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Cerebrovascular Response to Prostration (Sujud) in Habitual and Non-Habitual Practitioners

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Prostration, lowering the forehead to the ground, is integral to Islamic prayer and is performed 34 times daily by millions of Muslims worldwide. Placing the head below heart level raises hydrostatic pressure within the cranium, requiring the cerebral vasculature to adjust to defend perfusion. The cerebral vasculature typically adapts to chronic mechanical loading, but whether habitual, repeated prostration modifies the acute cerebrovascular response is unknown. **PURPOSE:** To compare cerebrovascular conductance index (CVCi) and end-tidal CO₂ (EtCO₂) responses to prostration between habitual practitioners and non-habitual adults. **METHODS:** Groups were defined by self-reported regular performance of prostration. Twelve habitual practitioners (29.8 ± 4.0 yr, 21.1 ± 2.7 kg/m², 67% female) and 11 non-habitual adults (24.0 ± 4.9 yr, 24.9 ± 5.2 kg/m², 55% female) completed two trials of 1 min kneeling followed by 1 min of prostration. Middle cerebral artery mean velocity (MCAv) was measured with transcranial Doppler. EtCO₂, an established metabolic driver of cerebral vasoreactivity, was measured with capnography. Brachial blood pressure was measured with an automated, oscillometric cuff and used to calculate CVCi as MCAv/mean arterial pressure. Variables were recorded during kneeling and at 60 s of prostration. Both trials were averaged for analysis. Linear mixed-effects models tested Condition $\times$ Group with random subject intercepts, adjusted for age and body mass index. **RESULTS:** CVCi increased from kneeling to prostration (condition effect, $p = .008$) in habitual practitioners (0.67 ± 0.06 to 0.71 ± 0.06 cm/s/mmHg) and in non-habitual adults (0.70 ± 0.06 to 0.76 ± 0.06 cm/s/mmHg), with no interaction ($p = .521$) or group effect ($p = .645$). EtCO₂ was unchanged (condition effect, $p = .413$) in habitual practitioners (34 ± 1 to 33 ± 1 mmHg) and in non-habitual adults (36 ± 1 to 36 ± 1 mmHg), with no interaction ($p = .726$) or group effect ($p = .179$). **CONCLUSION:** Prostration increased cerebrovascular conductance similarly in both groups, with EtCO₂ unchanged, indicating a largely hydrostatic rather than CO₂-mediated response. This novel comparison of habitual practitioners and non-habitual adults suggests that the acute cerebrovascular response to prostration is preserved regardless of habitual practice. The authors declare no conflicts of interest.



Hormonal Contraceptive Use May Not Alter Body Shape Trajectories in Physically Active Young Adult Women

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Weight gain is a commonly cited side effect of hormonal contraceptive (HC) use, which can deter initiation or contribute to discontinuation. Current evidence suggests small weight gain (<2 kg) in long-term oral contraceptive users, while findings for intrauterine devices (IUDs) are inconsistent. Limited research exists examining body shape changes in exercising HC users over time. **PURPOSE** To compare changes in abdominal and lower body circumferences and volumes among physically active women using HCs over a 24-week period. **METHODS** 59 women completed anthropometrics, three-dimensional body scan (3DBS; waist, abdomen, hip, and mid-thigh circumferences, and leg and torso volumes), and a 3-day food record at baseline, with repeat 3DBS at 12 and 24 weeks (wks). Women were categorized based on self-reported HC type: combined oral contraceptive pill (COCP; n=15), hormonal IUD (Mirena; n=15), and non-hormonal contraceptive users (nonusers; n=29). All women were physically active (≥ 150 min/wk), and a subset (n=35: nonusers=15, COCP=10, Mirena IUD=10) completed a high-frequency impact and resistance training program. Baseline differences were assessed via ANOVA (mean $\pm$ sd) or Kruskal-Wallis tests (median [Q1,Q3]). Linear mixed models were used for each 3DBS parameter, with HC status, time, and their interaction and intervention group as fixed effects, with participants as random intercepts. **RESULTS** Groups were similar in age (yrs; 26 [22,29]; p=0.247), BMI (kg/m²; 24.6 $\pm$ 3.2; p=0.986), and baseline energy intake (kcal; 1,848 $\pm$ 405; p=0.211). No significant HC*time interactions or effect of intervention were observed (p $\geq$ 0.107). Main effects of time were significant (p $\leq$ 0.001), such that mid-thigh and hip circumferences and torso and leg volume increased from baseline to 12 wks (mid-thigh: Δ =1.198cm, p=0.003; hip: Δ =1.056cm, p=0.004; torso: Δ =1103mL, p=0.026, leg: Δ =341.5mL, p=0.004) and baseline to 24 wks (mid-thigh: Δ =1.48cm, p<0.001; hip: Δ =1.62cm, p<0.001; torso: Δ =1740mL, p=0.007; leg Δ =375mL, p=0.004). **CONCLUSION** Following 24 weeks of exercise, women exhibited significant increases in lower body circumferences, and torso and leg volumes, regardless of HC group. These findings may inform patient counseling, suggesting that HC use may not be exclusively responsible for perceived body shape changes.

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Muscle Calcium Handling Protein Expression

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Calcium is essential to muscle contraction. Once released from the sarcoplasmic reticulum, calcium binds to troponin and allows myosin-actin binding and sarcomere shortening. During this process, calcium enters the mitochondria and activates mitochondrial oxidative phosphorylation, and is subsequently extruded from the mitochondria during relaxation. Recently, the protein responsible for Na⁺/Ca²⁺ exchange was identified as TMEM65. **PURPOSE:** Therefore, our goal was to determine how protein expression of calcium-handling proteins differs between slow-twitch (soleus) and fast-twitch (extensor digitorum longus, EDL) muscle mitochondria. **METHODS:** Following euthanization, slow-twitch soleus and fast-twitch EDL skeletal muscles from male and female mice were isolated, extracted, homogenized, and prepared for Western blotting. Following primary and secondary antibody staining of the western blot membranes, protein analysis was performed to measure the expression of calcium handling proteins (TMEM65, NCLX, MCU, LETM) and mitochondrial content markers (CIV, CV, ANT). **RESULTS:** TMEM65 expression was 55% higher in EDL (0.126 ± 0.018 AU) compared to soleus (0.056 ± 0.021 AU), however, NCLX (Ca²⁺/H⁺ exchanger) expression did not differ between EDL and soleus (0.152 ± 0.01 vs 0.201 ± 0.019 AU). Mitochondrial content was significantly higher in the soleus (0.448 ± 0.080) compared to EDL (0.067 ± 0.045), consistent with previous studies. **CONCLUSION:** TMEM65, recently identified as the Na⁺/Ca²⁺ exchanger, responsible primarily for calcium extrusion from the mitochondrial matrix, is greater in fast-twitch skeletal muscle, despite the much lower mitochondrial content. This greater TMEM65 expression, predicting a greater capacity for extrusion of calcium from the matrix in fast-twitch muscle, is consistent with faster cytosolic calcium transient in fast- compared to slow-twitch muscle.



Metabolic Syndrome Severity is Associated with Working Memory and Vascular Function: Potential Role of Central Adiposity

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Metabolic syndrome (MetS) is associated with cognitive decline and vascular dysfunction. However, the binary classification of MetS may not capture the extent of cardiometabolic dysfunction because individuals can differ substantially in the severity of individual MetS components. A continuous MetS severity score may better reflect overall metabolic burden and identify individuals at greater risk for cognitive and vascular impairment. **PURPOSE:** To examine associations between MetS severity, working memory, vascular function and central adiposity in older adults with and without MetS. **METHODS:** Forty-eight adults (66 ± 6 yr; 65% female) completed 0-, 1-, and 2-back tasks assessing working memory and executive function and brachial artery flow-mediated dilation (FMD). MetS severity was calculated as the natural logarithm of the sum of systolic blood pressure, fasting glucose, triglycerides, waist circumference and inverse high-density lipoprotein cholesterol. Pearson correlations examined associations between MetS severity, cognitive performance and FMD. **RESULTS:** Greater MetS severity was associated with faster reaction times during the 0-back ($r = -0.379$, $p = 0.033$), 1-back ($r = -0.295$, $p = 0.049$) and 2-back ($r = -0.379$, $p = 0.010$) tasks and lower 2-back accuracy ($r = -0.351$, $p = 0.023$). Waist circumference contributed the greatest variance to cognitive outcomes and was associated with lower 2-back accuracy ($r = -0.41$, $p = 0.006$) and lower FMD ($r = -0.44$, $p = 0.002$). **CONCLUSION:** Greater MetS severity was associated with altered cognitive performance, particularly poorer higher-order working memory. The concurrent associations of waist circumference with working memory and FMD suggest that central adiposity may represent an important link between metabolic dysfunction, vascular impairment and cognitive performance. These findings identify central adiposity as a potential target for preserving cognitive and vascular function.

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Does Habitual Protein Intake Predict Resistance to Strength Loss During Short-Term Upper-Limb Immobilization?

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Short-term limb immobilization rapidly reduces muscle strength, often more than muscle size. Dietary protein supports muscle maintenance and is associated with greater strength. Protein supplementation augments training-related strength gains but does not attenuate disuse-related strength loss, based largely on lower-limb studies. How habitual protein intake relates to strength loss during upper-limb immobilization remains unknown. **PURPOSE:** To examine whether habitual dietary protein intake is associated with grip strength loss during 7-day upper-limb immobilization, and whether this association differs from non-immobilized conditions. **METHODS:** Forty-two healthy adults (21.8 ± 3.6 yr) were grouped as immobilized (7-day non-dominant wrist/hand brace; $n=20$) or non-immobilized ($n=22$). Non-dominant grip strength was assessed by handheld dynamometer at baseline (PRE) and day 7 (POST). The highest of 3 trials was used to calculate percent change in strength. Dietary intake was recorded with a 3-day food log (2 weekdays, 1 weekend) analyzed with nutrition software. Mean protein was expressed as g/kg body mass. Linear regression predicted grip-strength percent change from protein intake, immobilization status, and their interaction ($\alpha=0.05$). **RESULTS:** Immobilization markedly reduced grip strength (immobilized $-9.5 \pm 10.9\%$, non-immobilized $+5.9 \pm 6.8\%$). The model explained 48% of variance ($R^2 = 0.48$, $F(3,38) = 11.84$, $p < 0.001$), driven by a large effect of immobilization ($b = -16.1\%$, $p < 0.001$, $\eta^2p = 0.47$). Protein intake did not significantly predict grip strength change ($b = +2.9\%$ per g/kg, $p = 0.62$, $\eta^2p = 0.01$), and the protein $\times$ immobilization interaction was not significant ($b = +4.5\%$, $p = 0.53$, $\eta^2p = 0.01$). The protein–strength slope was numerically steeper under immobilization ($+7.4$ vs. $+2.9\%$ per g/kg). **CONCLUSION:** During short-term upper-limb immobilization, variation in dietary protein intake was not associated with grip strength loss, nor did it differ between immobilized and non-immobilized conditions. However, the steeper protein–strength slope suggests protein may play a larger role over longer disuse periods. These preliminary findings are, to our knowledge, among the first to relate habitual, rather than supplemented, protein intake to upper-limb strength loss during immobilization.

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The Effect of Mindfulness Meditation on Sleep Quality and Cognitive Performance

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Sleep quality influences overall health and cognitive performance, however college-aged individuals have an increased risk of poor sleep quality. Mindfulness meditation tools have been proposed to potentially reduce stress and improve sleep quality. **PURPOSE:** This study examined the effect of a mindfulness meditation intervention on sleep quality and cognitive performance in college students. **METHODS:** Nineteen participants (4 male, 15 female; 19.8 ± 1.5 years) were randomly assigned to a control group (CON) or a mindfulness meditation group (MM). All participants completed a pre- and post- test session separated by a two-week intervention period. Tests consisted of completing the Pittsburgh Sleep Quality Index (PSQI), a Stroop test for reaction time (RT) and performance index (PI), and a memory test. All participants used the same smart watch model to track sleep and completed a daily sleep journal to track sleep duration, wake times, and perceived sleep quality (PSQ). Participants in MM completed at least 10 mins of guided mindfulness meditation every night using an online playlist of videos. Changes in sleep quality and cognitive performance were compared between the groups using 2x2 Analysis of Variance. **RESULTS:** After two weeks of MM intervention, PSQI scores improved in MM group by 24.6% (6.8 ± 4.3 to 5.1 ± 3.0), although there was no significant between-group difference (MM: 5.1 ± 3.0 vs. CON: 5.9 ± 2.0 , $p = 0.29$). RT (MM: 1.3 ± 0.4 vs. CON: 1.1 ± 0.4 sec, $p = 0.27$), Stroop performance index (MM: 51 ± 17 vs. CON: 58 ± 10 , $p = 0.29$), and memory index (MM: 97 ± 2.7 vs. CON: 96 ± 3.1 , $p = 0.62$) did not show significant post-test group differences either. Two weeks of MM intervention had a significant improvement in Stroop performance in MM (38.6 ± 14.6 to 51 ± 16.8 , $p = .034$). However, significant improvements were also observed in CON (41.9 ± 15.0 to 57.8 ± 9.8 , $p = .004$). Memory and RT improved in MM by 1.63% and 15.33%, respectively, although these changes had no statistical significance. **CONCLUSION:** The present study found no statistically significant differences between CON and MM across measures of memory, RT, attention, and sleep quality. Further research over a longer period of time is needed to assess the effects of MM intervention on sleep quality and cognitive performance. The authors declare no conflicts of interest.



Aerobic Exercise Training and Glucose Tolerance Status Alter Skeletal Muscle Lipid Morphology and Perilipin Expression

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Exercise training improves skeletal muscle glucose uptake in individuals with insulin resistance and type 2 diabetes mellitus (T2DM). Large lipid droplets in skeletal muscle are linked to insulin resistance, and exercise training may reduce lipid droplet size. Perilipin (PLIN) proteins are involved in regulation of lipid droplet size and metabolism; thus, altered expression or reorganization of PLIN proteins may be involved in lipid responses to exercise training. **Purpose:** This study aimed to determine whether six months of aerobic exercise training can affect PLIN expression and reduce lipid droplet size in people with T2DM, impaired (IGT), or normal glucose tolerance (NGT). **Methods:** Middle-aged and older adults (62 ± 7) with NGT ($n=8$), IGT ($n=11$) or T2DM ($n=7$) were studied before and after six months of aerobic exercise training. Skeletal muscle biopsies were obtained from the vastus lateralis at each time point. PLIN protein expression was quantified by western blot analysis. Lipid droplet volume was determined by 3D immunofluorescent analysis with co-staining for PLIN2 and PLIN5 to quantify lipid droplet-associated PLINs. RM-ANOVA was used to detect differences before and after training. Data are means $\pm$ SEM.

Results: Total PLIN2 and PLIN5 protein expression was greater across groups after training ($p < 0.05$). T2DM muscle contained a lower proportion of large ($0.32 - 0.45 \mu\text{m}^3$) lipid droplets after training ($12.0\% \pm 2.9$ vs. $6.8\% \pm 1.7$; $p = 0.001$). Participants with IGT had a $\sim 17\%$ increase in lipid droplet associated PLIN2 after training ($p = 0.03$), while no change was seen in the T2DM group ($p = 0.68$). Lipid droplet associated PLIN5 decreased by 31% in the NGT group after training ($p = 0.04$) but increased by 67.1% in the IGT group ($p = 0.02$) and 53.7% in the T2DM group ($p = 0.002$). **Conclusion:** Six months of aerobic exercise training increased PLIN expression across all groups and reduced the number of large lipid droplets in skeletal muscle from adults with T2DM. This occurred in tandem with a substantial increase in lipid droplet associated PLIN5 expression in the T2DM group, as well as the IGT group. These training-induced changes in IGT and T2DM may help mitigate insulin resistance by increasing PLIN5 expression on lipid droplets.

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Influence of Pre-exercise Carbohydrate and Sex on Metabolic and Endocrine Responses to Aerobic Exercise

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PURPOSE: The purpose of this study was to examine sex differences in endocrine and metabolic measures during 30-minutes of cycle ergometry performed at 63% of estimated peak power. **METHODS:** Twenty healthy college students (10 male, 10 female) completed three testing sessions. Day one consisted of consent form completion, collection of background demographic information, and a submaximal, graded cycle test to determine workload for day 2 and 3 testing. For experimental trials, participants came in either fasted or after consuming a carbohydrate solution (CHO) 45 minutes prior to arrival. Each test day, subjects completed the Perceived Stress Scale (PSS), and salivary cortisol, blood glucose (BG), and blood lactate (BL) measurements were collected. They then completed a 30-minute protocol that included cardiorespiratory assessments every ten minutes and a midpoint BG and BL measurement. Following completion of exercise, salivary cortisol, BG, and BL were measured again. **RESULTS:** There was a time effect ($p=0.002$) difference in salivary cortisol from pre (2.01 ± 0.27 ng·ml⁻¹) to post exercise (1.01 ± 0.15 ng·ml⁻¹). Females showed a more substantial drop in cortisol at post-exercise with a trend for a sex difference observed ($p=.053$), but there was no treatment effect present. For lactate, time by sex showed that males at midpoint (9.08 ± 0.83 mmol·L⁻¹) had higher lactate than females at midpoint (6.45 ± 0.33 mmol·L⁻¹). Males at endpoint (9.32 ± 1.05 mmol·L⁻¹) had a higher lactate than females at endpoint (6.75 ± 0.68 mmol·L⁻¹) ($p=0.029$). For glucose, the Pre timepoint was different from exercise measures ($p=0.001$). Time x treatment ($p<0.001$) effects were also present with Pre glucose higher with the CHO condition. A trend for a treatment effect was also found ($p=0.52$). **CONCLUSION:** Based on the results of this study, salivary cortisol tended to be higher in females and both sexes showed a reduction in cortisol after exercise. Males were found to have higher lactate during and after exercise. The findings suggest a potential sex difference in cortisol responses to exercise, with females appearing to demonstrate greater changes in cortisol than males. CHO provision did not appear to affect these responses despite large effects on pre-exercise glucose concentration.

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Inflammatory Biomarker Responses Following Treadmill High-Intensity Interval Training Differ Between Omnivore and Plant-Based Diets

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The inflammatory response to exercise has been studied in long-duration endurance exercise. Less is known about changes in inflammatory biomarkers between diet groups following acute bouts of exercise such as treadmill (TM) high intensity interval training (HIIT). **PURPOSE:** This study investigated interleukin (IL)-6, IL-8, and IL-10 responses following TM HIIT across omnivore (OMNI) and plant-based diets (VEG).

METHODS: Twenty-six participants (14 OMNI, 12 VEG; 26.92 ± 0.64 years) completed the study. Blood samples were taken in a fasted state (>10 hours) before, immediately after, 1 hour after, and 24 hours after TM HIIT. Plasma was isolated from blood samples and stored at -60°C until cytokine analysis. All cytokine concentrations were measured in pg/mL. Results are presented as mean $\pm$ standard error.

