rise in internal body temperature while exercising, which often results in decreases in performance. Various cooling strategies, including the use of cooling towels, have demonstrated their effectiveness for improving exercise performance in hot environments. While many competitive athletes train and compete in the heat, many recreational athletes complete their exercise in a thermoneutral environment, such as an air-conditioned gym. Additionally, previous research has established that many people live in a chronically dehydrated state. The effectiveness of cooling towels in a thermoneutral environment when participants are dehydrated is currently unknown. Therefore, the purpose of this study was to investigate the effect of cooling towels on exercise performance and perceptual measures during moderate intensity exercise in aerobically trained dehydrated females. Four females (age = 23 ± 4 ; body mass = 65.5 ± 10.9) participated in this randomized, counterbalanced, crossover study. For both trials, participants arrived at the lab following a twelve-hour fluid restriction. Their first-morning urine was collected, and urine specific gravity (USG) and urine color were assessed (USG = 1.024 ± 0.005 ; Urine Color = 5 ± 1). Participants cycled on a cycle ergometer for 45 minutes, keeping their heart rate between 75-85% of their estimated heart rate max. In one trial, cooling towels (Mission Inc. New York, New York) were applied to the head, neck, and wrists from minutes 30 to 45 of the exercise bout. Total distance and perceptual thermal sensation were recorded every 5 minutes throughout exercise. Total distance ($p = 0.870$) was not

different between the trials. Perceptual thermal sensation was significantly lower for 15 minutes after application ($p < 0.001$). In conclusion, the use of multi-site cooling towels did not enhance exercise performance but did improve thermal sensation in a thermoneutral environment.

P200: SLEEP TIMING AND VARIABILITY: ASSOCIATIONS WITH OTHER COMPONENTS OF THE 24-HOUR ACTIVITY CYCLE

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Background: Sleep, sedentary behavior (SED), and physical activity (PA) comprise the 24-hour activity cycle (24-HAC). Whether sleep timing or its variability are associated with SED and PA is unknown. This study examined associations between objectively measured sleep timing and variability with objective estimates of the other 24-HAC components (SED, light intensity PA [LPA], and moderate to vigorous intensity PA [MVPA]).

Methods: University students ($n=103, 20.2 \pm 1.6y, 66\%$ female, 66% white non-Hispanic) wore a 1) ActiGraph GT9X on the wrist, 2) activPAL3 on the thigh, and 3) ActiGraph GT3X on the hip for 7-10 days to capture habitual sleep, SED and LPA/MVPA, respectively. All participants had complete 24-HAC data from at least four weekdays and two weekend days. Times in and out of bed were derived by combining data from sleep logs, primary lying times from the activPAL3, and sleep bouts from the GT9X. The average sleep midpoint was used as an indicator of sleep timing and the standard deviation of the midpoints indexed sleep timing variability. General linear models estimated sex and sleep duration adjusted associations between sleep midpoint and sleep variability with other 24-HAC behaviors. Estimated changes in 24-HAC behaviors per one-minute increase in sleep metric (β), semipartial omega square (ω^2) effect sizes, and p-values are presented.

Results: Mean \pm SD values for key measures were: sleep duration (452.4 ± 66.3 min), sleep midpoint ($5:00$ am $\pm 1:27$ hr:min), sleep variability (58.4 ± 24.2 min), SED (622.8 ± 94.6 min), LPA (305.5 ± 74.6 min), and MVPA (59.4 ± 35.0 min). Adjusted associations between sleep midpoint and 24-HAC behaviors were significant for SED ($\beta=0.294, \omega^2=.063, p=.002$) and LPA ($\beta=-0.227, \omega^2=.055, p=.001$) but not MVPA ($\beta=-.072, \omega^2=.022, p=.062$). Adjusted associations between sleep variability and 24-HAC behaviors were only significant for MVPA ($\beta=-.379, \omega^2=.057, p=.006$). These associations persisted when both sleep midpoint and sleep variability were jointly modeled with minimal changes to model estimates.

Conclusions: In a sample of university students, independent of sleep duration, later sleep times were associated with increased SED and decreased LPA while greater variability in sleep timing was associated with decreased MVPA. Future experiments should examine if these relationships are causal.

P201: ASSOCIATION OF TRAIL USE, PHYSICAL ACTIVITY, AND MENTAL WELL-BEING IN A RURAL TENNESSEE COUNTY

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BACKGROUND: McMinn County residents report a greater number of poor mental and physical health days/month and a higher rate of physical inactivity compared to the average Tennessee state resident. Recent evidence finds that trail users report higher physical activity (PA) levels and greater well-being (WB) than trail non-users. The purpose of this study was to assess how trail use may impact PA and mental WB in a rural Tennessee county. **METHODS:** Self-report surveys were accessed by McMinn County trail users via a QR code on signage (12 signs) placed along the community trail system or via a link shared through local social media pages. Questions assessed general health, trail use, and PA behaviors. Mental WB was assessed using the 7-question Short Warwick-Edinburgh Mental Wellbeing Scale. Descriptive statistics summarized survey responses. Additionally, t-tests and chi-square analysis compared trail users poor mental and physical health days/month, and overall health status to McMinn County level data. **RESULTS:** Of the 127 survey respondents included in the analysis, most were female (68.5%), white (92.1%), and college graduates (63.0%). The mean age of respondents was 47.3 ± 15.5 years with a mean body mass index of 28.2 ± 5.9 kg/m². Overall, 78.0% of respondents lived within 15-min of their primary trail, but only 9.4% used active transportation to access the trail. When on the trail (average of 8.8 ± 7.0 days/month and 77.6 ± 38.1

minutes/visit), walking was the most popular activity (63.8%), followed by running (18.1%) and cycling (13.4%). 77.2% of respondents met the recommended 150 minutes/week of moderate-intensity aerobic PA, with only 15.0% reporting low mental WB. Trail users experienced fewer poor mental health days/month (5.1 vs 3.9, $p=.08$), fewer poor physical health days/month (3.8 vs 2.4, $p=.01$), and a lower proportion reported poor or fair health (17.0% vs 12.6%, $p=.24$) compared to McMinn County data. CONCLUSIONS: These trails contribute towards meeting the PA guidelines and to positive physical and mental health benefits for those who use them. Trail use should be promoted as a way to obtain physical and mental health benefits. Future research should compare trail users and trail non-users to better quantify the impact of trail use on PA and WB.

P202: OBJECTIVELY MEASURED PHYSICAL ACTIVITY DIFFERENCES IN YOUNGER VS OLDER COLLEGE STUDENTS

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BACKGROUND: Surprisingly little research exists examining the objective physical activity (PA) of college students. Previous research from our laboratory found daily step averages of approximately 8800 steps per day while averaging 60 minutes of moderate-to-vigorous intensity physical activity (MVPA) per day in a sample that consisted of all levels of college students. Yet to be examined is whether there is a difference in these values depending on time spent on campus of a residential university. Therefore, the purpose of this study was to examine the difference in PA between newer college students and those who are older and have more experience at a residential university setting. **METHODS:** Male ($n = 46$) and female ($n = 91$) college students (age = 20.3 ± 1.7 ; BMI = 24.5 ± 4.5) underwent 7-day objective PA assessment via ActiGraph accelerometer. Independent sample t-tests were used to assess mean differences in PA between students less than 20 years of age and those 20 years and older. **RESULTS:** Students 20+ years ($n = 90$) took fewer steps per day (8648.1 ± 2739.1 vs. 10897.0 ± 3764.8 , $P < 0.001$), and accumulated fewer minutes of MVPA per day (56.1 ± 22.5 vs. 80.2 ± 33.3 , $P < 0.001$) than students less than 20 years ($n = 47$). There was no difference in the number of sedentary minutes accumulated per day (773.8 ± 165.1 and 782.6 ± 156.1 for older and younger respectively; $P = 0.7$) or light intensity PA minutes (237.3 ± 66.7 and 248.5 ± 66.6 ; $P = 0.35$). Body weight or BMI did not differ between groups. **CONCLUSION:** Our findings indicate a substantial divergence in daily step count and MVPA between older and younger college students. Although the precise determinants of this gap remain elusive, our findings suggest that housing arrangements may play a pivotal role. Older college students tend to reside off-campus and depend more on motor vehicles for commuting to campus, while their younger counterparts predominantly live on-campus, resulting in increased PA through active commuting between dormitories, classes, dining facilities and other campus activities.

P203: PERCEIVED HEALTH BENEFITS OF LEISURE-TIME TRAIL USE IN A RURAL TENNESSEE COUNTY

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BACKGROUND: Understanding the perceived health benefits of being active on recreational trails may provide useful information to policymakers regarding the benefits of local trails to rural community members. The purpose of this study was to determine the perceived health benefits among users of recreational trails in a rural Tennessee county. **METHODS:** Self-report surveys were accessed by McMinn County trail users via a QR code on signage (12 signs) placed along the community trail system or via a link shared through local social media pages. The 13-item Perceived Health Outcomes of Recreation Scale (PHORS) was used to assess perceived health benefits of leisure-time trail use related to three subdomains: 1) improved condition (IMPV), 2) prevention of worse condition (PREV), and 3) realization of a satisfying psychological experience (PSYC). Answer options for the survey range from "1 = never like me" to "7 = very much like me". Independent t-tests and ANOVA were used to compare perceived health benefits of trail use by gender, age (18-34, 35-44, 45-64, 65+), primary trail activity (walking, running, cycling), and primary trail used (Eureka, Athens Regional, or Veterans). **RESULTS:** Of the 116 respondents included in the analysis, most were female (68.1%), white (92.2%), and college graduates (63.8%). The mean age of respondents was 46.2 ± 15.2 yrs of age with a mean body mass index of 28.1 ± 5.8 kg/m². They averaged 10.9 ± 7.6 days per month on the

trails and the primary trail activity was walking (64.7%). Perceived health outcomes did not differ between females and males (IMPV: 6.64 vs 6.41, PREV: 6.07 vs 5.98, and PSYC: 6.08 vs 5.77). Those 65+ had a significantly higher PSYC score than those 45-64 ($M=6.44$ vs 5.66 , $p=.03$). Cyclists, although not significant, scored higher on all PHORS subdomains compared to walkers and runners. Those who primarily used the Eureka trail had a significantly greater IMPV score than Athens Regional trail users ($M=6.68$ vs 6.32 , $p=.03$). CONCLUSIONS: Perceived health benefits of recreational trail users was high with minimal differences by gender, age, primary trail activity, or primary trail. These high scores likely reflect the importance trails have for improving health in rural areas with less accessibility to exercise opportunities. Future research should investigate if perceived health benefits of trail use in rural areas are associated with measured health outcomes.

P204: USAGE PATTERNS, PERCEIVED HEALTH EFFECTS, AND QUALITY OF LIFE AMONG YOUNG ADULT ELECTRONIC CIGARETTE USERS

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BACKGROUND: Electronic cigarettes (EC) are devices that deliver nicotine and other substances by heating a liquid solution to produce an aerosol that is inhaled. Popularity of EC use among college students and young adults has increased dramatically over the last decade, with a scarcity of research investigating the potential deleterious impact on health and well-being. Identifying associations between EC use, perceived health effects, and health-related quality of life (HRQoL) may provide valuable insights into lifestyle factors and conditions linked to EC use in young adults. **METHODS:** Targeted social media advertising was used to collect a convenience, respondent-driven sample of EC users. Subjects (ages 21-45 years) completed an online questionnaire that included measures of tobacco and EC use, perceived health effects, HRQoL assessed using the brief version of World Health Organization Quality of Life (WHOQOL-BREF), and sociodemographic factors. **RESULTS:** Survey respondents were predominantly young adults, 67% of whom identified as former cigarette smokers. Former smokers (62%) reported perceiving EC use as less harmful than tobacco cigarettes, compared to 30% of current smokers ($p=.010$). The majority (92.4%) of participants reported at least one adverse health effect attributable to EC use. WHOQOL-BREF scores were as follows: overall QOL (63.32 ± 20.45), physical health (60.44 ± 9.74), psychological well-being (60.51 ± 11.30), social relationships (64.31 ± 16.31), and environment (64.91 ± 12.97). The linear combination of QOL scores was significantly different based on smoking status ($p=.008$). **CONCLUSIONS:** The present study contributes to the limited literature on the associations of EC use with perceived health and HRQoL, especially in young adult populations. These associations may also identify groups most likely in need of targeted interventions to reduce health-related inequalities.

P205: EPIDEMIOLOGICAL COMPARISON OF INJURIES BETWEEN A NAIA MEN'S AND WOMEN'S SOCCER PROGRAM

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BACKGROUND: Previous research comparing injury rate differences among NCAA Injury Surveillance Program (ISP) and one NAIA women's soccer program (Truett McConnell University (TMU)) found remarkable injury risk among the NAIA soccer players. Greater attention has been placed on injury prevention and strength and conditioning as a result. The purpose of this study was to examine the sex differences between male and female soccer players at TMU for the 2021-2022 and 2022-2023 seasons. The findings can bring more awareness to injuries among soccer players and the need for injury prevention programs. **METHODS:** An epidemiological study was conducted to investigate injury rates between men and women's soccer at TMU, to investigate the difference of injury rates between women's soccer seasons 2021-2022 and 2022-2023; and, to investigate the difference of injury rates between men's soccer seasons 2021-2022 and 2022-2023. Injury data was collected by a staff certified athletic trainer (AT) from TMU using CSMI SportsWare Online. The study identified incident rate ratios (IRR) by finding the total number of knee injuries divided by the total number of athlete-

exposures (AEs). The study compared the IRR of men's and women's soccer, compared the IRR of women's soccer during the 2021-2022 and 2022-2023 seasons; and, compared the IRR of men's soccer during the 2021-2022 and 2022-2023 seasons. RESULTS: The rate of injury in women's soccer was higher in both regular seasons. Women's soccer IRR (1.625/1,000 AE) compared to the men's soccer at TMU (0.615/1,000 AEs) for the 2021-2022. The rate of injury in women's soccer was higher (1.357/1,000 AEs) compared to the rate of injury in men's soccer (0.073/1,000 AEs) for the 2022-2023 season. The rate of injury in women's soccer at TMU for the 2021-2022 season was higher (1.188/ 1,000 AEs) compared to the rate of injury of women's soccer for the 2022-2023 season (0.842/1,000 AEs). The rate of injury in men's soccer at TMU for the 2021-2022 season was higher (1.75/1,000 AEs) compared to the injury rate of men's soccer for the 2022-2023 season (0.571/1,000 AEs). CONCLUSIONS: During the 2022-23 academic year a certified strength and conditioning specialist was hired at TMU and the IRR for both teams dropped. The rate of injury of women's soccer was however almost twice as high as the injury rate of men's soccer at TMU for the seasons 2021-2022 and 2022-2023. The rate of injury among men and women's soccer during the season 2021-2022 was almost twice as high as the injury rate among men and women's soccer during the season 2022-2023. The results of this study highlights the need for injury prevention programs among both men and women's soccer players at TMU and soccer in general due to the physical nature of the sport.

P206: THE IMPACT OF SELF-EFFICACY ON BMI AND CHRONIC PAIN IN OLDER ADULTS: THE MORPH TRIAL

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Background & Objective: Pain is a pressing health concern that powerfully affects quality of life. One input to pain is body weight, which can affect pain through both mechanical loading and inflammation. A key input to dietary weight loss is self-efficacy, and herein we present for the first time the longitudinal relationships between self-efficacy and BMI in older adults with chronic pain. **Methods:** Participants were enrolled in the 12 week MORPH randomized control trial that focused on reducing pain and improving health in a group of 25 older adults (76% female, 70.41±4.76 years of age). Intervention participants attended weekly group sessions primarily via videoconference focused on nutrition, mindfulness, and community interaction. Participants self-monitored body weight and activity patterns via a smartphone app that integrated data from a smart scale and activity monitor. Control participants received the scale and monitor to account for any impact of device provision on health behaviors. **Results:** A linear regression demonstrated that group assignment and increases in self-efficacy for managing eating were independently associated with reductions in BMI over 12 weeks ($p=.018$ and $p=.035$ respectively). Improvements in self-efficacy were also associated with reductions in pain intensity ($p=.032$). **Conclusion:** In the long-term, we hope to better equip individuals with tools to improve their lifestyle and in turn better the health of the country. These results underscore the importance of enhancing self-efficacy related to key health behaviors for managing body weight and pain in older adults with chronic pain.

P207: ONLINE SPANISH PAIN COPING SKILLS TRAINING FOR PATIENTS WITH CANCER PAIN: A PILOT TRIAL

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Background: Cancer is the leading cause of death among Hispanic/Latine populations in the United States. Spanish-speaking patients routinely experience disparities in cancer-related care, particularly pain management. Compared to other racial/ethnic groups, Hispanic/Latine patients report greater levels of pain and have lower access to suitable treatments, which may contribute to medication misuse, mental health challenges, and diminished quality of life. Anxiety and depression are known to negatively impact patient prognoses and pain outcomes, and Hispanic/Latine patients may be at greater risk for anxiety and depression due to the many barriers that they face in accessing evidence-based Spanish-language cancer care. Language barriers are a key challenge limiting compliance with cancer and pain treatments: there is a need for affordable, accessible and culturally- and linguistically appropriate cancer-pain interventions. **Methods:** In collaboration with Hispanic/Latine community groups, advisory boards, advocates, and bilingual health experts, we followed a community-engaged and culturally-informed process to adapt a

validated online pain coping skills training (PCST) intervention (*painTRAINER*) for Spanish speakers. The resultant program (*painTRAINER en Español*) includes 8 weekly PCST modules (45 minutes each) led by a virtual coach who guides patients as they develop, practice, and master pain coping skills. The purpose of this study is to pilot test *painTRAINER en Español* among n=40 Hispanic/Latine cancer survivors (including those with active but stable cancer) who have persistent cancer-related pain. Primary outcomes will be collected pre- and post-intervention and include feasibility, acceptability, and preliminary efficacy for the management of pain severity and pain interference. Anxiety and depression will be assessed to determine their influence on pain coping and change in pain outcomes, and qualitative interviews will be conducted to better capture patient perceptions and experiences. **Anticipated Results:** We hypothesize that the program will be feasible and acceptable to Spanish speakers and will demonstrate preliminary efficacy to support its use in the management of pain. To date, 27 participants have enrolled. 75% of participants are breast cancer survivors and 100% are native Spanish speakers. Completion of primary outcome data is anticipated by December 1, 2023.

P208: TELEHEALTH HIGH-INTENSITY INTERVAL EXERCISE AND CARDIOMETABOLIC HEALTH IN SPINAL CORD INJURY TELEHEALTH HIGH-INTENSITY INTERVAL EXERCISE AND CARDIOMETABOLIC HEALTH IN SPINAL CORD INJURY

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PURPOSE: Recent studies have shown that high intensity interval training (HIIT) can improve cardiometabolic health in individuals with spinal cord injury (SCI). Individuals with SCI experience a number of barriers when participating in exercise; such as lack of time, accessible equipment and facilities, and transportation. It is imperative to identify modes of exercise that can promote adherence and improve cardiometabolic health while requiring low time commitment. Studies have demonstrated that HIIT can provide similar improvements in cardiometabolic health while only requiring 20% of the overall total time commitment compared to prolonged moderate intensity exercise (MIT) in non-disabled individuals. More recently, telehealth interventions have been shown to increase accessibility to exercise participation. Thus, the purpose of this study is to assess the changes in cardiometabolic and physical health following 16-weeks of home-based telehealth HIIT arm crank exercise in individuals with SCI. **METHODS:** Participants were randomly assigned to 16 weeks of HIIT arm crank exercise training or a no-exercise control group. Body composition, resting energy expenditure (REE), blood lipids, insulin sensitivity, blood pressure, aerobic capacity (VO₂ max), and muscular strength and endurance were assessed at baseline and at 16 weeks post intervention.

RESULTS: Eight participants (5 male, 3 female; n=3 in control, n=5 in HIIT exercise; mean age 52.7 ± 10.2) with longstanding SCI completed the study. Due to the small samples size we were not able to assess statistical changes between groups, however there were clinically meaningful improvements in resting energy expenditure (11.6%), VO₂max (17.2%) and insulin sensitivity (50%) following completion of the telehealth HIIT program.

CONCLUSION: This study showed improvements in resting energy expenditure, VO₂ max, and insulin sensitivity following 16-weeks of telehealth arm crank HIIT exercise. We were able to demonstrate that a home based HIIT program could be delivered safely, led to high adherence, was well tolerated, and improved cardiometabolic health in individuals with SCI.

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P209: EFFECTS OF DAILY EXERCISE AND WINE INGESTION ON GLYCEMIC CONTROL IN INSULIN-RESISTANT PARTICIPANTS

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BACKGROUND: Ethanol increases insulin secretion in response to ingested carbohydrates and exercise enhances insulin sensitivity; therefore, we tested the hypothesis that the combination of wine and exercise would enhance glycemic control in insulin-resistant participants. **METHODS:** Ten participants (7 female, 3 male; 4 with type 2 diabetes, 6 with pre-diabetes) completed four different 1-week treatment periods consisting of no alcohol and no exercise (CON), daily

red wine (14 g ethanol) with dinner and no exercise (WINE), no alcohol and daily exercise (60 min at 55% heart rate reserve; EX), 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 record blood glucose data. **RESULTS:** Average blood glucose levels over each 3-day period were 132 ± 5.3 , 132 ± 4.6 , 123 ± 4.7 , 123 ± 6.6 mg/dl for CON, WINE, EX, and WINE + EX treatments, respectively. Exercise lowered average glucose level ($p = 0.01$). The percentage of time with blood glucose higher than 130 mg/dl was $50 \pm 7.7\%$ for CON, $48 \pm 8.8\%$ for WINE, $32 \pm 7.7\%$ for EX, and $36 \pm 8.2\%$ for WINE + EX, indicating a significant effect for exercise ($p = 0.01$). Average overnight glucose (12:00AM-5:00AM) was measured at 128.9 ± 7.0 , 128.3 ± 6.3 , 124.7 ± 4.5 , 118.0 ± 7.1 mg/dl for CON, WINE, EX, and WINE + EX treatments, respectively. Neither exercise nor wine had a significant effect on average overnight glucose level ($p = 0.13$). **CONCLUSIONS:** These results suggest that one week of exercise lowers both average blood glucose levels and the fraction of time spent above 130 mg/dl in this group of insulin-resistant participants. There was no significant effect on average overnight glucose. Daily wine consumption did not affect glycemic control.

P210: EXPLORING THE RELATIONSHIP BETWEEN MIGRAINES, BLOOD FLOW, AND OCULOMOTOR DYSFUNCTION

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BACKGROUND: Migraines are a neurovascular disorder that causes extreme headaches, autonomic nervous system dysfunction, and sometimes aura. The purpose of this study is to assess how migraines, with and without visual aura, affect blood flow in the brain as well as oculomotor controls. **METHODS:** Participants who were healthy (H, $N=13$), and had migraines without aura (MO, $n=14$), and migraines with auras (MA, $n=13$) (completed two trials of oculomotor tests while simultaneously recording oxyhemoglobin and deoxyhemoglobin levels through an fNIRS system. The fNIRS data was filtered with a lowpass filter of 0.1 and obtained through Oxysoft. Visual motor control, including horizontal, vertical, and circular smooth pursuit, was assessed with a RightEye system. An univariate analysis ($p < .05$) was conducted to examine differences between groups for both fNIR and eye data. **RESULTS:** There were no significant findings in the frontal lobes between groups. However, the right and left temporal lobes showed a significant difference in total hemoglobin (mg/dL) between the H and the MA group ($p = .0045$). There was no difference between the MO and MA groups in the temporal lobes. Significant difference in efficiency error (≥ 7 mm off from the target location) in both the vertical and circular smooth pursuit between the H and MA groups ($p = 0.034$; $p = 0.012$, respectively). **CONCLUSIONS:** People who suffer from migraines with aura presented decreased efficiency in 2 out of the 5 oculomotor tasks when compared to a healthy group as well, and a group of migraine suffers with no aura. Additionally, the MA group presented decreased blood flow in the temporal regions of the brain when compared to the other groups.

P211: IMPACT OF CANCER TREATMENT ON PULSE WAVE VELOCITY IN CANCER SURVIVORS: A META-ANALYSIS

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BACKGROUND: Cancer survivors are at an increased risk of morbidities, including cardiovascular diseases (CVD). Chemotherapy and radiation have been correlated with cardiotoxicity. However, the magnitude of these effects and ways of mitigating them are unclear. Arterial stiffness (AS) has been established as a strong predictive measure of CVD risk. Pulse wave velocity (PWV) is a gold-standard non-invasive methodology to measure AS. Therefore, the objective of this meta-analysis was to measure the effects of cancer treatment on PWV in cancer survivors. **METHODS:** Electronic databases were searched from inception through April 2023. The following criteria were used to select trials for inclusion in this review: (i) English language, (ii) human studies, (iii) adults, (iv) cancer patients/survivors, (v) inclusion of cancer treatment, (vi) inclusion of at least two PWV measurements (pre- and post-treatment). Out of 127 identified articles, these criteria were met by 20 articles (24 trials). Extracted data included bibliographic information, participant characteristics, and PWV measurement details. **RESULTS:** Cancer treatment was

associated with a significant increase (worsening) in PWV ($\mu=0.63$ m/s, 95% CI: 0.35, 0.92, $k=21$, $p < 0.01$). Sub-group analysis did not reveal any effects on PWV by device ($p=0.15$) or site ($p=0.36$). However, there was a significant moderator effect for cancer type ($p=0.05$), with breast cancer survivors having significant decreases ($\mu=-0.94$ m/s, 95% CI: -1.84, -0.04, $k=6$, $p=0.04$) and acute lymphoblastic leukemia survivors having significant increases ($\mu=1.0$ m/s, 95% CI: 0.16, 1.84, $k=1$, $p=0.02$) in PWV. Additionally, there was a significant effect of time between pre- and post-treatment visits on PWV ($p=0.05$). Trials ≤ 12 weeks resulted in a significant increase in PWV ($\mu=0.57$ m/s 95% CI: 0.012, 1.126, $k=6$, $p=0.05$) whereas trials >13 weeks resulted in a non-significant increase in PWV ($\mu=0.32$ m/s, 95% CI: -0.013, 0.647, $k=11$, $p=0.06$). **CONCLUSIONS:** Cancer treatment increases PWV and has negative effects on AS. Coupled with low levels of physical activity and high levels of sedentary behavior, cancer treatment plays a role in the heightened CVD risk seen in cancer survivors. The interaction between these sub-optimal lifestyle behaviors and cancer treatment remains unknown. Further research is needed to identify effective interventions to mitigate their negative cardiovascular effects.