RESULTS: IL-6 significantly increased from baseline post exercise for OMNI (2.53-fold $\pm$ 0.80, $p = 0.013$) and VEG (8.56-fold $\pm$ 2.99, $p = 0.002$). IL-8 only increased immediately post TM HIIT in VEG (5.20-fold $\pm$ 2.08, $p = 0.031$) only. IL-8 increased from baseline 1 hour (OMNI: 3.25-fold $\pm$ 1.99, $p = 0.046$; VEG: 7.50-fold $\pm$ 3.10, $p = 0.005$) and 24 hours (OMNI: 2.-fold $\pm$ 1.34, $p = 0.049$; VEG: 9.78-fold $\pm$ 4.29, $p = 0.004$) following TM HIIT for both diet groups. Within the VEG group, IL-10 significantly increased from baseline at 1 hour (0.71-fold $\pm$ 0.26, $p = 0.009$) and 24 hours (1.62-fold $\pm$ 0.51, $p = 0.002$) following HIIT. There was no significant difference in IL-6 between diet groups at any timepoint. IL-8 differed between diet groups at baseline (OMNI: 24.64 ± 10.93 pg/mL vs VEG: 4.46 ± 1.80 pg/mL, $p = 0.038$). IL-10 levels varied between diet groups at all timepoints ($p < 0.05$), with the OMNI group being significantly higher at all timepoints. **CONCLUSION:** The results of this study indicate changes in inflammatory biomarkers, particularly IL-8, following TM HIIT. They also suggest larger changes in IL-8 and IL-10 levels in VEG following TM HIIT compared to OMNI. These findings improve understanding of high intensity exercise and diet on inflammatory responses, which can inform athletes' dietary choices. Future research should investigate correlations between changes in IL-8 and IL-10 following exercise with macro- and micronutrient levels.

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Physical Activity Enjoyment, Self-Efficacy, Activity Tracking, and Goal Setting as Predictors of College Students' Activity

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Physical inactivity has been established to be problematic for college students both short and long term. Their participation in physical activity (PA) is influenced by many factors which will be explored in this study. **PURPOSE:** This study examined the interrelationships of PA enjoyment, exercise goal setting, exercise self-efficacy, and recording PA behaviors and the impact on PA. **METHODS:** 1,476 students at a public university in the United States responded to a questionnaire which consisted of validated survey instruments regarding PA levels and exercise behaviors between 2014 and 2018. **RESULTS:** The final structural model was an adequate fit for the data ($\chi^2(245) = 2306.522$, $p < .05$, CFI = .904, RMSEA = .076 [.073, .078], SRMR = .06). The results indicated a positive and statistically significant relationship among the factors. Exercise self-efficacy ($b = 0.39$, $p < .05$), PA enjoyment ($b = 0.25$, $p < .05$), and recording PA ($b = 0.14$, $p < .05$) were all positive statistically significant predictors of PA with exercise self-efficacy being the strongest predictor. PA enjoyment ($b = 0.54$, $p < .05$) and exercise goal setting ($b = 0.21$, $p < .05$) were both positive significant predictors of exercise self-efficacy. PA enjoyment was the stronger predictor. **CONCLUSIONS:** Our findings reinforce the positive influence between PA enjoyment, exercise self-efficacy, and establishing exercise goals with increased PA. Particularly, exercise goal setting and PA enjoyment not only directly impact PA but also influence other model variables, underscoring their significance in enhancing PA among college students. The authors declare no conflicts of interest.



Test-Retest Reliability of Modified Price and Campbell Upper-Body Ergometer Protocol in Spinal Cord Injury

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Accurate, reproducible assessment of aerobic capacity is necessary to prescribe and evaluate exercise interventions in individuals with spinal cord injury (SCI). The Price and Campbell upper-body ergometer test is a multistage graded protocol used to assess VO₂peak within an ongoing home-based virtual reality (VR) exercise trial, but between-day reliability in SCI is unknown. **PURPOSE:** To examine the test-retest reliability of VO₂peak and maximal heart rate (HRpeak) from the Price and Campbell protocol in SCI.

METHODS: Eight participants with chronic SCI (mean age 39.6 ± 15.0 yr; 75% male; 4 cervical, 4 thoracic; 2 complete, 6 incomplete; median injury duration 14.4 yr, range 1.3–42.2; mean body mass 75.9 ± 10.8 kg) completed the protocol twice, 7 days apart. Testing began with a 2-min, 0-W warm-up followed by 2-min stages increasing 5 or 20 W (individualized to capacity) at 55 rpm to volitional exhaustion. HR, blood pressure, and rating of perceived exertion (RPE, 6–20 scale) were recorded each stage; VO₂ was measured continuously via breath-by-breath indirect calorimetry, with VO₂peak defined as the highest 30-s average. Reliability was assessed with two-way mixed effects, absolute-agreement intraclass correlation coefficients (ICC), paired t-tests, standard error of measurement (SEM), minimal detectable change (MDC95), and Bland-Altman bias with 95% limits of agreement (LoA). **RESULTS:** VO₂peak did not differ between Test 1 (20.7 ± 6.2 mL·kg⁻¹·min⁻¹) and Test 2 (20.2 ± 5.6 mL·kg⁻¹·min⁻¹; p=.61) with relative reliability ranging from moderate to excellent (ICC=0.91, 95% CI: 0.64–0.98; SEM=1.8 mL·kg⁻¹·min⁻¹; MDC95=5.0 mL·kg⁻¹·min⁻¹; bias=-0.5, 95% LoA -5.5 to 4.5). HRpeak also demonstrated excellent reliability (ICC=0.98, 95% CI: 0.85–1.00; SEM=2.7 bpm) with no significant between-session difference (139.8 ± 21.3 vs. 142.6 ± 19.7 bpm; p=.10). **CONCLUSION:** The Price and Campbell protocol demonstrated moderate-high test-retest relative reliability for VO₂peak and high reliability for HRpeak; the MDC95 for VO₂peak should be considered when interpreting individual-level change. Participants maintained their relative ranking well across sessions, but individual measurement error was not minimal. These findings support continued use of the protocol within our ongoing home-based VR trial.

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Front and Trail Leg Joint Powers in Varying Depth Lunge Exercises

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Lunge exercises are frequently used to improve lower extremity musculoskeletal function in a variety of populations. **PURPOSE:** The purpose of this project was to analyze the effects of utilizing varied lunge depths during standing lunge exercises on front and trail leg joint power (JP) values. **METHODS:** 12 males and 12 females (age = 21 ± 1 yrs; mass = 74 ± 17 kg; height = 1.73 ± 0.11 m) performed 4 sets of unloaded standing lunges (all combinations of right/left, deep/shallow). The trail leg knee contacted a depth indicator at 16% (shallow) and 6% (deep) of the subject's height. Step length was 42% of height for all lunges. Participants' movements were recorded with 8 cameras, while ground reaction forces and moments were obtained via 2 force plates. The peak total JP values during both the descent and ascent phases of the lunge exercise were used in the analysis (normalized to participants' body mass). The relationships between JP, front leg, and lunge depths were assessed using two-way factorial ANOVA tests. **RESULTS:** The following comparisons use pooled limb data (due to no significant differences between limbs). The front leg descent peak JP were significantly larger using a deep lunge than the shallow ($p < 0.05$ for hip (-1.58 vs -0.70), knee (-1.67 vs -0.68), and ankle (-0.59 vs -0.31) W/kg). The trail leg descent peak JP were larger in the deep lunge than the shallow ($p < 0.05$ for hip (0.58 vs 0.44), knee (-2.04 vs -1.09), and ankle (-0.37 vs -0.34) W/kg). The front leg ascent peak JP were significantly larger using a deep lunge than the shallow ($p < 0.05$ for hip (2.27 vs 1.01), knee (2.27 vs 0.97 and ankle (0.77 vs 0.46) W/kg). The trail leg ascent peak JP were larger in the deep lunge than the shallow ($p < 0.05$ for hip (-0.78 vs -0.56), knee (2.96 vs 1.60), but not the ankle (0.37 vs 0.42) W/kg). **CONCLUSION:** This novel study was the first to examine JP in the trail leg (in addition to the front leg) during lunges. JP values were larger in the ascent phase than in the descent phase for the hips and knees. Of special note is the finding that the trail leg knee exhibited larger JP values than the front leg knee during both descent and ascent phases. While the lunge exercise has been thought to focus on the forward leg, results from the present investigation indicate that the lunge exercise focuses on the front leg hip musculature and the trail leg knee musculature.



Females Exhibit a Delayed Reduction in Augmentation Index Following Maximal Cycling Exercise

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Augmentation index (AIx) measures arterial wave reflection and may provide insight into cardiovascular health at rest and in response to an acute stressor. Although resting AIx typically differs between males and females, less is known regarding sex differences in AIx immediately after and during recovery from acute exercise. **PURPOSE:** To examine sex differences in AIx at rest and throughout 60 minutes of recovery following maximal effort cycling exercise. **METHODS:** Pulse wave analysis was used to assess AIx (%) in N = 34 individuals (17 males and 17 females) following 15 min of supine rest. Participants then completed a maximal cycling test in which workload started at 50 Watts and increased continuously by approximately 1 Watt every 3 s until volitional exhaustion. AIx was assessed again while supine at 1-, 5-, 15-, 30-, and 60-min post-exercise. Repeated measures ANOVA was used to assess sex differences across 6 time points.

RESULTS: There was a significant sex-by-time interaction ($p < 0.001$) and main effect of time ($p < 0.001$), but no main effect of sex ($p = 0.431$). Compared to females, AIx was significantly lower in males at the 1 min post-exercise time point ($p < 0.001$) but was similar at rest ($p = 0.757$) and at all other post-exercise time points ($p > 0.05$ for all). Compared with rest ($11.5 \pm 2.3\%$), males experienced a reduction in AIx 1 min post-exercise ($-12.8 \pm 3.0\%$; $p < 0.001$) that remained until 5 min post-exercise ($0.353 \pm 3.3\%$; $p = 0.024$). Females did not experience any significant changes from rest ($12.5 \pm 2.3\%$), at 1- ($2.4 \pm 3.0\%$), 5- ($8.6 \pm 3.3\%$), 15- ($2.4 \pm 3.2\%$), or 30-min ($3.9 \pm 4.6\%$) post-exercise ($p > 0.05$ for all). However, AIx was significantly reduced at 60 min post-exercise vs. rest in female participants only (0.24 ± 3.8 vs. $12.5 \pm 2.3\%$, respectively; $p = 0.045$).

CONCLUSION: While the present study found that males and females exhibit similar AIx at rest, different AIx responses were reported following maximal exercise. Males experienced an immediate, short reduction in AIx, whereas females demonstrated a delayed reduction at 60 min post-exercise. These findings suggest that monitoring recovery in the later post-exercise period may reveal sex-specific response patterns that are not evident in data assessment of shorter time periods.

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Validation of AI-Based 3D Pose Estimation for Measuring Kinematics During Falls in Older Adults

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Falls are a major cause of injury in older adults. Although biomechanical parameters during a fall (e.g., hip and knee flexion and falling velocity) have been associated with fall-related injury risk, movement during falls is not well understood because laboratory fall studies are limited by safety concerns and marker occlusion. AI-based pose estimation may enable quantitative assessment of fall biomechanics, but the accuracy of models for dynamic fall kinematics remains unclear. **PURPOSE:** To validate three three-dimensional (3D) human pose estimation models - PromptHMR (PHMR), HSMR, and GVHMR - in measuring joint linear kinematics (hip vertical velocity and acceleration) and angular kinematics (hip and knee flexion angles, hip and knee angular velocities, and trunk yaw angle) from single-camera video-captured falls.

METHODS: Thirteen community-dwelling, older adults (age: 64.0 ± 5.9 years; 3 females, 10 males) completed laboratory-induced falls. Agreement between VICON motion capture (reference standard) and each pose estimation algorithm was quantified using mean absolute error (MAE), mean absolute percentage error (MAPE), and bias (mean signed error). **RESULTS:** PHMR demonstrated the highest accuracy for hip and knee flexion angles, with MAPEs below 15% (hip flexion: $14.3 \pm 10.5\%$; knee flexion: $9.0 \pm 7.1\%$). HSMR provided the best estimates of angular velocities (hip: $16.9 \pm 11.7\%$; knee: $16.5 \pm 10.9\%$) and both linear kinematic variables (hip impact velocity: $12.5 \pm 8.8\%$; hip impact acceleration: $26.1 \pm 14.0\%$). GVHMR achieved the lowest absolute error for trunk yaw at impact ($MAE = 7.33 \pm 5.01^\circ$).

CONCLUSION: While no single model excelled uniformly across all metrics, the best-performing algorithm for each variable can characterize diverse joint kinematics during a fall from single-camera video, with errors near or below 15% for most angular and linear kinematic metrics. Specifically, PHMR and HSMR demonstrated complementary strengths across joint angle and linear/angular velocity variables, while GVHMR was the most accurate for trunk yaw angle at impact. These findings support the potential utility of pose estimation for fall biomechanics research yet underscore the need for further validation across camera settings, fall contexts, and participant populations before clinical application.

The authors declare no conflicts of interest.



Urine Color as a Proxy for Hydration Status in Recreational Athletes and Tourism Workers

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Hydration assessment is important for individuals exercising or working in environments that increase the risk of fluid loss. Urine color provides a simple field-based measure that may be useful for assessing hydration when more objective measurements are not readily available. **PURPOSE:** We evaluated the efficacy of urine color as a proxy for hydration status in recreational athletes and tourism workers on the island of Crete, Greece. **METHODS:** A total of 104 recreational athletes (age: 38.5 ± 11.4 yrs; 60% female) and 51 tourism workers (age: 34.5 ± 16.7 yrs; 33% female) participated in the study. Hydration status was evaluated via urine specific gravity (USG) after a ~1-hour outdoor training session (running, soccer, basketball) or before and after an 8-hour work shift. Urine color was evaluated by the same, experienced researcher using the WHO urine color scale. **RESULTS:** The USG was lower in recreational athletes (1.019 ± 0.008) than tourism workers (start 1.027 ± 0.009 and end 1.029 ± 0.009 of work shift). Similarly, the urine color was lower in recreational athletes (2.6 ± 1.0) than tourism workers (start 3.2 ± 1.0 and end 3.4 ± 1.4 of work shift). A dehydrated state ($USG \geq 1.020$) was identified in 49% of samples from recreational athletes and 87% of samples from tourism workers. Screening via urine color indicated a dehydrated state in 54% of samples from recreational athletes and 80% of samples from tourism workers. There was a statistically significant association between USG and urine color in both recreational athletes ($r = 0.909$, $p < 0.001$; $r^2 = 0.828$) and tourism workers ($r = 0.637$, $p < 0.001$; $r^2 = 0.406$). The diagnostic efficacy of urine color as a proxy for USG-determined dehydration was high in both recreational athletes (sensitivity: 0.96; specificity: 0.87; diagnostic odds ratio: 161; $K = 0.82$, $p < 0.001$) and tourism workers (sensitivity: 0.88; specificity: 0.71; diagnostic odds ratio: 18.3; $K = 0.48$, $p = 0.03$). **CONCLUSION:** The present analysis revealed high prevalence of dehydration in recreational athletes and tourism workers on the island of Crete, Greece. The urine color demonstrated acceptable efficacy for use as a proxy assessment of hydration status in cases where USG measurements are not feasible. The authors declare no conflicts of interest.



Postural Sway and Cerebrovascular Hemodynamics in Dancers and Non-Dancers

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Postural sway reflects the integration of visual and vestibular sensory information with appropriate motor responses. Habitual dance training may enhance sensory-motor integration, thereby lowering the neural and cerebrovascular demands associated with postural control of balance. Whether habitual dancers possess lower cerebrovascular hemodynamic responses to balancing tasks compared to non-dancers remains unclear. **PURPOSE:** This study examined balance performance and cerebrovascular hemodynamics during balance tasks in habitual dancers and non-dancers. **METHODS:** We included 14 female dancers (Age: 24±3, Body Mass Index (BMI): 23±1 kg/m²) and 12 female non-dancers (Age: 23±3, BMI: 21±2 kg•m⁻²). Participants completed four, 30-second static balance tasks with eyes open and eyes closed on both a stable and unstable (foam) surface. Balance performance was assessed as the postural sway center of pressure path length (COP PL) during each balance condition using a force plate. Cerebrovascular hemodynamics were assessed as middle cerebral artery (MCA) mean velocity (MnV) and MCA pulsatility index (PI) during each balance condition using a transcranial Doppler. Repeated-measures ANOVAs were used to examine balance performance (across 4 conditions) and cerebrovascular hemodynamics between dancers and non-dancers. **RESULTS:** Dancers exhibited longer COP PL compared to non-dancers across all balance conditions (group effect, Table 1, p<0.01). However, the group x condition interaction was not significant. There were no group or condition differences or group x condition interactions for MCA MnV or MCA PI (see Table 1). **CONCLUSIONS:** Dancers had longer COP PL than non-dancers, with no observed differences in MCA MnV or MCA PI across all balance tasks. These findings suggest that greater postural sway during a balance task in dancers versus non-dancers may be mediated by other factors independent of cerebrovascular hemodynamics. The authors declare no conflicts of interest.

ABSTRACT CONTINUES ON NEXT PAGE



Table 1: Repeated measures ANOVA assessing balance performance (across 4 conditions) and cerebrovascular hemodynamics between dancers and non-dancers .

	Balance Condition				p-value		
	Eyes Open, Stable Surface	Eyes Closed, Stable Surface	Eyes Open, Foam Surface	Eyes Closed, Foam Surface	Group	Cond.	Int.
COP PL (cm)							
Dancer	22 ± 6	33 ± 9	41 ± 11	96 ± 30	<0.01	<0.01	0.12
Non-Dancer	18 ± 4	24 ± 7	34 ± 5	73 ± 21			
MCA MnV (cm/s)							
Dancer	55 ± 12	55 ± 11	56 ± 12	57 ± 11	0.56	0.54	0.80
Non-Dancer	59 ± 15	58 ± 13	59 ± 14	59 ± 14			
MCA PI							
Dancer	0.85 ± 0.15	0.87 ± 0.16	0.87 ± 0.14	0.86 ± 0.15	0.45	0.53	0.85
Non-Dancer	0.88 ± 0.15	0.90 ± 0.14	0.91 ± 0.14	0.92 ± 0.17			

Center of pressure path length, COP PL; middle cerebral artery, MCA; mean velocity, MnV; pulsatility index, PI; Condition, Cond; Interaction, Int.