P212: TUMOR-SUPPRESSIVE AND MYOPROTECTIVE EFFECTS OF VOLUNTARY WHEEL RUNNING IN C26 ADENOCARCINOMA BEARING MICE

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BACKGROUND: Up to 80% of cancer patients suffer from cancer cachexia, an often-fatal wasting syndrome characterized by severe muscle wasting. Due to the lack of diagnostic criteria, most patients progress undetected to late stages of cancer cachexia and become unresponsive to traditional treatment. Exercise can slow the development of cancer-mediated muscle wasting. However, the most beneficial modality of exercise as a protective measure against cancer cachexia and the underlying molecular pathways remain understudied. **PURPOSE:** To determine if voluntary wheel running can protect against cancer-mediated skeletal muscle wasting and identify affected molecular pathways. **METHODS:** Male Balb/c mice were randomly separated into four groups, sedentary non-tumor bearing (SED+NT), sedentary tumor bearing (SED+T), wheel run non-tumor bearing (WR+NT), and wheel run tumor bearing groups (WR+T). T groups were implanted with tumor cells (5×10^5 C26 adenocarcinoma cells in flank), while NT groups remained non-tumor for 4 weeks. During the 4 weeks, WR groups had unlimited access to running wheels while SED mice remained sedentary. Total distance run (km) was measured throughout the activity period. Body weight, grip strength and tumor evaluations were taken at baseline and sacrifice. After 4 weeks, muscle, spleen, and tumor tissue were collected and weighed. To determine underlying molecular pathways, gastrocnemius tissue was analyzed via Western Blotting. **RESULTS:** Tumor bearing resulted in an 11% decline in body mass ($P < 0.05$), indicating progressive cancer cachexia. WR+T mice did not experience a significant decline in body mass over time. Tumor bearing also resulted in a 15% decrease in grip strength ($P < 0.05$) but was preserved in exercised mice. Exercise-mediated protection of skeletal muscle coincided with lower expression of muscle wasting-associated proteins Atrogin1, MuRF1, GDF15 and GDF8/11 in WR+T compared to SED+T mice. Wheel running resulted in a 48% decrease in tumor mass and a 63% decrease in tumor volume compared to SED tumors ($P < 0.05$). **CONCLUSIONS:** Data of this study provide evidence of tumor-suppressive and myoprotective effects of wheel running exercise against cancer-mediated skeletal muscle wasting. Exercise seems to protect muscle mass and function, regulate molecular muscle wasting pathways, and stunts tumor growth. These findings are crucial in identifying the significance of exercise as a non-pharmacological, protective measure against cancer cachexia.

P213: HIGHER BODY FAT PERCENTAGE, FAT MASS, AND TOTAL MASS NEGATIVELY CORRELATED WITH PHYSICAL ACTIVITY AND SLEEP IN ENDOMETRIAL CANCER SURVIVORS

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Background: Obesity is strongly associated with endometrial cancer (EC), with ~60% of EC cases attributed to excess adiposity. Moreover, as rates of obesity increase in the US, EC incidence is expected to continue to rise. Poor 24-hour activity behaviors [24-ABS (moderate-to-vigorous physical activity (MVPA), sedentary behavior (SB), and sleep)] may contribute to obesity rates; however, associations have

been inconclusive in EC. Literature reports varying degrees of associations with MVPA/SB and sleep data are limited. Purpose: To investigate the relationship between body composition and 24-ABs in EC survivors. Methods: Stage 1 ECS, <12 months post-treatment, BMI ≥ 25.0 kg/m², age 50-80 years, were recruited. Body composition [body fat percentage (%), fat mass (kg), lean mass (kg)] was measured via bioelectrical impedance analysis. 24-ABs were measured for 7 days via accelerometry (MOX). Spearman's correlation was used to investigate the relationship between body composition and 24-ABs. Descriptive statistics are reported as mean \pm standard deviation. Results: Seventeen EC survivors (65% White, 25% Black, 5% Asian, 5% American Indian, 64 \pm 7 years old, 6 \pm 4 months post-treatment) participated in the study. On average, participants had body fat: 43.4 \pm 6.28 %, fat mass: 39.2 \pm 13.1 kg, lean mass: 49.5 \pm 5.8 kg, MVPA: 173 \pm 147 minutes/week, SB: 11.0 \pm 4.6 hours/day, sleep: 8.2 \pm 1.9 hours/day. There were negative correlations between body fat % and MVPA (r_s : -0.514, p = 0.035), fat mass and sleep (r_s : -0.574, p = 0.016), lean mass and sleep (r_s : -0.485, p = 0.049) and total mass and sleep (r_s : -0.572, p = 0.016). Body composition and SB were not correlated. Discussion: There are two key take aways from this preliminary analysis. 1) As hypothesized, higher body fat % was correlated with lower MVPA, this suggests that future interventions should target EC survivors with increased body fat %. 2) Higher fat mass and total mass was correlated with less sleep, as was lean mass although the implications of this latter finding are presently unclear. EC survivors may benefit from sleep interventions that have the potential to decrease as inflammation and may also be more amenable to change than MVPA, but needs to be tested in future intervention.

P214: INTERNATIONAL CRITERIA EKG INTERPRETATION COMPARISON STUDY

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BACKGROUND: There has been an evolution of athlete specific Electrocardiogram (EKG) criteria over the years, resulting in improved specificity and lower false positive rates, starting with the European Society of Cardiology 2005 guidelines and most recently with the current 2017 International Recommendations. The consistency of EKG interpretation with the 2017 International Criteria have been compared between various groups, including local and specialized center physicians. Whether novice EKG interpreters (undergraduate/graduate students) can be taught to accurately interpret athletes' EKGs with the 2017 International Criteria has not been extensively studied. This study seeks to assess the accuracy and variability of novice EKG interpreters, compared to cardiologist interpretations and expert readers. **METHODS:** Two novice EKG interpreters (undergraduate exercise science students) were trained in interpreting EKGs of athletes with the 2017 International Criteria during one semester under the instruction of an expert reader. During an annual high school, sports screening day 1350 EKGs were collected and assigned a corresponding number. The on-site cardiologists evaluated the EKGs in real-time and classified as "normal" or "abnormal" according to the International Criteria. Following the sports physical day, two novice EKG interpreters (students), a cardiologist and an Exercise Physiology Professor (expert reader) were asked separately to classify the same EKGs as "normal" or "abnormal" according to the International Criteria. All readers were blinded to the initial classifications made by the cardiologist during the sports physical event. Information regarding the athlete's age, gender, race/ethnicity, and sport was provided on the EKGs. We assessed the agreement between the cardiologist, expert reader and students in interpreting EKGs using Fleiss' kappa analysis. **RESULTS:** 1350 athlete EKGs (males = 879; females = 471, age (mean \pm SD) 15.09 \pm 1.3y) including 37 (2.7%) abnormal cases were reviewed. The inter-rater agreement between novice readers, expert reader, and physicians in classifying an EKG as abnormal was good (k = 0.7, p < .001). **CONCLUSION:** This study demonstrated that novice EKG readers could correctly classify EKGs based on the International Criteria as "normal and abnormal" to identify athletes at high risk of acute cardiovascular events.

P215: PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR LEVELS AND PATTERNS IN ADULTS WITH AND WITHOUT DOWN SYNDROME

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BACKGROUND: Low physical activity (PA) and high sedentary behavior (SB) levels in adults with Down syndrome (DS) have been evaluated with accelerometer cut-points for adults without DS. This study examined if levels and patterns of PA or SB differed between adults with and without DS when using population specific accelerometer cut-points. **METHODS:** Twenty-eight adults with DS (age 37 \pm 11 years) and 56 adults without DS (age 29 \pm 11 years) had PA and SB measured by hip worn accelerometer (wGT3X-BT, Actigraph). We scored accelerometer data using the following cut-points (DS: Sedentary ≤ 237 counts \cdot min⁻¹, Light ≤ 2166 counts \cdot min⁻¹, Moderate-to-vigorous (MVPA) ≥ 2167 counts \cdot min⁻¹; Non-DS: Sedentary ≤ 199 counts \cdot min⁻¹, Light ≤ 2690 counts \cdot min⁻¹, MVPA ≥ 2691 counts \cdot min⁻¹). The following thresholds were used for number and duration of SB and PA bouts: ≥ 1 , ≥ 10 , ≥ 30 , and ≥ 60 min. We used independent samples t-tests to determine differences between adults with and without DS for SB and PA variables. **RESULTS:** Adults with DS had less sedentary time (DS: 338 \pm 96 min \cdot day⁻¹; Non-DS: 502 \pm 113 min \cdot day⁻¹; p < .001), more light PA (DS: 330 \pm 93 min \cdot day⁻¹; Non-DS: 287 \pm 72 min \cdot day⁻¹; p = .012), and more MVPA time (DS: 95 \pm 49 min \cdot day⁻¹; Non-DS: 52 \pm 28 min \cdot day⁻¹; p < .001) than adults without DS. Adults with DS had more ≥ 1 min (DS: 53 \pm 10 bouts \cdot day⁻¹; Non-DS: 44 \pm 8 bouts \cdot day⁻¹; p < .001), and less ≥ 10 min (DS: 14 \pm 5 bouts \cdot day⁻¹; Non-DS: 17 \pm 3 bouts \cdot day⁻¹; p = .002), ≥ 30 min (DS: 2 \pm 2 bouts \cdot day⁻¹; Non-DS: 5 \pm 2 bouts \cdot day⁻¹; p < .001), and ≥ 60 min SB bouts (DS: .5 \pm .4 bouts \cdot day⁻¹; Non-DS: 1 \pm 1 bouts \cdot day⁻¹; p < .001) than adults without DS. Adults with DS had shorter ≥ 1 min (DS: 8 \pm 2 min \cdot bout⁻¹; Non-DS: 13 \pm 5 min \cdot bout⁻¹; p < .001) and ≥ 10 min SB bouts (DS: 21 \pm 6 min \cdot bout⁻¹; Non-DS: 26 \pm 7 min \cdot bout⁻¹; p < .001) than adults without DS. Adults with DS had more ≥ 1 min (DS: 35 \pm 13 bouts \cdot day⁻¹; Non-DS: 22 \pm 9 bouts \cdot day⁻¹; p < .001) and ≥ 10 min PA bouts (DS: 2 \pm 2 bouts \cdot day⁻¹; Non-DS: 1 \pm 1 bouts \cdot day⁻¹; p < .001), and longer ≥ 1 min (DS: 3 \pm 1 min \cdot bout⁻¹; Non-DS: 2 \pm 1 min \cdot bout⁻¹; p = .003), but shorter ≥ 10 min PA bouts (DS: 15 \pm 3 min \cdot bout⁻¹; Non-DS: 19 \pm 9 min \cdot bout⁻¹; p = .010) than adults without DS. **CONCLUSION:** Adults with DS engage in shorter sedentary bouts than adults without DS that are interrupted by short bouts of PA. Structured activities at group homes and day programs may contribute to more breaks in SB observed among adults with DS. Funding: MSU ORED and I'm An Athlete Foundation

P216: BETTER THAN AVERAGE: PHYSICAL EDUCATION REQUIREMENTS IN NORTH AND SOUTH CAROLINA'S TERTIARY INSTITUTIONS

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BACKGROUND: Physical education requirements (PERs) in college help students learn and practice healthy lifestyle habits. During the 1920s/30s, 97% of colleges/universities required their students to take some form of physical activity/education course. Since then, a downward trend has been observed, with the most recent national data showing that only ~32% of U.S. colleges/universities mandate full PERs today. The purpose of the study was to examine and compare the status of PERs in North and South Carolina's 4-year higher education institutions. **METHODS:** Institution's academic catalogs were obtained via their respective websites and searched for PER information. Institutional Review Board (IRB) review was not necessary, as the information gathered was publicly available and human contact was not required. Data were then summarized using descriptive statistics. **RESULTS:** Findings of this study revealed that ~41% of South Carolina's institutions (i.e., 13 of 32) required PERs, and ~9% partially required PERs (i.e., 3 of 32), meaning that not all degrees mandated a PER or that it was an option among other choices. In North Carolina, ~60% of institutions mandated a PER (i.e., 32 of 53), while ~19% of institutions had a partial requirement (i.e., 10 of 53). **CONCLUSION:** Both North and South Carolina are well above the national and state-level average regarding PERs. This is not an entirely unpredictable outcome, as previous research suggest institutions with the greatest number of PERs are located in the southern region of the U.S. However, future research should investigate the impact of PERs, given that obesity and physical inactivity levels are higher in southern states compared to other regions in the country. Grant/Funding Information: Research was funded by the South Carolina IDeA Networks of Biomedical Research Excellence (SC INBRE) program.

P217: RELATIONSHIP BETWEEN SEGMENTAL AND WHOLE-BODY BIOELECTRICAL IMPEDANCE VARIABLES IN COMMUNITY-DWELLING OLDER ADULTS

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BACKGROUND: Previous research from the 20th century has shown reliability between the summation of segmental impedance (Z) compared to whole-body Z, particularly when electrodes are placed on the body's right wrist, shoulder, hip, and ankle. However, modern BIA devices typically place electrodes on both hands and feet and forgo electrodes at the shoulder and hip. It is unknown if the evolution of BIA devices has affected relationships between segmental and whole-body Z, reactance (X_c), resistance (R), and phase angle (PhA). The purpose of this study was to compare both whole-body and segmental device-generated phase angle (PhA_{DG}) to phase angle calculated from left- and right-sided BIA values (PhA_{Calc}). We also compared BIA values between sides of the body. **METHODS:** We assessed PhA in 103 community-dwelling older women (n=87) and men (n=16) above 60 years of age with an InBody s10 BIA device at 50kHz. Participants sat with touch-type electrodes on their ankles, middle fingers, and thumbs. One male participant, an outlier with PhA_{DG} more than three standard deviations from the mean, was excluded from analysis. Left-sided X_c and PhA_{Calc} were nonnormal, thus nonparametric tests were used in comparisons for those values. Both right- and left-sided PhA_{Calc} were assessed for agreement with PhA_{DG} using a linear regression and Bland-Altman analysis. Segmental PhA_{DG} and PhA_{Calc} relationships were determined via Pearson's or Kendall's coefficients. Summed right- and left-sided BIA values were compared with a paired t-test or Wilcoxon rank. Data is presented as mean ± standard deviation, and alpha was set to p<0.05. **RESULTS:** PhA_{DG} (5.38±0.80°) demonstrated stronger agreement with right-sided PhA_{Calc} (bias=-0.04±0.05°, p=0.135, d=-0.149) compared to left-sided PhA_{Calc} (bias=0.137±0.15°, p=0.011, r_b=-0.290). Segmental BIA values (Z, R, PhA) differed between the left and right arms (p<0.05) but not between the legs.

CONCLUSIONS: PhA_{DG} demonstrates strong agreement with right-sided PhA_{Calc} measurements in older adults. However, agreement was weaker between PhA_{DG} and left-sided PhA_{Calc}, suggesting greater variability in left-sided BIA variables that requires further investigation. Overall, the results align with previous research showing stronger relationships between whole-body and right-sided segmental impedance measures compared to the left side.

P218: EXAMINING THE TEST-RETEST RELIABILITY OF THE BELLARMINE NORTON ASSESSMENT TOOL IN ADULT CANCER SURVIVORS

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BACKGROUND: Cancer treatments are commonly accompanied by dramatic reductions in physical function, and monitoring changes in physical function is an important part of supportive care in oncology. Critically, for assessment batteries to be easily implemented in clinical oncology as part of standard care, they need to be inexpensive, quick to implement and use minimal equipment. The Bellarmine Norton Assessment Tool (BNAT) is an emerging assessment developed to test physical function objectively in older adults and clinical populations. However, the psychometric properties of the BNAT have not been appropriately evaluated in cancer. The purpose of this study was to assess the validity, reliability, and standard error of measurement of BNAT scores in individuals with cancer. **METHODS:** A sample of adult cancer survivors completed a BNAT physical function test, which included a self-reported physical activity question, 30-second chair stand, 30-second sit-to-stand (STS), timed arm-curl, and timed up-and-go (TUG) test battery. The BNAT was performed twice with 48 hours between tests. Each test produces a raw score, which combine total BNAT ranging from 1-25 (higher scores indicate higher functioning). Test-retest reliability was examined using intraclass correlation coefficient (ICC). The measurement error was evaluated with standard error of measurement (SEM) and minimal detectable change (MDC). **RESULTS:** Sample was twenty adult cancer survivors (n=20, age 65.35±9.56 y, height 64.75±3.45 in., weight 176.05±33.98 lbs.). The majority of the sample (90%) was female breast cancer and 45% were non-Hispanic White, 45% were Black, 5% were Asian and 5% identified as "Other". The reliability of the BNAT (intraclass correlation coefficient [ICC_{2,1}] =0.87) was strong (95% confidence interval 0.71-0.95). The standardized measurement of error (SEM) was 0.98, 4.38% of average BNAT score totals, minimal detectable change (MDC) was 2.72. Low SEM and MDC measurements indicated the BNAT had satisfactory reproducibility. **CONCLUSIONS:** The BNAT physical function test battery demonstrated strong

reliability, supporting its use as an assessment of objective physical function testing in clinical oncology settings. The MDC value obtained can provide clinicians with further context when evaluating changes on the total BNAT score in follow-up assessments.

P219: EFFECTS OF A COMBINED RESISTANCE AND AEROBIC EXERCISE PROGRAM ON CARDIOVASCULAR OUTCOMES IN SURVIVORS OF CANCER

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BACKGROUND: Cardiovascular disease (CVD) is one of the greatest long-term health concerns for survivors of cancer. Research highlights exercise as a potential means to mitigate CVD risk. The measurement of augmentation index (Alx) and pulse wave velocity (PWV), key CVD risk factors, have gained prominence due to the non-invasive nature and time-efficiency of the measurements. However, their response to exercise in survivors of cancer remains unexplored. As such, this study aimed to investigate the effects of an exercise program on cardiovascular outcomes in survivors of cancer. **METHODS:** Participants were recruited from local hospital systems in the Midlands region of South Carolina. All participants completed supervised exercise sessions 2 days/week for 8 weeks. Sessions consisted of 6-8 resistance exercises targeting each of the major muscle groups of the upper and lower body. This was followed by 15-20 minutes of moderate-to-vigorous intensity aerobic activity. One week prior to and following the exercise program, brachial systolic blood pressure (SBP), brachial diastolic blood pressure (DBP), resting heart rate (RHR), Alx standardized to a heart rate of 75 BPM (Alx@75), and PWV were measured using an oscillometric cuff and applanation tonometry (SphygmoCor Xcel, AtCor Medical). Measurements were taken in a quiet room after 5-10 minutes of rest in the supine position. Paired samples t-test and Cohen's d effect sizes (ES) were used to compare differences in means with significance defined as p < 0.05. **RESULTS:** Ten female cancer survivors (age: 65 ± 9 yrs, BMI: 29 ± 5.3, time since diagnosis (mths): 47 ± 51.9, cancer type: breast n=7, ovarian n=1, kidney n=1, multiple myeloma n=1, history of CVD n=2) completed assessments prior to and following the exercise program. No significant differences were detected for changes in SBP (mmHg) (Pre: 139 ± 8.7, Post: 137 ± 9.5, p = 0.33, ES = .14), DBP (mmHg) (Pre: 79 ± 5.1, Post: 79 ± 8.3, p = 0.50, ES = .00), RHR (bpm) (Pre: 73 ± 8.1, Post: 71 ± 12.6, p = 0.21, ES = .26), Alx@75 (%) (Pre: 29.2 ± 9.2, Post: 31.0 ± 8.0, p = 0.3, ES = .16) or PWV (m/s) (Pre: 6.1 ± .72, Post: 6.0 ± 1.17, P = 0.36, ES = .12). **CONCLUSION:** These findings suggest that the exercise program used in this study did not result in changes to several cardiovascular outcomes. A limitation of this study is the inclusion of individuals without the presence of CVD at baseline, potentially preventing further improvements in cardiovascular outcomes. Future studies should aim to investigate the impacts of longer and/or more comprehensive interventions in addition to controlling for additional factors such as pre-existing CVD, disease type, and previous treatment regimen.

P220: EFFECT OF EXERCISE INTENSITY AND MODALITY ON HEALTH METRICS FROM WRIST-WORN FITNESS DEVICES

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BACKGROUND: The utilization of commercially accessible wrist-worn fitness devices for tracking health metrics, such as energy expenditure and heart rate, can offer valuable data for epidemiological and physiological studies. However, despite the advancements in technology, significant errors may continue to arise within the metrics being collected. The purpose of this study was to determine if exercise intensity, modality, hand dominance, and skin tone impact the accuracy of heart rate (HR) and energy expenditure (EE) in wrist-worn devices utilizing photoplethysmography. **METHODS:** Twelve volunteers (12 male, age 24 ± 5.9 years) completed a single-day laboratory trial comprising of two 15-minute progressive exercise protocols using a treadmill and a Monark 828e cycle ergometer. Two smart-watch brands, Apple Series 3 (AS3) and Fitbit Versa 2 (FV2) were selected by their commercial availability at the time of this study. Participants wore the same model at identical locations on their dominant (D) and non-dominant (ND) wrist, with the AS3 placed near the ulnar head, and the FV2 placed 2-3 finger widths above the ulnar head. Oxygen consumption and electrocardiography were assessed utilizing a

metabolic cart (MGC Diagnostics Ultima Cardio2), which served as the gold standard to compare the values of HR and EE derived from the smartwatches. RESULTS: No significant differences were found for the impact of skin tone on HR or EE, as well as the comparison of HR across devices for a given intensity and modality. However, the accuracy for FV2 increased as treadmill exercise intensity increased. For EE, significant differences ($p < 0.01$) were found between AS3 and FV2 for each modality, and for FV2 treadmill activities on both the D wrist ($p < 0.024$) and ND wrist ($p < 0.006$). AS3 accurately assessed treadmill HR and EE. Additionally, AS3 accurately assessed cycling HR but overestimated cycling EE ($p > 0.05$). CONCLUSIONS: Exercise intensity and modality can elicit erroneous values in HR and EE. Individuals and clinicians should be aware of the strengths and limitations of devices that measure HR and EE, as errors ranged from upwards of 13% for HR, and 18% for EE. The accuracy of these devices should be considered in recreational and clinical settings to interpret the validity of collected health and fitness metrics.

P221: SWIMMING VOLUME AND COGNITIVE IMPROVEMENTS IN ADOLESCENTS: A DOSE-RESPONSE STUDY

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BACKGROUND: Physical activity has been shown to benefit cognitive function and academic performance in adolescents. More frequent physical activity is associated with improved cognition, yet few studies have evaluated the impact of swimming frequency. This study will evaluate whether swimming 5 days per week versus 3 days per week improves cognition in adolescent swimmers. Research has shown that physical activity has a positive influence on brain structure, function, and cognition in adolescents. Higher-fit adolescents have larger hippocampal volumes and perform better on relational memory tasks compared to lower-fit youth. Aerobic exercise interventions have been shown to improve executive function, processing speed, attention, and academic performance in adolescents. The cognitive benefits of physical activity may be driven by exercise-induced neurotrophic factor production, angiogenesis, and neurogenesis in the hippocampus and prefrontal cortex. Despite evidence for physical activity enhancing cognition, few studies have specifically evaluated swimming frequency. Swimming is a unique form of physical activity that could confer additional cognitive benefits compared to land-based activities. This study will address a gap in the literature by investigating swimming frequency and cognition in adolescents. **METHODS:** 50 male and female swimmers aged 12-18 will be recruited for this study. Participants will be randomized to swim practice 3 days per week or 5 days per week for 8 weeks. A 10-item cognitive test evaluating processing speed, attention, memory, and reasoning will be administered to all participants before and after the 8-week intervention. The cognitive assessment will include tasks such as Symbol Search, Digit Span, Letter-Number Sequencing, Matrix Reasoning, and Trail Making from the NIH Toolbox Cognition Battery. Two-way repeated measures ANOVA will be used to assess changes in cognition between groups across time. **ANTICIPATED RESULTS:** Based on previous research showing greater cognitive benefits with increased physical activity frequency, we hypothesize that adolescents swimming 5 days per week will show greater improvements in cognition compared to those swimming 3 days per week. We expect significant group x time interactions, with greater pre-to-post intervention increases in processing speed, attention, memory, and reasoning scores in the 5 days per week group. Confirming this dose-response relationship between swimming frequency and enhanced cognition, and demonstrating that frequent swimming improves cognition more than moderate swimming, would provide evidence to recommend higher training volumes for cognitive benefits in developing adolescents. This could inform physical activity recommendations for adolescents and encourage increased participation in swimming programs.

P222: COMPARISON OF BIOELECTRICAL IMPEDANCE ANALYSIS FIELD TECHNIQUES AGAINST THE INBODY 520 CRITERION

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Physical activity, exercise, and nutritional interventions are used to reduce the risk of chronic disease linked to excessive adiposity. Health professionals overseeing, or individuals autonomously using, these

interventions have access to many different easy to use and widely available field assessments to track percent body fat (%BF). A newer commercially available bioelectrical impedance (BIA) device, Skulpt Chisel™, offers a unique multi-site full body approach to estimating %BF that overcomes the segmental restrictions of the upper-body (Omron™) and lower-body (Tanita™) only BIA devices. **PURPOSE:** The primary aim of this investigation was to compare the Skulpt Chisel™, Omron™, and Tanita™ BIA field devices against the InBody 520™, a whole-body multi-frequency BIA laboratory-based analyzer. **METHODS:** Twenty-six adults (25±4 years; BMI 23±3 kg·m⁻²), thirteen male and thirteen female, were assessed using the Skulpt Chisel™, Omron™, Tanita™, and InBody 520™ in a randomized sequence. All body composition assessments were completed during one visit with participants instructed to remain hydrated the day before and day of assessment, perform a four-hour fast, refrain from alcohol for 24 hours, exercise for 12 hours, and caffeine 15 minutes prior to body composition assessments on the day of testing. **RESULTS:** A significant bias for underestimation ($F_{1,24} = 4.634$, $R^2 = 0.162$, $p = 0.042$) and a significant mean difference ($t_{25} = -3.41$, $MD = -2.4 \pm 3.6\%$, $p = 0.002$, Cohen's $d = -0.67$) were found comparing the Omron™ to the InBody 520™. Bland-Altman limit of agreement (LOA) plots for the Skulpt Chisel™ minus the InBody 520™ were 13.97% for the upper bound (UB) and -10.1% for the lower bound (LB), 14.1% (UB) and -12.2% (LB) for the Tanita™ minus the InBody 520™, and for the Omron™ minus InBody 520™ the UB was 4.62% with a LB of -9.41%. **CONCLUSION:** At the group level the Omron™ shows an underestimation of %BF compared to the InBody 520™, however, at the individual level the Omron™ provides the best predictive estimate of %BF for the InBody 520™ method relative to the Tanita™ and Skulpt Chisel™. In contrast to the Omron™, the Tanita™ and Skulpt Chisel™ at group level means were similar to the InBody 520™ yet these devices at the individual level provided poor predictive estimates of %BF for the InBody 520™ due to unacceptably large LOAs.