The Effect of a Cool-Down Versus Passive Recovery on Heart Rate Complexity After Vigorous Exercise

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The American College of Sports Medicine's recommendation for 5-10 minutes of light to moderate exercise following vigorous exercise is founded on metabolite clearance and the recovery of heart rate and blood pressure. However, the use of a cool-down to aid in the recovery of heart rate complexity is not well known. **PURPOSE:** The purpose of this study was to evaluate changes in heart rate complexity (HRC) following a single bout of vigorous battle rope exercise performed with and without a cool-down. **METHODS:** HRC was measured in thirteen moderately active individuals (age 22 ± 1 yr) at Rest, and 20, 45, and 60 minutes post-exercise. Both a cool-down and passive recovery conditions were implemented immediately after exercise for each participant. Sample entropy (SampEn), a non-linear measure of vagal modulation, was used to examine the complexity of the R-R intervals over a 5-minute period. The R-R intervals are the time measurements between heart beats. SampEn is the probability of similar sequences over a short period of time. **RESULTS:** There were no significant condition by time interactions between the cool-down and passive recovery groups ($F_{1,24} = 3.50$, $p = .074$) and no changes in SampEn for either condition after vigorous exercise. **CONCLUSION:** These data suggest that the prescribed vigorous exercise did not disrupt autonomic function post exercise. The authors declare no conflicts of interest.



Effect of Hot Environmental Temperature on Maximal Lactate Steady State in Recreationally Active Female Runners

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Maximal lactate steady state (MLSS), the highest workload achieved without persistent blood lactate accumulation over time, is a beneficial marker of endurance performance in establishing aerobic training status and progression. Environmental conditions, particularly hot and humid, may impair aerobic exercise performance due to increased physiological and perceptual strain. **PURPOSE:** To compare the effects of a hot environment vs. a thermoneutral environment on MLSS and heat perception during treadmill running in recreationally active, college-aged females. **METHODS:** 10 recreational female runners (20.3 ± 1.70 years) completed a graded exercise treadmill test, followed by 2-4 30-min runs to determine MLSS, in which blood lactate concentration varied by less than $1.0 \text{ mmol}\cdot\text{L}^{-1}$ in the last 20 min. Participants then performed 2 counterbalanced experimental trials in a thermoneutral condition ($21.4 \pm 2.22^\circ\text{C}$; $40.2 \pm 11.55\%$ relative humidity) and a hot condition ($34 \pm 0.94^\circ\text{C}$; $45 \pm 10.02\%$ relative humidity). Repeated measures ANOVA was used to assess lactate, ventilation (VE) and rating of perceived exertion (RPE). Paired samples t-tests assessed delta scores for completion time (CT), core temperature (T_c), VO_2 , heart rate (HR), and systolic blood pressure (SBP). A Wilcoxon signed rank test analyzed thermal sensation responses.

RESULTS: CT was significantly lower in hot conditions (mean difference = 4.8 min; $p = 0.013$; Hedge's $g = 0.77$). Blood lactate (mean difference = $2.63 \text{ mmol}\cdot\text{L}^{-1}$; $p = 0.001$; Hedge's $g = 1.18$) and RPE (mean difference = 4; $p < 0.001$; Hedge's $g = 1.88$) showed significant condition x time interactions, with greater increases in heat vs. thermoneutral. VE showed significant main effects for condition (mean difference = 6.77 L/min ; $p = 0.03$) and time (mean difference = 57.50 L/min ; $p < 0.001$), but no significant condition x time interaction (mean difference = 11.96 L/min ; $p = 0.053$; Hedge's $g = 0.90$). No significant differences were observed for T_c , HR, SBP, VO_2 , or thermal sensation ($p > 0.05$). **CONCLUSION:** Performance at MLSS may be impaired during aerobic exercise in the heat due to evidence suggestive of limited buffering capacity and increased perceived strain. MLSS may not be an effective parameter to utilize during endurance performance in the heat when determined in thermoneutral conditions.

The authors declare no conflicts of interest.



Similar Arterial Stiffness Between Hormonal IUD Use and Aortic and Carotid Arterial Stiffness in Middle-Aged Women

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Synthetic progestin levonorgestrel (LNG), commonly used in oral contraceptives formulations, have been associated with impaired vascular health. However, the associations between LNG-containing hormonal intrauterine devices (IUDs) and arterial structure specifically in middle-aged women, remains unclear.

PURPOSE: This study aims to investigate the effect between hormonal IUD use and central aortic arterial stiffness, carotid artery stiffness and carotid artery compliance in middle-aged women. **METHODS:** The study compared women aged 35-55 years with and without the use of hormonal IUD. Carotid-femoral pulse wave velocity (cfPWV) was used to evaluate central aortic arterial stiffness using applanation tonometry. Carotid artery beta-stiffness and compliance were assessed as measures of regional arterial structure via ultrasound. Resting brachial blood pressure (BP) was measured using an automated device and reported as the average of two readings. Mann-Whitney U tests or Independent t-tests were used to compare means between hormonal IUD and naturally menstruating women (controls). **RESULTS:** Body mass index (BMI) was significantly higher in hormonal IUD than controls (hormonal IUD: $25.7 \pm 2.3 \text{ kg/m}^2$ vs controls: $22.6 \pm 2.2 \text{ kg/m}^2$, $p=0.03$). Systolic (SBP) and diastolic BP (DBP) were similar between groups: SBP (hormonal IUD: $113.6 \pm 9.4 \text{ mmHg}$ vs control: $114.3 \pm 6.8 \text{ mmHg}$, $p=.65$), DBP (hormonal IUD: $73.7 \pm 12.1 \text{ mmHg}$ vs control: 74.4 ± 7.6 , $p=0.90$). No significant differences were observed between groups in carotid beta-stiffness (Hormonal IUD: $5.90 \pm 1.06 \text{ A.U.}$ vs control: $5.69 \pm 1.20 \text{ A.U.}$, $n=7$ for both groups, $p=0.73$), cfPWV (Hormonal IUD: $n=7$, $5.86 \pm 0.97 \text{ m/s}$ vs. control: $n=5$, $6.85 \pm 0.81 \text{ m/s}$, $p=0.09$), or carotid arterial compliance (Hormonal IUD: $0.92 \pm 0.17 \text{ Mm}^2/\text{kPa}^{-1}$ vs control: $0.81 \pm 0.19 \text{ Mm}^2/\text{kPa}^{-1}$, $p=0.28$).

CONCLUSION: The study observed similar central and regional arterial stiffness and blood pressure with hormonal IUD use in middle-aged women. These findings suggest similar vascular health with hormonal IUD use, indicating usage of hormonal IUD impacts vascular function differently compared to oral contraceptives.

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1,3-Butanediol-Induced Hyperketonemia During Exercise-Induced Hypoglycemia-Prone Cycling: Effects on Endurance Performance, Whole-Body Metabolism, and Cognitive Function

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Carbohydrate ingestion improves prolonged exercise performance by maintaining blood glucose availability and supporting brain metabolism. Ketone bodies provide an alternative cerebral fuel and may reduce reliance on glucose during periods of reduced glucose availability. **PURPOSE:** We determined whether R-1,3-butanediol (BDO)-induced hyperketonemia could sustain endurance and cognitive performance during prolonged exercise performed under exercise-induced hypoglycemia (EIH)-prone conditions. **METHODS:** In a randomized, placebo-controlled, counterbalanced crossover design, 10 triathletes (36.0 ± 6.6 yr; 84.0 ± 13.5 kg; $\dot{V}O_{2\max}$: 56.5 ± 7.9 mL·kg⁻¹·min⁻¹) completed cycling time-to-exhaustion (TTE) trials at 70% $\dot{V}O_{2\max}$ following a 15-h fast. Participants consumed BDO (0.5 g·kg⁻¹) or placebo before exercise, with 0.03 g·kg⁻¹ doses every 20 min during TTE. Blood metabolites, substrate oxidation, heart rate, perceptual responses, and cognitive function were assessed. **RESULTS:** TTE reduced blood glucose in both conditions, with a greater decline in BDO than placebo (BDO: -13.9 mg·dL⁻¹, -15.3% ; placebo: -8.1 mg·dL⁻¹, -9.0%). BDO increased R- β -hydroxybutyrate concentrations approximately fivefold and maintained concentrations >1.0 mmol·L⁻¹ during and immediately post-exercise. TTE performance did not differ between conditions (BDO: 102.65 ± 23.27 vs. placebo: 97.86 ± 28.11 min; $p = 0.180$), although BDO was associated with a 4.79-min longer TTE and 3.1-km greater distance completed. BDO did not significantly alter substrate oxidation, lactate, perceptual responses, or EIH-related symptoms. Stroop incongruent mean reaction time and correct-response reaction time improved from pre- to post-exercise within BDO by 5.9% and 6.0%, respectively, but no condition $\times$ time interaction was observed.

CONCLUSION: Acute BDO supplementation produced sustained hyperketonemia but did not significantly improve TTE performance compared with placebo or alter whole-body substrate oxidation. Selected cognitive outcomes improved within BDO, supporting further investigation of exogenous ketones and cognitive function during prolonged exercise performed under conditions of reduced glucose availability. Supported by the Grove City College Exercise Science Department and Health Via Modern Nutrition, Inc. A.P.K. serves on scientific advisory boards for Simply Good Foods, Medifoodz, and Health Via Modern Nutrition, Inc.; T.D.N. is the author of low-carbohydrate nutrition books. Book royalties are donated to The Noakes Foundation, which contributes to the Eat Better South Africa Campaign; P.J.P. serves on the scientific advisory board for Nutrishus. All other authors declare no conflicts of interest.



Shuttle Improvement and In-Season Performance in Collegiate Women's Lacrosse

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PURPOSE: Field-based tests are commonly used to monitor readiness, but their relationship with competitive performance in collegiate women's lacrosse is unclear. To determine whether offseason-to-preseason changes in shuttle, countermovement jump (CMJ), and plank performance were associated with in-season performance across two seasons. **METHODS:** Forty-three athlete-season observations were included. Athletes completed a timed 5-10-5 shuttle, CMJ, and timed plank during the offseason and preseason. Total Performance Index per game (TPI/game) was calculated as $((\text{points} + \text{ground balls} + \text{draw controls} + \text{caused turnovers}) - \text{turnovers}) / \text{games played}$. Separate linear regression models examined each change score while adjusting for season and weighting observations by games played. A mixed-effects model with a participant random intercept evaluated repeated observations. **RESULTS:** The shuttle model explained 17.1% of the variance in TPI/game ($R^2=.171$). Greater shuttle improvement was associated with higher TPI/game ($B=-6.67$, $SE=2.37$, $p=.008$); a 0.10-s improvement corresponded to an estimated 0.67-point increase in TPI/game. The association did not differ by season (interaction $p=.305$). CMJ change ($R^2=.032$, $p=.305$) and plank change ($R^2=.037$, $p=.247$) were not associated with TPI/game. In the mixed-effects sensitivity analysis, the shuttle coefficient remained negative but was attenuated ($B=-2.26$, $SE=1.26$, $p=.095$), with substantial participant-level variance ($ICC=.908$). **CONCLUSION:** Offseason-to-preseason shuttle improvement was the only tested change measure associated with TPI/game in the weighted analysis, although the effect was attenuated after accounting for repeated athletes. Longitudinal shuttle testing may provide a practical readiness signal for in-season performance when interpreted alongside athlete-specific factors. By linking change in shuttle performance with in-season game contribution, these findings support further investigation of longitudinal change-of-direction testing in other multidirectional field sports.

The authors declare no conflicts of interest.



Acute Effects of Energy Drink or Caffeine Tablet Consumption on Central Hemodynamics and Wave Reflection

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Acute caffeine ingestion is known to increase blood pressure and large artery stiffness resulting in increased wave reflection. Many young adults consume caffeine in the form of an energy drink containing added stimulants such as taurine and guarana seed extract. It is unclear whether an energy drink elicits the same response as caffeine alone. **PURPOSE:** This study aimed to assess the effects of consuming 200mg of caffeine administered as part of an energy drink or caffeine tablet on resting central hemodynamics and wave reflection. **METHODS:** Twenty-four young adults (13F/11M, 22±4yrs) completed two visits in this double-blind randomized (energy drink and placebo tablet or caffeine tablet and placebo drink) crossover study. Measurements were taken at baseline, 30, 60, and 120 minutes post caffeine ingestion. Aortic pressure and flow waveforms were acquired by radial tonometry (via a generalized transfer function) and echocardiography, respectively, and pressure-flow analyses were performed. Data were analyzed via 2x4 (condition x time) ANOVA. **RESULTS:** Central systolic (cSBP), diastolic (DBP) and mean arterial (MAP) pressure increased over time (main effect of time: cSBP $p<0.001$; DBP $p<0.001$; MAP $p<0.001$) with a condition x time interaction (cSBP $p=0.004$; DBP $p=0.02$; MAP $p=0.04$) indicating greater pressure at 30 minutes following energy drink consumption (cSBP 118±8 mmHg; DBP 86±7 mmHg; MAP 99±9 mmHg) compared to the caffeine tablet (cSBP 112±10 mmHg; DBP 82±8 mmHg; MAP 94±9 mmHg; all $p<0.05$). Total peripheral resistance (TPR), backward wave amplitude (BWA) and reflection magnitude (RM) increased over time (main effect of time: TPR $p<0.001$; BWA $p=0.02$; RM $p=0.03$), while heart rate decreased ($p<0.001$) following caffeine ingestion; however, there were no condition x time interactions. Stroke volume (SV) and forward wave amplitude (FWA) were not altered by caffeine ingestion (SV $p=0.47$; FWA $p=0.28$) and there was no interaction. **CONCLUSION:** Caffeine ingested as part of an energy drink or tablet resulted in an increase in BP, with an earlier and greater response following energy drink consumption. Further, these data suggest that the resulting increase in blood pressure from caffeine ingestion is likely due to greater TPR. The authors declare no conflict of interest.



Novel Study Design: Portable Near-Infrared Spectroscopy to Assess Microvascular Exercise Response Across the Menstrual Lifecycle

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Menopause is associated with declining estrogen levels, impaired vascular function and increased risk of cardiovascular disease. Although exercise has been shown to improve vascular health and reduce menopause-related health risk, most studies have focused primarily on pre- or postmenopausal women, leaving the perimenopausal transition relatively understudied. **PURPOSE:** The purpose of this study is to investigate the acute effects of exercise on microvascular function across the menstrual lifecycle using a portable near-infrared spectroscopy (NIRS) device. **METHODS:** Adult women over the age of 18 are invited to enroll in the study and must be free of cardiovascular and metabolic disease, cleared for aerobic exercise and not taking any vasoactive or hormone replacement medications for inclusion. Consenting participants will visit the lab two times. At Visit 1, participants will complete a Visit 1 Baseline vascular occlusion protocol (VOP). This protocol will indirectly measure microvascular function by assessing skeletal muscle oxygenation (smO₂) during reactive hyperemia. A portable NIRS device will be placed over the participant's left flexor digitorum superficialis muscle, and a blood pressure (BP) cuff secured around the antecubital space on the same arm. After 5 minutes of baseline smO₂ measurement, the BP cuff will be inflated to 200 mmHg for 5 minutes. After 5 minutes of occlusion, the cuff will be deflated and recording continued for 5 minutes post-occlusion. During Visit 2, participants will complete a Visit 2 Baseline VOP followed by 20 minutes of aerobic treadmill exercise at 70% predicted max heart rate, and an immediate repeat VOP (Post-Ex). **RESULTS:** We will perform a test-retest assessment to compare Visit 1 Baseline to Visit 2 Baseline within participants to determine reliability of the portable NIRS device for our VOP. To determine differences between Visit 2 Baseline and Post-Ex reactive hyperemia, we will use paired samples t-tests to compare smO₂ re-saturation within subjects. We will use a one-way ANOVA design to compare VOP results between the three study groups (pre-, peri- and post-menopause). **CONCLUSION:** This novel study aims to improve understanding of female vascular aging, inform exercise-recommendations for aging women, and fill the gap in knowledge related to perimenopause.



Cardiac Rehabilitation Staff Perspectives: Education, Self-Efficacy, and Patient Connection to Mental Health Resources

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Cardiovascular disease (CVD) is associated with a high prevalence of depression, as approximately one in five individuals with heart disease experiences depressive symptoms. Cardiac rehabilitation (CR) primarily addresses the physical recovery process with minimal exposure to the psychosocial component. Therefore, a need exists to better understand the knowledge, education, and comfort of CR staff in addressing mental health (MH) concerns among this patient population. **PURPOSE:** This study explored CR staff perceptions of education, knowledge, and comfort in discussing and providing patient MH resources. **METHODS:** An online Qualtrics survey was administered via email to CR staff from a health network in Northeastern Pennsylvania to assess professional background, MH training, comfort discussing patient MH concerns, and confidence in providing resources. A one-sample t-test was used to analyze data from eight multiple choice (Likert scale) questions. Eight open-ended survey questions were analyzed to establish frequency data. AI software facilitated thematic analysis to mitigate researcher bias. **RESULTS:** Overall, nine CR staff (4 nurses, 5 exercise physiologists) reported slightly above average comfort in discussing MH with patients ($M = 3.67 \pm 0.87$, $p = 0.05$). However, CR staff ($n = 8$) reported moderate confidence or lower in knowing which resources to recommend to patients experiencing depression ($M = 2.63 \pm 1.19$, $p = 0.40$). Nurses had slightly more years of experience, education, and MH training when compared to exercise physiologists ($M_{years} = 3.75 \pm 1.50$, $M_{courses} = 2.25 \pm 0.96$, $n_{trainings} = 2$). Limited knowledge of available MH resources and communication challenges were identified as barriers to addressing patient MH concerns. **CONCLUSION:** CR staff are generally comfortable discussing MH concerns but lack confidence in connecting patients to appropriate MH resources. **SIGNIFICANCE/NOVELTY:** These findings highlight a need for additional MH education and training for CR staff. Case-based learning and real-life clinical scenarios may improve staff confidence. Fostering collaboration with social services and developing clear referral pathways may provide alternative approaches to improve access to MH support and continuity of care. The authors declare no conflicts of interest.



‘People don’t want to workout with homeless people’: Physical Activity Access for People Experiencing Homelessness

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People who have experienced homelessness (PEH) face barriers to physical activity (PA) and its health benefits, yet intervention priorities informed directly by PEH remain limited.

PURPOSE: We examined self-reported barriers and facilitators to PA by PEH and identified community-informed strategies to improve PA access. **METHODS:** Guided by action-based interviewing, 15 adults who had experienced homelessness within the previous two years and were living in transitional housing completed semi-structured interviews. Deductive thematic analyses were guided by the Socio-ecological Framework and Self-Determination Theory; inductive analysis identified intervention suggestions. **RESULTS:** Our theoretically informed themes spanned across systemic, institutional, interpersonal, internalized, autonomy, competence, and relatedness categories. Homeism (i.e., discrimination based on unhoused status) was identified as a barrier across systemic (societal stigma against homelessness), institutional (exclusion reinforced by fitness spaces), and interpersonal (discrimination initiated directly by others) levels. PA was often perceived as a low priority during critical homelessness because food, shelter, safety, stress, and substance use took precedence. Limited PA knowledge and social support also constrained PA, whereas internal motivation, supportive relationships, and positive perceived choice facilitated PA. Interviewees recommended integrating PA with support for other well-being needs, improving interpersonal support from program staff in fitness environments, and adapting the types of PA offered to be more inclusive of varied skill levels. **CONCLUSION:** Community-informed, theory-guided interviews revealed that PA access for PEH is hindered by homeism and basic needs. Novel findings support integrating PA within broader well-being services and training staff to provide trauma-informed and inclusive support that counters homeism and accommodates varied competency levels in PA interventions for PEH.

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Instructional Method Affects Direction but Not Magnitude of NCAA Minimum-Weight Estimation Error

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Establishment of minimum wrestling weight (MWW) is necessary before participation in NCAA competition. **PURPOSE:** To determine whether skinfold instructional method affects agreement with experienced-assessor MWW classifications under NCAA LAW 1 procedures immediately after instruction and two weeks later. **METHODS:** 49 non-experienced participants underwent one of three randomly assigned instruction methods: lecture only (LO), see-one, do-one (SODO), or Peyton's 4-step method (P4S). All participants performed skinfold measurements on the same model once after their instruction and again two weeks later. **RESULTS:** Agreement with the experienced assessor's 149-lb NCAA class (148.64 lb. MWW) differed by instructional group (Wald $\chi^2(2)=6.32$, $p=.042$), but not by time or the group $\times$ time interaction ($p=.776$ and $.159$, respectively). Model-estimated agreement was 50% for LO, 24% for SODO, and 18% for P4S, with greater agreement for LO than P4S ($p=.033$). Signed disagreement (novice minus assessor) also differed by group ($F(2,46)=15.56$, $p<.001$, $\eta^2=.404$): LO underestimated LAW1 by 5.84 lb., whereas SODO and P4S overestimated it by 2.64 and 4.06 lb., respectively; LO differed from both hands-on groups (both $p<.001$). Signed disagreement did not change over time ($p=.196$), and the interaction was nonsignificant ($p=.082$). Absolute disagreement did not differ by group (6.65, 4.71, and 4.82 lb., respectively; $F(2,46)=0.98$, $p=.384$, $\eta^2=.041$), time ($p=.522$), or interaction ($p=.699$). The probability of underestimating the assessor differed by group (Wald $\chi^2(2)=15.92$, $p<.001$), and group $\times$ time (Wald $\chi^2(2)=6.66$, $p=.036$), but not time ($p=.861$); observed immediate/two-week underestimation was 87.5%/68.8% for LO, 18.8%/37.5% for SODO, and 17.6%/17.6% for P4S. **CONCLUSION:** Instructional method influenced the direction and classification consequences of NCAA LAW1 estimates but not the absolute magnitude of disagreement from the experienced assessor. Although LO participants more frequently matched the assessor's weight class, they underestimated MWW and were more likely to produce estimates below the assessor. The hands-on methods produced higher estimates, while absolute disagreement did not differ among groups.



Assessing Feasibility of Near-Infrared Spectroscopy in Running Individuals during an Graded Treadmill Test: A Pilot Study

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Aerobic capacity tests provide various measurements, including VO_2max and ventilatory thresholds, that can be used for exercise prescription. However, the current gold-standard method for measuring aerobic capacity requires a metabolic cart, which is costly, uncomfortable, and not available to most. Near-infrared spectroscopy (NIRS) is a non-invasive method to measure muscle oxygenation that is more cost efficient and less cumbersome than the traditional method. Recent studies also suggest that NIRS may be a suitable tool for measuring ventilatory thresholds during graded cycling tests. **PURPOSE:** To determine the feasibility of using NIRS, and the relationship between NIRS-derived and indirect calorimetry measurements, in running individuals during a graded treadmill test. **METHODS:** Four endurance trained individuals (20.8 ± 1.5 yrs; 1 female) completed a graded treadmill test. Heart rate was continuously monitored using a chest strap and oxygen consumption (VO_2) was measured using indirect calorimetry. Lactate was measured via a finger prick before and 5 minutes after the test. A NIRS device was secured approximately 2/3 the distance between the right hip and knee so that it was situated on the vastus lateralis. Oxygenated (O_2Hb) and deoxygenated (HHb) hemoglobin were measured continuously during the test, and tissue saturated index (TSI) was calculated as $\text{O}_2\text{Hb}/(\text{O}_2\text{Hb} + \text{HHb})$. Correlations were conducted between each individuals NIRS measurements and VO_2 . **RESULTS:** VO_2 peak was successfully measured in all subjects according to the American College of Sports Medicine's criteria. Weak to strong relationships were observed between VO_2 and O_2Hb ($r=0.27$ to 0.60), and TSI ($r=-0.22$ to -0.90). HHb ($r=0.75$ to 0.90) exhibited a strong correlation with VO_2 for all subjects, although they were not as strong as those between HR and VO_2 ($r=0.91$ - 0.96). **CONCLUSIONS:** It is feasible to obtain NIRS measures in running individuals during a graded treadmill test. TSI correlated well with VO_2 in some, but not all participants. HHb exhibited strong correlations with VO_2 in all participants, though HR was a stronger predictor of VO_2 . Additional participants are needed to confirm these findings. Future analyses will determine if NIRS measures may be a better surrogate measure of VO_2max or ventilatory thresholds as compared to HR.

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Effects of Instructional Method on Novice Skinfold Accuracy and Procedural Independence

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Instruction techniques for skinfold measures (SF) are poorly understood. **PURPOSE:** To compare immediate accuracy and two-week retention of SF-derived body-fat estimates among novice assessors. **METHODS:** 49 novice participants were randomly assigned to one of three instructional methods: lecture only (LO), see-one, do-one (SODO), or Peyton's 4-step method (P4S). All participants performed SF on the same model once after their instruction and again two weeks later. **RESULTS:** Signed error relative to the experienced assessor's Jackson–Pollock 7-site body-fat estimate (novice minus assessor) differed by instructional group ($F(2,46)=16.07$, $p<.001$, $\eta^2=.411$), but not by time ($F(1,46)=3.25$, $p=.078$, $\eta^2=.066$). Averaged across time, LO participants overestimated body fat by 3.08 percentage points, whereas SODO and P4S participants underestimated it by 0.84 and 1.79 percentage points, respectively. Total procedural reminders differed by instructional group (Wald $\chi^2(2)=36.82$, $p<.001$) and increased over time (Wald $\chi^2(1)=19.26$, $p<.001$), without a group-by-time interaction (Wald $\chi^2(2)=2.79$, $p=.247$). LO participants required more reminders (estimated marginal mean: 4.64) than SODO (1.38) and P4S participants (0.62; both adjusted $p<.001$); the hands-on groups did not differ ($p=.132$). Site-location reminders differed by instructional group (Wald $\chi^2(2)=15.30$, $p<.001$) and increased over time (Wald $\chi^2(1)=7.06$, $p=.008$, without a group-by-time interaction, Wald $\chi^2(2)=1.01$, $p=.603$). LO participants required more site reminders than SODO ($p=.007$) and P4S participants ($p<.001$); the hands-on groups did not differ ($p=.640$). Technique reminders differed by instructional group (Wald $\chi^2(2)=33.24$, $p<.001$) and increased over time (Wald $\chi^2(1)=11.53$, $p<.001$), without a group-by-time interaction (Wald $\chi^2(2)=2.12$, $p=.347$). LO participants required more technique reminders than SODO and P4S participants (both adjusted $p<.001$); the hands-on groups did not differ ($p=.270$). **CONCLUSION:** Instructional method influenced error direction and procedural independence, but not absolute body-fat estimation accuracy. LO instruction produced overestimation and more procedural reminders, whereas P4S instruction produced underestimation; both hands-on methods required fewer reminders and performed similarly.



A High-Sodium, Carbohydrate-Free Electrolyte Supplement Improves 15-km Treadmill Time-Trial Performance in Warm and Humid Conditions

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Sodium ingestion before or during exercise may support fluid balance and endurance performance in the heat, but most prior studies have used sodium-loading, hyperhydration, or carbohydrate-electrolyte protocols. **PURPOSE:** This study investigated whether a high-sodium, carbohydrate-free electrolyte supplement (HSES) improves 15-km treadmill time-trial performance and modulates physiological and perceptual responses in trained male runners under warm-humid conditions. **METHODS:** In a randomized, single-blind, counterbalanced crossover design, 10 trained male runners ($\text{VO}_{2\text{max}}$: $57.3 \pm 8.1 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) completed two 15-km treadmill time trials at 26.7°C and 60% relative humidity. Participants consumed HSES or flavor-matched placebo (PLA) 30 min before exercise and every 15 min during the time trial. HSES provided 3000 mg sodium, 600 mg potassium, and 180 mg magnesium in approximately 1.5 L fluid. Performance, hydration, metabolic, cardiovascular, thermoregulatory, and perceptual responses were assessed. **RESULTS:** Cumulative time-trial performance differed between conditions, with significant condition ($p = 0.034$), time/distance ($p < 0.001$), and condition $\times$ time effects ($p = 0.023$). HSES produced faster cumulative times at 5 km (23.77 ± 3.97 vs. 25.77 ± 5.27 min), 10 km (45.92 ± 7.98 vs. 48.47 ± 8.69 min), and 15 km (68.76 ± 12.28 vs. 70.18 ± 13.33 min) compared with PLA (all $p < 0.0001$), representing improvements of 7.8%, 5.3%, and 2.0%, respectively. No condition effects or condition $\times$ time interactions were observed for hydration, cardiovascular, metabolic, blood metabolite, or perceptual responses. Estimated core temperature was higher during HSES at 15 km and 10 min post-exercise, whereas skin temperature did not differ. **CONCLUSION:** HSES improved 15-km treadmill time-trial performance in trained male runners under warm-humid conditions despite no clear differences in hydration, cardiovascular, metabolic, or perceptual responses. These findings suggest that a practical, carbohydrate-free, high-sodium electrolyte beverage can improve self-paced running performance, although the mechanism was not identified by the measurements employed in this study. Supported by the Grove City College Exercise Science Department. Drink LMNT, Inc. provided the study product but provided no direct financial support.

T.D.N. is the author of low-carbohydrate nutrition books. Book royalties are donated to The Noakes Foundation, which contributes to the Eat Better South Africa Campaign. P.J.P. serves on the Scientific Advisory Board for Nutrishus and is an advisor for RxSugar. All other authors declare no conflicts of interest.



Comparison of Subjective DOMS Timelines Between Omnivore and Vegetarian Diets Following High Intensity Exercise

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Delayed onset muscle soreness (DOMS) may occur as a result of microscopic tears in the skeletal muscle following an intense exercise that includes eccentric movements. To minimize symptoms, it is crucial to maintain a healthy diet with sufficient protein for amino acid monomers to rebuild muscle fibers. Variations in diet should be considered, as alterations in macronutrient intake may inhibit muscle repair as well as prolong or exacerbate DOMS. **PURPOSE:** The purpose of this study was to compare the severity of subjective DOMS between omnivore (OMNI) and plant-based (VEG) diets after completing high intensity interval training (HIIT). **METHODS:** Twenty-six participants (14 OMNI, 12 VEG; 26.92 ± 0.64 years) completed treadmill (TM) and cycling (CE) HIIT. ASA24 food recalls were taken at each laboratory visit. DOMS was assessed using a 6-point Likert scale before exercise (pre), immediately (post), 1 hour (1h), 6 hours (6h), and 24 hours (24h) after exercise. Results are presented as mean $\pm$ standard error. **RESULTS:** Subjective DOMS was significantly increased from baseline immediately (0.43 ± 0.17 vs 1.79 ± 0.38 ; $p = 0.032$), 1 hour (0.43 ± 0.17 vs 2.07 ± 0.40 ; $p = 0.016$), 6 hours (0.43 ± 0.17 vs 1.714 ± 0.266 ; $p < 0.001$), and 24 hours after (0.43 ± 0.17 vs 2.07 ± 0.32 ; $p = 0.001$) TM HIIT in the OMNI group. DOMS was significantly increased 24 hours following TM HIIT in the VEG group (0.42 ± 0.15 vs 2.50 ± 0.49 ; $p = 0.028$). Subjective DOMS was significantly increased from baseline immediately (0.50 ± 0.20 vs 2.29 ± 0.43 ; $p = 0.001$), 1 hour (0.50 ± 0.20 vs 1.57 ± 0.34 ; $p = 0.002$), and 6 hours after (0.50 ± 0.20 vs 1.64 ± 0.39 ; $p = 0.003$) CE HIIT in the OMNI group. DOMS was significantly increased immediately following (0.25 ± 0.13 vs 1.42 ± 0.36 ; $p = 0.004$) CE HIIT in the VEG group. There were no significant differences between the diet groups at any timepoint for either modality. **CONCLUSION:** Both diet groups displayed increased muscle soreness following HIIT exercise, with the OMNI group experiencing significant increases in muscle soreness earlier in time compared to the VEG group. However, there was no statistically significant evidence that suggests one diet group was more beneficial in reducing DOMS following HIIT at each timepoint.



Generating Spleen Dynamics by Creating a Splenic Responsiveness Index

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Splenic volumetric changes occur in response to various stressors and may display an innate protective response to alterations in central blood pressures. Specifically, splenic contraction occurs during sympathetic activation (apnea), and splenic dilation occurs in response to central hypervolemia (water immersion). Splenic contraction can increase circulating blood volume, while splenic enlargement decreases portal venous pressures. While these benefits of spleen dynamics are evident, currently there is no standardized range for which a spleen will dilate and contract. Thus, this study sought to define the general limits of splenic volumetric changes. **PURPOSE:** To establish the general limits of splenic volumetric changes in a healthy population and define a splenic responsiveness index through an absolute value, via documenting the induced excursion and contraction of the spleen. **METHODS:** Twelve healthy participants (3 women, age: 25±5 y, mass: 90.0±11.6 kg, height: 180.5±13.5 cm) completed splenic volume measurements at four timepoints: baseline, post apnea, 20-min washout, and 30-min post head out water immersion (HOWI). Splenic measurements were made via ultrasound with volume calculated using the Pilstrom equation. Changes in spleen volume were compared to baseline and between post apnea and post-HOWI using paired t-tests. A splenic responsiveness index (SRI) was calculated using a baseline formula of $((\text{max}-\text{min})/\text{baseline}) \times 100$ and a max formula $((\text{max}-\text{min})/\text{max}) \times 100$, to generate an expected percent excursion of the spleen compared to baseline and max volume. **RESULTS:** Absolute mean splenic volume was 277±88 ml at baseline, 225±72ml post apnea, 278±90ml at washout and 353±94ml post-HOWI. Washout splenic volume did not differ from baseline ($p=0.48$), but post apnea was smaller ($p < 0.01$) and increased post-HOWI ($p<0.01$). The mean splenic volume change from baseline to post apnea was $-60 \pm 42\text{ml}$ and from baseline to post-HOWI was $+76 \pm 15\text{ml}$. The mean splenic volume difference between post-HOWI and post apnea was $128 \pm 27\text{ml}$. The SRI values showed a splenic volume excursion of $48 \pm 8\%$ of baseline and $37 \pm 5\%$ of max volume. **CONCLUSION:** The splenic volume of healthy young individuals is dynamic demonstrating between a 37 to 48% change in absolute volume depending on the reference volume utilized.



Assessing Microvascular Response to Exercise in Pre-, Peri-, and Post-Menopausal Women: A Novel Study Design

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Aging is associated with reduced physiological function, and a major goal of aging research is to identify cellular mechanisms underlying healthspan. Despite menopause affecting 50% of the global population, it remains under-researched, leaving a critical gap in understanding why women experience accelerated vascular and cognitive decline compared to men of the same age. **PURPOSE:** The purpose of this study is to examine how acute exercise impacts microvascular function in pre-, peri-, and post-menopausal women, and determine biomarkers associated with vascular and cognitive function. **METHODS:** During Visit 1, participants will complete measurements of height, weight, blood pressure, cognitive and microvascular function. Microvascular function will be assessed via vascular occlusion protocol (VOP) and near-infrared spectroscopy to measure skeletal muscle oxygen saturation during reperfusion. Participants will also complete a submaximal exercise test to predict max heart rate (HR). Visit 2 will include baseline blood collection, baseline VOP, and a 20-minute exercise bout at 70% predicted max HR followed by post-exercise repeat VOP and blood draw. Whole blood will be used for measurement of inflammatory biomarkers and total RNA-seq to assess transcriptome differences between pre-, peri- and post-menopausal women. **RESULTS:** We will use within-subjects paired t-tests to compare microvascular reperfusion before and after acute exercise for each participant. To compare the pre-, peri-, and post-menopause groups, we will use one-way ANOVA to determine differences in cognitive function, biomarkers of inflammation, differentially expressed genes, and microvascular response to acute exercise. **CONCLUSION:** This novel study design will allow us to examine cellular and functional differences in cognitive and vascular function and exercise response in pre-, peri- and post-menopausal women. So far, two participants have completed the study.

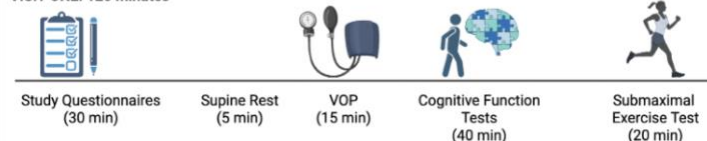
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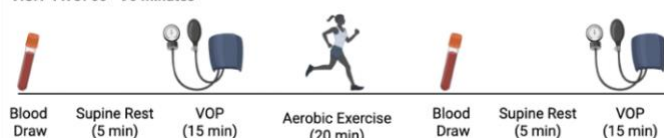
Health history and medication screening
Physical activity readiness screening
Inclusion or exclusion determined

INFORMED CONSENT: in-person, 30 minute appointment

VISIT ONE: 120 minutes



VISIT TWO: 60 - 90 minutes





Combination Supplementation (Berberine, Blackcurrant, and Curcumin) Alters Ventilatory and Thermoregulatory Responses During Exercise-Heat Stress

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Previous studies have shown that dietary supplementation with berberine blackcurrant, and curcumin can individually influence physiological responses to exercise-heat stress. However, the combined effect of these supplements during exercise-heat stress has yet to be explored. **PURPOSE:** This study examined the effect of 7d of combination dietary supplement (1.5g berberine/0.6g blackcurrant/0.5g curcumin) on systems-level physiological responses to exercise-heat stress. **METHODS:** Eight participants (Stature: 1.78 ± 0.07 m, Mass: 78.5 ± 12.2 kg, $\dot{V}O_{2\max}$: 54 ± 6 mL·kg⁻¹·min⁻¹) ingested Supplement or Placebo twice daily for 7d prior to 1hr treadmill run (65% $\dot{V}O_{2\max}$) in hot ambient conditions (35°C/25%RH). Condition order was counterbalanced. Conditions were separated by a 2-wk washout period. Oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$), minute ventilation (VE), respiratory rate (RR), tidal volume (Vt), heart rate (HR), core temperature (Tc), and mean skin temperature (Tsk: tricep, chest, thigh, calf) were measured throughout exercise. Two-way RM ANOVAs were used to evaluate changes between groups. Significant main and interaction effects were further evaluated with Sidaks multiple comparison tests. **RESULTS:** The rise in Tc during exercise was not different between study conditions (Supplement: $1.86 \pm 0.63^\circ\text{C}$ vs Placebo: $1.99 \pm 0.63^\circ\text{C}$; $p = 0.445$). However, there was a significant interaction effect for Tsk ($p = 0.0006$), indicating that from 25-60 min of exercise Tsk rose less in Supplement ($0.43 \pm 0.65^\circ\text{C}$) as compared to Placebo ($0.81 \pm 0.76^\circ\text{C}$). A significant main effect of condition ($p = 0.0350$) indicated that Vt rose more in Supplement (0.95 ± 0.31 L/min) as compared to Placebo (0.79 ± 0.30 L/min). Conversely, a significant main effect of condition ($p = 0.0335$) indicated that RR was lower in Supplement (20.4 ± 6.9 br/min) as compared to Placebo (26.1 ± 7.6 br/min). **CONCLUSION:** Findings suggest the combination supplement may have promoted a more efficient ventilatory pattern, allowing participants to preserve minute ventilation by increasing tidal volume while reducing respiratory rate. This response could decrease dead space ventilation and the work of breathing during exercise-heat stress, which could slightly decrease respiratory metabolic demand and metabolic heat production.