P223: EFFECTS OF CONSUMING PEANUT BUTTER FOR 7-WEEKS ON BODY COMPOSITION IN FIREFIGHTERS

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BACKGROUND: Many firefighters have BMI above average and are considered overweight or obese. Considering that obesity is a risk factor for cardiovascular disease (CVD), one of the leading causes of death amongst firefighters, it is important that firefighters achieve and maintain a healthy body composition. Studies have shown that diets high in monounsaturated fatty acids, which are prevalent in peanut butter, can help prevent conditions such as CVD. Therefore, the purpose of this study was to determine if prolonged peanut butter consumption would alter body composition in full-time firefighters. **METHODS:** Forty firefighters participated in this randomized, controlled 8-week study that consisted of two groups: a peanut butter group ($n=20$) and a control group ($n=20$). After a one-week baseline period, the peanut butter group was provided peanut butter to consume five nights per week for seven weeks. The control group was to maintain their normal diet. Waist and hip circumference, BMI, and body fat percentage via bioelectrical impedance analysis (BIA) were measured at the beginning (PRE) and end (POST) of the 8-week period. Mixed-factorial ANOVAs were completed in SPSS version 29 to analyze the effects of group (peanut butter or control) and time (PRE and POST) on the following variables: waist circumference, hip circumference, body fat percentage, and BMI. Alpha level was set at .05 and Bonferroni adjustments were used for post-hoc tests when appropriate. The magnitude of Cohen's d is reported as effect size. **RESULTS:** There was no significant effect of group or time, or interaction effect, on any of the variables analyzed. Favorable changes over time were observed in the peanut butter group for body fat percentage (-0.27% , $CI_{95\%} = -0.69-0.15\%$, $d = 0.33$) and BMI (-0.30 kg/m², $CI_{95\%} = -0.72-0.13$ kg/m², $d = 0.27$), while non-significant increases were observed in the control group. **CONCLUSION:** Overall, within this subgroup of firefighters, there were no significant differences observed between groups over time. There was a small decrease in fat percentage and BMI in the peanut butter group, but the effect size was not significant. Consuming peanut butter 5 nights/week for 7 weeks did not negatively affect body composition and should be examined further as an affordable alternative for improving body composition.

P224: THE EFFECT OF HAND CLEANLINESS ON BIOELECTRIC IMPEDANCE ANALYSIS MEASUREMENTS COMPARED TO AIR DISPLACEMENT PLETHYSMOGRAPHY

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BACKGROUND: Bioelectrical impedance analysis (BIA) is a cost-effective, easily transportable, and reliable method of estimating body composition. CDC recommendations for handwashing continue to be advocated, however it is unclear how these recommendations affect BIA accuracy. **PURPOSE:** The purpose of this study was to determine the effect of "unclean" hands, hands washed with soap and water, and hand sanitizer on the accuracy of body composition assessed by a hand-held bioelectrical impedance analyzer as compared to air displacement plethysmography. **METHODS:** Air displacement plethysmography (BP) was performed on 78 participants (23.1±5.8 years, 68.1±4.3 in, 174.0±37.1 lbs, 40 women). Participants underwent BIA assessments with hands that were unwashed for at least two hours prior to reporting to the lab (B1), again after following CDC recommendations for soap and water washing (B2), and for a third time following CDC recommendations for hand sanitizer usage (B3). **RESULTS:** A repeated measures ANOVA, with a Greenhouse-Geisser correction, determined that mean scores for percent body fatness differed significantly between assessment types ($F(1.033, 79.51) = 29.18, p < 0.001$). Post hoc testing using the Bonferroni correction revealed no difference in BIA conditions (B1-19.5±6.9%, B2-19.6±6.9%, B3-19.6±6.9%), yet all were significantly lower than BP (BP-22.2±8.9%). There were statistically significant correlations between BP and all BIA conditions ($r = 0.88, p < 0.05$). Using a Bland-Altman analysis, there were statistically significant positive correlations between BP and all BIA conditions ($r = 0.49, p < 0.05$). Interestingly, the standard error of the estimate was lowest for soap and water washing (B1 - 3.26, B2 - 3.20, B3 - 3.22), albeit modest differences between conditions. **CONCLUSION:** There was a difference between percent fat values from BP and BIA conditions (B1, B2, and B3) following a means comparison analysis. Additionally, correlations yielded strong statistical similarities between BP and BIA. While no hand conditions differed from each other, the predictability of the BIA lessened as the percent values increased. Furthermore, the standard error of the estimate revealed that percent fat estimations were lowest following washing hands with soap and water. Cleanliness of hands does not appear to affect BIA's ability to estimate body composition. Although, BIA's ability to estimate does weaken as percent fat values increase.

P225: A COMPARISON OF BODY FAT AND TOTAL BODY WATER MEASUREMENT AMONG COLLEGIATE FEMALE TENNIS PLAYERS

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BACKGROUND: Measuring hydration as well as body fat percentage in collegiate athletes is crucial during periods of training and performance. Serial measurements of body fat percentage and hydration in collegiate athletes during the season can pose a challenge due to the NCAA Time Limits for Athletically Related Activities. Athletic programs face issues such as access to specialized equipment and athlete priority to practice and training, which limits their time to undergo testing for hydration and body fat percentage. **PURPOSE:** To evaluate the concordance in the measurements of body fat and hydration levels between the following three instruments: bioelectrical impedance BIA via Tanita, BIA via RJL Systems and body density measures via dual-energy x-ray absorptiometry (DXA) among student athletes. **METHODS:** Nine female collegiate tennis players at a southeastern university volunteered for this study. The participants underwent each measurement procedure in alignment with manufacturer guidelines. Concordance correlation coefficients for measuring agreement were calculated to estimate the level of agreement regarding the measurements taken using three different methods: Tanita BIA, RJL BIA, and DXA. **RESULTS:** The participants had a mean age of 21.11 ± 1.9 years and BMI of 21.84 ± 2.91 kg/m². When considering measurements for Body Fat (BF), the strongest agreement was between TANITA BIA and RJL BIA (concordance correlation [rc] = 0.641, 95% Confidence Interval [CI] [0.117, 0.886]). The measurement agreement for BF was smaller between RJL BIA and DXA (rc = 0.541, 95% CI [0.143, 0.788]) and TANITA BIA and DXA (rc = 0.454, 95% CI [0.075, 0.718]). The measurement agreement between TANITA BIA and RJL BIA for Total Body Water was smaller (rc = 0.383, 95% CI [0.017, 0.658]). **CONCLUSIONS:** This study found a stronger agreement between Tanita BIA and RJL BIA, which supports the use of these two instruments as convenient and

interchangeable measurements in the field. However, using instruments for repeated measures is recommended considering inter-instrument reliability was weak. The study recommends using TANITA BIA as a valid field test of BF and hydration levels due to time constraints of NCAA student athletes. As research continues, further investigation should focus on larger sample sizes.

P226: BODY COMPOSITION COMPARISON BETWEEN ENGLISH AND WESTERN COLLEGIATE EQUESTRIAN ATHLETES

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BACKGROUND: Anecdotal reports state body composition, specifically fat free mass (FFM) and fat mass (FM), is crucial to equestrian athlete performance. Having a lower FM while keeping increased necessary FFM to maintain strength needed for riding. In collegiate equestrian, there are two disciplines of riding: English and Western, which might reveal a difference in body composition. The purpose of this study was to determine any differences between English and Western riders when it comes to body composition. **METHODS:** The University of South Carolina collegiate Equestrian team (N=31, age=20.13±1.26 years) underwent body composition testing using air displacement plethysmography. The athletes were instructed to arrive >3 hours fasted and without vigorous exercise prior to their visit. FFM, FM percentage, and body mass index (BMI) were calculated and compared between English (N=15) and Western (N=16) riders using a two tailed t-test with the significance standard at P<0.05. **RESULTS:** English riders averaged 44.81 ± 2.97 kg for FFM, FM percentage of 25.31 ± 5.06%, and a BMI of 21.29 ± 2.24kg/m². Western athletes averaged 44.35 ± 4.18 kg FFM, FM of 28.34 ± 6.17%, and a 22.33 ± 4.27kg/m² BMI. There was no significant differences between English and Western riders for FFM, FM, and BMI (P>0.05).

CONCLUSIONS: Although there were not any statistically significant differences between the two groups, knowing the baseline body composition of the athletes is crucial. This can help keep the riders healthy and work towards increasing FFM throughout the season providing a benchmark beginning point. This research promotes future differential findings between English and Western equestrian athletes to drive peak performances and optimal body composition based on discipline.

P227: DETERMINATION OF THRIFTY AND SPENDTHRIFT METABOLIC PHENOTYPES THROUGH ACUTE INDIRECT CALORIMETRY MEASUREMENTS

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BACKGROUND: The prevalence and severity of obesity across all age ranges is a continuing problem not only in the United States, but worldwide. While a simple explanation for obesity is a greater number of calories consumed versus the number of calories expended, there are numerous intrinsic physiological mechanisms in place that are responsible for the maintenance of body weight. Previous literature has determined that an individual may be more susceptible to body weight fluctuations based on their metabolic phenotype classification, denoted as thrifty and spendthrift. Individuals who are thrifty largely restrict energy expenditure (EE) during times of famine or fasting, and have smaller increases in EE when overfed, while individuals who are spendthrift are less metabolically efficient and exhibit smaller decreases in EE during fasting and greater EE when overfed. Consequently, thrifty phenotypes are more susceptible to obesity, and the determination of these phenotypes may have future implications for exercise prescription. To date, these phenotypes have been studied through precise, multiple week studies in which a participant lives in a metabolic chamber, which uses indirect calorimetry to measure EE. Building on previous nutritional and metabolic studies used to elucidate these phenotypes, the purpose of this novel and prospective study is to classify thrifty and spendthrift phenotypes through two acute 24-hour dietary conditions, utilizing indirect calorimetry to assess changes in resting energy expenditure (REE). **METHODS:** I plan to recruit 10 subjects (5 overweight/obese) between the ages of 18-45 for this pilot study. Each participant will complete a baseline REE, a 24h-fast, and 2x daily caloric needs of low-protein overfeeding (LPO), each interspersed with an eucaloric washout day. An MGC Diagnostic metabolic cart and face tent will be used for REE. Results will be analyzed using repeated measures ANOVA to determine the impact of fasting and LPO on REE. Additionally, multivariate linear regression will be used to model REE as a function of the covariates in this study such as sex, age, ethnicity, and body composition. **ANTICIPATED RESULTS:** It is hypothesized that the acute dietary interventions will reveal the

different metabolic phenotypes, in which thrifty individuals will exhibit a larger decrease in REE during fasting, and a smaller increase during LPO.

P228: CUSTOM SEGMENTAL LOWER LIMB LEAN MASS ANALYSIS IN MALE AND FEMALE DIVISION I ATHLETES

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BACKGROUND: Lean mass (LM) asymmetries may impact athlete availability and injury risk. Despite the known risks that asymmetries may present, clinically significant differences in LM have not been established and may not be detected by whole limb analysis. Segmental custom regions of interest (ROI) analysis may reveal LM differences that would otherwise go undetected. The purpose of this study was to assess LM at standard and custom ROIs to detect muscular imbalances and establish meaningful differences in Division I athletes. **METHODS:** Dual-energy x-ray absorptiometry testing was performed on 581 NCAA Division I athletes (mean±SD; Age=20.2±1.4 yrs, Height=176.4±12.6 cm, Weight=83.3±26.0 kg; 46% female) from August 2015 to July 2023. Full body scans were completed as part of normal testing for nine teams. Standard ROI analysis was used to determine total leg LM. Custom ROI analysis was completed for glute (G), quadriceps (Q), and calf (C) by using the polygon function on each leg. G ROI consisted of the tissue between the top of the pelvis and the bottom of the pubic symphysis. The Q ROI contained the tissue between the bottom of the pubic symphysis to the tibiofemoral joint. The C ROI consisted of the tissue between the tibiofemoral joint and the talocrural joint. Regional percent differences [(segment LM difference)/(total segment LM/2) *100] were calculated and meaningful differences were established from mean and standard deviations of each segment. **RESULTS:** Average segmental limb differences for male athletes were (mean ± SD): G=1.41±4.39%, Q=0.26±2.92%, C=0.64±4.65% and for female athletes: G=2.04±4.43%, Q=0.25±4.17%, C=0.79±4.61%. For males, values above G:5.8%, Q:3.2%, C:5.3% appeared to be clinically relevant. For females, differences above G:6.5%, Q:4.4%, C:5.4% resulted in meaningful cut-points. Segmental limb differences were prevalent amongst the whole sample, with clinically relevant imbalances occurring in 19% (G), 23% (Q), and 24% (C) of each respective region. **CONCLUSION:** Segmental LM analyses may provide a clinically relevant target to support injury prevention and rehabilitation, that often is not detected with whole limb analysis. Regional differences may provide insight into an acceptable target for LM asymmetry at each segment to better support injury prevention and return to play. Future research should evaluate the relationship between regional differences and injury.

P229: CORRELATES OF BARBELL VELOCITY METRICS THROUGHOUT A BARBELL BACK SQUAT WORKOUT IN RESISTANCE TRAINED ADULTS

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Background: In recent years, velocity-based training (VBT) has increased in popularity due to its ability to objectively autoregulate an athlete's training and measure overall daily performance. Additionally, it has been well established that measures of body composition can influence athletic performance. Thus, we sought to investigate the relationship between body composition and common barbell velocity metrics. **Methods:** Thirty-nine resistance trained college aged males (n=20) and females (n=19) completed three total visits. On the first visit, participants' body composition was assessed via Dual Energy X-Ray Absorptiometry (DXA) followed by the establishment of a single repetition maximum (1RM) for the barbell back squat. On the subsequent two visits, participants completed a workout consisting of 4 sets at 80% of the previously established 1RM. The first 3 sets were taken to a subjective 1 repetition in reserve, with the final set performed to volitional failure. A linear transducer was attached to the barbell to assess average and peak average concentric velocity (ACV). The velocity drop off was determined by calculating percent change [(Set 4-Set 1)/(Set 1)] for average and peak ACV. Pearson correlation coefficients were then assessed between measures of body composition and barbell velocity metrics. Significance was accepted at p≤.05. **Results:** Average ACV drop off was significantly correlated with total grams of body fat (r=.329, p=.041), along with trunk percent (r=.328, p=.042) and absolute fat (r=.391, p=.014). No significant correlations were seen for peak ACV drop off, but trends were noted for percent (r=.277, p=.088) and absolute (r=.298,

p=.065) trunk fat. All lean mass metrics were significantly correlated (rs>.346, ps<.05) with average ACV in Sets 1, 3, and 4. Similar findings were noted for peak ACV except for fat free mass index no longer being significantly correlated (p=.491). **Conclusions:** Significant correlations were seen for measures of fat mass and average ACV drop off. Indicating, athletes that displayed greater levels of trunk absolute and relative fat had a greater decrease in average ACV from set 1 to set 4. This relationship did not hold true when examining peak ACV. Also, these data suggest that the amount of lean mass may significantly relate to individual set peak and average ACV. Thus, practitioners should account for body composition if utilizing VBT to guide training.

P230: IMPACT OF SUGAR INTAKE ON BODY COMPOSITION DURING THE TRANSITION FROM HIGH SCHOOL TO COLLEGE

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TITLE: IMPACT OF SUGAR INTAKE ON BODY COMPOSITION DURING THE TRANSITION FROM HIGH SCHOOL TO COLLEGE BACKGROUND: Research indicates that college freshmen are 5.5 times more likely to gain weight than the general population, with an average weight gain of 7.4 pounds. Many factors contribute to eating habits however, the college transition is where most students go from a dependent state to an independent state where they can make their own choices and decisions with food including foods with added sugar. This transition can have long-term implications for body composition, chronic disease development, and lifelong eating habits. Therefore, the purpose of this study is to examine eating habits including intake of added sugar, and body composition change during the transition from high school to college. **METHODS:** This study will recruit high school seniors (n=75) aged 17-19 years. Baseline assessment will take place during the senior year of high school and follow-up assessment after the first year of college. Demographic and anthropometric measurements will be collected. Body composition will be assessed using Dual Energy X-ray Absorptiometry, DXA (Lunar Prodigy, GE Healthcare, Madison, Wisconsin). The National Cancer Institute Automated Self-Administered 24-hour (ASA24) dietary assessment tool will be used to assess macro- and micro-nutrients including foods with added sugar consumption. Participants' venous blood will be collected via blood draw. The Piccolo Xpress Chemistry Analyzer (Lipid Panel Plus; Abaxis, Inc., Union City, CA) will be used to measure blood biomarkers including glucose, LDL, HDL, total cholesterol (TC), TC to HDL ratio. **ANTICIPATED RESULTS:** It is anticipated that there will be an increase in the amount of added sugar consumed. Additionally, there will be an increase in body fat percentage via DXA analysis and a change in blood biomarker levels. These changes will be associated with dietary intake changes such as increased processed food consumption with added sugar, dining hall food, and personal choices. **FUNDING:** Funding for this project will be provided by the National Heart, Lung, and Blood Institute of the National Institutes of Health under Award Number R15HL159650.

P231: FAT FREE MASS CHANGES IN DIVISION I COLLEGIATE ATHLETES

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The pre-season preparatory phase of collegiate football athletics is marked by increased skill and strength training to develop appropriate body size and body composition for enhanced performance. While specific body composition recommendations are dependent on the position and skill of the athlete, all players' performances may benefit from maintaining their fat-free mass (FFM). The loss of FFM can be attributed to various causes including low energy availability (LEA). LEA occurs when caloric intake does not match the energy expended causing an inadequate amount of energy left to maintain physiological functioning. **PURPOSE:** The purpose of the study is to investigate the effects of FFM changes in preparation of the competitive season among Division I collegiate football athletes. **METHODS:** Seventy Division I football players were tested at the end of the spring season (age: 20.3±1.5yrs, height: 184.1±8.7cm, body mass 104.3±1.5kg, fat-free mass 84.6±0.4kg, body fat percent: 18.3±1.1% and again during the competitive season. Height was measured using a stadiometer while mass and body composition were measured using bioelectrical impedance for each player. A statistical analysis relied on paired t-tests, spearman correlation (R), and 95% confidence interval (mean±SD). **RESULTS:** Results indicate a significant difference in body mass and FFM difference (0.6+4.1kg p<0.01; -1.9+3.6kg;

$p < 0.01$) respectively from spring to competitive season. Of the seventy players, 59% had lost or maintained their body weight (< 2 kg of weight gain) over the 8-month period, whereas 39% lost or maintained (having less than a 2 kg gain) their FFM concentrations. There was no significant difference across time points (83.1 ± 10.6 kg; 84.9 ± 11.1 kg). **CONCLUSIONS:** At a time of significant training and purposeful gaining of mass/FFM, athletes lacked appropriate strategies to accomplish their goals. The loss of FFM is consistent with the symptoms of LEA, or low energy availability (lack of adequate calories). Undereating or not maintaining the proper diet while performing at an increased training volume or intensity can lead to a loss in body weight and/or FFM. LEA is also a precursor for various physiological, neuroendocrine, and psychological diminutions. Ensuring proper nutrition during the preparatory phase and in-season will decrease the risk of athletes experiencing low energy availability further allowing them to perform at their highest capability.

P232: HEALTH CHARACTERISTICS OF MARCHING BAND PARTICIPATION

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BACKGROUND: Health characteristics of marching band participants are largely ignored, except for the substantial contribution to daily physical activity (PA) (Cowen, 2006). This study examines differences in health characteristics between collegiate marching band members and the general public. **METHODS:** Participants were members of a marching band ($n=32$). Body composition, and total, spinal, and leg bone mineral density (BMD) was determined via DXA. Anthropometry (height, weight, waist circumference) and blood pressure (BP) was assessed. This sample was contrasted with curated NHANES (2017-2018) data to match band demographics, race, and ethnicity. T-tests and X^2 analyses were used. **RESULTS:** Mean BMI of band members was overweight (26.7 ± 6.7 kg/m²) but mean waist circumference was healthy (84.0 ± 15.6 for men and 82.6 ± 12.9 for women). Both systolic and diastolic BP were considered normotensive (118.2 ± 13.2 mmHg, 73.0 ± 11.6 mmHg, respectively). No significant differences emerged when considering location-specific BMDs, BMI, or WC. Significant differences were observed in systolic BP (118.2 ± 13.2 vs. 112.7 ± 10.0 , $p < 0.05$), diastolic BP (73.0 ± 11.6 vs. 64.7 ± 9.2 , $p < 0.05$). **CONCLUSION:** Few differences were found between marching band members and NHANES data. BP was higher in band members, which suggests regular BP screening for marching band members may be useful.

P233: ANTHROPOMETRIC CHARACTERISTICS ASSOCIATED WITH FIREFIGHTER COMPETITION PERFORMANCE

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BACKGROUND: Firefighting competitions (FFC) are emerging as a novel sport among first responders; however, limited research exists to describe the anthropometric characteristics associated with competition performance. Thus, the purpose of this study was to identify anthropometric characteristics associated with FFC time among firefighters (FF). **METHODS:** Twenty-five FF (21 males, 4 females; aged 32 ± 6 y) volunteered for this study. Height was measured using a portable stadiometer, and body composition and mass were measured using whole-body bioelectrical impedance. All FF competed in one of three categories: individual, tandem, or relay. The FFC was performed in personal protective equipment and involved the timed (sec) completion of a high rise carry, hose hoist, forcible entry, hose advance, and victim rescue task. Of the 25 FF, 14 (11 male, 3 female) ran as individuals (completed the entire course). Descriptive statistics are presented as mean \pm standard deviation, and the relationships between metrics and completion time were assessed using Pearson's correlations (r) with $\alpha \leq 0.05$. **RESULTS:** The group mean height, %BF, and BMI were 179.1 ± 8.3 cm, $23.0 \pm 7.8\%$ and 28.9 ± 3.3 kg/m², respectively. The mean time to complete the course in the individual event was 132.4 ± 46.3 seconds. Overall, the group mean BMI fell into the overweight category. When separated by sex and ranked according to ACSM standards, females were classified as poor and males as fair for %BF. There was a strong correlation between %BF and Time ($r=0.73$, $p=0.003$), a weak correlation

between BMI and Time ($r=0.34$, $p=0.240$), and a moderate correlation between Height and Time ($r=0.43$, $p=0.128$). **CONCLUSIONS:** The strong correlation seen between %BF and Time suggests a higher %BF may be detrimental to performance, although this relationship was largely driven by the female FF. Interestingly, height exhibited a positive moderate relationship with completion time, suggesting that taller competitors may be at a disadvantage in FFC performance despite conflicting evidence in other studies examining FF job task performance. Future research should further investigate sex differences, as both male and female FF are expected to complete the same occupational duties and FFC tasks.

P234: EFFECT OF SHIFT SCHEDULE ON FIREFIGHTERS' SLEEP QUALITY AND QUANTITY

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BACKGROUND: Obtaining adequate amounts of sleep is critical for optimal health and physical performance. Firefighters' sleep patterns are often disrupted due to emergency responses. Fire agencies utilize a variety of shift schedule configurations. Unfortunately, there is a lack of research investigating the impact of shift schedules on firefighters' sleep quality and quantity. Evaluating sleep outcomes by shift schedule will guide fire agencies in implementing appropriate on-duty interventions (eg, scheduled napping, sleep hygiene education) and guide work schedule configuration. Therefore the purpose of this proposed study is to descriptively compare sleep quantity and quality outcomes between fire agencies utilizing different shift schedules. **METHODS:** An international sample of fire departments utilizing different shift schedules and a control group composed of law enforcement officers working day shift will be recruited to participate in this study. The firefighter shift schedules will include 24/48 (24 hr on-duty, 48 hr off-duty), 48/96 (48 hr on-duty, 96 hr off-duty), Swing Shift (SS; 2 day shifts (10 hr), 2 night shifts (10 hr), 4 days off; $n=50$), and a control group including a police department day-shift (10 hr) schedule. Demographic data will include sex, age, occupational experience, second job status, call characteristics, use of sleep medication and alcohol use, exercise level, body mass index, sleeping conditions, smoking status, caffeine intake, and diagnosed sleep disorders. The Pittsburgh Sleep Quality Index (PSQI) will be utilized to assess sleep outcomes. Specifically, 7 components of sleep outcomes will be scored on a 0-3 scale (aggregate range: 0 ("no difficulty") to 12 ("severe difficulty")) including subjective sleep quality, latency, duration, efficiency, disturbances, medication use, and daytime dysfunction. An electronic survey will be distributed via agency listserv. Kruskal-Wallis one-way ANOVA will be used to compare PSQI outcomes between shift schedule cohorts, utilizing covariates as necessary. Post-hoc analyses will be conducted using pairwise Mann-Whitney tests with Bonferroni correction. **ANTICIPATED RESULTS:** It is hypothesized that firefighters will report inferior sleep outcomes compared to non-shift workers and that the SS schedule will yield inferior sleep outcomes compared to other firefighter shift configurations potentially due to greater circadian rhythm disruption.

P235: IS FIREFIGHTERS' MENTAL TOUGHNESS ACCURATELY ASSESSED? CONCURRENT EVALUATION OF CURRENT PRACTICES

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BACKGROUND: The concept of mental toughness (MT) has been extensively investigated in various high-stress domains, including sports and the military. It is associated with superior performance in challenging environments. Presently, the Sports Mental Toughness Questionnaire (SMTQ) and Military Training Mental Toughness Inventory (MTMTI) are administered to assess MT in firefighters. Previous research suggested these instruments may lack specificity for firefighting. Therefore, this study aimed to investigate the concurrent validity of SMTQ and MTMTI in the context of firefighters. In addition, to determine whether the SMTQ and MTMTI could validly assess MT in firefighters. **METHODS:** Sixty-two male firefighters from two southern Florida Fire departments participated in a two-day data collection process. They completed the SMTQ (self-assessment), while a

colleague and an officer rated their MT using the MTMTI. Mean MTMTI scores per day for both assessors were computed, and both surveys were converted into z-scores for statistical analysis. This analysis involved Pearson correlation (r), Cohen's Kappa (k), and two-way random Intraclass correlation coefficient (ICC2k) using R statistical packages in Jamovi version 2.4.8 ($p < 0.05$). RESULTS: On Day 1, inventory scores were negatively correlated ($r = -0.09$, $p = 0.5$), while on Day 2, they were positively correlated ($r = 0.1$, $p = 0.5$). The reliability agreement on Day 1 was extremely poor (ICC2k < 0.001 , 95%CI [-0.53, 0.35]). On Day 2, reliability improved but remained relatively low (ICC2k = 0.13, 95%CI [-0.33, 0.43]). Cohen's kappa for both days indicated no agreement between the inventory scores ($k < 0.001$). CONCLUSION: The results suggest weak and non-significant correlations between the MT inventory scores on both Day 1 and Day 2, along with poor reliability and agreement between the measurements. These findings indicate a need for caution when interpreting and relying on these inventory scores for making inferences. Further development of firefighting-specific MT assessment tools may be warranted.