Front and Trail Leg Joint Moment Ratios in Lunge Exercises of Varying Depths

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Previous research has established the importance of hip-to-knee (H/K) joint moment ratios during lower extremity exercises, but the H/K ratio has not been examined in the trail leg during lunge exercises.

PURPOSE: The purpose of this project was to analyze the effects of utilizing varied lunge depths during lunge exercises on front and trail leg H/K joint moment ratios. **METHODS:** 12 males and 12 females (age = 21 ± 1 yrs; mass = 74 ± 17 kg; height = 1.73 ± 0.11 m) performed 4 sets of unloaded standing lunges (all combinations of right/left, deep/shallow). The trail leg knee contacted a depth indicator at 16% (shallow) and 6% (deep) of the subject's height. Step length was 42% of height for all lunges. Participants' movements were recorded with 8 cameras, while ground reaction forces and moments were obtained via 2 force plates. The hip and knee flexion/extension joint moment values at the low point of the lunge exercise were used in the analysis. The relationships between H/K ratio, front leg, and lunge depths were assessed using two-way factorial ANOVA tests. **RESULTS:** Joint moment ratios did not differ between left and right limbs and were thus pooled together for subsequent analyses. The H/K joint moment ratios were not significantly different using a deep or shallow lunge for the front leg ($p > 0.05$; deep, 1.57 ± 0.15 , shallow, 1.53 ± 0.16). The H/K joint moment ratios were significantly larger using a deep lunge than the shallow lunge using the trail leg ($p < 0.05$; deep, 0.63 ± 0.04 , shallow, 0.36 ± 0.05). **CONCLUSION:** This original study was the first to examine H/K joint moment ratios in the trail leg (in addition to the front leg) during lunges. H/K ratios were larger in the deep lunge than in the shallow for the trail leg, but the H/K ratio was not different for the front leg. The finding that the trail leg H/K ratio was less than 1.00 for both lunge depths shows that the exercise is knee extensor dominant on the trail leg. The front leg H/K ratio was larger than 1.00 for both lunge depths, indicating the emphasis on the hip musculature. Practitioners have thought that the lunge exercise focuses on the forward leg musculature, however, results from the present investigation indicate that the lunge exercise focuses on the front leg hip and the trail leg knee musculature.



Effects of Music Timing on Cycling Performance and Perceptual Responses

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Music is commonly used during exercise to enhance performance and perceived effort, but the influence of when music is introduced remains unclear. **PURPOSE:** This study examined whether music exposure during warm-up, exercise, or both influences 3-km cycling performance, heart rate (HR), and rating of perceived exertion (RPE). **METHODS:** Fifteen recreationally active college students (18–22 yr) completed four randomized 3-km cycling trials: no music (NM), music during warm-up only (MWU), music during exercise only (ME), and music during both warm-up and exercise (MB). Cycling resistance was established at 3.75% of body mass. Cadence was not controlled, and participants were instructed to complete each trial with an all-out effort. Music consisted primarily of electronic dance music/house and rap tracks with a minimum tempo of 130 beats·min⁻¹. Completion time and HR were recorded, and RPE was assessed using the 6–20-point Borg scale. Repeated-measures ANOVA tested differences among conditions. **RESULTS:** Completion time differed among conditions, $F(3,42)=23.70$, $p<.001$, and was 9.4 ± 1.5 min (NM), 7.8 ± 0.5 min (MWU), 7.0 ± 0.7 min (ME), and 6.8 ± 0.5 min (MB). Completion HR also differed, $F(3,42)=51.40$, $p<.001$, with values of 178.1 ± 3.1 , 173.3 ± 2.5 , 171.1 ± 2.2 , and 168.3 ± 2.9 beats·min⁻¹ for NM, MWU, ME, and MB, respectively. Completion RPE differed, $F(3,42)=29.04$, $p<.001$, and was 16.1 ± 1.0 (NM), 15.5 ± 0.8 (MWU), 13.7 ± 1.0 (ME), and 13.7 ± 0.8 (MB). **CONCLUSION:** Music timing influenced cycling performance, HR, and perceived exertion. Continuous music exposure from warm-up through exercise was associated with the fastest mean performance and lowest HR, while exercise-phase music was associated with lower perceived effort. These findings highlight music timing as a novel, low-cost strategy to enhance short-duration cycling performance.



Juvenile Exercise-Induced Cardiac Transcriptional Remodeling Persists Into Adulthood and Confers Cardioprotection Comparable to Adult Exercise

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Voluntary exercise early in life is cardioprotective against adrenergic stress in adulthood, but the molecular basis of this "memory" effect is unknown. **PURPOSE:** To determine whether juvenile exercise establishes a cardiac transcriptional program that persists into adulthood and resembles the cardioprotective program induced by adult exercise. **METHODS:** Mice completed 2 weeks of voluntary wheel running beginning at 3 weeks of age or remained sedentary; an adult-exercise group was included for comparison. Cardiac RNA sequencing was performed after the juvenile exercise window and following isoproterenol (ISO) challenge in adulthood to compare exercise-associated transcriptional responses across groups. Differentially expressed genes (DEGs) were identified using an a priori false discovery rate (FDR) threshold of 0.05, and gene set enrichment analysis (GSEA) was performed using an a priori FDR threshold of 0.05. **RESULTS:** Juvenile running induced a distinct cardiac transcriptional signature, with GSEA identifying enrichment of pathways related to adrenergic signaling, extracellular matrix remodeling, and cardiac growth (FDR < 0.05). This signature persisted into adulthood without continued exercise, including sustained downregulation of adrenergic receptor expression, and closely resembled the profile induced by adult exercise. Following ISO challenge, juvenile-exercised hearts mounted a blunted transcriptional stress response relative to sedentary ISO-exposed hearts, paralleling adult-exercised hearts. **CONCLUSION:** A brief period of juvenile exercise establishes a durable cardiac transcriptional program that persists for months and is associated with protection against later adrenergic stress comparable to adult exercise. These findings support a lasting molecular imprint of early-life exercise and motivate studies of the regulatory mechanisms that maintain this cardiac "memory."

The authors declare no conflicts of interest.



The Effect of Exam-Related Mental Stress on Microvascular Function in University Students

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At the university level, academic responsibilities, particularly examinations, are a primary source of stress for students. Psychological stress is associated with impairments of both macro- and microcirculation associated with cardiovascular disease. Exam-related stress has been specifically shown to increase sympathetic drive and the production of reactive oxygen species, which are mechanistically linked to endothelial dysfunction. **PURPOSE:** The purpose of this study is to examine the effects of acute stress associated with university exams on skeletal muscle oxygenation following a non-invasive vascular occlusion protocol (an indirect measure of microvascular function) in college students. **METHODS:** Students enrolled in Drexel's Anatomy and Physiology course series (A&P) were invited to participate in this study. Consenting participants reported to the lab twice: Visit 1 during the first week of the academic quarter and again on the day of their A&P midterm exam. During each visit, participants completed a GAD-7 anxiety survey and a microvascular function test. Microvascular function was indirectly measured using a vascular occlusion protocol (VOP) to assess skeletal muscle oxygenation (smO_2) during reactive hyperemia. A portable near-infrared spectroscopy (NIRS) device was placed over the participant's left flexor digitorum superficialis muscle, and a blood pressure (BP) cuff was secured around the antecubital space on the same arm. After 5 minutes of baseline smO_2 measurement, the BP cuff was inflated to 200 mmHg for 5 minutes. After the 5 minutes of occlusion, the cuff was deflated and recording continued for 5 minutes post-occlusion. **RESULTS:** GAD-7 total anxiety scores (0-21 scale) were significantly higher on Exam Day (7.81 ± 4.43) compared with Visit 1 (5.93 ± 2.92 ; $p < 0.05$, $n = 17$). GAD-7 difficulty ratings (0-3 scale) also increased from Visit 1 (0.50 ± 0.52) to Exam Day (1.06 ± 0.57 ; $p < 0.05$, $n = 17$). For the VOP, smO_2 re-saturation slope did not differ between Visit 1 ($1.57 \pm 1.44\%/s$) and Exam Day ($2.21 \pm 0.52\%/s$). **CONCLUSION:** Students reported significantly higher levels of anxiety on Exam Day compared to Visit 1. However, there were no differences in VOP results between the two visits. The increase in exam-related anxiety was not accompanied by significant changes in microvascular function.



Fortnite and Arterial Stiffness

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PURPOSE: To examine the impact of Fortnite on arterial stiffness. **METHODS:** Eight gamers (played video games for at least 10 hours per week) and eight non-gamers (did not regularly play video games) voluntarily played two conditions of Fortnite for 60 minutes. A competitive condition (Comp) involved playing against humans, while a non-competitive condition (Non-comp) involved playing against computer avatars. Measures of arterial stiffness included systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), which were assessed after 15-minutes of quiet rest (Rest), every 15 minutes during play, and immediately post the gaming session (Post). A three-way analysis of variance (ANOVA) was utilized to assess measures of arterial stiffness between groups (Gamers, Non-gamers) and conditions (Comp, Non-comp), across the repeated measure of time. **RESULTS:** There was a main effect of condition for SBP, such that it was significantly ($p \leq 0.05$) increased at all time points during game play (Comp 15 min: 121 ± 13 mmHg; Comp 30 min: 122 ± 20 mmHg; Comp 45 min: 118 ± 16 mmHg; Comp 60 min: 117 ± 15 mmHg; Non-comp 15 min: 110 ± 11 mmHg; Non-comp 30 min: 111 ± 12 mmHg; Non-comp 45 min: 112 ± 8 mmHg; Non-comp 60 min: 111 ± 14 mmHg) compared to Rest (Comp: 104 ± 7 mmHg; Non-comp: 104 ± 7 mmHg) and Post (Comp: 109 ± 9 mmHg; Non-comp: 109 ± 9 mmHg). There was also a significant ($p \leq 0.05$) main effect of time for MAP, such that it was attenuated at all time points during game play for Comp (15 min: 121 ± 13 mmHg; 30 min: 122 ± 20 mmHg; 45 min: 118 ± 16 mmHg; 60 min: 117 ± 15 mmHg) compared to Rest (104 ± 7 mmHg) and Post (109 ± 9 mmHg). No interactions or main effects of group were observed. Further, no other main effects of condition or time were observed. **CONCLUSIONS:** Playing Fortnite for one hour can impact arterial stiffness in gamers and non-gamers, regardless of Fortnite condition. As such, players should be mindful of time spent playing Fortnite, and those with cardiovascular disease history should monitor blood pressure if playing for extended durations. The authors declare no conflicts of interest.



Central-to-Peripheral Arterial Pressure Gradient and Health Status in Individuals with Post-Treatment Lyme Disease Syndrome

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Chronic conditions, such as Post-Treatment Lyme Disease Syndrome (PTLDS), are associated with a decrease in quality of life. Decrements in quality of life may stem from increased cardiovascular dysfunction in those with PTLDS. Whether measures of cardiovascular function differ in individuals with PTLDS compared to those without PTLDS remains unknown. **PURPOSE:** To compare the central-to-peripheral arterial pressure gradient (CPAPG) between PTLDS participants and controls, as well as correlate self-reported general health assessment with CPAPG in individuals with PTLDS. **METHODS:** Five PTLDS participants (38.2 ± 25.9 years; BMI: 26.9 ± 5.2 kg/m²; $n = 2$ females) and five controls (38.6 ± 24.6 years; BMI: 27.2 ± 5.2 kg/m², $n = 2$ females) partook in the study. Following 5 minutes of quiet supine rest, resting brachial blood pressure was obtained via an automated blood pressure device. Central systolic blood pressure was estimated using pulse wave analysis and a generalized transfer function from brachial pressure waveforms. CPAPG was calculated as the difference between brachial systolic and central systolic blood pressures. An independent sample t-test compared CPAPG between PTLDS participants and controls. Spearman correlation coefficients were used to evaluate the relationship between CPAPG and self-reported assessment of general health. **RESULTS:** An independent sample T-test demonstrated a trend toward lower CPAPG in PTLDS compared to controls (PTLDS; 7.9 ± 6.2 vs Con; 13.1 ± 6.1 , $p = 0.108$). Spearman correlation showed a trend toward an increased CPAPG with a better self-reported health assessment ($r = 0.811$, $P = 0.096$). **CONCLUSIONS:** Our results suggest PTLDS participants may trend lower in CPAPG compared to controls, suggesting PTLDS patients may have an increased risk for cardiovascular disease. Additionally, in individuals with PTLDS, worse self-reported health assessment trended toward a lower CPAPG. These findings suggest that arterial pulse wave amplification may be related to increased symptom burden in those with PTLDS. Data collection is ongoing, and the sample size will be increased to further explore these relationships.

The authors declare no conflicts of interest.



Implementing pre-surgical exercise for adults with esophageal cancer (IMPROVE- Esophageal)

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Esophageal cancer (EC) is the 8th most common cancer worldwide, with a 5-year survival rate of approximately 22%. Due to the insidious nature of symptoms, diagnoses are often made at late-stage advanced disease. The succession of neoadjuvant chemotherapy (NACT) followed by surgery (esophagectomy) and adjuvant chemotherapy creates an increased risk of malnutrition, functional loss, and frailty which results in reduced quality of life, physical function, and increased healthcare use. There is limited research on how intervening before surgery may affect treatment recovery in adults with esophageal cancer. **PURPOSE:** IMPROVE-Esophageal explores the feasibility and acceptability of a prehabilitation exercise and nutrition program for adults with advanced EC receiving a minimally invasive esophagectomy (MIE). **METHODS:** Adults diagnosed with EC scheduled to receive an MIE at UPMC Hillman Cancer Center (HCC) are eligible for enrollment. Participants are randomized to prehabilitation (EX) or usual care (UC). Functional assessments and questionnaires are completed at five timepoints: baseline, ± 2 days from MIE, and 2 weeks-, 6 weeks-, and 4 months-post-MIE. **RESULTS:** We have screened 1,519 adults, with 98% ineligible due to absence of an EC diagnosis. We have approached 26 adults, recruited 16, and have 30 additional potentially eligible participants. Enrolled participants are, on average, 67 years, 94% male, 100% Caucasian, travel an average of 172 miles to their designated HCC, and 94% received NACT. Six participants have been randomized to EX, and five to UC. Before randomization, four participants were withdrawn due to disease progression, frustration with surgery date, unable to return phone calls, or time restrictions. After randomization, four participants (1 EX, 3 UC) were withdrawn due to being overwhelmed, disease progression, or refusal to quit smoking. Hospital length of stay after MIE for participants in EX averaged 8.5 days compared to 16 days for participants in UC. **CONCLUSION:** Enrollment and retention in IMPROVE-Esophageal has fluctuated due to complications of disease progression. Alternative strategies need to be explored to expand reach and to increase exercise accessibility during the difficult treatment journey for adults with EC.

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Equivalent Cardiopulmonary Responses Following Suspension Training and Walking Warm-ups in Highly Active Adults

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Warm-up protocols before treadmill exercise testing typically include several minutes of submaximal walking. Variations in warm-up protocols may influence physiological responses and performance during a maximal cardiopulmonary exercise test (CPET). Dynamic suspension-training exercise may represent a practical warm-up, but its effects on CPET performance remain unknown. **PURPOSE:** To assess the cardiopulmonary differences of a treadmill walking warm-up (WW) versus a suspension training warm-up (SW) immediately before CPET in highly active young adults. **METHODS:** This randomized crossover trial evaluated equivalence between two warm-up conditions. Fifteen participants (6 females, 9 males; 21.2 ± 1.83 years) completed two separate sessions over two non-consecutive test days (≥ 48 h, ≤ 7 d). Participants were randomized to complete either a WW (6 min at 3 mph on a treadmill with 0% incline grade) or a SW (6-min sequence of 5 suspension-training exercises), followed by an incremental treadmill CPET protocol up to maximal exertion. A portable metabolic analyzer was used. Differences among primary outcomes were analyzed using paired t-tests and linear mixed-effects models. Two one-sided tests were used to test equivalence with an a priori equivalence bound of ± 1 MET (± 3.5 mL $\cdot$ kg $^{-1}\cdot$ min $^{-1}$) for peak oxygen consumption (VO₂). **RESULTS:** Fifteen participants completed both conditions without adverse events. Equivalence testing demonstrated that peak VO₂ differences fell within the predefined equivalence bounds (-2.33 to 2.48 mL $\cdot$ kg $^{-1}\cdot$ min $^{-1}$; $p=0.010$ and $p=0.013$). Mean peak VO₂ between SW (58.8 mL $\cdot$ kg $^{-1}\cdot$ min $^{-1}$; SD = 9.33) and WW (58.9 mL $\cdot$ kg $^{-1}\cdot$ min $^{-1}$; SD = 10.34) did not differ significantly ($p = 0.957$, $d = -0.01$). Similarly, mean peak heart rate (HR) of SW (196 bpm; SD = 6.52) and WW (195.0 bpm; SD = 5.01) were comparable ($p = 0.439$, $d = 0.21$). Linear mixed model analyses revealed no significant effect of warm-up on peak VO₂ ($F_{1,12} = 0.003$, $p = 0.955$) or peak HR ($F_{1,12} = 0.522$, $p = 0.484$), and no warm-up order effects were observed ($p > 0.05$). **CONCLUSION:** A brief SW elicited equivalent cardiopulmonary responses compared with a traditional WW in highly active young adults. These findings provide novel evidence that suspension exercise is a practical pre-CPET warm-up without compromising maximal exercise performance.