P236: EFFECT OF HIGH VELOCITY/HYPEROXIC BREATHING THERAPY ON BLOOD LACTATE DECLINE AND FATIGUE RATING AFTER A WINGATE TEST

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BACKGROUND: Sprint-type exercise of 30-60s elevates blood lactate concentration ($[La-]_b$) causing acidosis and fatigue. Post-exercise, $[La-]_b$ peaks within 4-7min, then gradually returns towards baseline over an hour. High velocity breathing therapy (HVT) delivers not only O_2 but is also purported to improve CO_2 elimination and ventilatory efficiency by clearing the anatomical dead space. HVT offers the intriguing possibility of hastening $[La-]_b$ decline and speeding recovery. The present study investigated HVT's impact on $[La-]_b$ decline after intense exercise (Wingate test). **METHODS:** 15 participants (8M; 7F; 26±2y) completed a 30s Wingate test, followed by 60min of recovery under 4 randomized HVT conditions: 21% O_2 at 5L/min, 21% O_2 at 35L/min, 100% O_2 at 5L/min, and 100% O_2 at 35L/min. Cycle ergometer resistance was set at 0.085 kp/kg body mass. Assessments included Perceived Recovery Status, Rating-of-Fatigue, and physiological measurements (breath frequency, heart rate, arterial O_2 saturation, blood pressure). Blood samples were collected pre-exercise and during recovery. **RESULTS:** As planned, recovery status was the same prior to each test ($p = 0.2759$), as were Wingate performance metrics, including peak power ($p = 0.3896$), final power ($p = 0.2801$), and fatigue index ($p = 0.2046$). Arterial O_2 saturation was significantly higher during both hyperoxic conditions ($p < 0.0001$) throughout most of recovery. Heart rate ($p = 0.0897$), systolic blood pressure ($p = 0.874$) and diastolic blood pressure ($p = 0.4687$) were not significantly different among conditions. Rating of fatigue improved throughout recovery with no difference among conditions ($p = 0.6773$). Breath frequency was significantly lower with 35 L/min HVT ($p < 0.0001$) regardless of O_2 level. Although $[La-]_b$ was not significantly different among conditions at any sample time ($p = 0.0733$), there was a tendency for a significantly smaller area under the curve over the entire recovery period for 100% O_2 at 35L/min ($p = 0.0530$). **CONCLUSIONS:** Limited significant effects of HVT and hyperoxia were observed, but there were trends for a slightly lower breath frequency and a smaller area under the curve in venous $[La-]_b$ in the 35L/100% condition. **FUNDING:** Contract from Vapotherm, Inc. Authors Bergeski and Whittle are employees of Vapotherm, Inc. Study design and implementation were independently approved and performed by Auburn University researchers.

P237: EFFECTS OF VARYING BODY FAT LEVELS ON FAT OXIDATION RATES IN EUMENORRHEIC FEMALES

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Title: Effects of Varying Body Fat Levels on Fat Oxidation Rates in Eumenorrhic Females **Authors:** Catherine R. Vezey¹, Gaven A. Barker¹, Eric K O'Neal¹, Matthew J. McAllister², & Hunter S. Waldman¹ **Institutions:** ¹University of North Alabama, ²Texas State University **BACKGROUND:** Fatty acids (FA) are the predominate fuel source at exercise intensities $< 65\%$ of maximal oxygen consumption (VO_{2max}). Aerobically trained individuals tend to exhibit a greater ability to oxidize FA at higher relative intensities than untrained individuals. Eumenorrhic females have a greater ability to oxidize FA than men, partially due to hormonal differences. Interestingly, a recent review

concluded that unlike males, body composition does not affect fat oxidation (Foxi) rates in women. However, no studies have yet matched subjects first for aerobic fitness status prior to testing Foxi rates. Therefore, the purpose of this study is to compare Foxi rates between lean and overweight females when matched prior for aerobic fitness status. **METHODS:** A between-subjects design will be used to compare Foxi between lean and overweight females with matched fitness statuses. Thirty healthy and eumenorrhic female participants between the ages of 18-39 will be recruited to complete two trials. Trial 1 will consist of descriptive data collection and a peak aerobic test (VO_{2peak}) consisting of a walk phase (1.0-3.5 mph) and a run phase (4-8 mph) using a motorized treadmill set at a 3% grade. Participants will be matched for aerobic status (VO_{2peak} between $35 \pm 5 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) and stratified into 2 groups based on body fat percentage (BF%), (seca mBCA 515, Hamburg, Germany). A graded exercise test (GXT) for trial 2 will be completed during the menses phase of the participants' menstrual cycle and will consist of 6 (25%, 35%, 45%, 55%, 65%, 75% of VO_{2peak}), 3-minute stages at a 3% incline on a motorized treadmill. Throughout the GXT, metabolic data and heart rate will be collected via Parvo Metabolic cart and a sternal heart rate monitor, respectively. At each stage heart rate and cardiorespiratory measures will be recorded and later used to calculate Foxi rates across each stage. Data will be analyzed with a 2-way repeated measures analysis of variance to identify differences, if any, between lower-fat and higher-fat groups. **ANTICIPATED RESULTS:** It is hypothesized that, when matched for aerobic fitness, overweight females will demonstrate higher rates of Foxi compared to their lean counterparts at lower intensities.

P238: FETAL METABOLIC GENE EXPRESSION IN CORD BLOOD IS CORRELATED TO NEONATAL ADIPOSITY

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BACKGROUND: Neonatal adiposity is correlated with the development of childhood overweight and obesity. Maternal metabolic health during pregnancy is associated with neonatal adiposity at parturition. However, the relationships between maternal and fetal metabolism are understudied, specifically the expression of target genes known to regulate lipid oxidation (CPT1A, and PGC-1 α) and insulin sensitivity (ADIPOR 1 & 2). These may offer important insight on pathways that connect maternal and neonatal health, offering potential for future therapeutic targets. The purpose of this study was to explore the relationship between the expression of target metabolic genes in cord blood and neonatal anthropometrics. **METHODS:** Pregnant persons with GDM (gestational diabetes mellitus) were excluded. Cord blood samples (N=25) were collected at delivery. RNA was isolated from cord blood and mRNA expression were quantified for metabolic genes [adiponectin receptor 1 (ADIPOR1), adiponectin receptor 2 (ADIPOR2), carnitine palmitoyltransferase 1A (CPT1A), PPAR γ coactivator (PGC-1 α)] using RTPCR. Ponderal Index (PI), an indicator of neonatal weight status and growth, was calculated using birthweight and length. Data were analyzed using descriptive statistics and normality was assessed for continuous variables using Shapiro-Wilk tests. Pearson product-moment correlation coefficients were used for normally distributed variables and Spearman's rank-order correlation coefficients were used for non-normally distributed variables. Partial correlations were used to adjust for potential co-founders. **RESULTS:** All neonates were delivered at term and birthweight ranged from 2760-4150 grams. The average PI was $2.51 \pm 0.26 \text{ kg/m}^3$ (range 2.05 to 3.18 kg/m^3). mRNA expression of all genes were positively correlated to PI (ADIPOR: $r=0.448, p=0.025$; ADIPOR2: $r=0.550, p=0.004$; CPT1A: $r=0.533, p=0.006$; PGC-1 α : $r=0.478, p=0.016$) and these relationships remained after controlling for gestational age at delivery, baby sex, and maternal pre-pregnancy BMI ($p < 0.05$). **CONCLUSIONS:** It has been established that maternal lipid metabolism is associated with neonatal anthropometrics. Findings from this study suggest that the relationship between maternal metabolism and neonatal anthropometrics may be mediated by the neonate's metabolic profile, particularly genes associated with lipid oxidation and insulin sensitivity. **Grant or funding information:** None to disclose.

P239: ATTENUATED CARDIOMETABOLIC BENEFITS FROM EXERCISE TRAINING IN INDIVIDUALS WITH GENETICALLY PREDICTED HIGH LP(A) LEVELS

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Background: High levels of lipoprotein(a) [Lp(a)] are a causal risk factor for cardiovascular disease. Lp(a) levels are primarily determined genetically, around 90%. Although Lp(a) remains a risk factor for cardiovascular disease, little is known about how individuals with genetically elevated levels of Lp(a) respond to exercise training.

Purpose: This research investigates whether the cardiometabolic responses to exercise differs based on LPA genotype. **Methods:** We measured LPA genotype (SNP rs3798220) and phenotypes in 670 Black and White participants of the HERITAGE Family Study who completed 20 weeks of exercise training. Phenotypes were measured before and after training, including body composition, cardiopulmonary exercise tests, lipid panels, inflammatory markers, and measures of glucose homeostasis. Student's t-tests and general linear models were used to determine whether mean training-induced changes in phenotypes differed between LPA genotypes. $P < 0.05$ was used to determine significance. **Results:** At baseline, individuals with genetically predicted high levels of Lp(a) (rs3798220 CT genotype, $n=24$) had a generally worse cardiometabolic profile (e.g., higher concentration of triglycerides, apoB, and small LDL compared to the TT genotype ($n=646$). For several phenotypes both LPA genotypes experienced similar improvements in response to training, including increases in VO_{2max} and HDL-C and decreases in submaximal exercise blood pressure (all $p < 0.05$ for within group changes). However, the rs3798220 CT genotype group experienced some training responses in an unexpected direction, including significant increases in resting blood pressure (+3.0 (6.6) mmHg SBP; +3.0 (6.1) mmHg DBP), fasting glucose (+0.3 (0.4) mmol/L), and LDL-C (+7.8 (15.5) mg/dL) that were not observed in the TT genotype. **Conclusions:** LPA genotype reflects a subset of the population with higher lifetime CVD risk that may experience unfavorable cardiometabolic responses to exercise training for select phenotypes. These findings may have important clinical implications, as individuals with genetically predicted high Lp(a) levels should still exercise for its many other beneficial effects. However, these individuals may need to focus on dietary and pharmacological interventions to maximally reduce CVD risk. Larger studies with measured Lp(a) levels are needed to validate these genetic findings.

P240: THE INFLUENCE OF BODY WEIGHT ON HBA1C WHEN PREDICTING DIABETES IN ACTIVE OLDER ADULTS

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BACKGROUND: Elevated blood glucose leads to diabetes and is the eighth leading cause of mortality in the United States (USA) and has a greater prevalence in African Americans than other USA populations. Glycosylated glucose (HbA1c) is an assessment of the stability of glucose over a time with a value less than 5.7 m/mol% normal and a value greater than 6.5m/mol% considered diabetic. Diabetes and elevated blood glucose can be controlled with lifestyle choices such as weight control, exercise, and diet. **METHODS:** Thirty-seven volunteers (25 exercisers and 12 non-exercisers) 55 years of age and older from the same recreational center signed institutional consent forms and attended an assessment coordinated with a senior health risk program. They were evaluated with a lifestyle questionnaire and for blood variables including HbA1c at the beginning and conclusion of the program. HbA1c values were evaluated for differences between the groups with an independent t-tests. **RESULTS:** The non-exercisers were heavier (90.6 ± 26.6 kg; $p < 0.05$) than the exercisers (81.8 ± 15.3 kg $p < 0.05$). HbA1c values between the groups were not different (Non-exercisers 5.5 ± 0.46 and exercisers 5.7 ± 0.63 m/mol%: $p > 0.05$) even though the non-exercisers were 10.8% heavier than exercisers. The exercisers were prediabetic as their HbA1c mean was 5.7 m/mol%. The age of the participants also was not different ($p > 0.05$). These results suggest that weight was not a factor that influenced HbA1c in these active older populations. Although further research is warranted on this topic, these data indicate that HbA1c would not be an effective indicator of diabetes in this older active group of urban adults.

P241: ENERGY COST OF RESISTANCE TRAINING IN OBESE, PRE-DIABETIC, POSTMENOPAUSAL WOMEN.

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BACKGROUND: Energy expenditure (EE) from exercise is a minor but important consideration in the context of total daily energy demands and plays a role in weight management strategies. This has not been well characterized for resistance training (RT). The purpose of this study was to measure the EE of RT in post-menopausal, pre-diabetic, obese women. Understanding the energy cost of RT in this population will provide valuable to inform health professionals aiming to understand overall energy demands of RT and the application to weight management. **METHODS:** Nine pre-diabetic, postmenopausal women (50-70 years old, 96.4 ± 7.9 kg) completed the resistance training (RT) portion of a larger study approved by FSU Human Subjects Committee. Participant screenings prior to RT excluded those with a blood pressure >140/90 mmHg; type I or type II diabetes; medical contraindications to exercise; recent musculoskeletal disease or injury (<6 months); history of, or current cancer, CVD, respiratory disease, uncontrolled thyroid dysfunction, liver or renal dysfunction; use of tobacco products or medications affecting lipid metabolism; and/or diagnosis with an eating disorder. Participants needed to have a Body Mass Index of 30-39.9 kg/m², a waist circumference > 88.0 cm, meet at least one criterion of prediabetes (HbA1c 5.7 - 6.4%, fasting blood glucose 100-125 mL/dL, and/or 2-hr OGTT blood glucose 140-199 mg/dL), and be sedentary with a stable bodyweight (< ±2 kg in preceding 6 months). RT involved a circuit of seven machine-based resistance exercises: chest press, horizontal leg press, cable seated row, quad extension, shoulder press, seated hamstring curl, and cable biceps curl. A 10-repetition maximum lift (10RM) was tested for all exercises one week prior to RT. The participants lifted their 10RM for all sets of all exercises. Metabolic rate was measured using a metabolic cart during RT. Each RT session ended when the subject expended 200 kcal. The first ten and final six minutes were discarded from the data set when calculating average EE. **RESULTS:** The average EE in the RT group was 1.47 ± 0.33 kcal/min. Interestingly, the EE did not significantly correlate with participant's bodyweight ($r = 0.37$, $p = 0.32$), weekly training load ($r = 0.10$, $p = 0.80$), or relative strength ($r = 0.02$, $p = 0.97$). **CONCLUSIONS:** The results suggest that the EE of post-menopausal, pre-diabetic, obese women during RT is 1.47 ± 0.33 kcal/min. Grant or funding information: 1 R01 DK125728-01.

P242: IS A CUP ENOUGH? LEVELS OF ENERGY EXPENDITURE DURING SPEED STACKING

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Speed Stacking, introduced in the early 1980s, is a key component of U.S. physical education (PE) programs. It's known for enhancing motor skills, hand-eye coordination, and reaction time by up to 30%. Yet, there are doubts about its effectiveness in achieving recommended moderate to vigorous physical activity (MVPA) levels (>3.0 METs for adults, >4.0 METs for youth) when compared to continuous (e.g., walking, running) and discrete (e.g., kicking, throwing, striking) skills. Twenty young adults (average age: 20.4 ± 1.5 years, average BMI: 25.4 ± 3.5) volunteered for a study with four five-minute testing phases: baseline rest, Speed Stacking, Running, and Speed Stack and Run. They wore a portable metabolic computer (COSMED K5) and a heart rate monitor to measure METs. During the Running phase, participants completed a short run to a stacking table and back with brief intervals every 40 seconds. Ratings of Perceived Exertion (RPE) on a 1-10 scale were recorded for analysis. The average METs for adults and children were 1.40 (±0.24) and 2.51 (±0.88) during the rest condition, 2.97 (±0.56) and 3.86 (±0.93) during the Speed Stacking, 2.95 (±0.32) and 4.55 (±1.34) during the Running condition and 3.47 (±0.57) and 5.02 (±1.32) during the Speed Stack and Run condition. Avg RPE: Rest = 2.45 (±1.64) and 1.8 (±1.3), Speed Stack = 2.65 (±1.62) and 2.48 (±1.43), Run = 3.0 (±1.64) and 2.59 (±1.85), Speed Stack & Run = 3.05 (±1.72) and 2.68 (±1.53). There was a main effect for sex ($df = 1, 18$, $F = 472.103$, $p < .05$ $\eta^2 = 0.378$) with post hoc t-tests indicating women demonstrated higher METs at each performance trial interval except the Speed Stack and Run conditions. Contrary to previous research on Speed Stacking's energy expenditure, this study failed to meet the minimum MVPA threshold in both genders and age groups, except during Running and Speed Stack combined conditions. This aligns with the well-established effectiveness of running for MVPA. The absence of gender-based differences underscores Speed Stacking's low-intensity nature. RPE

scores remained low, suggesting it's suitable for a recovery day in PE classes. To achieve MVPA recommendations, Speed Stacking should be complemented with higher-intensity activities, particularly in children, warranting further investigation.

P243: DOES NOTCH AFFECT MUSCLE REPAIR AND ATROPHY AFTER INJURIOUS EXERCISE IN NORMAL AND OBESE MICE?

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PURPOSE: Notch has a pleiotropic role during skeletal muscle repair. It promotes cellular proliferation, inhibits muscle differentiation, and influences cellular quiescence. Notch is also suggested to affect muscle atrophy, but there is little work describing that interaction. In addition, the effect of different disease states on Notch's influence on repair and atrophy processes is unknown. Obesity delays muscle repair, but the influence of Notch on the impaired repair is unknown. The purpose of this study is to measure markers of muscle repair and atrophy in young, obese mice with inhibited Notch signaling and were exposed to injurious exercise. **METHODS:** Two mouse trial studies were performed. In Study #1, Young (2-4 months) male C57BL/6 mice were injected with 100,000 TUs of shRNA Notch1 inhibitor into the left gastrocnemius (Control vector in right) for five consecutive days. Mice were exposed to an injurious bout of downhill running and were euthanized at 1D, 2D, 3D, and 4D post-exercise. In Study #2, Young (2-4 months) male and female C57BL/6 mice were fed either standard chow or a high-fat diet for 12 weeks and were injected with shRNA Notch1 inhibitor into the left gastrocnemius for five consecutive days. Mice were exposed to an injurious bout of downhill running and were euthanized at 3D, and 5D post-exercise. The rodent treatments were approved by UNC Charlotte's Institutional Animal Care and Use Committee. Markers of muscle repair and atrophy were measured in the gastrocnemius via western blot analysis. Depending on groups, either one way or two-way analysis of variance (ANOVA) tests were performed to determine differences between experimental groups and post-hoc comparisons were accomplished via a Tukey's test, with statistical significance set a priori at $p < 0.05$. **RESULTS:** There was a main effect of muscle repair markers, MyoD, Myogenin, and embryonic Myosin Heavy Chain (eMHC) with significant elevation in Notch inhibited mice relative to control ($p < 0.05$). **CONCLUSION:** Downregulation of Notch accelerates the expression of later-stage muscle repair markers and inhibits muscle atrophy. The role of Notch signaling may be better described as a moderator of muscle size rather than a requirement for muscle repair. Supported by UNC Charlotte's Faculty Research Grant to STA.

P244: ALTERED P38 ACTIVATION IN THE FEMALE APCMIN MICE

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BACKGROUND: Cancer cachexia is associated with catabolic conditions that trigger skeletal muscle wasting. Research has indicated the presence of sex differences in the development of cancer cachexia and in the severity of muscle mass loss. In male mice, the p38 mitogen-activated protein kinases (MAPK) are known to play a role in the progression of cancer cachexia. However, their role in female mice remains unclear. This study aimed to investigate whether there are alterations in p38 MAPK activity in female mice with cachexia. **METHODS:** Female ApcMin/+ (Min, n=4) mice and age-matched wild-type (WT, n=4) mice were used. The body weights were recorded every week. All the mice were sacrificed at 22 weeks old. The right gastrocnemius (GAS) muscles were removed, weighed, and snap-frozen at sacrifice. The tissues were homogenized for routine western blotting using 30~50 μ g of the total protein. Student's t-test was used to compare the difference between WT and Min. The coefficient of determination (r^2) was used to examine a significant correlation. The significance level was set at $p < 0.05$. **RESULTS:** Female Min mice had smaller body weight (BW, 22.6 ± 0.3 g vs. 18.3 ± 1.7 g, for WT and Min mice, respectively, $p < 0.05$). Min mice lost 18.9% of BW compared to their peak BW. Likewise, GAS weight in Min mice was smaller than in WT mice (104.2 ± 4.9 mg vs. 80.8 ± 9.4 mg, respectively). Western blot analysis showed that Min mice had a reduced phosphorylated state of eukaryotic translation initiation factor 4E (eIF4E)-binding protein 1 (4E-BP1) than WT mice by 34% ($p < 0.05$). Conversely, the levels of p38 MAPK activity were elevated in Min mice by 63% ($p < 0.05$). There was a significant correlation between 4E-BP1 and p38 MAPK ($r^2 = 0.6609$, $p < 0.05$). **CONCLUSIONS:** These results suggest

that p38 MAPK might contribute to muscle wasting by attenuating an anabolic pathway in female cachectic mice.

P245: ABSTRACT WITHDRAWN

P246: IS DOING MORE BETTER? THE IMPLICATIONS OF ACCOUNTING FOR BASELINE TRAINING VOLUME IN PREVIOUSLY TRAINED INDIVIDUALS

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PURPOSE: To determine whether increasing an individual's baseline training volume on a per session basis influences the skeletal muscle growth response following 12 weeks of resistance training. **METHODS:** Forty-two resistance trained individuals completed unilateral elbow flexion resistance training twice weekly for a 12-week training period. Participants had each arm randomized to complete either a higher volume (HV) or lower volume (LV) condition. The amount of exercise volume performed was based on each individual's average baseline training volume (per session) for the elbow flexion exercise. For example, if the individual regularly performed 4 sets per session, one arm was randomized to complete an additional 2 sets of exercise (i.e., HV), while the contralateral arm performed what they were regularly accustomed to (i.e., LV). Each condition performed exercise to muscular failure with 60s rest periods between sets and loads corresponding to an 8-12 repetition maximum (RM). Measures of muscle thickness (MT) and 1RM strength were taken prior to and following the 12-week training period. **RESULTS:** Changes in 1RM strength were no different between the higher volume [2.2 (1.6) kg] and lower volume conditions [2.3 (1.7) kg] ($p = 0.52$). For changes in MT, at the 50% muscle site, there was no interaction ($p = 0.81$) and there was no main effect for condition. However, there was a main effect for time ($p < 0.001$). Muscle size increased from pre to post intervention [mean change = 0.15 (0.09-0.19)cm]. For the 60% muscle site, there was no interaction ($p = 0.57$) and there was no main effect for condition ($p = 0.83$). However, there was a main effect for time ($p < 0.001$). Muscle size increased from pre to post intervention [mean change = 0.15 (0.09-0.19)cm]. For the 70% muscle site, there was no interaction ($p = 0.64$) and there was no main effect for condition ($p = 0.32$). However, there was a main effect for time ($p < 0.001$). Muscle size increased from pre to post intervention [mean change = 0.15 (0.09-0.20)cm]. **CONCLUSION:** In conclusion, the current data would suggest that accounting for an individual's baseline training volume does not seem to influence changes in muscle size or strength, as both conditions increased similarly over a 12-week training period.

P247: EXAMINATION OF ACUTE MUSCLE AND CARDIOVASCULAR RESPONSES FOLLOWING LOW-PRESSURE BLOOD FLOW RESTRICTION EXERCISE USING TWO DISTINCT METHODS OF APPLYING PRESSURE

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PURPOSE: To examine acute changes in muscle thickness (MT), isometric strength (ISO), and blood pressure (BP), following exercise with 40% limb occlusion pressure (LOP) using two distinct blood flow restriction (BFR) devices. **METHODS:** Forty-four trained individuals had each arm randomized to perform exercise with either a SmartCuffs or Hokanson BFR device. Each condition performed 4 sets to volitional muscular failure at 30% of individual's one repetition-maximum (1RM) with 30s rest periods. For both conditions, LOP was set at 40%. Blood pressure, MT, and ISO were measured before and after exercise. **RESULTS:** For MT, there was no condition x time interaction ($p = 0.68$), or main effect for condition ($p = 0.50$), however, there was a main effect for time ($p < 0.001$). When examining changes, MT increased from pre ($3.8 \pm .67$ cm) to post ($4.3 \pm .72$ cm). For ISO, there was no condition x time interaction ($p = 0.53$), or main effect for condition ($p = 0.50$). However, there was a main effect for time ($p < 0.001$). When examining changes, ISO decreased from pre (23.7 ± 8.5 AU) to post (13.2 ± 5.6 AU). For systolic BP, there was no condition x time interaction ($p = 0.1$), or main effect for condition ($p = 0.52$). However, there was a main effect for time ($p < 0.001$). Systolic BP increased from pre (122 ± 12 mmHg) to post (136 ± 19 mmHg). For diastolic BP, there was no condition x time interaction ($p = 0.56$), or main effect for condition ($p = 0.44$). However, there was a main effect for time ($p < 0.001$). Diastolic BP increased from pre (72 ± 9 mmHg) to post (78 ± 13 mmHg). **CONCLUSIONS:** In conclusion, we observed significant

increases in MT and BP, as well as significant decreases in ISO following exercise, with no differences between the exercise conditions. Our data would suggest that both methods of applying BFR seem to provide similar acute muscular and cardiovascular responses following BFR exercise with 40% LOP.

P248: MITOCHONDRIAL MRNA ACUTE RESPONSE TO BOUTS OF HIGH- AND LOW-LOAD RESISTANCE TRAINING

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BACKGROUND: The effects of high-load (HL ~80% of 1-RM) versus low-load (LL ~30% of 1-RM) resistance training (RT) on various molecular outcomes has proven to be similar between the two paradigms. However, the mitochondrial response to such training paradigms remains understudied. Therefore, the purpose of this study was to interrogate the transcriptional response of HL and LL RT in mRNAs related to mitochondrial biogenesis and remodeling.

METHODS: Eleven resistance trained males completed two acute bouts of either HL or LL barbell back squats and seated leg extensions to failure. Each session was completed in randomized order and separated by 7 days. Vastus lateralis muscle biopsies were collected at PRE, 3 hours post- (3h), and 6 hours post-exercise (6h). Ten mRNAs related to mitochondrial biogenesis and remodeling were investigated using the Clariom S Assay Human mRNA array, and two-way ANOVAS were performed to detect any interactions or main effects of timepoint and condition. **RESULTS:** NRF1 was statistically significantly higher in the LL condition ($p = 0.040$), but no other markers of mitochondrial biogenesis demonstrated statistically significant differences. However, there was a statistically significant main effect of timepoint for multiple markers of mitochondrial biogenesis. This included NRF1 ($p = 0.049$) decreasing at 3h and both PGC1- α ($p < 0.001$) and TFAM ($p = 0.030$) increasing at 6h compared to PRE. There was a main effect of timepoint, but not condition, in markers of mitochondrial remodeling with MFN2 ($p = 0.021$) and Parkin ($p = 0.006$) showing decreased mRNA expression from PRE to 3h. **CONCLUSION:** Resistance training load had little effect on mRNA markers of mitochondrial biogenesis and remodeling. However, it appears that acute resistance exercise uniquely affects markers of mitochondrial biogenesis and remodeling at 3h and 6h timepoints. Further investigation is warranted to delineate the time course of the transcriptional response of each marker of mitochondrial biogenesis and remodeling.

P249: EFFECTS OF HIGH HEELS ON GASTROCNEMIUS STIFFNESS IN WOMEN

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Background: The effects of an acute bout of high heel wear on the mechanical properties of lower leg musculature has not been shown. Therefore, the purpose of this study is to use ultrasound elastography (SWE) to examine changes in shear modulus of the gastrocnemius (GS) muscles following a simulated workday in high heels. Because the plantar flexors are held in a shortened position it was hypothesized that stiffness of the GS would increase after a day of high-heel wear. We hope to further inform the public on the effects of high-heel wear.