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How Participation in Domains of Physical Activity Differ by Lifestyle Behaviors Among US College Students

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Unhealthy engagement in modifiable lifestyle behaviors, including physical activity (PA), substance and alcohol use, diet, and sleep, drive rising prevalence of chronic diseases among adults. Findings suggest these behaviors cluster, interacting to exacerbate impacts on health outcomes. While this clustering has been researched among college students, how engagement in PA across different domains may interact with other lifestyle behaviors is unclear. **PURPOSE:** This study aimed to examine associations between domains of PA and broader lifestyle behaviors among men and women in college. **METHODS:** A volunteer sample of students at a large northeast US university self-reported gender identity, weekly minutes of active transportation (AT), moderate and vigorous aerobic (MET-minutes), muscle strengthening (MS), and nature-based PA (NPA), as well as wider lifestyle behaviors: substance use, alcohol consumption, sleep, and diet. Non-PA lifestyle behaviors were categorized as meeting/not meeting guidelines. Meeting of substance and alcohol use guidelines are classified as unhealthy behaviors, and for sleep and diet guidelines as healthy behaviors. **RESULTS:** Meeting dietary guidelines was associated with significantly more weekly minutes of all PA domains for men ($p<.05$) and women ($p<.001$). Meeting sleep guidelines was significantly associated with higher ST ($p<.01$) and MET-mins ($p<.001$), but not AT or NPA among men and women. Men meeting alcohol use, and women meeting substance use guidelines engaged in significantly more NPA (47.55 and 33.12 minutes respectively). Men meeting alcohol guidelines also engaged in more ST (38.71 minutes, $p<.001$). **CONCLUSION:** Associations with lifestyle behaviors differ by PA domain and gender identity. The inclusion of AT and NPA in this research provides novel contributions to literature. Findings emphasize the potentially counter-intuitive divergence of lifestyle behaviors, and support targeting multiple lifestyle components to improve health. Further differences by gender identity also appear to be pertinent. Longitudinal research should examine whether lifestyle behavior clustering in college remains consistent throughout adulthood.



Reliability of a Unilateral Single-Leg Romanian Deadlift for Eccentric Hamstring Strength in Collegiate Female Lacrosse

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Hamstring strains are prevalent and recurrent in sport, with eccentric hamstring strength considered a primary modifiable risk factor; however, methods for assessing eccentric strain remain limited. **PURPOSE:** To determine the reliability of an eccentric single-leg Romanian deadlift (SLRDL) assessment and associated force-velocity (F-v) profiles in NCAA Division II female lacrosse athletes. **METHODS:** Seventeen athletes (age: 19.18±1.85 years; height: 167.21±6.06 cm; weight: 68.40±9.41 kg) completed 1-repetition maximum (1RM) SLRDL testing followed by three experimental sessions at 30% and 80% 1RM. Vertical velocity and force were measured using 3-D motion capture systems and force plates. **RESULTS:** Eccentric velocity demonstrated good-to-excellent reliability (intraclass correlation coefficients [ICC]=0.87–0.94; coefficients of variation [CV]=9.42–11.64%; minimal detectable difference [MDD]=0.07–0.10 m/s), while eccentric force demonstrated excellent reliability (ICC=0.92–0.98; CV=1.59–2.84%; MDD=0.54–0.97 N/kg). Dominant-leg velocity ranged from -0.28±0.07 to -0.31±0.09 m/s at 30% 1RM and -0.21±0.04 to -0.25±0.06 m/s at 80% 1RM across sessions. Eccentric combined-force F-v slopes demonstrated excellent reliability for dominant (ICC=0.99; CV=3.52%; MDD=4.68 N·s/m) and non-dominant legs (ICC=0.99; CV=7.32%; MDD=9.53 N·s/m), whereas front-leg slopes were more variable (ICC=0.77–0.82; CV=28.08–41.19%). **CONCLUSION:** The SLRDL demonstrated good-to-excellent reliability for assessing eccentric velocity and force. Combined-force F-v profiles demonstrated greater reliability than front leg profiles. The SLRDL may be a practical assessment of eccentric hamstring strength in collegiate athletes. The authors declare no conflicts of interest.



Collective Effects of Self-Esteem, Athletic Identity, and Meaning in Life on Collegiate Athletic Performance

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Self-esteem, athletic identity, and meaning of life are psychological factors that have been individually related to sport performance. However, the interaction between self-esteem, athletic identity, and meaning of life remains unclear. **PURPOSE:** To explore the collective effects on sport performance in a team sport setting. **METHODS:** One-hundred-twenty-two collegiate athletes, aged between 18-26 years, participated in this study. Our variables of interest will be assessed primarily via a series of self-report questionnaires. Specifically, the strength of the participants' athletic identity will be assessed via the Athlete Identity Measurement Scale (AIMS), participant self-efficacy was measured via the Rosenberg Self-Efficacy Scale (RSES), and meaning in life was assessed by the Meaning in Life Questionnaire (MLQ). Team athletic performance was assessed via public records from the corresponding performance season of when the self-report was given. All analyses were conducted with JAMOVI. **RESULTS:** Initial correlational analyses did not reveal significant relationships between team success, as measured by team win percentage, and Meaning in Life (Kendall's Tau B = 0.073, $p = 0.255$), Self Esteem (Kendall's Tau B = -0.015, $p = .825$), and Athletic Identity (Kendall's Tau B = -0.074, $p = 0.238$). Further, regression analysis revealed that team success was not significantly predicted by a linear combination of Meaning in Life, Self Esteem, and Athletic Identity ($F(3, 118) = 1.21$, $p = 0.310$). **CONCLUSION:** No significant relationships were observed between sports team performance and self-esteem, athletic identity, and meaning of life, collectively or individually. Thus, there is no indication that these individual athlete psychological variables relate to team-level sport performance metrics. Significance/novelty: We observed that the individual athlete's self-esteem, athletic identity, and meaning of life are collectively not relevant to a team's success. This would imply that the athlete's self-esteem, athletic identity, and meaning of life are not useful predictors for team success. Future work should consider gathering psychometric and performance data within the bounds of a single performance event. Further, perhaps team-based psychometrics would better predict team-based results.

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High-Fat Overfeeding Increases Overnight Blood Glucose Independent of Exercise

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Purpose: To examine changes in overnight blood glucose after high-fat overfeeding (HFOF) with and without exercise. **Methods:** In a crossover manner, healthy young adults (n=28) completed three diets for one day each: a eucaloric control (CONT), HFOF, and HFOF+Exc (NCT07633704). The morning following each diet, participants completed a 75g oral glucose tolerance test to assess insulin sensitivity and substrate metabolism. A subset (n=6; n=3 female) wore a blinded continuous glucose monitor (CGM) throughout the study to measure interstitial glucose in an exploratory analysis. We compared overnight blood glucose from 12-8 AM following each diet and from 4-6 AM against outcomes from the OGTT the following morning. Outcomes were compared using mixed-effects models and Pearson correlations.

Results: Data are mean $\pm$ SE. In the full sample, HFOF decreased insulin sensitivity compared to CONT (449 ± 2 vs. 414 ± 2 mL/min/kg; $p < 0.05$), which was attenuated following HFOF+Exc (449 ± 2 vs. 430 ± 2 mL/min/kg; $p > 0.05$ vs. CONT). Mean overnight glucose was higher after HFOF (93 ± 2 vs. 84 ± 1 mg/dL; $p < 0.001$ vs. CONT) and HFOF+Exc (93 ± 3 vs. 84 ± 1 mg/dL; $p < 0.001$ vs. CONT) compared to CONT. For both HFOF and HFOF+Exc, glucose was elevated above CONT for all timepoints from 12:00 am until 7:15 am (all $p < 0.02$). When data were pooled across diets, greater overnight glucose from 4:00 am to 6:00 am was associated with worse insulin sensitivity during the OGTT ($r = -0.48$; $p = 0.05$) and higher peak blood glucose during the OGTT ($r = 0.60$; $p = 0.011$). **Conclusion:** HFOF elevated overnight blood glucose and insulin sensitivity, which was not attenuated following HFOF+Exc. This pilot data highlights the early negative effects of HFOF. Future studies should explore the use of overnight blood glucose as a means of detecting changes in insulin sensitivity and glucose control, as well as the mechanisms underlying aberrant overnight glucose homeostasis.

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Overnight Heart Rate Variability Across Short and Long-Haul Travel

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Jet-lag is known to impact recovery in athletes, influencing heart rate variability (HRV) and sleep duration. Increased HRV is associated with improved recovery, and enhanced performance. While the athletic population has been studied across long-haul travel, the general population is limited. **PURPOSE:** To assess differences in overnight HRV across short- and long-haul travel within a college-aged population.

METHODS: 29 university students (age: 20 ± 1 yrs, height: 170 ± 11 cm, mass: 69 ± 13 kg) volunteered to wear Garmin Vívactive[®] 6 smartwatches for a 28-day study abroad program. Data for each leg of the trip was averaged starting 5 days prior to both the 3-hour short-haul and 14.5-hour long-haul flights. Students self-reported daily metrics from their Garmin Connect app via an online survey. Linear mixed effect models were used to assess differences from baseline to night of travel, 24, 48, and 72hr post-travel for short- and long-haul travel. **RESULTS:** In long-haul travel, there was a decrease in overnight HRV from baseline (63.9 ± 19.4 ms) at 24hrs post travel (55.0 ± 20.3 ms, $p < .01$) but did not differ on the day of travel (62.1 ± 19.2 ms, $p = 0.67$) or at 48hr (58.4 ± 18.5 ms, $p = 0.19$) or 72hr (66.9 ± 18.7 ms, $p = 0.79$) post-travel. There was no difference between 24 and 48hr post long-haul travel ($p > 0.99$), but there was between 24 and 72hr ($p = .02$). In short-haul travel, there was a decrease in overnight HRV from baseline (56.0 ± 17.0 ms) for the night of travel (50.0 ± 20.8 ms, $p < 0.01$) but did not differ at 24hr (58.7 ± 19.8 ms, $p = 0.62$), 48hr (56.9 ± 24.9 ms, $p = 0.99$) or 72hr (60.9 ± 21.0 ms, $p = 0.47$) post-travel. There was no difference between 24 and 48hr post short haul travel ($p = 0.99$) or between 24 and 72hr ($p = 0.99$). When comparing overnight HRV baseline before the trip (63.9 ± 19.4 ms) to baseline short haul flight (56.0 ± 17.0 ms) that occurred 10 days later, baseline overnight HRV was decreased ($p = .03$). **CONCLUSION:** Overall, long and short haul travel can decrease overnight HRV. However, the magnitude and when the effect occurs may be different and may represent a cumulative effect of study abroad in this cohort, as baseline HRV for short haul travel was lower 10 days post long-haul travel. Travel across the international dateline (i.e. overnight on plane) caused overnight HRV scores to be misrepresented due to GPS and time synchronization issues.



Feasibility and Acute Physiological Responses to Blood Flow Restriction Training in Probable Sarcopenia

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Blood flow restriction (BFR) may address attenuated exercise responses in sarcopenia by augmenting physiologic stress at low loads, but its tolerability in this population is unclear. **PURPOSE:** To compare feasibility, acceptability, and acute physiologic response of low-load resistance training with BFR versus high-load resistance training (HLRT) in older adults with probable sarcopenia. **METHODS:** In this within-subject crossover trial, adults ≥ 55 years with probable sarcopenia completed 3 sessions of each condition in randomized order, separated by a two-week washout. Knee extension and flexion exercises were performed at approximately matched volume-load (BFR: 30% 1 repetition maximum [1RM], 75 repetitions [1x30, 3x15], 60% limb occlusion pressure; HLRT: 70% 1RM, 4x8). Feasibility was defined as completion of $\geq 75\%$ of prescribed repetitions per session, acceptability as session-related discomfort on a 100-mm visual analog scale (VAS; tolerated < 80 mm). Rectus femoris (RF) thickness and maximal voluntary isometric contraction (MVIC) were measured pre/post each session and analyzed with linear mixed-effects models. $N = 4$ men (78.8 ± 10.2 yrs). **RESULTS:** BFR completion was $78.8 \pm 20.1\%$ for knee extension and $94.3 \pm 9.2\%$ for knee flexion, versus $96.2 \pm 4.6\%$ for HLRT; feasibility was met in 63.6% of BFR knee extension sessions and 100% of all others. All BFR sessions were tolerated (11/11; median VAS 38, range 9-63) versus 7/9 HLRT sessions (median VAS 37, range 12-87). RF thickness increased 0.26 cm (+13.3%) after BFR (95% CI 0.12-0.41, $p=0.007$) versus 0.10 cm (+4.8%) after HLRT (difference in change -0.16 cm, 95% CI -0.36 to 0.04, $p=0.161$). Knee extension MVIC was unchanged after BFR (+1.1 N, +2.0%) but declined after HLRT (-45.1 N, -10.1%; difference in change -46.2 N, 95% CI -83.8 to -8.7, $p=0.022$). Knee flexion MVIC did not differ (-7.2 N, 95% CI -37.4 to 23.1, $p=0.646$). **CONCLUSION:** BFR was well tolerated in older adults with sarcopenia. The standard 75-repetition protocol, however, was not consistently completed for knee extension. BFR produced greater muscle swelling with less neuromuscular fatigue than HLRT and may offer a lower-load alternative for those who tolerate heavy loading poorly; data collection is ongoing.

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Creatine-Induced Changes in Intracellular Water Alter Multi-frequency Bioelectrical Impedance Analysis Body Composition Estimates

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Multi-frequency bioelectrical impedance analysis (MF-BIA) is used to assess body composition in military populations to make physical training decisions, however, bioelectrical estimates are sensitive to changes in body water volume and distribution. **PURPOSE:** We tested the hypothesis that 7 days of creatine monohydrate loading would increase intracellular water (ICW) and alter MF-BIA derived body composition and body water estimates. **METHODS:** Twenty-one healthy, active adults (9 males; age: 25±5 y; body mass: 72.9±13.8 kg) completed MF-BIA testing (InBody 770) before and after 7 days of creatine loading. Participants consumed 0.3 g of creatine per kg of body mass daily. Fat-free mass index (FFMI), an indicator of physical performance, was calculated using the equation: $FFMI = \text{lean body mass (kg)} / \text{height (m)}^2$. Dependent t-tests were used to compare body composition and body water measures before and after creatine supplementation. **RESULTS:** Seven days of creatine loading reduced MF-BIA-estimated body fat percentage (Pre: 23.4±10.2%, Post: 22.4±10.2%, $p=0.008$). MF-BIA estimates of skeletal muscle mass (Pre: 31.4±8.6 kg, Post: 31.8±8.8 kg, $p=0.029$), ICW (Pre: 25.6±6.6 L, Post: 25.9±6.8 L, $p=0.024$) and total body water (Pre: 40.9±10.3 L, Post: 41.4±10.6 L, $p=0.031$) increased following supplementation, while fat mass estimates decreased following supplementation (Pre: 16.6±8.0 kg, Post: 15.8±7.6 kg, $p=0.006$). FFMI increased following supplementation (Pre: 18.7±2.8, Post: 18.9±2.9, $p=0.039$). **CONCLUSION:** One week of creatine loading produced a physiologically meaningful increase in ICW and a small improvement in MF-BIA derived body composition measures without an actual change in adipose tissue in young adults. Although the small changes are unlikely to affect overall military physical training recommendations, short-term creatine supplementation could be relevant when an individual is near a body fat or FFMI physical training decision threshold.

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Sensegiving and Sensemaking in Exercise Science Student Career Understanding: A Mixed Methods Case Study

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Exercise Science has many possible careers which can make it difficult for students to decide which career is best for them. Faculty play a role in this decision making process by providing context and information that help students create meaning of different careers through a process called sensegiving. Students in turn make meaning in a process call sensemaking. **Purpose:** The purpose of this study was examine how faculty engage in sensegiving during course interactions and how those messages shape student's sensemaking of the Exercise Science careers. **Methods:** Nine Exercise Science faculty were interviewed to better understanding the sensegiving process happening in course interactions. 55 students participated in an online survey to assess their career preparedness, a proxy for the sensemaking process. **Results:** The primary strategies faculty use during course interactions included *connecting the dots* between content and careers. Faculty also regularly provide a *how to* for students to achieve their career goals, use *vicarious experiences*, and encourage them to *engage with their community*. This sensegiving process can be difficult as faculty must also spend time *setting the record straight*, dispelling any misinformation about the field and careers. Students respond to these sensegiving strategies and engage in their own sensemaking. Of different domains of career preparedness, students ranked Career Confidence highest and Career Exploration lowest. There was a positive relationship between each domain and academic rank. Students who earned an associate's degree prior had statistically significant higher scores in Occupational Expertise and Soft Skills whereas students who started their career at a four year institution had a statistically significant and lower rating for Occupational Expertise and Career Confidence. **Conclusion:** Faculty's primary method for sensegiving helps student's career confidence but there is a need to facilitate career exploration for students to explore and learn more about the field of Exercise Science. There is also a need to understand how and why earning an associate's degree results in higher domains of career preparedness and how to translate that to those earning four year degrees and identify more key experiences that significantly impact career preparedness. The authors declare no conflicts of interest.



NCAA Student-Athletes' Mental Health – An Evaluation of High-Risk Depression Referrals Throughout the Academic Year

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The National Collegiate Athletics Association (NCAA) has made significant progress in identifying needs, generating awareness, and creating best practices regarding the Mental Health (MH) of its own Student-Athletes' (SA). These progressions warrant an evaluation, specifically regarding screening protocols mandated and recommended by the NCAA. While member schools are mandated to screen SA for MH at least once throughout the academic year, it is uncommon for universities to implement repeated screenings after Pre-Participation Evaluations (PPE), usually conducted by Sports Medicine Staff. **PURPOSE:** The purpose of this study was to evaluate the implications of increasing MH screening frequency for NCAA SA throughout the academic year, over a two-year period, regarding high-risk depression referrals via the PHQ-9 Question #9. **METHODS:** Over two academic years, 764 subjects participated in the study with 222 subjects participating in both years. Year 1 included 375 subjects from a limited sample of team sport athletic teams who were screened for depression via the PHQ-9 1-6 times. Year 2 included 606 subjects from a more inclusive sample of athletic teams who were screened 1-4 times. **RESULTS:** Eighty-one (10.6%) subjects at some point flagged on Q9 with a score other than 0. Four of these subjects at some were experiencing "thoughts of death or harming themselves," nearly every day in the two-week period prior to answering. If screenings were only conducted at PPE, only 22 (2.9%) would have been identified, effectively missing 59 SA. **CONCLUSION:** There is a need for NCAA member institutions to increase the number of MH screenings for SA across the academic year past PPE as a significant number of SA will most likely not be identified for High-Risk Depression that otherwise may have at a different time in academic year. Due to the known association between depression and suicide and the increase in the number of deaths by suicide in the NCAA SA population since 2002, the chances of a SA losing their life from suicide related deaths are rising and MH screening is a way to potentially mitigate these unnecessary losses of life.



Acute Effects of Circuit vs Traditional Resistance Exercise on Circulating miRNA Expression in Young Adults

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Evidence suggests that physical activity promotes musculoskeletal health through mechanical loading and biochemical signaling between skeletal muscle and bone. Beyond myokines and osteokines, microRNAs (miRNAs) have emerged as key molecular mediators of muscle–bone crosstalk and exercise-induced adaptation. Among these, miR-133a and miR-29a may play complementary roles in muscle–bone adaptation to exercise, but their acute exercise-induced responses and contribution to muscle–bone crosstalk remain poorly understood. **Purpose:** This study compared acute serum miR-133a and miR-29a responses to circuit training (CT) and traditional resistance (TR) exercise in young healthy adults. **Methods:** In this randomized, repeated-measures crossover study, 6 men and 6 women completed the protocols across 4 visits. Participants performed two protocols separated by 2-week wash-out periods: 1. CT (cycle ergometer, push-up, step-ups, medicine ball twist, and front squats with kettlebell for three sets) and 2. TR exercise (3 sets 10 repetitions 50-60% 1RM for leg press, seated cable row, barbell bench press, kettlebell deadlifts, and dumbbell seated shoulder press). Blood samples were analyzed before exercise training (PRE), immediately post-exercise (IP), and 30 minutes post-exercise (30P) for miR-133a and miR-29a using RT-PCR. **Results:** For miR-133, both exercise protocols showed increased expression relative to Pre. CT increased approximately 49% at IP and reached 6.86 times baseline at 30P. TR increased approximately 26% at IP and reached 6.29 times baseline at 30P. The response was modest immediately post-exercise but substantially larger at 30 minutes in both conditions. For miR-29, a significant protocol effect was observed ($p < 0.01$), indicating that the expression response differed between the two exercise protocols. CT decreased approximately 24% at IP but increased to 2.43 times baseline at 30P. TR increased approximately 43% at IP but decreased approximately 27% below baseline at 30P, suggesting a potentially condition-dependent temporal response. **CONCLUSION:** Overall, the findings suggest that miR-133 may show a relatively consistent response to acute exercise, while miR-29 may be more sensitive to the type and timing of the exercise stimulus and warrants further investigation.



What's More Important for Brain Health: Muscle Mass or Muscle Strength?

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The hippocampus plays a critical role in supporting long-term memory, working memory, processing speed, executive function, and spatial navigation. Hippocampal atrophy on MRI predicts cognitive decline and conversion to dementia and is a key marker of brain aging and ADRD (Alzheimer's disease and related dementias) risk. Muscular health is linked to overall neurocognitive health, but it remains unclear whether muscle mass or muscle strength is more strongly linked with hippocampal volume. **PURPOSE:** This study examined whether muscle mass (DEXA-derived total lean mass) or muscle strength (handgrip strength) is more strongly associated with hippocampal volume in middle-aged and older adults. **METHODS:** Secondary analyses evaluated 159 participants from the Midlife in the United States (MIDUS) study (age 65±9 years, 59% female). Hippocampal volume was derived from T1-weighted magnetic resonance imaging (MRI) scans. Muscle mass was assessed via DEXA-derived lean mass; Muscle strength via handgrip dynamometry (average of left/right hand maximal voluntary contractions, in triplicate). Linear regression models tested associations between each muscular health measure, separately and combined, with hippocampal volume. We present models unadjusted and adjusted for age, sex, body mass index, and estimated intracranial volume to account for differences in overall brain size. **RESULTS:** Muscle mass was positively associated with hippocampal volume in unadjusted models (unstandardized β =.019, 95% CI .007-.031, p =0.002), but this association was no longer significant after adjusting for covariates (unstandardized β =-.011, 95% CI -.033-.010, p =0.291). Grip strength was positively associated with hippocampal volume in unadjusted models (unstandardized β =29.68, 95% CI 19.07-40.28, p <0.001) and remained significant after adjusting for covariates (unstandardized β =17.26, 95% CI 2.55-31.97, p =0.022) including after addition of lean muscle mass to the model (unstandardized β =24.40, 95% CI 8.41-40.38, p =0.003). **CONCLUSION:** Muscle strength, independent of muscle mass, was associated with hippocampal volume, suggesting that muscular strength may play a larger role in overall brain health compared to muscle mass. These findings point to a potentially modifiable target for preserving brain health.



Muscle Function Recovers While Fatty Infiltration Progresses After Rotator Cuff Repair in Rabbits

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Rotator cuff tear (RCT) predisposes to muscle atrophy and fatty infiltration that impair function and limit the efficacy of surgical repair, yet the mechanisms of these changes remain unclear. **PURPOSE:** Establish a rabbit model of RCT and relate *in vivo* muscle function to fatty infiltration and muscle quality following acute repair. **METHODS:** RCT was modeled in eighteen rabbits with a unilateral surgical tenotomy of the supraspinatus and infraspinatus (contralateral limb as control). Nerve-evoked muscle function (tetanic torque) was assessed *in vivo* at baseline (n=12), 2 weeks post RCT (n=6), and 2 (n=4), 4, 6, and 8 weeks (n=3) post repair. At each time point, the fat fraction (FF; Dixon MRI) and muscle cross-sectional area (CSA) were quantified. Histological assessments of adipocyte area, adipocyte number, and muscle fiber CSA were quantified using a machine-learning model trained in Cellpose (v3) and Fiji/ImageJ. **RESULTS:** Tetanic torque declined by ~40–50% post-RCT and recovered to control levels at 8 weeks post-repair. MRI showed a significant decline in muscle CSA at 2 weeks post-RCT, which recovered to control levels by 8 weeks post-repair. In contrast, FF increased post-RCT and continued to increase through 8 weeks post-repair. These MRI assessments were histologically validated, showing increased adipocyte number and total area. **CONCLUSION:** Neuromuscular function declines post-RCT, with acute repair yielding recovery at 8 weeks. Fatty infiltration is a consequence of RCT and progresses independently of functional recovery. Supported by a VA Merit RR&D grant (RX003489). The authors declare no conflicts of interest.



The Reliability of Different Measures of Reactive Strength During Vertical Jumps Performed by Resistance-Trained Men

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Reactive strength is the ability to tolerate high stretch-loads and rapidly transition from eccentric to concentric muscle actions in tasks involving the stretch-shortening cycle (SSC). The reactive strength index (RSI), calculated as the ratio of jump height to contact time, is often used as a measure of reactive strength. However, there is evidence that RSI may be insensitive to changes in the SSC associated with different jumping tasks. **PURPOSE:** To explore the reliability of different mechanical variables recorded during countermovement (CMJ) and depth jumps (DJ) as assessments of reactive strength in resistance-trained men. **METHODS:** Twenty men (22.9 ± 1.89 yrs) performed 3 repetitions of CMJ and 3 repetitions of DJ from two different drop heights (0.30 m [DJ₃₀], 0.60 m) during three sessions separated by a minimum of 48 hours. The order of the jumps was counterbalanced and all jumps were performed on force plates to allow the calculation of mechanical variables including RSI along with different measures of reactive strength based upon the rate of change of kinetic energy ($_{rate}\Delta KE$) and total energy ($_{rate}\Delta TE$) and the efficiency of work ($W\eta$) and power ($P\eta$) during ground contact. Between-session reliability statistics including systematic bias, intraclass correlation coefficients (ICC), and coefficients of variation (CV) were calculated for the mechanical variables. **RESULTS:** No measure of reactive strength produced systematic bias ($p < 0.05$). Although RSI demonstrated acceptable relative reliability during all jumping tasks ($ICC > 0.91$), the absolute reliability was poor for DJ₃₀ ($CV = 13.8\%$). Both $_{rate}\Delta KE$ and $_{rate}\Delta TE$ produced acceptable relative reliability ($ICC \geq 0.81$), but absolute reliability was unacceptable during the DJ tasks ($CV \geq 20.4\%$). $W\eta$ and $P\eta$ returned acceptable relative reliability ($ICC \geq 0.70$) and absolute reliability ($CV \leq 8.9\%$) across all jumps. **CONCLUSION:** Assessing reactive strength using the efficiency of work and power during ground contact has acceptable between-session reliability and may provide more mechanically meaningful assessments of SSC ability during jumping tasks compared to RSI. The authors declare no conflicts of interest.



Novel Aminobutyric Acid Compound Changes Following Acute Ballistic Exercise and Their Association with Musculoskeletal Health

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Aminobutyric acid compounds (ABAs) are amino acids that are not incorporated into proteins and are released during physical activity. ABAs are emerging biomarkers implicated in bone and muscle health, yet whether resistance exercise alters circulating ABAs or if they relate to bone structure and strength in young adults is unknown. **PURPOSE** To examine the acute-exercise response of ABAs and their associations with tibial bone characteristics and total soft tissue lean mass. **METHODS** This pilot study consisted of 10 adults (5 women; 23 [21, 25] years; BMI 23.5 [22.6, 24.6] kg/m²). Dual-energy X-ray absorptiometry assessed body composition and high resolution-peripheral quantitative computed tomography assessed 4% and 30% tibial geometry, microarchitecture, and strength. Participants had fasted blood draws before (pre) and immediately following (post) an acute lower body resistance exercise test (AET; 10 sets of 10 reps PlyoPress 40% leg-press 1RM). Liquid chromatography-mass spectrometry (LC-MS) detected 5 ABA isomers (D,L- β -aminoisobutyric acid [BAIBA], γ -aminobutyric acid [GABA], D,L- α -aminobutyric acid [AABA]). Wilcoxon signed-ranks tests compared pre and post-AET [isomer], with median change ($\Delta \pm$ interquartile range) reported. Spearman's correlations with Benjamini Hochberg adjustments determined associations between [ABA] and tissue parameters. **RESULTS** L-AABA (median=29.88 $\pm$ 16.14 μ M, Δ =-1.33 $\pm$ 2.20 μ M, p=0.232) did not change following the AET; however, D-BAIBA (median=2.04 $\pm$ 2.14 μ M, Δ =-0.21 $\pm$ 0.11 μ M, p=0.008) and GABA (median=0.23 $\pm$ 0.07 μ M, Δ =-0.033 $\pm$ 0.02 μ M, p=0.006) decreased following the AET. L-BAIBA was detected in 9/20 samples; D-ABBA was undetected. Pre-AET [ABA] were not significantly associated with tibial bone parameters or soft tissue lean mass (p $\geq$ 0.200). **CONCLUSION** No associations were found between [ABA] and tissue parameters, though this pilot's small sample size limited power to detect effects; larger studies are needed to clarify the utility of circulating ABAs as biomarkers of bone and muscle health in young adults. D-BAIBA and GABA decreased following AET contrasting previous reports of increases after endurance exercise, suggesting that exercise mode may influence circulating ABA responses.

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Pre-Exercise Cold-Water Immersion Alters Physiological and Perceptual Responses During Multimodal Exercise

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Pre-exercise cold water immersion (CWI) is commonly used as a pre-cooling strategy to attenuate physiological strain and potentially enhance exercise performance. However, its effects during high-volume multimodal exercise performed under thermoneutral conditions remain unclear. **PURPOSE:** To examine the effects of pre-exercise CWI on performance and physiological and perceptual responses during a high-volume, multimodal bodyweight workout performed in a thermoneutral environment. **METHODS:** Eleven well-trained males (age: 23.55 ± 5.15 years; VO_2max : $59.06 \pm 8.63 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) completed two experimental sessions separated by ≥ 7 days. Before exercise, participants underwent 5 min of whole-body immersion in either cold water (CWI; $\sim 13^\circ \text{C}$) or thermoneutral water (TN; $\sim 34^\circ \text{C}$), followed by 30 min of seated rest. Participants then completed a high-volume bodyweight workout (1-mile run, 20 sets of 5 pullups, 10 pushups, 15 squats, 1-mile run) as fast as possible. Heart rate (HR), skin temperature (ST), estimated core temperature (CT), blood lactate, and perceptual measures (RPE, affect, thermal sensation) were assessed. **RESULTS:** Overall workout completion time did not differ between conditions (CWI: 39.97 ± 7.13 vs. TN: 41.04 ± 6.93 min; $p=0.370$). Compared with TN, CWI lowered overall average HR (-10.39 ± 6.65 bpm; $p=0.019$), reduced ST at several time points ($p<0.05$), lowered thermal sensation ($p=0.001$), and reduced session RPE ($p=0.016$). CT, blood lactate, momentary RPE, and affect did not differ between conditions ($p>0.05$). **CONCLUSION:** Pre-exercise CWI lowered heart rate, skin temperature, thermal sensation, and session RPE during high-volume, multimodal exercise but did not significantly improve exercise performance. This study extends pre-cooling research beyond endurance performance in hot environments by demonstrating that brief pre-exercise CWI favorably alters physiological and perceptual responses during multimodal bodyweight exercise performed in thermoneutral conditions. The authors declare no conflict of interest.



Effects of Chronic High-Intensity Exercise on Indices of Arterial Stiffness

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Investigations into specific behaviors and practices that influence arterial stiffness have been a priority in the past few years. Chronic aerobic activity has consistently been shown to attenuate or not influence markers of arterial stiffness in adults, while the effect of chronic high-intensity exercise training on vascular compliance is less understood. **PURPOSE:** To determine the effects of a chronic high-intensity exercise training program on pulse wave velocity and beta-stiffness index. **METHODS:** Participants (18-40 years old) were placed in a non-randomized fashion into a high-intensity exercise training (HFRT) group (n = 9; >6 months of CrossFit experience; 4 female), or control (CON) group (n = 8; < 6 months of exercise experience; 6 female). Participants in the HFRT group trained at the same local facility 4 -5 days a week, utilizing the same training program. CON group refrained from exercise during the study period. Body composition, 1,000-meter rowing test, deadlift 1-repetition maximum (1 RM), hemodynamic assessments, and vascular compliance were assessed at baseline and follow-up. We used repeated-measures analysis of variance to examine within- and between-group interactions in indices of arterial stiffness. **RESULTS:** There were baseline differences between groups in deadlift 1 RM (72.3±18.2 kg mean difference (MD), p < 0.01), rowing time (143.8±35.7 sec MD, p < 0.01), and rowing average watts (153.8±34.6 watts MD, p < 0.01). Following the intervention, seated diastolic blood pressure (DBP) increased only in the CON group (3±4 mmHg MD, p = 0.04). We found no significant within- and between-group interactions in arterial stiffness variables. **CONCLUSIONS:** The findings indicate that participation in chronic high-intensity exercise training does not affect arterial stiffness indices.

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Association Between Daily Antiseptic Mouthwash Use and 24-Hour Blood Pressure in College Students

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The oral microbiome contains bacteria that facilitate nitrate-reducing pathways and thus contribute to endogenous nitric oxide production. Current literature suggests that antiseptic mouthwash has the capacity to disrupt oral nitric oxide homeostasis by eliminating these useful bacteria. **Purpose:** To examine differences in 24-hour blood pressure measurements relative to the amount of daily antiseptic mouthwash use. **Methods:** Blood pressure was measured using Bionet's LAB24 24-hour ambulatory blood pressure monitor on two non-consecutive weekdays in sedentary and recreationally active college students ($n = 22$; males = 13, females = 9). Blood pressure was recorded automatically at the brachial artery every 20 minutes during the day and every 30 minutes during a designated nighttime period (11:00 p.m.–7:00 a.m.). Data were analyzed using Bionet's LAB24 analysis software. Daytime blood pressure load was defined as the percentage of measurements above 140/90 mmHg, and nighttime blood pressure load was defined as the percentage of measurements above 120/80 mmHg. Nocturnal dipping was derived from the percentage difference between nighttime and daytime mean arterial pressure. Subjects were divided into two groups based on their self-reported mouthwash use. The moderate (M) group ($n = 14$) reported using mouthwash 0–2 times per day, whereas the high (H) mouthwash-use group ($n = 8$) reported using mouthwash 3 or more times per day. Differences in blood pressure variables were analyzed using a two-tailed Student's *T*-test. **Results:** Subjects reporting high mouthwash use had a smaller nocturnal reduction in blood pressure compared with moderate users (3.38% vs. 10.72%; $p < 0.05$). Further, high mouthwash users had a greater average nighttime diastolic blood pressure ($M = 70$ vs. 61 mmHg; $p < 0.05$) and greater nocturnal blood pressure load (25.4% vs. 19.9%; $p < 0.05$) compared with moderate users. **Conclusion:** These data may suggest that increased mouthwash use may have a negative impact on nighttime hemodynamics.



Memory Recall Performance Predicts Skinfold Measurement Accuracy in Students Learning with Peyton's 4-Step Approach.

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PURPOSE: Body composition assessment using skinfolds (SF) is an important technique taught in kinesiology programs and a critical assessment in various weight-class sports. Understanding best practices for teaching this technique is important. This investigation tested whether students' memory recall and recognition ability predict measurement accuracy after learning the SF technique using three separate teaching methods. **METHODS:** 49 students with no experience in SF measurement participated in the study after providing informed consent. They were assigned to one of three instructional methods: lecture only (LO), see-one, do-one (SODO), or Peyton's 4-step method (P4S). All participants performed SF on the same model after their instruction (day 1) and again two weeks later (day 2). Accuracy was compared to an experienced assessor's Jackson Pollock 7-site body-fat estimate. Change in skinfold accuracy between the two assessments was calculated (absolute difference from the experienced assessor's measure on day 1 minus the difference from the experienced assessor on day 2). After instruction and the first assessment, participants completed the learning trials of the Rey Auditory Verbal Learning Test (RAVLT). Two weeks later, after the second SF measurement, RAVLT recall and recognition were assessed. Recognition memory was determined by calculating d' . Linear regression analyses were performed for each group to determine whether recognition or recall predicted change in SF accuracy. **RESULTS:** Recognition memory did not predict SF accuracy change in any group. Recall significantly predicted SF accuracy change in the P4S group ($F(1,15)=10.02$, $p=0.006$, slope=-0.3473), with higher recall scores associated with better accuracy. **CONCLUSION:** Although an effective instructional method, the cognitive demands of the P4S method for learning SF may favor those with greater recall capacity compared to other instructional techniques. Students with lower recall memory may need additional hands-on instruction to become competent in SF measurements.



Impact of an Exercise Oncology Program on Healthcare Utilization in Adults with Gastrointestinal Cancer

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During active infusion therapy for gastrointestinal cancers, treatment-related toxicities such as neuropathy, neutropenia, gastrointestinal distress, and fatigue may reduce functionality and quality of life, and lead to severe symptom burden requiring unplanned healthcare use. Exercise has been shown to help reduce adverse events during chemotherapy and contribute to better functionality. **PURPOSE:** This study examined the effect of a telehealth supervised home exercise program (HEP) on treatment tolerance in older adults with gastrointestinal cancer receiving active infusion therapy. **METHODS:** We performed a retrospective analysis of older adults who were enrolled in the UPMC Moving Through Cancer Program. Patients who completed the telehealth HEP were matched to adults who declined participation in the HEP based on age, cancer subtype, cancer stage, sex, and race. Data from 44 patients (72 ± 7.0 yrs; 45.5% female; 88.1% Caucasian) with various Gastrointestinal Cancers (31.8% colon) were analyzed. Healthcare utilization was abstracted from the electronic health record (i.e. Emergency Department visits, unplanned hospitalizations, rehabilitation referrals, treatment changes, Palliative Care contacts, and death). **RESULTS:** Participants were enrolled in the HEP for approximately 11.76 weeks. In the HEP group, 18% of adults were hospitalized during treatment compared to 41% of those who did not exercise. For those who were hospitalized, the hospital length of stay was shorter in the exercise group compared to non-exercisers (3.2 vs 26.8 days). Those who did not exercise during chemotherapy also visited the Emergency Department more frequently, with 36% requiring at least one visit, versus 27% in the HEP. Rehabilitative service referrals were more common in non-exercisers (27%) compared to HEP (4.5%). There were no referrals made to Palliative Care among the participants, but 41% of those who declined were provided with a referral. **CONCLUSION:** Participants of the HEP had significantly less encounters with the healthcare system during the course of the program compared to those who declined. Overall, the exercise group experienced less toxicities associated with chemotherapy, with remarkable differences in referral rates and unplanned hospitalizations.