Methods: 17 women aged 26.6 ± 7 yrs. in good health, were split between experimental ($n=8$) and control groups. SWE images were taken of the medial and lateral GS in anatomical neutral with the participants lying prone on a plinth. Participants in the experimental group wore 3-inch heels provided by the experimenter, the control group wore their own athletic sneakers without a raised heel. To simulate eight-hour workday participants were given a desk and asked to sit with feet planted. Seat height was adjusted to place the hip and knee at 90° of flexion. Every two hours participants completed a short walking task either retrieving multiple objects at the end of a hallway or descending and ascending six flights of stairs. SWE images were taken at the same imaging positions at the end of the day. A mixed model ANOVA was performed to evaluate the effects of group and time on shear modulus of the GS muscles. **Results:** The ANOVA revealed significant effects for group*time for each muscle. Post hoc t-tests were conducted to illuminate the factors of group and time. Stiffness of the GS increased with high heel wear in the experimental group. In the left lateral GS stiffness increased from 12.8 to 16.4 kPa ($t(7)=1.89, p=0.006$). In the left medial GS stiffness increased from 12.5 to 18.3 kPa ($t(7)=1.89, p=0.005$). In the right medial GS stiffness increased from 11.6 to 17.7 kPa ($t(7)=1.89, p=0.005$). In the right

lateral GS stiffness increased from 12.3 to 18.3 kPa ($t(7)=1.89, p=0.001$). No significant differences were found between groups before the intervention. No significant changes in GS stiffness were seen in the control group. **Conclusion:** An eight-hour workday of wearing high heels correlates to significant increases in GS stiffness. There were conversely no significant increases in stiffness in the control who completed the same intervention while wearing sneakers.

P250: THE EFFECTS OF ESTROGEN ON DELAYED ONSET MUSCLE SORENESS AFTER ECCENTRIC EXERCISE

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BACKGROUND: The female reproductive hormone estrogen has been postulated to have antioxidant properties which may indicate a connection between estrogen and a shortened duration or lower intensity of delayed onset muscle soreness (DOMS). However, many studies have attempted to compare males and females' reaction to DOMS after exercise to determine if estrogen has a protective effect on muscle damage, but fewer studies have attempted to compare women in different phases of the ovarian cycle and the intensity of DOMS. The ovarian cycle has a distinct phase of breakdown and rebuilding. Thus, if estrogen does influence DOMS, women in ovarian phases in which estrogen is high may have a shorter or possibly less intense period of DOMS. The purpose of this study is to determine the effect of estrogen on the intensity of DOMS during different phases of the ovarian cycle when endogenous levels vary. **METHODS:** We plan to recruit 15 untrained eumenorrheic (28-32 day cycles) females who have not taken oral contraceptives in the past 6 months and are between the ages of 18 and 25. The participants will be asked to run downhill for 20 minutes at a 12% decline at a speed of 5.0 mph to 5.5 mph. They will complete this run once in their early follicular phase, 2-5 days after onset of menses, and once in their mid-luteal phase, 4-8 days after expected ovulation. These phases will be estimated by past menstruation data reported by the participants. We will test passive knee flexion range of motion, pain perception using a Likert scale, force production using an isometric mid-thigh pull, and swelling with thigh circumference to determine the intensity of DOMS. The outcome measures will be evaluated four times for each run: immediately pre-run, immediately post-run, 24-hour post-run, and 48-hour post-run. **ANTICIPATED RESULTS:** We hypothesize that the data from the early follicular phase will show lower pain perception and swelling with greater force and range of motion by 48 hours after exercise.

P251: LEAN MASS AS THE MEDIATOR: INSULIN AND BONE HEALTH IN HIGH SCHOOL SENIORS

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BACKGROUND: Research has shown that lean body mass (LBM) is directly associated with bone mineral density (BMD) and bone mineral content (BMC) in adolescents. In addition, insulin hormone acts as an anabolic agent in bone formation. A mediating effect of greater LBM on lower insulin levels and increased bone health has been previously observed in similar populations. Therefore, the purpose of this study is to examine LBM as a mediator of insulin and bone health variables in high school seniors. **METHODS:** 84 participants (69% female, 18 ± 1 years of age, Body Mass Index 24 ± 5 kg/m²) completed this cross-sectional study. Participants were recruited in their senior year of high school and completed one laboratory visit. Participants' body composition and bone mineral density was measured via dual-energy X-ray absorptiometry (DXA) imaging including total lean body mass (TLBM), bone mineral density (BMD), bone mineral concentration (BMC), and Trabecular Bone Score (TBS) was analyzed using iNsiteTM software. Participants' venous blood was drawn to assess fasted insulin levels. Serum insulin levels were analyzed via enzyme-linked immunoassay (ELISA). Multiple linear regression analysis was used to evaluate the relationship among the variables with significance set at $p < 0.05$. **RESULTS:** TLBM, BMD, BMC and TBS were significantly correlated with one another ($p < 0.02$). In particular, TLBM was positively correlated with BMC ($r=0.78$), BMD ($r=0.65$), and TBS ($r=0.27$), BMC was positively correlated with BMD ($r=0.84$) and TBS ($r=0.34$), and BMD and TBS were positively correlated ($r=0.45$). However, no significant correlations were observed for insulin and TLBM ($r = -0.05, p=0.75$), insulin and BMC ($r = -0.03, p=0.84$), insulin and BMD ($r = -0.17, p=0.23$), insulin and TBS ($r = -0.13, p=0.38$). **DISCUSSION:** Adolescents with higher TLBM have higher BMD, BMC and TBS. However, higher TLBM was not related to insulin levels

suggesting there may not be a mediator relationship between insulin and bone health parameters in high school seniors. FUNDING: Funding for this project was provided by the National Heart, Lung, and Blood Institute of the National Institutes of Health under Award Number R15HL159650 and Elon University Summer Undergraduate Research Experience.

P252: RESPONSE OF VIMENTIN TO MECHANICAL OVERLOAD INDUCED SKELETAL MUSCLE HYPERTROPHY

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Introduction: Vimentin (VIM) is an intermediate filament that plays a key role in development and regeneration of various tissue types, however the role of VIM during skeletal muscle hypertrophy, to our knowledge has not been fully elucidated. Therefore, the purpose of this study was to determine the role and response of VIM following mechanical overload (MOV) induced skeletal muscle hypertrophy.

Methods: C57BL/6 mice (age 4mo) were subjected to 10 or 20 days of synergist ablation to induce overload of the plantaris muscle, time matched sham surgery mice served as controls. Following overload, the plantaris was removed and either sectioned for immunohistochemistry (IHC) or placed in Trizol for RNA/protein isolation. VIM expression was examined via RT-qPCR, western blotting, and IHC. To examine expression of VIM in stromal cells occupying the muscle environment, the Tabula Muris single cell transcriptome data set was used for stromal cell target selection, and IHC was performed to examine co-expression of stromal cells and VIM (area of VIM per stromal cell) in response to overload. Data were checked for normality via Shapiro-Wilks tests and one-way ANOVAs were performed with Tukey post-hoc tests. Western blotting data and RT-qPCR data were normalized to sham mice and IHC derived data were expressed as a percentage. **Results:** VIM mRNA and protein expression was significantly upregulated following 10 and 20 days of MOV ($p < 0.001$). Cross-sectional muscle area occupied by VIM and VIM area per fiber significantly increased following 10 and 20 days of MOV ($p < 0.001$). Based on the Tabula Muris data set, mesenchymal stem cells (e.g. fibro-adipogenic progenitors; FAPs), satellite cells, and macrophages presented the highest expression of VIM in skeletal muscle in the basal state. Area of VIM per stromal cell with satellite cells, FAPs (FAPs), and macrophages increased following 10 and 20 days of MOV ($p = 0.0012$, $p < 0.001$, and $p < 0.001$, respectively). Interestingly, area of VIM per fibroblast did not significantly change following 10 or 20 days of MOV ($p = 0.581$). **Conclusion:** VIM expression is upregulated following MOV induced skeletal muscle hypertrophy. Furthermore, VIM is co-expressed with various stromal cells, and appears to be predominantly produced by fibroblast in response to overload.

P253: IMPACT OF AGING ON MARKERS OF ENDOPLASMIC RETICULUM STRESS AND THE UNFOLDED PROTEIN RESPONSE

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BACKGROUND: Aging dampens the ability of skeletal muscle to respond to stimuli and is a key driver in dysregulated proteostasis. Such dysfunction can lead to an accumulation of truncated, improperly translated, or otherwise misfolded proteins. The accumulation of these proteins can result in endoplasmic reticulum stress (ERS) and trigger the unfolded protein response (UPR). The chief function of the UPR is to blunt global translation while enhancing the production of chaperones and foldases. While ERS responses have been examined in certain age contexts, the expression of ERS related proteins have not been examined across the lifespan. Therefore, the purpose of this study was to examine the basal expression of ERS and UPR effector proteins across the lifespan in a cohort of rats. **METHODS:** Fischer 344 rats were sacrificed at 3, 6, 12, 18, and 24 months (mo) of age, whereafter plantaris and soleus muscles were collected for analysis. ERS and UPR effector proteins were examined via western blotting, and all data were normalized to 3 mo and expressed as fold change. Data were checked for normality via Shapiro-Wilk tests and one-way ANOVAs were performed with Tukey post-hoc tests. **RESULTS:** The ER chaperone binding immunoglobulin protein (BiP) was significantly different across the lifespan in both plantaris and soleus ($P < 0.001$) with 24 mo rats being lower than 3 mo in plantaris and soleus ($P < 0.001$). The translation inhibitor eukaryotic initiation factor 2 alpha (eIF2 α) was different across the lifespan (phospho/pan) in both muscles ($P < 0.001$) and was upregulated in the plantaris as compared

to 3 mo ($P = 0.006$). The apoptosis signaling protein and downstream UPR effector C/EBP homologous protein (CHOP) was differentially expressed across the lifespan in plantaris and soleus ($P < 0.001$). CHOP was upregulated ~ 2.79 and 3.08 -fold at 18 and 24 mo respectively in the soleus ($P < 0.001$), and 2.62 and 2.44 -fold at 18 and 24 mo respectively in the plantaris. Finally, principal effector Activating Transcription Factor 6 (ATF6) was differentially expressed across the lifespan (cleaved/pan) in the plantaris and the soleus ($P \leq 0.024$). ATF6 was upregulated 1.23 -fold at 18 mo in the soleus ($P = 0.035$) and 1.34 -fold at 18 mo in the plantaris ($P = 0.026$). **CONCLUSIONS:** Effectors of the UPR are upregulated across the lifespan. Given the global maladaptation of aging, this represents a potential avenue for further research and therapeutics.

P254: NEUROMUSCULAR DYSFUNCTION AND ALTERED ADAPTATION TO AEROBIC EXERCISE IN A MOUSE MODEL OF ALZHEIMER'S DISEASE.

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BACKGROUND: Alzheimer's disease (AD) develops along a continuum that spans years to possible decades prior to cognitive decline and clinical diagnosis. Notably, pre-clinical AD is associated with a significant loss of muscle mass and strength (sarcopenia, and dynapenia) and impaired skeletal muscle mitochondrial respiration compared to age matched individuals. Exercise is a potent and reproducible means to promote skeletal muscle and cognitive health and function, thus, exercise may serve to be a potential therapeutic for AD. The purpose of this study was to characterize neuromuscular function in an AD-like context and to assess whether the adaptation of skeletal muscle to aerobic exercise is altered in early AD-like pathology prior to manifestation of overt cognitive impairment. **METHODS:** Using 5xFAD mice and wild type littermates we longitudinally assed tibial nerve and direct muscle stimulated plantar flexor torque *in-vivo* from 3-6 months of age. Additionally, at 7 months we assessed sciatic nerve compound (motor) neuron action potential (CNAP). In a separate cohort we exercise trained 5xFAD and wild type litter mates starting at 10 weeks of age via voluntary running wheel for 12 weeks and assessed exhaustive exercise capacity, T-maze cognition, and skeletal muscle mitochondrial respiration and gene expression. Data were analyzed via Graphpad Prism 9.5.1 using Student's t-test, two-way ANOVA, or repeated measures two-way ANOVA when appropriate. Post-hoc analyses were performed when a significant interaction between a categorical and a quantitative variable was found. Statistical significance was established *a priori* as $p < 0.05$. **RESULTS:** Our data shows early tibial nerve stimulated muscle function impairment beginning at 4 months of age $p < 0.01$. Sciatic nerve CNAP was significantly slower in 5xFAD mice at 7 months $p < 0.01$. Post-exercise training, skeletal muscle mitochondria respiration adaptation was impaired $p < 0.05$, prior to overt cognitive impairment in 5xFAD mice. Additionally, gene changes in skeletal muscle with exercise were particularly contrasting in expression patterns from the wild type in 5xFAD mice. **CONCLUSIONS:** Changes in peripheral systems, particularly neural communication to skeletal muscle, may be precursors for AD and have repercussions for lifestyle intervention strategies (e.g. exercise) in AD afflicted populations.

P255: RELATIONSHIPS BETWEEN MULTIPLE INDICES OF MUSCLE QUALITY AND PHYSICAL FUNCTION IN YOUNG AND OLDER MALES

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BACKGROUND: Indices of muscle quality vary in the literature with some emphasizing skeletal muscle composition, and others the ratio between muscle function and mass or size. The study of muscle quality is important as it is increasingly clear that factors other than muscle size are critically important for physical function. The purpose of this study was to determine relationships between different measures of muscle quality and maximal walking velocity (MWV) in young and older males. **METHODS:** Thirty healthy, young ($n = 15$, age = 20.7 ± 2.2 yrs) and older ($n = 15$, age = 71.6 ± 3.9 yrs) males underwent dual energy x-ray absorptiometry scans and ultrasound imaging to examine leg lean mass and cross-sectional area of the quadriceps, respectively. Echo intensity, an indirect indicator of skeletal muscle tissue composition, was also derived from grey-scale analysis of ultrasound images. Participants performed isometric and concentric isokinetic (60 deg/sec and 180 deg/sec) testing of the quadriceps. Peak torque was defined as the highest 500 ms and 25 ms rolling

average for isometric and isokinetic contractions, respectively. Normalized strength was calculated via two methods for each velocity: 1) dividing peak torque by cross-sectional area, and 2) dividing peak torque by leg lean mass. Contractile acceleration was calculated from the velocity-time curve during unloaded knee extensions. For MWV, participants were instructed to walk as "fast as safely possible" along a 4 m course. Partial correlations, controlling for age and BMI, were conducted to examine relationships between MWV and muscle-related variables. RESULTS: MWV was positively correlated with contractile acceleration ($r = 0.414$; $p = 0.029$), but no other measures ($p > 0.05$). CONCLUSION: A greater capacity of the quadriceps to increase velocity rapidly was associated with a faster MWV. Contractile acceleration is indicative of muscle quality aspects (i.e., rate of activation, cross-bridge rate), but is not typically used as a standalone muscle quality metric. Muscle strength relative to size or mass, regardless of testing velocity, was not related to physical function in our smaller sample of males. It is likely the muscle group tested, and limitation of a single physical function measure were influential in these outcomes.

P256: INTERPRETIVE AND STATISTICAL CONSIDERATIONS FOR RATIOS OF MUSCLE STRENGTH PER UNIT OF MUSCLE SIZE

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BACKGROUND: Ratios of muscle strength per unit of muscle size are widely used. Statisticians point out that ratios often lead to spurious findings because they can 1) violate statistical assumptions, and 2) differ systematically across the range of denominator values simply due to mathematical artifact, not physiology. **PURPOSE:** Evaluate uneven scaling in muscle strength/size ratios via recommended isometry tests. **METHODS:** To evaluate working with ratios at the population level, 1999-2002 NHANES data including isokinetic knee extensor force and leg lean mass measures ($n=2,848$) were analyzed. To evaluate decision-making with sample data, we analyzed one-repetition maximum bicep curl (1RM) and bicep ultrasound muscle thickness data ($n=151$) from one of our previous studies. For each data set, regression lines were fit to numerator (strength) against denominator (size) variables via standardized major axis regression, testing for a non-zero y-intercept (indicates isometry issues). The ratio was then regressed on the denominator, with a non-zero slope indicating uneven scaling due to artifact. Recommended solutions including log transformation and intercept adjustment were also explored. **RESULTS:** For NHANES data, peak force (kg) regressed on leg lean mass (kg) yielded a line of $y = -13.85 + 6.51x$. The zero-intercept test indicated a non-isometric relationship, $p < 0.001$. When the strength/size ratio was regressed on leg lean mass, a systematic difference in the ratio (i.e., significant slope test) was observed across the leg lean mass values, $y = 5.13 - 0.06x$, $R^2 = 0.008$, $p < 0.001$. For the smaller sample, 1RM (kg) regressed on muscle thickness (cm) yielded a line of $y = -8.28 + 8.14x$. The zero-intercept test indicated a non-isometric relationship, $p < 0.001$. When the strength/size ratio was regressed on muscle thickness, a systematic difference in the ratio was observed across the muscle thickness values, $y = 3.30 + 0.58x$, $R^2 = 0.118$, $p < 0.001$. Log transformation did not alleviate scaling issues in either data set, although intercept adjustment may. **CONCLUSION:** Scaling issues were present in both cases, each in opposite direction. In one case, higher leg lean mass is associated with lower ratio scores, and in the other, greater muscle thickness is associated with greater ratio scores, each likely due to artifact. Ratio data should be evaluated case-by-case before subjected to analysis. Other techniques, i.e., ANCOVA or multiple regression, may better control for muscle size.

P257: WESTERN DIET AFFECTS TIBIAL STRUCTURE AND FUNCTION FOLLOWING VOLUMETRIC MUSCLE LOSS INJURY IN MICE

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BACKGROUND: Volumetric muscle loss (VML) injury is the surgical or traumatic removal of muscle tissue resulting in irrecoverable loss of muscle function, and maladaptation to the adjacent tibia. Western diet (WD) results in excessive weight gain and altered muscle metabolism, which may influence the muscle-bone relationship following traumatic injury. To date, limited investigations into the influence of Western

Diet on the muscle-bone relationship following traumatic injury have been made. Therefore, the purpose of our study was to determine whether WD following VML injury results in altered muscle and bone functional capacity. **METHODS:** Male C57Bl/6 mice ($N=23$) were subjected to a unilateral VML injury to the gastrocnemius muscle (~15%). Mice were randomized into two groups: VML + Normal Chow (VML-NC) ($n=11$) and VML + Western Diet (VML-WD) ($n=12$). Eight weeks after VML injury animals were assessed for body mass, peak-isometric strength of the injured limb, tibial mid-diaphysis microtomography, and whole-bone (tibia) functional capacity via a 3-point bending test. **RESULTS:** VML-WD resulted in a significantly greater body mass (46.01 ± 6.77 vs 32.20 ± 1.95 grams, $p < 0.0001$) as compared to VML-NC. There were no significant differences between VML-NC and VML-WD in tibial mass (66.08 ± 7.46 vs 64.70 ± 7.43 mgs, $p=0.66$), normalized peak-isometric strength (118.60 ± 24.50 vs 109.60 ± 18.70 mN-m/mg muscle mass, $p=0.32$), and cortical bone CSMI (0.15 ± 0.027 vs 0.16 ± 0.032 mm⁴, $p=0.046$), CSA (1.10 ± 0.11 vs 1.02 ± 0.082 mm², $p=0.071$), as well as ultimate load (22.15 ± 2.74 vs 17.20 ± 3.11 N, $p=0.0006$) were significantly greater in VML-WD as compared to VML-NC. **CONCLUSIONS:** Our data suggest that WD increased tibia bone strength, therefore, tibial bones remain plastic after VML injury. Further investigation is needed to understand how weight-bearing load affects bone structure-function following traumatic injury. This abstract submission is sponsored by Dr. Kevin McCully¹, FACSM.

P258: CHANGES IN SURFACE ELECTROMYOGRAPHY AND RATE OF FORCE DEVELOPMENT FOLLOWING MAXIMAL ECCENTRIC AND CONCENTRIC EXERCISE

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BACKGROUND: The purpose of this study was to examine the time-course in recovery of rapid force characteristics following maximal eccentric (ECC) or concentric (CON) contractions. **METHODS:** Seventeen strength-trained college-aged males completed this randomized, cross-over study. Subjects completed 6 sets of 10 repetitions of maximal unilateral ECC or CON contractions of the elbow flexors on an isokinetic dynamometer at 60°/s with 2 min rest between sets. Peak rate of force development (pRFD) and peak rate of electromyography (EMG) rise (pRER) were assessed instantaneously during a 10 ms window during a maximal voluntary isometric contraction (MVIC) at 90° of elbow flexion before (PRE), immediately after (POST), 1-hour (POST1), 24- (POST24), 48- (POST48), and 72-hours (POST72) post-exercise. Separate 2 (condition) × 6 (time) repeated measures ANOVAs were run for each dependent variable. **RESULTS:** There was no significant interaction effect for pRFD ($p=0.257$), however, there were significant main effects for condition ($p < 0.001$) and time ($p < 0.001$). Post-hoc analysis revealed that when collapsed across time, pRFD was significantly lower in ECC (2681.7 ± 725.1 N s⁻¹) than CON (3063.1 ± 673.6 N s⁻¹; $p=0.001$). When collapsed across condition, pRFD was significantly greater at PRE (3754.0 ± 1366.5 N s⁻¹) when compared to all other time points ($p < 0.001-0.002$). pRFD was reduced at POST (2337.5 ± 679.9 N s⁻¹) and POST1 (2454.4 ± 788.1 N s⁻¹) when compared to POST24 (2866.9 ± 887.9 N s⁻¹; $p=0.001-0.012$), POST48 (2907.6 ± 1128.7 N s⁻¹; $p=0.007-0.027$), and POST72 (2914.0 ± 1014.9 N s⁻¹; $p=0.003-0.005$). There was a significant interaction effect for pRER ($p=0.028$) by which, during ECC, pRER decreased from PRE (1.06 ± 0.61 mV/s) to POST (0.77 ± 0.41 mV/s; $p=0.051$), remained depressed at POST1 (0.72 ± 0.48 mV/s; $p=0.004$) before recovering to baseline at POST24 (1.11 ± 0.61 mV/s; $p=0.033$), which did not differ from POST48 (1.03 ± 0.63 mV/s; $p=0.863$) or POST72 (1.15 ± 0.47 mV/s; $p=0.645$). pRER was significantly lower in ECC at POST and POST1 when compared to CON (POST: 0.98 ± 0.41 mV/s; POST1: 1.09 ± 0.63 mV/s; $p=0.043-0.048$). During CON, pRER was significantly greater at PRE (1.35 ± 0.87 mV/s) when compared to POST72 (0.95 ± 0.47 mV/s; $p=0.035$). **CONCLUSIONS:** The findings of the present study suggest that pRER may be more sensitive than pRFD at discriminating contraction-specific changes in neuromuscular function following an acute bout of exercise.

P259: COMBINING MAXIMAL MENTAL EFFORT WITH ELASTIC BAND TRAINING TO ENHANCE NEUROMUSCULAR ADAPTATIONS IN OLDER WOMEN

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BACKGROUND: Despite substantial evidence that resistance training (RT) is effective at mitigating age-related losses in muscle mass and function, few older adults participate in RT due to perceived difficulty, risk of pain or injury, or financial cost. Elastic band training is an accessible, low-cost option for RT that improves muscle strength and functional capacity. Though effective, RT programs that more directly target neural adaptations may enhance strength gains given the neuromuscular deficits in older adults. Preliminary research indicates that increased mental effort (ME), the effort associated with intended motor action, stimulates strength gains regardless of training intensity. However, very few studies have examined the implementation of maximal ME during practical RT on muscle function. The aim of this study will be to determine if maximal ME during elastic band training enhances strength and neuromuscular adaptations compared to elastic band training alone in older women. **METHODS:** We plan to recruit 45 healthy, community-dwelling women aged 65-79 yrs to participate in this randomized control trial. Subjects will be randomly assigned into one of three groups: elastic band training (EBT), elastic band training with maximal ME (EBT+MME), or control (CON). Both training groups will participate in 6 weeks of virtual-supervised, moderate intensity whole-body elastic band training, but EBT+MME will mentally urge their muscle to contract maximally during each contraction. Specifically, both training groups will perform the same exercises at the same intensity but subjects in EBT+MME will be instructed to "imagine maximally contracting the muscle" during the concentric portion of each repetition. Before and after the 6-week protocol, muscle strength and size, and functional capacity (30-s and 5-time chair rise) will be measured. Changes in dynamic and isometric strength will be assessed for the quadriceps and biceps brachii. Voluntary activation, the central nervous system's ability to activate skeletal muscle, of the biceps brachii will be estimated using the twitch interpolation technique with percutaneous muscle stimulation. Two-way (group \times time) and three-way (group \times muscle \times time) repeated measures ANOVAs will be used to analyze changes between groups. **ANTICIPATED RESULTS:** It is hypothesized that EBT+MME will produce greater increases in strength and voluntary activation than EBT.

P260: ASSESSING LEG BLOOD FLOW USING MULTIPLE NEAR-INFRARED SPECTROSCOPY DEVICES
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Background: Leg blood flow has been measured using a single near-infrared spectroscopy (NIRS) device after exercise or ischemia. This study evaluated leg blood flow using three NIRS devices on three locations, using cuff ischemia and postural ischemia. The aim was to determine the optimal method and duration for these measurements. **Methods:** Young, healthy adults (males: n=5 and females: n=2) were tested on two separate days. Blood flow was measured as the half-time of recovery (T1/2) of the NIRS tissue saturation index (TSI) after leg lifts (60s, 120s) or cuff ischemia (30s, 60s, 180s, 300s). NIRS devices were placed on the vastus lateralis, medial gastrocnemius, Extensor digitorum brevis. T-tests were made to compare values between days and tests. **Results:** All subjects preferred the leg lifts to cuff ischemia to measure blood flow. T1/2 values for 60 seconds and 120 seconds of leg lifts were 4.6+0 and 4.3+2.6 for the thigh, 7.3+3.1 and 9.5+6.9 for the calf, and 7.7+6.1 and 8.4+2.7 for the foot. The values were 3.4+1.6, 6.6+4.4, and 6.50+5.3 for 30 seconds of ischemia. The values were 4.2+1.0, 4.9+1.8, and 4.3+2.3 for 60 seconds of ischemia. The values were 6.9+1.8, 7.5+2.4, and 16+8.2 for 180 seconds of ischemia. The values were 9.7+1.1, 10.7+3.0, and 22.6+6.1 for 300 seconds of ischemia. The mean values were not different between leg lift durations and were slower in the foot in comparison to the thigh values for all measures. There was no significant difference between the calf and thigh measurements. **Conclusions:** Leg lifts are a subject's preferred method to measure blood flow in the leg. Normal values for the foot will be longer than for the calf and the thigh.

P261: AGE-RELATED DIFFERENCES IN MITOPHAGY RESPONSE TO ACUTE EXERCISE IN SKELETAL MUSCLE OF MICE

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Background: mitophagy, a process that is responsible for eliminating damaged mitochondria, gradually declines during aging. This decline, particularly prominent in aging skeletal muscle, correlates with

compromised mitochondrial function, impacting mobility and muscle strength in older individuals. Previous research demonstrates that after 6 hours of acute exercise, young mice exhibit heightened mitophagy compared to their sedentary counterparts. However, many studies revealed that the accumulation of damaged mitochondria due to oxidative stress, DNA mutations and dysfunctional lysosome can overwhelm the mitophagy process, reducing its efficiency in removing dysfunctional mitochondria in aged skeletal muscle. Therefore, our hypothesis is exercise-induced mitophagy in skeletal muscle is impaired with aging. **Methods:** We transfected *pMito-timer* into Flexor digitorum brevis (FDB) muscle of 3 (young) and 25 (old) month old mice. After 10 days recovery, mice were familiarized to treadmill running for three days (10 min at 10m/min). On the fourth day, mice performed 90 minutes treadmill running exercise. Young mice ran 10 min at 13m/min, 10 minutes at speed 16m/min, 50 minutes at 19m/min, and finally 20 minutes at 21m/min. Based on the NMR data, the old mice have higher body fat mass and lower muscle mass in compare with young group. Therefore, old mice cannot have same performance as young group. In this regard, we normalized and adjusted the running protocol for workload equality. We calculated the work performance based on body weight by using the equation (Body weight (kg)*distance (m)*time (m)* 0.05 incline). Also, we monitored blood lactate before and after exercise to monitor relative exercise intensity. After 6 hours, we harvested FDB to observe mitophagy by confocal microscopy. **Result:** Young mice had significantly higher mitophagy following exercise, as seen previously. However, mitophagy was significantly elevated in sedentary old mice compared to either young group. Furthermore, there was no effect of exercise in old mice to further elevate mitophagy above sedentary, age-matched counterparts. **Conclusion:** Our study shows age-related differences in skeletal muscle mitophagy and the mitophagy response to acute exercise. To better comprehend our findings, we need to investigate how metabolic preferences during acute exercise differ between young and old mice and how these variances impact mitophagy.

P262: PERCEIVED BENEFITS AND BARRIERS TO WATER-BASED EXERCISE IN ACTIVE OLDER ADULTS

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BACKGROUND: Water-based exercise is an effective training mode for improving strength, physical function, and balance in older adults. It can also serve as an alternative to land-based exercise for those requiring non-weight-bearing activities to manage joint pain and chronic disease symptoms. Despite these benefits, older adults are less likely to engage in recreational aquatic activities compared to younger adults. Therefore, more research is needed to explore older adults' perceptions of water-based exercise. **PURPOSE:** The purpose of this study was to explore perceived benefits and barriers to water-based exercise and perceptions on how it differs from land-based exercise in older adults who regularly participate in water exercise classes. **METHODS:** Older adults were recruited from two fitness centers. Semi-structured interviews were conducted to explore participants' opinions regarding benefits and barriers to water-based exercise and how it differs from land-based exercise. Interviews were transcribed and analyzed using first and second cycle qualitative coding. **RESULTS:** Eleven older adults (69 \pm 7 years) completed the interviews. Participants engaged in 3.5 \pm 1.2 water classes/week and had been attending water-based classes for 10.5 \pm 7.6 years. Five themes emerged regarding perceived benefits: improved feelings of well-being, positive class elements, social engagement, improved health and fitness, and pain management. Three themes were identified regarding barriers: body image, class-related factors, and participant schedule. Compared to land activities, water-based exercise was perceived to be safer, more enjoyable, and within participants' physical capabilities. **CONCLUSIONS:** Findings highlight important factors that influence older adults' participation in water-based exercise, which may inform future programming strategies to enhance promotion of and engagement in water-based classes. Numerous benefits were reported, which correspond to several wellness domains including physical, mental, and social well-being. Participants highlighted advantages to exercising in the water compared to land, which influenced their exercise class decisions. Fewer barriers were identified, which may have been influenced by the fact that participants were already consistently attending water classes. Future research should explore perceptions of older adults who do not regularly participate in water-based exercise.

P263: UNDERGRADUATE STUDENTS' PERCEPTIONS OF THE OLDER POPULATION AFTER PARTICIPATING IN THE BINGOCIZE® PROGRAM

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BACKGROUND: Bingocize® is a strategic combination of physical exercise and the game of bingo specifically designed for the older population. Bingocize® has also been used as a tool in health science undergraduate programs to create meaningful fieldwork experiences that prepare students to become the well-prepared staff needed for the future care of older people. The purpose of this study was to analyze undergraduate students' attitudes towards the older population after completing a Bingocize® fieldwork experience. **METHODS:** A retrospective post-course survey was administered to 20 students who completed a field experience course focused on delivering the Bingocize® exercise intervention to the older population. The survey assessed students' perceptions of working with the older population, both before and after the course, using single-time measurement. **RESULTS:** Data were analyzed using frequency distribution to describe shifts in students' perceptions. Prior to the course, a notable 76.4% of the participants were either uninterested in or unsure about working with the older population. After the course, a significant change was observed, with 70.6% of students stating they would now enjoy such work. Regarding their initial reluctance for the field placement, 58.8% of students were hesitant to participate. However, post-course responses illustrated a positive shift; 76.5% of students rated their field experience as positive or very positive. **CONCLUSIONS:** Although numerous exercise science careers involve working with older people, many undergraduate students were initially uninterested in working with this population. However in this study, students enjoyed participating in Bingocize® despite having these negative feelings beforehand. Therefore, having students directly involved in established programs like Bingocize® and providing organized training for them can create more positivity and excitement towards careers involving working with older people. Using the results of this study as a pilot, future research should look at the effect of student experiences with Bingocize® on the perception of the older population by collecting survey data before and after participating in the program. Funding information: United States Center for Medicare Services Civil Money Penalty Grant

P264: MAXIMAL AND RAPID FORCE PRODUCTION IN YOUNG AND MIDDLE-AGED WOMEN FOR LOWER AND UPPER BODY

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BACKGROUND: Age-related reductions in rapid force production are more dramatic than maximal force, but this has been primarily shown in lower body muscle groups and older adults. Decrements are likely in middle age, yet studies involving this age group and women are lacking. The purpose of our study was to determine age-related differences in maximal and rapid force parameters for handgrip and plantar flexor testing. **METHODS:** Healthy, untrained young ($n = 16$; age = 21 ± 2 yrs) and middle-aged ($n = 13$; age = 55 ± 2 yrs) women completed a testing visit 3-7 days following a familiarization session. Subjects performed rapid, maximal isometric plantar flexion and handgrip actions using an isokinetic (torque) and hand-held electronic dynamometer (force), respectively. Maximal force (or torque) was considered the highest 500 ms rolling average. Rate of force development (slope of force-time curve) and absolute force were calculated at 30, 50, 100, and 200 ms (RFD_{0-200} and F_{200} , respectively) after contraction onset. Given the different devices and units, independent samples t-tests and effects sizes (g) were used to compare age groups for each testing modality. **RESULTS:** RFD_{0-200} ($p = 0.036$; $g = 0.67$) and F_{200} ($p = 0.034$; $g = 0.70$) were significantly lower in middle-aged women for the plantar flexors, whereas only a moderate effect size was shown for maximal force ($p = 0.055$; $g = 0.59$). There were no age-related differences for handgrip ($p > 0.05$; $g \leq 0.23$). **CONCLUSIONS:** Rapid force production, particularly the latter phase, was decreased more than maximal force in middle-aged women for the lower body. No age-related differences were found for maximal or rapid force production of the upper body. These findings indicate a preferential decrease in lower body rapid force production occurs prior to older adulthood. Given the importance of rapid force production for physical function, this highlights the importance of exercise targeting rapid force adaptations prior to later life.

P265: EVALUATING THE RELATIONSHIP BETWEEN PERINATAL PHYSICAL ACTIVITY AND POSTPARTUM DEPRESSION SCORES

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BACKGROUND: Postpartum depression (PPD) affects 10-15% of new mothers annually. The maternal mental health field is rapidly evolving, but little is known about the effect of perinatal physical activity (PA) on maternal mental health outcomes. In response, the proposed study aims to evaluate the relationship between perinatal PA status and postpartum depression scores. **METHODS:** The proposed cohort study will use data from pregnant individuals ($n=840$) enrolled in the Mother and Infant Determinants of Vascular Aging Study (MIDAS) to evaluate the relationship between self-reported perinatal (i.e. third trimester, six months postpartum, change score) PA level and depression scores six months postpartum in high (e.g., gestational diabetes, hypertension) and low-risk pregnancies. PA during the third trimester and six months postpartum will be evaluated using the International Physical Activity Questionnaire (IPAQ-27). Depression scores at six months postpartum will be evaluated using the Edinburgh Postnatal Depression Scale (EPDS). The relationship between perinatal PA and postpartum depression scores will be assessed using multiple regression. IPAQ-27 scores during the third trimester, six months postpartum, and the PA change score will serve as main independent variables and EPDS score will be the dependent variable. Pregnancy risk group (high, low) and sleep quality (Pittsburgh Sleep Quality Index (PSQI)) will be included as effect modifiers. This model will control for potential confounding variables, including education, age, number of prior pregnancies and births, and maternal mental health history. **ANTICIPATED RESULTS:** We anticipate a significant inversely linear relationship between perinatal PA level and postpartum depression scores indicating a protective effect of high perinatal PA levels, with a more pronounced effect in high-risk pregnancies and among individuals with better sleep quality. Findings from this study will support future research on perinatal PA and maternal mental health. Next steps may involve incorporating wearable technology to capture objective PA data, evaluating environmental factors related to PA levels and postpartum depression scores, and using geographical data to quantitatively evaluate access to mental healthcare.

P266: INVESTIGATING THE RELATIONSHIP BETWEEN PRENATAL PHYSICAL ACTIVITY AND BIRTH WEIGHT

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BACKGROUND: Birth weight is a key indicator for neonatal health. Maternal prenatal physical activity (PA) is thought to support healthy pregnancy outcomes. Research evaluating the relationship between prenatal PA and newborn birth weight is primarily in individuals with gestational diabetes and thus warrants further investigation in both high- and low-risk pregnancies. **OBJECTIVE:** This study will aim to examine the relationship between prenatal PA level and infant birth weight, in high-risk (e.g., gestational diabetes, hypertension) and low-risk pregnant individuals. **METHODS:** The proposed study will evaluate data from 840 pregnant individuals from diverse backgrounds, locations, and risk groups enrolled in the Mother and Infant Determinants of Vascular Aging Study (MIDAS). The relationship between prenatal PA, pregnancy risk status, and birth weight of infants will be evaluated using a linear regression. PA measured by the International Physical Activity Questionnaire (IPAQ-27) during the third trimester will serve as the main independent variable, birth weight will be the continuous dependent variable, and pregnancy risk group will serve as an effect modifier. We will control for potential confounding variables including sex of infant and age at pregnancy. **ANTICIPATED RESULTS:** We expect to find a significant relationship between prenatal PA level and healthy birth weight and hypothesize that higher PA will

be associated with birth weights considered healthy. **CONCLUSIONS:** Findings from this study will characterize the association of perinatal PA and newborn birth weight and potentially inform the development of specific PA guidelines during pregnancy.

P267: PROTOCOL OVERVIEW: THE MOTHER AND INFANT DETERMINANTS OF VASCULAR AGING STUDY (MIDAS)

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BACKGROUND: Cardiovascular Disease (CVD) is a leading cause of death for females, a largely underrepresented population in research, particularly during pregnancy. **OBJECTIVE:** The Mother and Infant Determinants of Vascular Aging Study (MIDAS) aims to examine differences in pulse wave velocity (PWV), a validated measure of arterial stiffness, in order to assess CVD risk in healthy and medically-complex mother/infant dyads women during pregnancy and post-partum through the first year of life. **METHODS:** Pregnant women (n=840, aged 18-45) from diverse backgrounds will be recruited from three research universities. High-risk mothers must meet ≥ 1 of the following criteria: gestational hypertension, preeclampsia, gestational diabetes, or fetal growth restriction ($\leq 10\%$ FGR at 34-40 weeks or abdominal circumference < 10 th percentile). Participants will undergo four visits: at 34-40 weeks' gestation, within 72 hours of delivery, and at 6 and 12 months post-delivery. To address the primary aim of MIDAS, at all visits, carotid-to-femoral PWV (cfPWV) and brachial-to-femoral PWV (bfPWV) will be measured in mothers and bfPWV in infants, respectively. Lifestyle questionnaires will be administered at visits 1, 3, and 4 to further assess personal and socioecological CVD risk factors. Body composition (skinfold, DEXA), blood, urine, and microbiome (fecal sample) analysis will serve as additional metrics for CVD risk assessment. **ANTICIPATED RESULTS:** We hypothesize that, compared to low-risk mother/infant dyads, high-risk dyads will have significantly higher PWV and increased PWV change over time. **CONCLUSIONS:** Findings from the MIDAS study will contribute to guideline and intervention development intended to capitalize on the window of pregnancy to promote CVD prevention and risk mitigation in women and their children.

P268: PROTOCOL OVERVIEW: EARLY PREDICTION OF PREECLAMPSIA USING ARTERIAL STIFFNESS IN HIGH-RISK PREGNANCIES (PULSE)

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BACKGROUND: Preeclampsia (PE), a hypertensive syndrome of pregnancy, represents a leading cause of death amongst pregnant women around the world. Women with PE have an increased risk of developing hypertension and cardiovascular disease (CVD). Current tools used to detect PE include clinical metrics including mean arterial pressure (MAP), blood biomarkers, uterine artery doppler (UAD) indices, or report of symptoms after 20 weeks of pregnancy. Pulse wave velocity is a non-invasive measure of arterial stiffness (AS), an indicator of vascular dysfunction. **OBJECTIVE:** The primary aim of this study is to investigate AS, an indicator of vascular dysfunction, as a possible predictor of PE in high-risk pregnant individuals. **METHODS:** Women with a singleton pregnancy (n=370) who display ≥ 1 high risk ≥ 2 moderate risk factors according to the United States Preventative Services Task Force (USPSTF) guidelines will be recruited for this multinational prospective study. Participants will complete two visits, one at 10-13 weeks gestation and another at 18-21 weeks gestation. Carotid-to-femoral pulse wave velocity (cfPWV) and UAD PWV will be collected as measures of AS. The SphygmoCor is used to measure blood pressure, pulse wave velocity (PWV), and wave reflection. The UAD will be used to capture 3 waveforms of each the right and left uterine arteries crossing the external iliac arteries. **ANTICIPATED RESULTS:** We hypothesize that PE will be associated with significantly higher measures of AS. **CONCLUSION:** Findings from the PULSE study

will promote early risk identification (beginning in 1st trimester) and prediction of PE in high-risk women. Early risk identification could help to mitigate PE risk and CV consequences associated with PE, potentially allowing for clinical and lifestyle interventions to be implemented more effectively.

P269: COGNITIVE AND PHYSICAL ACTIVITY DIFFERENCES AMONG ELDERLY, CARING FOR GRANDCHILDREN VS. THOSE WHO DO NOT

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Background: Levels of cognition in the elderly vary depending on their health status and mental capacities. A disease like Alzheimer's will affect that person's cognitive state immensely. Cognition, as it pertains to this study, is the ability to store, recall, and maintain information and action in daily living. When caring for a child, being cognitively competent is a necessity. It is established that with increasing age we see a decline in cognition and physical activity levels. However, we propose that there is a positive relationship between cognition and physical activity levels when providing care to a grandchild. **Methods:** We aim to recruit 50 participants, age 65 years or older, who identify as a grandparent. We will divide the group into those who provide care to a minor grandchild at least once a week and those who do not. We will utilize the Mini-Cog test that screens for early dementia and data from 7 days of accelerometry. We will use Pearson correlation measures and t-tests to determine relationships between the two variables and differences between the two groups, respectively. **Anticipated Results:** Grandparents who care for their grandchildren will have higher levels of cognition and physical activity than grandparents who do not care for their grandchildren.

P270: ADOLESCENTS' PERCEPTION OF PARENTAL SUPPORT FOR ENGAGEMENT IN PHYSICAL ACTIVITY

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Parents play an important role in the lives of adolescents, particularly in relation to physical activity (PA). They act as role models and offer emotional support. Yet, the way adolescents perceive this support can influence levels of participation in PA. **PURPOSE:** To understand adolescents' perception of parental support in regards to PA participation. **METHODS:** Participants (N=1072) included adolescents aged 12-17 years and their parents from a national survey, the Family Life, Activity, Sun, Health and Eating Study (FLASHE). The FLASHE study was a cross-sectional study conducted in 2014 by the National Cancer Institute to understand the relationships between healthy behaviors and cancer among a nationally representative sample of the United States parent-adolescent dyads. This data focuses only on the adolescents, specifically their report of parenting style related to PA support. Adolescents answered six survey questions using a 5 point Likert Scale related to their agreement with what their parents say and do when it comes to PA. Descriptive statistics were calculated and differences reported between males and females using an Independent Samples t-test ($p < 0.05$). **RESULTS:** Adolescents were between ages 12-17 years and of normal body size (BMI boys: 22.71 ± 4.71 kg; BMI girls: 22.02 ± 4.8). Frequencies indicated adolescents "somewhat agreed" that parents: "have to make sure I get enough PA" (30%); "take me places where I can be PA" (40%); "make me exercise or go out and play" (27%); and "try to be PA when I am around" (31%). However, 43% of adolescents reported they "disagree" that decisions are made together regarding PA and 48% "agreed" that it was okay for rules to be made by parents about the amount of PA. Nonetheless, adolescents reported having a very good (38%) or excellent (42%) health status. There was no significant difference between the male and female responses. **CONCLUSION:** Overall, adolescents mostly feel supported by their parents in terms of engagement in PA. However, when it comes to making the rules, adolescents appear to be content with not being involved in deciding the amount of PA they should engage in as parents seem to be fulfilling this role for them. Thus, parents are a key factor in adolescents achieving the appropriate amount of PA.

P271: EXERCISE INDUCED HEPICIDIN SUPPRESSION AND IRON LEVELS: PILOT STUDY

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Background: Iron Deficiency (ID) is a common nutritional disorder affecting women which can lead to anemia causing symptoms of fatigue, weakness, and shortness of breath. Iron metabolism and

absorption is regulated by the protein hepcidin. Soluble transferrin receptor (sTfR), a marker of iron levels is elevated when ID is present and erythropoiesis, a common adaptation to aerobic exercise, is known to suppress hepcidin production. Iron deficiency is commonly treated with nutritional intervention, however little is known about the efficacy of treating iron deficiency with aerobic exercise alone. **Purpose:** The purpose of this study is to measure the effect of aerobic exercise induced erythropoiesis on hepcidin and iron levels as measured by sTfR in females. **Methods:** I intend to recruit 20 healthy female participants aged 18-24 that are not currently engaged in an aerobic training program. I will randomize participants into a control (group A) and an exercise group (group B). Group B will undergo an aerobic training program 3 days/week at 50-70% max heart rate for 4 weeks. I will measure RBC, hepcidin, and sTfR at baseline and after 4 weeks. Results will be analyzed with a two-sample t-test with a p-value of 0.05. Anticipated **Results:** I expect Group B to have lower hepcidin and sTfR, but higher RBC than group A.

P272: AGE AND PHYSICAL ACTIVITY DO NOT IMPACT CIRCULATING SOLUBLE CD14 CONCENTRATION IN APPARENTLY HEALTHY ADULTS

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Background: Soluble CD14 (sCD14) (cluster of differentiation 14) is a co-receptor of bacterial lipopolysaccharide that is released from monocytes upon activation. There is a well-recognized role of sCD14 in inflammation, and aging has been associated with increased inflammation and cardiometabolic health risk factors (e.g., high blood pressure [BP], hyperglycemia). However, there is limited information on the combined influence of aging and physical activity on circulating sCD14. Therefore, the purpose of this study was to examine the influence of aging on plasma sCD14 concentration and the potential influence of physical activity. **Methods:** Twenty young (11 females, age 22.7 ± 2.6 , body mass index 26.7 ± 3.3 , BP $119/73 \pm 7/8$ mmHg) and 21 old (11 female, age 58.4 ± 7.4 , body mass index 27.8 ± 4.8 , BP $125/76 \pm 12/8$ mmHg) adults participated in the study. Physical activity (PA) was assessed using waist worn ActiGraph GT3X accelerometers for a minimum of 5-days (7.6 ± 1.6 days) to obtain average daily steps, sedentary time, and moderate and vigorous PA (MVPA). We measured brachial BP using a SpyghmoCor XCEL after 10-minutes of supine rest. We assessed plasma concentrations of sCD14 using an enzyme-linked immunosorbent assay kit. Normality was assessed using Shapiro-Wilk. Students' T Test or Mann Whitney test were used to make age comparisons between young (<35 years) and older (>45 years) adults. Pearson's correlation and Spearman's rho, controlled for age, body mass index, and sex, were used to assess relations between MVPA and steps with sCD14. Statistical significance was set as $p \leq 0.05$. **Results:** There was not a difference between young and older adults in circulating sCD14 concentration (young: 2348 ± 441 vs. older: 2487 ± 541 pg/ml, $p = 0.501$). There was not a difference between young and older adults in MVPA (young: 47 ± 25 vs. older: 48 ± 24 min/day, $p = 0.873$) or average daily steps (young: 7179 ± 3171 vs. older: 7797 ± 3595 steps/day, $p = 0.679$). There were not associations between sCD14 and daily MVPA ($r = -0.176$, $p = 0.343$) or Steps ($r = -0.278$, $p = 0.130$). **Conclusion:** Our preliminary data indicate that there were no age differences in circulating sCD14 and no associations between habitual physical activity and circulating sCD14.

P273: AGE AND PHYSICAL ACTIVITY DOES NOT IMPACT LIPOPOLYSACCHARIDE-BINDING PROTEIN CONCENTRATION IN APPARENTLY HEALTHY ADULTS

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Background: LBP (lipopolysaccharide-binding protein) is an acute-phase protein that binds lipopolysaccharide in the blood and plays a role in subsequent activation of immune cells through the production of proinflammatory cytokines. LBP is associated with future cardiovascular disease in middle-aged and older adults. However, there is limited information on the combined influence of aging and physical activity on circulating LBP. Therefore, the purpose of this study was to examine the influence of aging on plasma LBP concentration and the potential influence of physical activity. **Methods:** Ten young (4 females, age 23.5 ± 2.2 , body mass index 26.3 ± 2.5 blood pressure $120/74 \pm 8/8$ mmHg) and 11 old (4 female,

age 60.7 ± 5.5 , body mass index 27.2 ± 3.2 , blood pressure $124/74 \pm 12/6$ mmHg) participated in the study. Physical activity (PA) was assessed using waist worn ActiGraph GT3X accelerometers for a minimum of 6-days (7.1 ± 0.5 days) to obtain average daily steps, sedentary time, and moderate and vigorous PA (MVPA). We measured brachial blood pressure using a SpyghmoCor XCEL after 10-minutes of supine rest. We assessed plasma concentrations of LBP using an enzyme-linked immunosorbent assay kit. Normality was assessed using Shapiro-Wilk. Students' T Test or Mann Whitney test were used to make age comparisons between young (<35 years) and older (>45 years) adults. Pearson's correlation, controlled for age, body mass index, and sex, was used to assess relations between MVPA and steps with LBP. Statistical significance was set as $p \leq 0.05$. **Results:** There was not a difference between young and older adults in circulating LBP concentration (young: 8045 ± 3222 vs. older: 8905 ± 7087 pg/ml, $p = 0.605$). There was not a difference between young and older adults in MVPA (young: 56 ± 30 vs. older: 51 ± 28 min/day, $p = 0.748$) or average daily steps (young: 8150 ± 4315 vs. older: 8358 ± 4158 steps/day, $p = 0.921$). There were not associations between LBP and daily MVPA ($r = -0.188$, $p = 0.519$) or Steps ($r = -0.267$, $p = 0.356$). **Conclusion:** Our preliminary data indicate that there were no age differences in circulating LBP and no associations between habitual physical activity and circulating LBP.

P274: LION'S MANE AND ITS EFFECT ON COGNITIVE FUNCTION OVER EXTENDED USE

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BACKGROUND: Lion's Mane mushroom is found in supplements purporting to enhance cognition. The purpose of this study is to determine whether Lion's Mane enhances cognitive brain functions such as memory, reaction time, or thought process speed. **METHODS:** 20 college-aged student-athletes (10 male, 10 female) were recruited for this study. Subjects were randomized into either a control group (CT) or supplementation group (LM). The LM group was given 1,000 mg of Lion's Mane per day for three weeks, while the CT group did not receive any supplementation. Two computerized assessments were used to determine whether cognitive brain function improved. The Criteria Cognitive Aptitude Test (CCAT) was used to evaluate different styles of cognitive function, including but not limited to; Numerical Reasoning, Verbal Reasoning, Abstract Reasoning, and Attention to Detail. The second assessment was a digital Reaction Time Test performed on the computer, in which subjects waited for the screen to turn green before pressing a button. Subjects were tested with the CCAT and the Reaction Test three times in total; one familiarization test during the consent process, a pre-test at least 2 days after familiarization but before supplementation, and a post-test at the end of the 3-week supplementation period. Data were analyzed with SPSS® software to determine within and between group significance using repeated measures ANOVA. **RESULTS:** No significant differences were found between groups for CCAT ($p = 0.075$) or reaction time ($p = 0.846$). Within groups, the LM group improved CCAT scores from pre- to post-testing (0.40 ± 0.14 to 0.5200 ± 0.14924 ; $p = 0.007$). Reaction time in the LM group improved between familiarization and post-testing (318.60 ± 45.24 to 286.70 ± 27.72 ; $p = 0.012$) but did not reach significance for pre- to post-testing (307.80 ± 62.46 to 286.70 ± 27.72 ; $p = 0.176$). The CT group improved CCAT scores from familiarization to pre-test (0.18 ± 0.10 to 0.30 ± 0.07 ; $p = 0.022$) and post-test (0.18 ± 0.10 to 0.40 ± 0.12 ; $p = 0.006$), but not from pre- to post-test (0.30 ± 0.07 to 0.40 ± 0.12 ; $p = 0.156$). No significant improvements were found in CT reaction time scores for any time points. **CONCLUSION:** There is not sufficient evidence to either prove or disprove that Lion's Mane influences Cognitive Performance, Reaction Time and Thought Process Speed. Even though the Lion's Mane demonstrated greater improvement through both tests, the disparity between the two Groups was not significant enough to show a definite result.

P275: ASSESSING THE IMPACT OF HIGH THEACRINE DOSES ON HEMODYNAMIC MEASURES, COGNITIVE PERFORMANCE, AND PHYSIOLOGICAL STRESS

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BACKGROUND: Theacrine (TCR) is a natural supplement found in the *Camellia kucha* plant that exhibits stimulant properties and is structurally similar to caffeine. Preliminary evidence shows beneficial effects, including improved feelings of energy with no increase in hemodynamic variables after consumption. However, TCR has not

been proven to enhance cognitive performance. The lack of impact of TCR consumption on hemodynamic variables and objective cognitive performance measures could be attributed to low-intake doses utilized in previous studies. Additionally, this study will be the first to investigate the impact of a TCR-exclusive supplement on salivary cortisol and alpha-amylase (sAA), two measures of physiological stress. Therefore, this study will use larger TCR doses relative to body weight to determine if higher doses impact hemodynamic variables, cognitive measures, and physiological stress. The findings of this study will contribute to further analysis of TCR as a viable alternative to caffeine for individuals with hypertension, tachycardia, or regular caffeine consumers wanting to avoid a stimulant with adverse effects. **METHODS:** The proposed study will be a randomized, double-blind, crossover design that will recruit 30 men and women (18-30 years) who are habitual caffeine consumers (> 2 days/week). Participants will be brought into the laboratory for one baseline testing visit and four experimental visits with at least a 7-day washout period between each visit. Participants will be randomly assigned one of the four treatments during each experimental visit: Placebo (PLA), 3 mg/kg TCR, 6 mg/kg TCR, or 9 mg/kg TCR. Brachial heart rate (HR) and blood pressure (BP) will be assessed, and salivary cortisol and sAA will be analyzed via ELISA. Feelings of energy, alertness, and mood will be assessed via an online Visual Analog Scale. The Trail Making Test and a Flanker Inhibitory Control and Attention Task will be completed online to assess cognitive performance. These measurements will be completed six times each experimental visit, pre-treatment, then 60, 90, 120, 150, and 180 minutes post-treatment. Data will be analyzed via repeated measures ANOVA. **ANTICIPATED RESULTS:** It is hypothesized that higher doses of TCR will improve feelings of energy without increasing HR, BP, salivary cortisol, and sAA. Additionally, this study anticipates that high TCR doses will improve cognitive performance.

P276: TRYPTOPHAN IN PEANUT BUTTER; IS IT ENOUGH TO IMPROVE SLEEP IN SHIFT WORKING FIREFIGHTERS?

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BACKGROUND: Sleep is vital for mental health, physical health, quality of life, and safety. Firefighters are at a higher risk for chronic sleep disruption due to a combination of factors including rotating 24-hour on and 48-hour off work schedules, unpredictable and hazardous work obligations, and/or traumatic events experienced while on shift. Tryptophan is an amino acid found in peanuts that has been positively associated with sleep quality due to its influence on melatonin and serotonin levels in the body. Therefore, the purpose of this study was to determine the effect of consuming peanut butter at night on aspects of sleep in shift-working firefighters. **METHODS:** 40 firefighters participated in this 8-week study and were randomized into a peanut butter group (n=20) or control group (n=20). An Actigraph GT3X sleep and activity wristwatch was worn for 8 weeks to assess sleep quality and quantity. Participants of both groups completed a baseline week of normal living before beginning the 7-week intervention. During the intervention, both groups were asked to stop eating two hours before bedtime. The peanut butter group was asked to consume a serving of peanut butter two hours before bedtime for five nights a week. SPSS version 29 was used to analyze the variables latency, efficiency, time in bed, time asleep, time until first awakening, number of awakenings, and time spent awake via separate linear mixed-effects models. Individual subjects were specified as a correlated random effect. Averages for each week were computed and designated as the repeated measures variable Time with 8 points (baseline and weeks 2-8). The fixed factors were Time and Group (peanut butter or control). **RESULTS:** There appeared to be a significant effect of Time on latency, $F_{7, 154.77} = 2.71, p = .011$, which was higher at week 8 (23.35 min, $CI_{95\%} = 13.43-33.23$ min) than at baseline (8.98 min, $CI_{95\%} = 1.91 - 16.04$ min). However, no time point differences were significant following Bonferroni adjustments. There were no main effects of Time or Group, or interaction effect, on any of the other variables. **CONCLUSION:** Peanut butter did not alter sleep variables compared to the control group in this study, nor were the sleep variables impaired by peanut butter consumption. However, the data does demonstrate abnormal sleep patterns of firefighters and further research is needed to find simple strategies to improve sleep in this population. **Grant Information:** The Peanut Institute funded this study.

P277: RACIAL DISCREPANCIES OF ELEMENTARY TEACHERS BASED ON FLUID CONSUMPTION AND HEALTH MEASURES DURING THE WORKDAY

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BACKGROUND: Previous data from our lab suggests that elementary school teachers consume inadequate amounts of fluid because of their limited restroom access. Inadequate fluid intake can promote renal and cardiovascular issues associated with chronic dehydration. The purpose of this study is to determine if there are fluid consumption and health discrepancies between elementary school teachers when stratified by race. **METHODS:** 29 elementary school teachers were stratified into two groups based on race (15 white and 14 non-white) (age 34 ± 8.9). Pre- and post-school day anthropometrics and vitals were conducted and heart rate (HR) measurement via Polar® H10 monitor was collected through the school day. Fluid consumption during the workday was self-reported. Urine samples were collected pre and post for analysis of urine-specific gravity (USG), creatinine, and lipocalin-2 concentrations. Data was analyzed using paired samples t-test for time within groups (pre-post) and independent t-test for between groups at an α of $p \leq 0.05$. **RESULTS:** The non-white systolic blood pressure (SBP) (118 ± 14 mmHg) was significantly higher than the white SBP (108 ± 10 mmHg) at both pre and post measurements ($p=0.0347$), while the age and body fat% discrepancy between different races was nonsignificant. Mean Arterial Pressure (MAP) was significantly greater in the non-white teachers (93 ± 10 mmHg) than in the white teachers (85 ± 9 mmHg) ($p=0.037$). No other racial discrepancies were found. The average HR throughout the workday was 90 ± 8.9 bpm, and they reached a max HR of $69.5 \pm .05\%$ of their calculated HR max. Pre-creatinine levels were significantly higher (216.8 ± 117.4 mg/dL) for all teachers than post-creatinine levels (164.2 ± 94.4 mg/dL) ($p=0.024$). The differences between USG and Lipocalin-2 levels throughout the workday were insignificant. **CONCLUSION:** These results provide a characterization of fluid consumption habits and health measures between white and non-white teachers. Only SBP is affected by one's race independent of age and BF% in this population. Creatinine levels decreased for all teachers despite low fluid consumption throughout the day. More research is needed in this population to determine the relative risk of renal and cardiovascular health issues.

P278: CANNABIDIOL (CBD) AND RESISTANCE TRAINING: DOES CBD ATTENUATE ACUTE PAIN?

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BACKGROUND: Resistance training (RT) is a beneficial form of physical activity for health and performance benefits; these benefits are maximized when done strenuously. Strenuous RT can induce acute inflammatory pain which can lead to delayed-onset muscle soreness (DOMS). Common analgesics like non-steroidal anti-inflammatory drugs (NSAIDs) can block protein synthesis, so other alternatives are needed for exercise and athletic communities. Cannabidiol (CBD) is a non-psychoactive cannabinoid with purported anti-inflammatory, antioxidant, and analgesic properties. One of the main reasons for the use of CBD in exercise is pain alleviation; however, research in humans is limited. Therefore, the purpose of this study is to evaluate two doses of CBD on acute pain after a single bout of strenuous RT. **METHODS:** Participants (n=15) will participate in a double-blind, crossover study for three weeks with a one-week washout between conditions. At the beginning of each condition, they will ingest either a placebo, low dose (2mg/kg), or high dose (10mg/kg) two hours prior to RT protocol and then again eight hours later. CBD supplementation will continue for 48 hours with two doses each day. Starting each week, participants will complete a strenuous RT protocol which will include four sets of back squats. Participants will follow a cadence of 4 seconds down and 1-2 seconds up. Pain will be assessed with a Visual Analog Scale (VAS) and Pain Pressure Threshold (PPT) at baseline (before the first dosage), immediately after RT, then again at 24h, 48h, and 72h for each condition. Data for VAS will be analyzed using 3x4 repeated measures ANOVAs for condition and time, and 3x5 for PPT for condition and time. **ANTICIPATED RESULTS:** Research with CBD and exercise is limited, but animal models have shown promising results. Although research on humans has been inconclusive, a recent pilot study with CBD and eccentric exercise (Stone et al., 2023) encourages more research to continue investigating this phenomenon. Implementing eccentric RT across a larger portion of the body and increasing sample size may allow for the detection of differences between conditions. Therefore, it is hypothesized based on animal

models and limited research on humans, that CBD will attenuate acute pain after strenuous back squat protocol.

P279: QUALITY OF LIFE AND FATIGUE DECREASE WITH THE INITIATION OF ANDROGEN RECEPTOR SIGNALING INHIBITORS FOR THE TREATMENT OF ADVANCED PROSTATE CANCER

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BACKGROUND: Quality of life (QoL) is a key patient reported outcome that can be tracked during prostate cancer (PC) treatment and in response to interventions. It is well-established testosterone suppression for localized PC adversely impacts QoL, although far less is known during advanced disease. Cross-sectional studies suggest that men with metastatic PC being treated with androgen receptor signaling inhibitors (ARSI) have lower QoL. However, the rate of change in QoL remains unclear and to what extent of the decline is due to ARSI treatment. This 12-week observational pilot study aimed to determine longitudinal changes in QoL following the initiation of ARSI treatment. Changes in fatigue, depression and anxiety were also examined.

METHODS: Men with advanced PC (n=6, 70±9 y, 30.1±3.5 kg/m² BMI) initiating ARSI completed testing at baseline and after 12 weeks of follow up. The majority (66.7%) of men were diagnosed with castration-sensitive metastatic PC. QoL was the primary outcome and was assessed using the functional assessment of cancer treatment-prostate (FACT-P). The minimal clinically important change (MCID) for FACT-P is 6-10 points. Fatigue was assessed using the Functional Assessment of Chronic Illness Therapy (FACIT-F), with a MCID of 3 points. Depression and anxiety were assessed using the Hospital Anxiety and Depression Score (HADS). Mean differences (MD) were calculated as 12-week follow-up - baseline and effect sizes are presented as Cohen's D (d). **RESULTS:** QoL from baseline to 12-weeks revealed worsening change that approached significance (MD= -11.8, 95% CI -21.0, -2.5, d=1.01; p= 0.056) but exceeded the MCID. There was a non-significant decrease (worsening) for fatigue (MD=-4.0, 95% CI -8.0, 0.1, d=0.779; p=0.115) that also exceeded the MCID. Fatigue and QoL also revealed a strong correlation (r=0.732, p=0.007). There were no changes in anxiety and depression scores (MD=1.2, 95% CI -0.6, 3.0, d=0.523; p=0.256). **CONCLUSIONS:** In support of cross-sectional studies, these preliminary results suggest that 12 weeks of ARSI lead to clinically important decreases with large effect sizes in both QoL and fatigue during advanced PC treatment. Interventions that can minimize fatigue may lead to improvements in QoL. Longer follow up studies (i.e., 24 weeks) and larger sample sizes are required to confirm these initial findings.

P280: AMMONIA INHALANTS DO NOT IMPROVE FATIGABILITY DURING ENDURANCE EXERCISE

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Background: Ammonia Inhalants (i.e. smelling salts) are a popular ergogenic aid typically used by powerlifting and bodybuilding athletes that have also been used by other populations, including clinical patients. The goal of smelling salts is typically to improve muscle strength, power, and endurance during exercise. Although it has been proposed to help improve acute bouts of muscle strength and power production, and potentially have psychological benefits, it is unclear if it provides any ergogenic effect for muscle endurance (fatigue). The purpose of this study was to examine the effects of an ammonia inhalant on muscular fatigue. **Methods:** Nineteen college aged males and females participated in this study (mean±standard deviation, height=176±11cm, weight=76±18kg). Across three trials separated by at least 48 hours, participants inhaled either an ammonia inhalant, placebo (menthol), or no inhalant directly before a fatigue test. For the ammonia inhalant and placebo trials, the substance was placed in an opaque dram with a cotton ball placed over the substance. For the control trial, a cotton ball was placed in the dram with no substance beneath it. For all trials, the dram was held open 10cm from the participant's nose, and they were instructed to inhale through the nose for 3-seconds. Immediately after the 3-second inhalation, participants completed the fatiguing test. The fatiguing test consisted of 50 maximal isokinetic leg extensions and flexions at an angular velocity of 180°·s⁻¹. Peak torque (PT) and mean power (MP) were averaged

across the first three repetitions (initial) and last three repetitions (final). Repeated measures ANOVAs examined the effects of each condition (ammonia inhalant vs. placebo vs. menthol) on initial vs. final PT and MP. **Results:** PT and MP decreased from initial to final (p < 0.001), however, there were no differences across conditions (p ≥ 0.167). **Conclusion:** Although it has been proposed that ammonia inhalants may promote acute improvements in muscle strength and power, it does not seem to improve fatigability. Thus, it is possible the acute improvements in performance from ammonia inhalants are more efficient during short-burst activities of high strength and power output rather than longer duration activities. Nevertheless, due to its proposed psychological benefits, future research should examine if ammonia inhalants influence perceived exertion during fatiguing exercise.

P281: CHARACTERIZATION OF FREE-LIVING STEP-BASED PHYSICAL ACTIVITY METRICS AMONG PATIENTS WITH FEMOROACETABULAR IMPINGEMENT SYNDROME

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BACKGROUND: Femoroacetabular impingement syndrome (FAIS) is a hip-joint disorder characterized by abnormal bony morphology (femoral-sided, "cam"; or acetabular-sided, "pincer"). FAIS is a precursor to hip arthritis and is often associated with low physical activity (PA) due to pain. Previous studies have relied on self-report questionnaires to assess PA. Device-based measurement (e.g., accelerometry), specifically step-based metrics (e.g., steps/day and cadence indices), may offer a more comprehensive assessment of PA patterns in this population. **METHODS:** We recruited 25 participants with FAIS (age=31.0±9.2 years, 60% women, BMI=26.1±4.7 kg/m²) and 14 healthy controls (age=28.1±9.1 years, 64% women, BMI=26.3±3.4 kg/m²). Participants were categorized as Cam only, Combined (cam and pincer), or Healthy (controls). Participants wore a waist-mounted accelerometer (ActiGraph GT3X+, ActiGraph LLC, Pensacola, FL) for 7 days during waking hours. Step-based metrics were computed, including steps/day, peak 1- and 30-min cadence (PK1 and PK30; steps/min), and time spent in various cadence bands (1-19, 20-39, 40-59, ...100-119 steps/min). One-way ANOVAs with post hoc testing were conducted to examine group differences. Effect sizes (eta squared; η²) were calculated and interpreted as small=0.01, medium=0.06, and large=0.14. **RESULTS:** We found significant group effects for PK1 and PK30 (p=0.02 and 0.05, η²=0.29 and 0.25, respectively). Post hoc tests showed lower PK1 and PK30 for Cam vs. Healthy (p=0.003 and 0.005, respectively) and Combined vs. Healthy (p=0.02 and 0.05, respectively). Similarly, there were main effects for time spent in slow, medium, and brisk cadence bands (60-79, 80-99, and 100-119 steps/min (p=0.004, 0.02, and 0.02; η²=0.27, 0.26, and 0.19, respectively). Post hoc tests indicated differences in time spent in these cadence bands for Cam vs. Healthy (p=0.007, 0.03, and 0.02, respectively), while Combined differed significantly from Healthy only for the slow and medium cadence bands (p=0.01 and 0.03, respectively). There was no main effect for steps/day between groups (p=0.06, η²=0.1). **CONCLUSION:** Although there was no main effect of group for steps/day, several cadence-based metrics were lower among the FAIS groups, particularly for Cam vs Healthy. Future studies are encouraged to examine step-based metrics in individuals with FAIS, as they appear to capture real-world differences in walking behaviors.

P282: PHYSIOLOGICAL AND PSYCHOLOGICAL RESPONSES TO PERCUSSIVE THERAPY MASSAGE GUN MYOFASCIAL RELEASE INTRA-EXERCISE

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BACKGROUND: With the advancement in technology, individuals have easier access to benefits from massage therapy in the form of a percussive therapy massage gun for individualized myofascial release (MFR) treatment. These devices aid in muscle recovery by reducing soreness, inflammation, tension, and pain. Though these devices have been heavily researched post-exercise, there is a significant lack of research intra-exercise. The purpose of this study was to examine the physiological responses (i.e., sets/reps) and psychological outcomes

(i.e., affect, pain, enjoyment) performing MFR during single-arm bicep curls and single-leg quadriceps extensions relative to a control condition. METHODS: Participants [$N= 18$, 8 females; age ($M \pm SD$); 20.33 ± 1.50 yrs; BMI ($M \pm SD$); 22.4 ± 11.9] completed an initial 10-RM for biceps curls and quadriceps extension until functional failure (i.e., ≤ 6 reps). All participants were randomly assigned percussive therapy and completed an active (i.e., MFR) and control (i.e., no MFR) condition. RESULTS: Participants completed significantly more sets [$M_{diff} \pm SE = 1.61 \pm 0.52$; $P = .006$; Cohen's $d = 0.56$] and reps [$M_{diff} \pm SE = 14.81 \pm 5.57$; $P = .017$; Cohen's $d = 0.53$] during the control relative to the active. Participants had high levels of enjoyment in both active [$(M \pm SD)$; 107 ± 14] and control [$(M \pm SD)$; 109 ± 11] conditions, however, there were no differences between conditions [$P = 0.69$]. There were no differences in pain between conditions but rather slight increases from pre- to post-exercise [Cohen's $d = 1.10$]. Lastly, there were no differences in psychological affect between conditions but significant changes pre- and post-exercise: increases in Energy [Cohen's $d = 1.26$], Tension [Cohen's $d = 0.75$], State Anxiety [Cohen's $d = 0.60$], and decreases in Tiredness [Cohen's $d = 0.73$] and Calmness [Cohen's $d = 0.95$]. CONCLUSION: The results indicate percussive therapy MFR may be more effective to use post-exercise as it does not suggest any significant benefits intra-exercise but perhaps deters performance. Despite the active condition being well tolerated by participants, results indicate there are no significant psychological benefits relative to the control. Further investigation is encouraged as there is a growing popularity to utilize these devices in various exercise events.

P283: ISOMETRIC STRENGTH RATIOS DIFFER BETWEEN YOUTH BASEBALL PLAYERS WITH AND WITHOUT UPPER EXTREMITY PAIN

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BACKGROUND: Up to 73% of youth baseball players report upper extremity pain throughout a season. Throwing shoulder isometric (ISO) strength ratios differ between softball pitchers with and without upper extremity pain; however, it is unknown if this is true in youth baseball athletes. This paper aimed to investigate the difference in throwing shoulder and bilateral hip rotational ISO strength ratios (internal (IR) and external (ER)) between youth baseball players with and without upper extremity pain. METHODS: Forty-eight youth baseball players (13.5 ± 2.1 yr, 57.7 ± 12.5 kg, 165.0 ± 12.1 cm) completed a health history survey indicating whether they experienced upper extremity pain. Those who answered 'yes' were placed in the pain group. Those who answered 'no' were placed in a pain-free group. Throwing shoulder and bilateral hip IR and ER ISO strength were recorded using a handheld dynamometer. For hip rotation strength testing, participants were seated with knees flexed to 90° and legs hanging off the table. For shoulder rotation strength testing, participants were lying supine with their throwing shoulder abducted to 90° and elbow flexed to 90° . Participants were instructed to perform two three-second maximal effort IR and ER ISO contractions into the dynamometer. Data were averaged for analysis. A one-way analysis of variance (ANOVA) determined if hip and shoulder rotation strength ratios differed between groups. RESULTS: The one-way ANOVA revealed a significant difference based on pain-group membership ($F_{1,45.6} = 5.23$, $p = .027$) in stride hip ISO strength ratios, with those in pain having higher IR:ER ratios than those pain-free (1.34 ± 0.33 vs. 1.11 ± 0.36). No differences were present between groups in ISO strength ratios for the stance leg ($F_{1,43.2} = 1.54$, $p = .22$; pain = 1.00 ± 0.15 , pain-free = 0.99 ± 0.19) or throwing shoulder ($F_{1,43.8} = 2.16$, $p = .15$; pain = 1.21 ± 0.38 , pain-free = 1.07 ± 0.30). CONCLUSIONS: Youth baseball players with upper extremity pain have stride hip rotational ISO discrepancies, displaying an IR dominant ratio. Whereas those without upper extremity pain display a more balanced ISO ratio. Using stride hip ISO ratio as a screening test may assist clinicians in identifying players at risk of developing upper extremity pain in youth baseball. Additionally, an effort should be made in restoring imbalances in stride hip ISO strength, as it may be useful for reducing reported pain in this sample.

P284: POST-CONCUSSION SEIZURE DISORDER IN A RECREATIONAL VOLLEYBALL PLAYER: A CASE STUDY

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Background: A concussion is classified as a type of traumatic brain injury, or TBI, that is caused by a blow or jolt to the head or body that

causes the brain to rapidly move back and forth. Concussions are common in contact sports, however between 2014-2019, women's volleyball had an incidence rate of 4.93 per 10,000 athlete exposures with 6.05 occurring in competition and 4.43 during practices. Symptoms related to concussion typically involve somatic, cognitive, behavioral and/or sleep disturbances, however seizures are uncommon. The risk of developing a seizure disorder following a traumatic brain injury, or concussion, depends on the severity, site, and previous history of a traumatic brain injury (Anwer, 2021). Methods: 21-year-old African American female, recreational volleyball player fell and hit the back of her head during a recreational volleyball practice. Initially after the incident, the patient was verbal and complained of pain between C2-C4 spinous processes and presented with constricted pupils. Within minutes the patient became nonverbal and was instructed to respond to questions by blinking her eyes once for yes and twice for no. Heart rate was shallow at 68-72 bpm and O2 levels were 98%. Dermatomes, Myotomes, and Strength were reported as normal. She was transported to the Emergency Room. Differential diagnoses included: epidural hematoma, brain lesion, aneurysm, concussion, and epilepsy. Results: Initial assessment of the athlete was an epidural hematoma with a possible cervical fracture. Further evaluation and imaging revealed a concussion with seizures secondary to brain injury. The athlete was put on Levetiracetam, a seizure medication, for one week following the injury. The medication was discontinued and no subsequent seizures occurred. Within 5 months, many concussion symptoms disappeared, but she still reported occasional post-concussion migraines, nausea, and light sensitivity. The patient was prescribed medication for migraines and cleared to return to sport. Currently, she has chosen not to return to activity. Discussion: In this case, nonverbal responses and constricted pupils indicated a more severe injury. The resultant post-concussive seizures and migraines affected the athlete's ability to perform activities of daily living and ability to return to sport. Clinicians should be cautious underestimating the potential for serious complications following concussion.

P285: THE RELATIONSHIP BETWEEN PSYCHOLOGICAL, PHYSICAL PERFORMANCE, AND BRACE USAGE POST ACL REPAIR: A PATIENT PERSPECTIVE

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BACKGROUND: Anterior cruciate ligament (ACL) ruptures account for 60% of sports-related injuries and the gold standard for treatment is surgical intervention to replace the damaged ligament with a graft to restore function of the ACL and re-establish stability within the knee joint. Braces are typically used to return to previous physical activity levels; however, there are no clear guidelines on their utilization. Beyond the physical consequences of undergoing ACL reconstruction surgery, the psychological component is often ignored. Studies show that those who underwent the surgery reported feelings of hesitation, lack of trust, and fear of reinjury. There are two purposes of this study, the first is to learn more about the experience with bracing from the patient perspective and to gather information that may be pertinent to their own story. The second purpose of this project is to analyze the impact of bracing on physical performance and how this relates to the mental status of the patient during a drop vertical jump. METHODS: For Aim 1, inclusion criteria include ACL tear and surgical repair in the past 5 years, and survey data is being collected via Qualtrics to determine brace usage, graft type, and overall experiences with ACL reconstruction/rehab and bracing. For Aim 2, WKU college students who complete Aim 1 will complete a drop vertical jump (DVJ) protocol with and without the usage of their knee brace. After familiarization protocols, participants will be asked to step off a 30-centimeter box with one foot, followed by a two-foot landing on the force plates and then immediately perform a maximum vertical jump for each condition (braced and unbraced). Following each condition, participants complete a survey to gather data regarding their confidence and overall functionality of their affected knee. Questions on the survey are modified from the International Knee Documentation Committee 2000, the ACL- Return to Sport after Injury, and the Tampa Scale of Kinesiophobia questionnaires. Ground reaction forces and lower extremity muscular activity (EMG) will be collected. ANTICIPATED RESULTS: It is hypothesized that the braced condition will lead to greater vertical ground reaction forces, greater EMG activity, and increased confidence, compared to the unbraced condition.

P286: ULTRASOUND SCREENING FOR PATELLAR TENDINOPATHY IN COLLEGE ATHLETES

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BACKGROUND: Patellar tendinopathy is a chronic overuse injury associated with repetitive overloading and microtrauma. Due to these inherent risk factors, collegiate athletes are at increased risk for developing symptomatic patellar tendinopathy or "jumper's knee." This study addresses gaps in previous research by directly comparing women's soccer and volleyball players at the collegiate level. The purpose of the study is to assess the utility of point-of-care ultrasound as a screening modality for the development of symptomatic patellar tendinopathy in athletes. This study further adds to the literature by examining multiple secondary factors that could contribute to patellar tendinopathy. **METHODS:** Approximately 40 total participants were recruited from a collegiate female soccer and volleyball team. The participants were females ranging from age eighteen to twenty-two. All participants completed an initial questionnaire (pre-season), along with a follow-up questionnaire (post-season). Each participant will undergo ultrasound imaging using the Clarius Portable Ultrasound Machine at three different intervals (pre, mid, and postseason). The Clarius Portable Ultrasound Machine is a wireless device that provides high-definition images up to 7 cm. This device is recommended for imaging of superficial structures such as vessels, nerves, and musculoskeletal tissue. The subjects had both their left and right patellar tendons scanned by the primary investigator or an assistant under direct supervision. During sonographic evaluation, participants were placed in the supine position, with the knee flexed to thirty degrees. The transducer was placed in the longitudinal position over the patellar tendon. The patellar tendon thickness was measured fifteen millimeters below the inferior patella. Results will be analyzed to determine the utility of point-of-care ultrasound and any relationship with secondary factors. **ANTICIPATED RESULTS:** It is theorized that point-of-care ultrasound is a practical screening modality for monitoring the development of symptomatic patellar tendinopathy. It is also hypothesized that there will be associations between patellar health and a myriad of secondary factors such as position on team, specialization, prior injuries, etc.

P287: DIFFERENCE IN TREATMENT PRACTICES OF EMERGENCY MEDICINE VS. FAMILY MEDICINE TRAINED SPORTS MEDICINE PHYSICIANS

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BACKGROUND: Previous studies have investigated treatment practices between orthopedic surgeons and primary care sports medicine physicians; however, our study solely looks at primary care physicians and investigates if the primary specialty training impacts treatment. The aim of this study is to evaluate differences in treatment of acute injuries based on primary specialty. **METHODS:** Patients that fit inclusion criteria at Steadman Hawkins orthopedic outpatient clinics were included. Treatment recommendations were compared between Emergency Medicine (EM) and Family Medicine (FM) trained Sports Medicine Physicians. Treatment options evaluated were: additional imaging, medications, injections, physical therapies, durable medical equipment (DME, e.g. splint, brace), activity restrictions, and surgery or follow up. Data was input into REDCap and analyzed using Fisher's exact test. **RESULTS:** 35 patients were included, 12 received care from EM physicians and 23 from FM physicians. FM physicians prescribed medication more frequently than EM physicians (52.2% vs 0%, $p=0.002$). There were no significant differences between frequency of recommendations for additional imaging, injection, physical therapy, stabilization, activity restrictions, surgery or follow up. There was a non-significant trend with EM physicians prescribing more DME than FM physicians (83.3% vs 56.5% of patients, $p=0.11$). **CONCLUSIONS:** The data collected suggests there are differences in documented treatment recommendations based on the residency completed prior to sports medicine fellowship. More specifically, there was a statistically significant difference in FM physicians prescribing medication more frequently than EM physicians.

P288: ASSESSING HAND PRECISION WITH A HAPTIC PEN: IS THERE A LEARNING EFFECT?

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BACKGROUND: Recently, robotic devices have been developed that have great potential to advance hand therapy. One application is having patients use a haptic "pen" to complete drawing and or writing tasks. This approach is advantageous as data can be electronically collected; many repetitions can be assessed quickly and easily. For this preliminary study, we tested hand precision by having patients attempt to trace circles. **PURPOSE:** Have patients use a haptic pen to complete a hand precision exam (drawing circles) and determine if there is a learning effect. **METHODS:** Thirteen healthy subjects participated in the study (24.23 ± 4.37). Each participant completed ten trials. This was done by five consecutive repetitions, followed by a one-minute break, and then another five repetitions. Breaks were provisioned to eliminate adverse effect of fatigue. The forearm of dominated hand was harnessed using a 3D-printer fixture to isolate wrist movements; therefore, a participant could only move the wrist while completing tasks. A haptic pen (Touch, 3D Systems, USA) was utilized to trace predefined paths around four circles. For each trial, the participant traced a larger circle ($D=6$ cm) and three were smaller circles ($d=2$ cm). The perimeters of the three smaller circles (summed) was equal to the perimeter of the larger circle to equalize the amount of tracing. Each circle was analyzed in one-degree intervals. For each interval, a straight line was extended from the center of circle to intersect the participant's traced circle. The error score was calculated at each interval (360 points). For each circle, the overall error score was determined by taking the mean of the 360 internal error scores. Finally, overall error score for the first five trials (error score 1) and the second five trials (error score 2). Dependent t-tests were used ($\alpha;=0.05$) to determine if there were significant differences between error score 1 and error score 2. **RESULTS:** Participant error scores ranged from 9mm-39mm. There was a significant reduction ($p=0.03$) in error scores from score 1 (22.1mm) to score 2 (17.1mm). Eleven of the 13 participants had error scores reduce (for error score 2). The other two participants were top performers with very low error scores (9-15mm) and minimal increase (approximately 1mm). **CONCLUSION:** There appeared to be a slight learning effect; participants reduced their error score by approximately 4 mm from round 1 to round 2. Future studies should assess more repetitions to determine when the learning effect plateaus.

P289: BODY WEIGHT SUPPORT TREADMILL FOR STABILITY AND CARDIOVASCULAR FUNCTION IN PATIENTS POST-UNILATERAL KNEE ARTHROPLASTY

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Background: Knee arthroplasty surgery involves the replacement of the knee joint with a prosthesis. These surgeries are costly and require lengthy recoveries. The primary variation in cost for knee arthroplasties comes post-operation from the recovery process. Transportation, high medical costs, and lower access to equipped facilities have been identified as primary barriers to healthcare in rural Appalachia. Bodyweight support treadmills (BWS) have been shown to reduce the effective body weight of patients, build cardiovascular health and mobility, and decrease fall risk in knee arthroplasty patients. The development of mobile, low-cost BWS systems may be beneficial to decrease health disparities in rural Appalachia. The purpose of this study is to assess the efficacy of a mobile BWS system in Appalachian knee arthroplasty patients. **METHODS:** 20 patients who are 6-8 weeks post single knee arthroplasty will be recruited from local clinics. Participants will be randomly assigned to one of two groups: control or BWS. Both groups will participate in standard physical therapy. The control group will concurrently complete 8 weeks of treadmill walking at a self-selected pace. The BWS group will concurrently complete 8 weeks of treadmill walking with 20% bodyweight reduction on a BWS system at a self-selected pace. At baseline, 4 weeks into the intervention, and post-intervention, participants will complete a walking economy test, the Performance Oriented Mobility Assessment (POMA), and manual muscle testing (MMT). Results will be analyzed using a repeated measures ANOVA to determine significant differences between the control and BWS groups. **ANTICIPATED RESULTS:** We hypothesize that the BWS group will have greater improvements in walking economy, and muscle strength as measured by MMT, along with better mobility and fall risk as measured by the POMA.

P290: THE ASSOCIATION BETWEEN CENTRAL NERVOUS SYSTEM FUNCTION AND BODY TEMPERATURE IN EXERTIONAL HEAT STROKE PATIENTS

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BACKGROUND: Exertional heat stroke (EHS) is a leading cause of death in athletes. While there is evidence supporting best practices to prevent death, there is a lack of understanding regarding the clinical presentation of EHS. Therefore, Aim 1 was to describe central nervous system (CNS) function, using the Glasgow Coma Scale (GCS) and signs and symptoms (S&Sx), in EHS patients; Aim 2 was to determine if a relationship exists between rectal temperature (T_{re}) and GCS in EHS patients. **METHODS:** A cross sectional research design was utilized by observing EHS patients (defined as $\geq 40^{\circ}\text{C}$ + CNS dysfunction) at an 11.3-km road race. De-identified medical records were provided by the medical director. The primary outcome variables were GCS cumulative score, T_{re} , and S&Sx (recorded as pre-determined nominal values). Trained, dedicated scribes recorded information on the patient's medical record. Parametric and non-parametric descriptive statistics were calculated according to data type. A Spearman's rank correlation was used to determine if a relationship existed between GCS score and T_{re} . **RESULTS:** Runners diagnosed with EHS (male=13, female=10) were aged $30 \pm 14\text{y}$ (range 15-58y), with an initial T_{re} of $41.0 \pm 0.6^{\circ}\text{C}$ ($40.0\text{-}42.1^{\circ}\text{C}$) and GCS of 14 ± 3 (4-15). Across evaluation and treatment time points, the maximum T_{re} was $41.2 \pm 0.7^{\circ}\text{C}$ ($40.0\text{-}42.6^{\circ}\text{C}$) and the worst cumulative GCS scores were 13 ± 4 (0-15). At the initial recording, S&Sx observations included nausea (17.4% of recorded observations), dizziness, irritability, aggressive, headache, and malaise (all 4.3%). Confusion (13%), difficulty remembering (8.7%), and irritability (8.7%) had the highest percent of observations at different time points over the course of evaluation and treatment. A significant correlation did not exist for average T_{re} and GCS ($r_s(20)=-0.88$, $p=0.218$), nor with maximum T_{re} and GCS ($r_s(20)=-0.34$, $p=0.144$) or minimum T_{re} and GCS ($r_s(20)=0.044$, $p=0.852$). **CONCLUSIONS:** GCS ranged widely for EHS during evaluation and treatment. As a result, there was no relationship between GCS and T_{re} . Additional S&Sx observations also varied widely, with not one symptom category representing the majority of observations at any time point. Clinicians should be prepared to recognize CNS dysfunction in EHS patients in a variety of ways. GCS may not be a good measure of CNS dysfunction in EHS patients, let alone for clinical decision making.

P291: TRAUMATIC TRAMPOLINE INJURY? TYPE-II SALTER HARRIS FRACTURE IN MIDDLE SCHOOL GYMNAST: A CASE STUDY

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BACKGROUND: Phalanx fractures are the most common pediatric hand fracture typically resulting from a crush or traumatic event such as a fall. A Salter-Harris Type II fracture involves a fracture extending through the physal plate (growth plate) of a bone proximally through the metaphysis. **METHODS:** An 11-year-old African American female gymnast with 1 year of competitive cheer was performing a back tuck on the trampoline when another person jumped on the trampoline causing her to lose balance and land forward causing a direct impact of her right third distal phalanx on the trampoline while trying to catch herself. She initially reported pain feeling like her finger was "jammed" and unable to move her finger. Initial observation revealed an obvious lateral deviation of the distal phalanx and edema at the metacarpophalangeal joint (MCP joint). She was immediately treated with ice and then transported to the Emergency room (ER) 45 minutes later. X-ray revealed a Salter-Harris Type II Fracture in the proximal phalanx of the right third phalanx with a buckle deformity in the metaphysis and widening of the physis without a dislocation. Following diagnosis, the patient was given hydrocodone for pain and her fingers were buddy taped for stability and referred to an Orthopedist. Two days after initial injury the orthopedist suggested surgical intervention to correct the deformity, in which they placed an internal fixation of the proximal phalanx to close the physis. After surgery her hand was placed in a heavy bandage with instructions to return for a post-op visit 13 days later. **RESULTS:** Immediately following the surgery, she had trouble writing, as the injury affected her dominant hand, but subsided after one-week. She did not complete any rehabilitation and was not permitted to get the hand wet until her follow-up appointment. Initial projected recovery was four-six weeks. At the patients' three-week follow-up, the orthopedic surgeon stated healing was sufficient and the physician approved return to activity as long as

she didn't have pain. **CONCLUSION:** Finger injuries are common in sports and typically follow a conservative treatment (casting or splinting). However, surgery was recommended due to the age of the patient, involvement of the physal plate and obvious gross deformity present. Finger injuries are often overlooked as insignificant; however, clinicians should take extreme care to evaluate the best course of treatment to avoid poor outcomes and potential debilitating long-term consequences.

P292: ATHLETIC TRAINING STUDENTS RECOGNIZE LEADERSHIP AS MENTORSHIP

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BACKGROUND: Characteristics of transformational and servant leadership appear highly similar to traits of mentorship. Clinical educator mentorship is an expectation of preceptors and is associated with first-attempt success on the national certification exam for athletic trainers. This study aimed to determine if athletic training graduates associate leadership in clinical education with mentorship. **METHODS:** Board of Certification research services distributed an email invitation to complete the researcher-developed online Leadership in Clinical Education survey (LCE) to 4500 athletic trainers who had certified within the prior two years. One-hundred ninety (4%) graduates responded. The survey contains statements about 16 leadership behaviors written as Likert-type items that are replicated into 2 scales: a behavior agreement scale and a behavior frequency scale. Both scales demonstrated excellent reliability as was determined by Cronbach's alpha (.960 for agreement scale, .946 for frequency scale). Frequency and agreement scales are summed for an overall leadership score and respondents use a sliding scale to indicate the extent to which they consider the preceptor from whom they learned the most about leadership to be their mentor. Pearson correlation analyzed the relationship between perceptions of leadership and mentorship. **RESULTS:** Pearson correlation revealed a moderate positive correlation between overall leadership score and mentorship score as was determined by the sliding scale response, $r(188)=.384$, $p<.001$. Not all data were normally distributed, as was determined by Shapiro-Wilk's test ($p<.001$), but the sample size was adequate to lessen any impact of non-normality. **CONCLUSIONS:** Athletic training graduates seem to consider preceptors who display more leadership behaviors more frequently in clinical education to be mentors. To foster mentoring relationships between athletic training students and their preceptors, athletic training programs may choose to consider clinical education placements with preceptors who exhibit more leadership characteristics.

P293: PERCEPTIONS OF COMMUNITY ENGAGED RESEARCH AMONG HEALTH AND EXERCISE SCIENCE FACULTY AND STUDENTS

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Institutions: Wake Forest University
BACKGROUND: Community engaged research (CER) aims to create meaningful and sustainable community-academic partnerships in order to better understand community needs, priorities, and concerns. CER empowers community members to have decision-making power over research conducted with and in their communities, supports inclusion of community members in all stages of research, and enhances research processes in alignment with community-led priorities. Fundamental to CER is the acknowledgement that communities have unique expertise and assets that can be leveraged to support higher quality and more impactful research designs that also advance health equity. However, many researchers do not consider CER a robust scientific process, and few researchers have received appropriate training to conduct CER. To facilitate diverse recruitment and enhance equity in aging research, the Wake Forest Pepper Center received funding to establish strategic community-academic partnerships and develop a curriculum for training community members and researchers to engage in CER approaches. This work will provide a model of engagement that can be scaled to guide future studies across the larger Pepper Center network. Important to this process is understanding the perceived value, facilitators and barriers, and readiness to engage in CER among researchers across the career continuum. **METHODS:** We will develop and administer a survey among $n=52$ faculty, graduate students, and undergraduate students at a single health and exercise science department, and will conduct qualitative interviews with a convenience sample of survey

respondents (n=12) in order to capture more in-depth understanding of their training, views, and uses of CER. Survey data will be analyzed via descriptive statistics, and qualitative interviews will be analyzed through an iterative thematic process. **ANTICIPATED RESULTS:** We anticipate wide variance in perceived value, facilitators and barriers, and readiness to participate in CER. Results will indicate areas of significance in the curriculum as well as an initial framework for implementing similar partnerships across Pepper Centers. Grant or Funding: This work is funded by the NIA and the Wake Forest Pepper Center (P30AG21332)

P294: INDIVIDUAL CONSTRAINTS AND TIME SCALE ON JOINT COUPLING PATTERNS IN SOFTBALL PITCHERS

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BACKGROUND: Individual constraints such as fatigue may gradually influence a performer's movement patterns over time. The degree of linkage between joint angles of the throwing arm can help describe the extent that joint actions are coupled. The purpose of this study was to examine changes in joint coupling patterns in softball pitchers at increased pitch counts. **METHODS:** Eighteen high-school softball pitchers (15±1.6y, 1.6±0.2m, 77.2±17.0kg) pitched four blocks of twenty-five randomly assigned common pitch types. Randomly determined rest ranging from four to seven minutes was provided between blocks to mimic time between innings of a game. Participants' kinematics were captured using an electromagnetic tracking system which recorded positional data of sensors placed on body segments. Trials were trimmed from top of the pitch to end of follow through and interpolated 0-100% of the pitch. Each participant's mean time series data of shoulder, elbow, and wrist sagittal-plane angular motion were determined from three fastball pitches in the first and last blocks. Joint-to-joint time series correlations were performed on the shoulder and elbow, shoulder and wrist, and elbow and wrist. To evaluate if the joint-to-joint correlation coefficients between the first and last blocks were statistically different, correlation coefficients were transformed into Z-scores and compared using Steiger's Z-tests. **RESULTS:** The respective correlation coefficients for the first and last blocks were as follows: shoulder-elbow=.44/.34; shoulder-wrist=.68/.61; and elbow-wrist=.32/.25. The strengths and direction of the correlation coefficients ranged from weak to strong and were positive but non-significant (>.05). Differences in joint-to-joint correlation coefficients between the first and last blocks were non-significant: shoulder-elbow; Z-diff=.35, p=.73; shoulder-wrist; Z-diff=.32, p=.75; elbow-wrist; Z-diff=.19, p=.85. **CONCLUSIONS:** Greater joint coupling (higher coefficient) may represent a strategy to limit motions and simplify the task, whereas a releasing of joint coupling may represent more independent components or movement exploration. This work suggests joint coupling occurs in softball pitching but changes may be minimal at this pitch volume (100 pitches). Additional work identifying the effects of individual constraints on softball pitching is needed to understand workload implications on movement patterns and injury risk.

P295: COMBINING EXPLICIT LEARNING INSTRUCTIONS AND HIGH PRESSURE SIMULATIONS DURING PRACTICE PREVENTS CHOKING UNDER PRESSURE

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BACKGROUND: Determining practical ways to enhance motor learning and performance are crucial for adaptive behavior under high-pressure. Research has shown that external focus of attention; learning a skill implicitly; and exposing individuals to high-pressure practices facilitate performance under high-pressure. However little is known about a synergistic effect to prevent choking. This study examined a potential synergistic effect to maximize performance under high-pressure on beginners who learned dart-throwing techniques. **METHODS:** Eighty participants performed a 10-trial pretest and learned dart-throwing techniques (6 blocks of 10 trials) on **day 1**, and on **Day 2** (24 hours after practice), they performed two posttests (low and high pressure - 10 trials in each block). Individuals were **divided into four practice condition groups:** (1) explicit learning high-pressure practice (EH); (2) explicit learning low-pressure practice (EL); (3) analogy learning high-pressure practice (AH); and (4) analogy learning low-pressure practice (AL). **To increase pressure on day 1**, participants were recorded while practicing and told their kinematics would be analyzed. On day 2, **during the high-pressure**

posttest, in addition to recording the trials, participants were told the best 5 performances would receive money; and that the previous participant had the best result so far. For both low-pressure practice groups and low-pressure posttest, the instructions were to do their best while aiming for bulls-eye. **RESULTS:** To assess motor learning two 2 (Practice Pressure: low vs. high) x 2 (Practice Instructions: explicit vs. analogy) x 2 (Post-Test: low- vs. high-pressure) mixed-factor ANOVAs, with repeated-measures on the last factor for accuracy and precision were utilized. Results revealed that there was a statistical significant difference between groups **during the high-pressure posttest** ($F(1,75) = 6.641, p=0.012$). Specifically, the explicit learning high-pressure practice group showed superior performance. Mean scores were as follows: **Explicit High-pressure (M 7.19 cm ± 2.44 cm); Analogy High-pressure (M 9.79 ± 2.21); Analogy Low-pressure (M 10.07 ± 2.39 cm); Explicit Low-pressure (M 14.02 cm ± 5.69 cm)** (lower score represents better performance/learning). **CONCLUSIONS:** Combining explicit learning instructions and high-pressure simulation during practice provided a superior performance on the posttest and prevented choking under pressure.

P296: RESISTANCE EXERCISE ELICITS SEX-SPECIFIC IMPROVEMENTS IN COGNITION, BUT NOT IN BRAIN BLOOD FLOW

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BACKGROUND: Previous investigations have suggested that physical activity, with emerging data related to resistance exercise with blood flow restriction training (BFR), can acutely improve cognition. Our purpose was to determine which modality of resistance exercise elicited the greatest acute change in various cognitive domains and cerebral blood flow as measured by the internal carotid artery (ICA). **METHODS:** 20 healthy college-aged (22 ± 4 yrs) adults (9 female) completed familiarization and experimental visits. During the familiarization visits, the participants completed one-repetition maximum (1RM) of bilateral leg extension and cognitive testing. Participants completed baseline cognitive testing on three occasions to yield an average score, negating the practice effect. The randomized, volume-equated experimental visits consisted of 30%1RM, 30%1RM + BFR, and 70%1RM. The repetition scheme of the 30%1RM trials was 1x30, 3x15, whereas the high-load was 4x8. Eleven minutes following each exercise bout, participants completed the Stroop and Shifting Attention tests through the computer-based CNS Vital Signs. Baseline and post-exercise values were used to calculate change scores, and the resulting means were evaluated with 2-way mixed factorial ANOVAs (Sex x Exercise Scheme). A $p \leq 0.05$ was considered statistically significant. **RESULTS:** All measured outcome variables increased in response to exercise. The 2-way mixed factorial ANOVAs for cognitive scores indicated that there were no significant ($p > 0.05$) interactions, but for cognitive flexibility and executive function, there were main effects of Sex. The women demonstrated a significantly greater increase in cognitive flexibility (16.0 ± 7.6 vs. 6.1 ± 10.8 au; $p = 0.010$, 95% CI $\Delta = 10.6 - 21.4$) and executive function (15.9 ± 7.1 vs. 6.2 ± 9.5 au; $p = 0.003$, 95% CI $\Delta = 3.6 - 15.8$) than the men. For the exercise-induced increases in ICA blood flow, there was not a significant interaction or any significant main effects between conditions. **CONCLUSIONS:** Each resistance exercise scheme yielded acute improvement in cognition, which was more pronounced in females. Additionally, all resistance exercises equally increased ICA blood flow. Future studies should evaluate chronic changes as a result of these exercises as well, particularly in populations at risk for Alzheimer's Disease and related dementias.

P297: EFFECT OF MUSIC VOLUME ON FINE MOTOR SKILL SPEED AND ACCURACY

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Background: Music can be an ergogenic aid to exercise performance, and can also impact fine motor skill task performance. Some evidence suggests loud and intrusive music interferes with attention and focus, while other evidence suggests soft music may positively impact task performance, such as surgical skills in physicians. However, studies of music generally focus on tempo and lyrics rather than volume alone. Therefore, the purpose of this study was to determine whether music volume has an effect on speed and accuracy of fine motor skill performance. **Methods:** n=22 college-age males and females

(20.9±0.6 yrs; 67.4±4.1 in; 158.1±38.6 lb) provided informed consent and participated in this study. Participants visited the laboratory for a single visit in which they completed four tasks (typing, domino stacking, Operation board game, and Rubik's connector snake) under three conditions (loud, soft, and no music). Order of the 12 total trials was counterbalanced. Participants selected their own preferred, single song that was >120 bpm in tempo. Their chosen song was then played via a 12-inch external speaker at loud (85 dB) or soft (65 dB) volumes during the tasks. Typing was conducted using an online typing program that assessed speed and accuracy of a 60-s typing task. Domino stacking required the participant to use 30 dominoes to build a tower following a picture sample provided to participants. Score was calculated as total stacked - total collapsed in three minutes. Participants also were timed on their ability to successfully complete 12 "operations" utilizing the board game Operation, which requires removing anatomical parts using tweezers without touching a pre-determined perimeter around the area. Scores were calculated using total successful - total unsuccessful operations. Rubik's connector snake puzzle was performed by familiarization of each participant at the beginning of the visit to the puzzle where they watched a video explanation of the puzzle being completed (i.e. turning the snake into a cat) and were permitted to practice as many times as they wished. Participants then were timed on their ability to convert the snake into a cat shape. A repeated measures ANOVA was used to compare motor skill performance on the four tasks when listening to loud, soft, and no music. Results: There were no significant differences in typing speed ($p=0.97$), typing accuracy ($p=0.97$), dominoes score ($p=0.25$), successful operations score ($p=0.72$), or time to complete the Rubik's puzzle ($p=0.42$) among the three conditions. Conclusions: These data indicate that music volume neither positively nor negatively impacts fine motor skill performance. Thus, people should choose if and at what volume to listen to background music during fine motor task performance based upon preference alone.

P298: BIASED RECRUITMENT OF THE GLUTEUS MAXIMUS AND BICEPS FEMORIS DURING PRONE HAMSTRING EXERCISE

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BACKGROUND: Recent work has questioned the utility of resistance exercise in reducing the prevalence and severity of hamstring strains. Inter-limb differences in hamstring recruitment may partly explain why preemptive hamstring exercise does not prevent future hamstring strains. Therefore, we examined how movement strategy (bilateral vs. unilateral movement), eccentric (ECC) exercise tempo (*fast*: 2-second vs. *slow*: 4-second), and external load characteristics (coupled load vs. independent loads) affected mean electromyography (mEMG) of the biceps femoris (BF) and gluteus maximus (GMAX) during prone hamstring exercise (PHE). **METHODS:** Twenty college-aged students aged 18 - 33 ($M = 23.4$, $SD = 3.12$ years) with ≥ 3 months of targeted hamstring training ($\geq 1x$ per week) completed familiarization (lab visit 1) and experimental protocols (lab visit 2) during separate visits at least 72 hours apart. Active knee range of motion (aROM) and maximum voluntary contractions (MVC) were obtained prior to the experimental PHE variations. Separate linear mixed models examined mEMG data for interactions between exercise variation, tempo, and side (right vs. left) during the ECC and concentric (CON) phases of the PHE. **RESULTS:** Isokinetic strength and aROM did not differ between legs, $p_s > 0.174$. Three-way interactions between variation, tempo, and side were not detected for GMAX or BF mEMG during the ECC ($p_s \geq 0.530$) or CON ($p_s \geq 0.341$) PHE. The main effect of side was detected for BF and GMAX mEMG during the ECC ($p_s \leq 0.001$) and CON ($p_s \leq 0.006$) PHE. The left BF was preferentially excited compared to the right BF during the ECC (ΔM [right - left] = -5.70 %MVC), $p < 0.001$) and CON ($\Delta M = -7.59$ %MVC, $p < 0.001$) PHE. The contralateral right GMAX recruitment was greater than the left during the ECC ($\Delta M = 2.21$ %MVC, $p < 0.001$) and CON ($\Delta M = 1.81$ %MVC, $p = 0.006$) PHE. **CONCLUSION:** The PHE resulted in biased recruitment of the left BF and right GMAX despite no differences in pre-experimental knee aROM or isokinetic/isometric strength measurements. Further investigation is warranted to decipher whether this intra-exercise bias predicts hamstring strain risk. **FUNDING:** The project was supported by an internal grant awarded to the PI (NS) from the Faculty Research Committee - Research Seed Funding (FY2022 - FY2023) at Georgia Southern University.

P299: RESPIRATORY MUSCLE FATIGUE AND REDUCED OPERATING LUNG VOLUMES WITH PROLONGED LOAD CARRIAGE IN HYPOXIA

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BACKGROUND: Prior research indicates that thoracic load carriage induces shallower breathing patterns and respiratory muscle fatigue in normoxic conditions. The purpose of this study was to determine whether load carriage compromises the compensatory ventilatory responses to hypoxic exposure. **METHODS:** Pulmonary function (i.e., forced vital capacity [FVC], forced expiratory volume in 1 sec [FEV₁], and peak flow [PEF]), respiratory muscle fatigue (i.e., maximal inspiratory [MIP] and expiratory [MEP] pressure), dyspnea, and ventilatory responses (i.e., operating lung volumes and ventilation [V_E]) to prolonged exercise were assessed in healthy male subjects ($n=12$) under 3 conditions: unloaded normoxic ($F_{iO_2}=20.93\%$; UN), unloaded hypoxic (equivalent to $\sim 3,650m$; $F_{iO_2}=\sim 13.0\%$; UH), and loaded hypoxic (~ 30 kg pack; $F_{iO_2}=\sim 13.0\%$; LH). Exercise consisted of 45 min uphill (8%) walking at speeds individually customized to elicit an equivalent relative intensity in hypoxia ($64.0\pm 2.6\%VO_{2max}$) and absolute VO_2 across conditions (2.0 ± 0.2 L/min). One-way ANOVAs and t-tests were employed to analyze pulmonary function and respiratory muscle fatigue (pre- vs. post-exercise), respectively. Exercise data were analyzed via two-way repeated measures ANOVA with post hoc one-way ANOVA tests to identify differences in the case of significant interactions ($\alpha=0.05$). **RESULTS:** FVC (-7.8-8.5%), FEV₁ (-9.0-10.2%), and PEF (-8.3-11.0%) were reduced with LH relative to the unloaded conditions ($p < 0.05$). Additionally, MIP (-12.2±9.7%) and MEP (-10.2±11.2%) were reduced following exercise with LH ($p < 0.05$) but were unchanged with UN and UH. In both hypoxic conditions relative to normoxia, V_E and dyspnea were increased throughout exercise ($p < 0.05$). However, with LH vs. UH, V_E and dyspnea were further increased starting at 30 min ($p < 0.05$), which coincided with increases in deadspace V_E (i.e., starting at 20 min; $p < 0.05$). In addition, breathing frequency and tidal volume were increased and decreased ($p < 0.05$), respectively, throughout exercise due to reductions in end inspiratory lung volumes ($p < 0.05$). **CONCLUSIONS:** Load carriage reduces respiratory efficiency and increases breathing discomfort during exercise in hypoxia. This may compromise health and performance during occupational tasks in high altitude environments. **GRANT OR FUNDING INFORMATION:** This study was funded by the Jackson-Hope New Directions in Research grant.