Association of Physical Fitness with Arterial Stiffness, Cerebrovascular Pulsatility, and Brain Stiffness in Midlife Adults

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Alzheimer's disease (AD) pathology begins decades before symptoms, making midlife (50-64 years) a key time for prevention. Indeed, greater physical activity during midlife lowers dementia risk. While the mechanisms linking physical activity/fitness with dementia are unclear, vascular/cerebrovascular factors and brain mechanical properties may be involved. In young and older adults, higher cardiorespiratory fitness is associated with better brain mechanics. However, the relation between fitness and brain mechanics during midlife remains unexplored. **PURPOSE:** To test the hypothesis that physical fitness (six minute walk distance (6MWD) and handgrip (HG) strength) is associated with brain mechanics and vascular/cerebrovascular function in midlife adults. **METHODS:** Forty-five midlife adults (32 women; 59 ± 4 years) completed a six-minute walk test and isometric HG strength testing in an ongoing longitudinal study. Whole brain and hippocampal stiffness were measured via magnetic resonance (MR) elastography. 2D phase-contrast MR imaging was used to assess pulsatility index (PI) in the middle (MCA) and posterior (PCA) cerebral arteries. Carotid stiffness, carotid pulse pressure (cPP), and carotid-femoral pulse wave velocity (PWV) were also assessed. Pearson or Spearman correlations were used to assess the relation of 6MWD and HG strength (normalized to body mass) with vascular/cerebrovascular function and brain mechanics. **RESULTS:** 6MWD and HG strength were not associated with whole brain or hippocampal stiffness (All: $|r \text{ or } \rho| \leq 0.23$, $p \geq 0.21$, $n = 30-31$) or MCA or PCA PI (All: $|r \text{ or } \rho| \leq 0.23$, $p \geq 0.20$, $n = 29-33$). However, 6MWD was negatively correlated with cPP ($\rho = -0.37$, $p = 0.02$, $n = 42$) and carotid stiffness ($r = -0.33$, $p = 0.03$, $n = 44$). Similarly, HG strength was negatively correlated with cPP ($\rho = -0.37$, $p = 0.02$, $n = 43$) and carotid stiffness ($\rho = -0.41$, $p < 0.01$, $n = 45$) and trended towards a negative correlation with PWV ($\rho = -0.28$, $p = 0.07$, $n = 43$). **CONCLUSION:** Physical fitness was associated with arterial stiffness and cPP but not cerebrovascular pulsatility or brain mechanics in midlife adults. Longitudinal follow up will further elucidate whether vascular/cerebrovascular factors mediate the neuroprotective effects of better physical fitness during midlife.

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Differential Effect of Sex in Neuromuscular Performance During 24-Weeks of ROTC Training

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Reserve Officer Training Corps (ROTC) should physically and intellectually prepare cadets for military officer roles upon graduation. Performance testing throughout ROTC training provides insight to the development of physical readiness and help identify sex differences in training responses. **PURPOSE:**

Examine neuromuscular performance between men and women after 24-weeks of ROTC training.

METHODS: 39 male ($24.3 \pm 2.6 \text{ kg/m}^2$, $19.8 \pm 1.5 \text{ yrs}$) and 29 female ($24.2 \pm 3.0 \text{ kg/m}^2$, $19.4 \pm 2.4 \text{ yrs}$) cadets completed a countermovement jump (CMJ; three maximal trials on VALD forcedecks) and total body dual x-ray absorptiometry (DXA) at 0 weeks (pre), 12 weeks (mid), and 24 weeks (post). An acute exercise test (AET) consisting of 10 sets of 10 jumps at 40% of leg press one-repetition max on a horizontal plyo-press machine was completed at pre and post testing. All outcomes were analyzed using linear mixed models to evaluate the interaction between group (sex) and performance over time. **RESULTS:** In the unloaded CMJ, an interaction effect in peak power shows women decreased from pre to mid (Mean Difference: $95.15 \text{ W} \pm 33.09$, $p = .010$) then rebounded at post. Men displayed no change. Main effects of time and sex were observed for relative peak power; men displayed higher relative power (MD: $12.66 \text{ W/kg} \pm 1.26$, $p < .001$) and decreased from pre to mid (MD: $0.99 \text{ W/kg} \pm 0.30$, $p = .005$) but rebounded by post. In the loaded AET, a main effect of sex shows men had higher mean peak power (MD: $431.79 \text{ W} \pm 89.32$, $p < .001$); but not after normalizing to system weight. Men displayed greater relative propulsive forces (main effect of sex: $.811 \text{ N/kg} \pm .306$, $p < .001$), not landing forces. Main effects of time show cadets significantly increased relative propulsive (MD: $.468 \text{ N/kg} \pm .177$, $p = .011$) and landing (MD: $.619 \text{ N/kg} \pm .176$, $p < .001$) forces in the AET from pre to post. Main effects of time and sex show body mass (MD: $0.942 \text{ kg} \pm 0.27$, $p = .003$) increased and lean mass decreased (MD: $.572 \text{ kg} \pm .189$, $p = .011$) from pre to mid, both rebounded by post; men were heavier (MD: $13.15 \text{ kg} \pm 2.52$, $p < .001$) and had more lean mass (MD: 18.92 ± 1.77 , $p < .001$). **CONCLUSION:** The lack of meaningful performance improvements suggests ROTC training may be ineffective in developing physical fitness. Standardized training programs may target power development in women to lessen sex differences in absolute performance.

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Temporal and Spatial Adaptations in Tibialis Anterior Muscle Activation Following Repeated Bouts of Eccentric Exercise

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Muscle activation may adapt after damaging eccentric exercise and contribute to the repeated bout effect (RBE). **PURPOSE:** To determine whether temporal and spatial tibialis anterior (TA) activation changes across repeated eccentric exercise bouts. **METHODS:** Nineteen recreationally active adults (7 female; 27±6 years) performed 10×10 maximal eccentric dorsiflexions on two occasions 3–4 weeks apart. Maximal voluntary contraction (MVC) torque, soreness, and high-density surface electromyography-derived global root mean square (RMS) amplitude, entropy, and activation centroid were assessed before, during, immediately after, and 24–72 hours after each bout at 10%, 20%, and 40% MVC. Linear mixed-effects models tested time×bout effects. Ethics approval and written informed consent were obtained. **RESULTS:** Work was similar between bouts (1251.3±423.2 versus 1254.7±431.1 J; P=0.958). MVC torque fell 10.52 N·m after Bout 1 (95% confidence interval [CI] 6.62–14.42; P<0.001) versus 7.23 N·m after Bout 2 (95% CI 3.33–11.13; P<0.001), with Bout 2 returning to baseline by 24 hours. Soreness increased 49.42 mm at 24 hours after Bout 1 (95% CI 39.99–58.85; P<0.001) versus 20.12 mm after Bout 2 (95% CI 10.52–29.73; P<0.001). Immediately after Bout 1, global RMS increased 26.04±34.51% at 20% MVC (P=0.009) and 40.91±51.93% at 40% MVC (P=0.024), while entropy fell 1.51±3.03% (P=0.025) and 1.94±3.35% (P=0.009), respectively; neither changed after Bout 2. Centroid coordinates showed no time×bout interaction at any intensity (all P≥0.13). **CONCLUSION:** Repeated eccentric exercise attenuated increases in activation amplitude and reductions in activation uniformity without shifting activation location. Novelty/significance: altered activation magnitude and uniformity, rather than centroid relocation, are identified as novel neuromuscular features of the RBE.

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Effects of Audio and Visual Reinforcement on Cycling Performance in College Students

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Regular participation in exercise is influenced by various external factors that can affect an individual's motivation, effort, and overall performance. Audio and visual motivational strategies may serve as an effective way in improving one's exercise performance. **PURPOSE:** This study examined the effects of audio and visual reinforcement on cycling performance. **METHODS:** Fifteen college-aged participants (Age = 20.5 ± 1.2 years, mass = 78.8 ± 13.4 kg) took part in three exercise sessions using a within-subject crossover design. The three testing sessions included a control condition (C) with no reinforcement, an audio condition (A) using motivational audio, and a visual condition (V) using motivational video clips. Each condition consisted of the following: a warm-up period, a 10-minute bout of cycling at a predetermined resistance based on subjects' body mass, and recovery period. Heart rate (HR), rate of perceived exertion (RPE), and distance were recorded. Pre and post motivation, confidence, and mood were also measured by using a visual analog scale. Data were analyzed using a one-way ANOVA with repeated measures. **RESULTS:** No significant differences were found in distance covered between conditions (4.5 ± 1.0 (A) vs. 4.3 ± 1.0 (V) vs. 4.5 ± 0.8 (C) km, $p = 0.56$). Participants' post exercise RPE showed no significant differences either (13.9 ± 2.8 (A) vs. 13.9 ± 2.6 (V) vs. 13.8 ± 2.9 (C), $p = 0.98$). HR post exercise was also not significantly different. On the other hand, results from the subjective measures did produce a notable change. Post exercise motivation level was shown to be higher in A and V when compared to C condition (12.1 ± 1.9 (A) vs. 11.5 ± 1.8 (V) vs. 11.0 ± 2.4 (C), $p = 0.10$). Similar trends were shown in confidence (11.8 ± 1.7 (A) vs. 11.6 ± 1.5 (V) vs. 10.9 ± 2.5 (C), $p = 0.19$) and mood (12.2 ± 1.5 (A) vs. 11.9 ± 1.4 (V) vs. 11.7 ± 1.4 (C), $p = 0.26$). **CONCLUSION:** Based on the findings, neither performance outcomes nor physiological measures differed significantly across the conditions. However, marginal (but not statistically significant) improvements were observed in the A and V conditions compared to the C condition. This suggests that under a short, fixed-intensity protocol, reinforcement strategies may not produce measurable changes in work output or perceived difficulty.

The authors declare no conflict of interest.



Comparison of AI-Based Energy and Macronutrient Estimates with Dietitian-Analyzed Food Records

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Artificial intelligence (AI)-based food tracking applications provide a convenient approach for estimating dietary intake. These applications may be particularly useful for physically active individuals and athletes who monitor energy and macronutrient intake to support health, training, and performance. However, the accuracy of AI-generated estimates compared with dietitian-analyzed food records remains unclear.

PURPOSE: To compare AI-generated energy and macronutrient estimates with food records analyzed by a registered dietitian. **METHODS:** Eleven participants (age: 24.9 ± 10.0 yrs; 64% female) recorded 82 matched meals (4–15 meals/participant) over a 7-day period using an AI-based food tracking application and a detailed written food record. Participants photographed each meal approximately 10 inches above the food in good lighting. The application generated energy and macronutrient estimates from each photograph without participant input or modification. Food records were analyzed by a registered dietitian using USDA FoodData Central. Nutrient estimates were averaged across meals within each participant. Paired t-tests compared estimates between methods, while Pearson correlations assessed associations between methods. **RESULTS:** AI-generated estimates were significantly lower than dietitian-analyzed records for energy (560.5 ± 93.6 vs. 648.4 ± 150.3 kcal; $p = .017$), protein (25.7 ± 6.1 vs. 31.5 ± 7.9 g; $p = .003$), and carbohydrate (59.2 ± 12.6 vs. 66.6 ± 19.0 g; $p = .030$), whereas fat estimates did not significantly differ between methods (24.9 ± 4.7 vs. 28.9 ± 7.2 g; $p = .117$). Positive correlations between methods were observed for energy ($r = 0.743$, $p = .009$), protein ($r = 0.769$, $p = .006$), and carbohydrate ($r = 0.884$, $p < .001$), but not for fat ($r = 0.201$, $p = .554$). **CONCLUSION:** AI-based dietary assessment demonstrated strong associations with dietitian-derived estimates of energy, protein, and carbohydrate, while producing significantly lower estimates for these nutrients. These findings demonstrate the potential of image-only AI for estimating meal-level nutrient content while highlighting systematic differences that should be considered when such applications are used to inform dietary strategies supporting health, training, and performance.

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Evaluation of the Eurans Wrist-Worn Pulse Monitor to Determine Heart Rate during Exercise

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Research is limited in commercially available, affordable HR monitoring technology for real-time regulation of exercise intensity. **PURPOSE:** The purpose of this study was to examine the validity of a wrist-worn photoplethysmography (PPG) HR monitor in women and men during exercise. **METHODS:** A total of 106 recreationally active adults (mean age 29.5 ± 12.1 years) were recruited for this investigation. Participants were prepared for ECG analysis using the functional placement of the limb leads. Once continuous ECG monitoring was confirmed, all subjects were fitted with a Eurans PPG watch on the left arm proximal to the wrist. HR from PPG and ECG were recorded at the end of each minute of rest and exercise and averaged over the 3-minute stage. The 3-minute exercise stages were as follows: Stage 1 – 1.7 mph at 10% grade; Stage 2 – 2.5 mph at 12% grade; Stage 3 - 3.5-5.0 mph at 0% grade; Stage 4 – 3.0 mph at 0% grade.

RESULTS: For both men and women, there were no significant differences between ECG and Eurans across any rest or exercise time period. Strong correlations were observed between HR measured by Eurans and ECG for women ($r = 0.90-0.96$, $p < 0.001$), men ($r = 0.78-0.95$, $p < 0.001$), and combined ($r = 0.90-0.96$, $p < 0.001$). In addition, regardless of HR device, men exhibited significantly lower HR compared to women at every time point ($p < 0.001$). **CONCLUSION:** A Eurans PPG HR device can be used to provide accurate measures of HR in both resting and physically active conditions. The findings of the present study could benefit those individuals seeking an affordable, wrist-worn PPG HR monitor.



Glycemic, Insulin, and Incretin Responses to 4-Week HIIT vs. TRE in Young Adults with Overweight/Obesity

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Reducing excess adiposity improves glucose-insulin dynamics and lowers type 2 diabetes risk across adulthood. Although high-intensity interval training (HIIT) and time-restricted eating (TRE) have shown promise for improving metabolic health, their effects on oral glucose tolerance test (OGTT)-derived diabetes risk indices and the incretin hormones remain unclear. **PURPOSE:** To determine whether 4 weeks of HIIT or TRE improves glucose-insulin dynamics and total glucagon-like peptide-1 (GLP-1) & glucose-dependent insulinotropic polypeptide (GIP) responses during OGTT in young adults with overweight/obesity. **METHODS:** Forty young adults (age 22.7 ± 3.6 [SD] years; BMI 31.0 ± 4.3 kg/m²; 26M/14F) with overweight (n=17) and obesity (n=23) were randomized 2:2:1 ratio to HIIT (n=16), TRE (n=16), or control (n=8). HIIT group performed 3 supervised 20-min cycling sessions/ week for 4 weeks (10×20-s bouts at ~90% max heart rate, 100-s active recovery). TRE group restricted daily caloric intake to a self-selected of ≤10-hr eating window for 4 weeks. All participants underwent body composition assessment and a pre- & post- intervention 2-hr 75g OGTT for glucose, insulin, and incretin measurement. Group x time effects were assessed via repeated measures ANOVA with post-hoc tests (significance set at $p < .05$). **RESULTS:** No significant baseline between-group differences were observed in physical or metabolic characteristics. Following 4-week HIIT intervention, OGTT-glucose area under the curve (AUC) and Matsuda Index were significantly improved only in the HIIT group (14468.0 ± 726.8 to 13465.7 ± 574.9 mg/dL, and 4.06 ± 1.1 to 5.50 ± 2.8 , respectively, $p < .05$). HIIT significantly increased total GIP-AUC (12151.7 ± 1720.6 to 16651.4 ± 2724.3 pg/mL, $p < .05$), with no change in total GLP-1-AUC. No such intervention effects were observed in the TRE or control groups. **CONCLUSION:** HIIT, but not TRE, improved OGTT-derived diabetes risk indices and selectively increased the GIP response. This suggests HIIT-induced amplification of GIP response may confer glycemic benefit both as an adjunct to incretin-based pharmacotherapy and after its discontinuation, warranting further mechanistic investigation. This study was supported by Falk College of Sport, Syracuse University (JYK). The authors declare no conflicts of interest.



Acute Exercise Bout Raises Cortical Perfusion and Brain Insulin Sensitivity in Adults with Cardiometabolic Risk

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Cortical hypoperfusion in the Posterior Cingulate Cortex (PCC) and Anterior Cingulate/Medial Prefrontal Cortex (ACC/mPFC) are recognized as vulnerable regions for Alzheimer's Disease pathology and ischemic cerebrovascular disease. Whether acute exercise can improve cortical perfusion in these cerebral territories before and/or in response to insulin remains unclear. **PURPOSE:** To determine whether a single bout of aerobic exercise increases fasting and insulin-stimulated cortical perfusion within the PCC and ACC/mPFC. **METHODS:** Fifteen (12F/3M) cognitively unimpaired (MoCA 28.2 ± 1.3 a.u.) middle-aged to older adults (56.7 ± 8.2 years) with cardiometabolic risk factors (BMI 31.8 ± 1.3 kg/m², HbA1c $5.8 \pm 0.30\%$, VO₂max 23.9 ± 0.9 mL/kg/min), completed randomized, counterbalanced exercise and rest conditions. Participants performed 60 min of treadmill exercise ($\sim 70\%$ VO₂max) or time-matched rest ~ 16 hr before neuroimaging. After an overnight fast, pseudo-continuous arterial spin labeling MRI was performed before and 30 min after intranasal insulin (40 IU) to determine cortical cerebral blood flow (quantified within Glasser Atlas defined regions). Data were analyzed using paired t-tests, 2x2 repeated-measures ANOVAs, and effect sizes. **RESULTS:** Exercise increased fasting cortical perfusion within PCC (RSC2: $P=0.044$, $d=0.573$; 31pd2 $P=0.018$, $d=0.693$) and ACC/mPFC areas (area 25: $P=0.037$, $d=0.595$; s32: $P=0.021$, $d=0.671$; P24: $P=0.042$, $d=0.579$). Exercise also decreased PCC perfusion in response to insulin compared to rest (condition x time interaction; RSC2: $P=0.011$, $\eta^2p=0.379$; d23ab2: $P=0.025$, $\eta^2p=0.311$; 31pv2: $P=0.025$, $\eta^2p=0.162$; 31pd2: $P=0.012$, $\eta^2p=0.370$; v23ab2: $P=0.040$, $\eta^2p=0.258$). **CONCLUSIONS:** An acute bout of aerobic exercise increased fasting PCC and ACC/mPFC perfusion compared with rest in adults with cardiometabolic risk. Exercise also raised brain insulin sensitivity in the PCC. These findings together suggest that acute aerobic exercise may modulate perfusion within cortical regions susceptible to Alzheimer's Disease and vascular cognitive impairment.

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Accuracy of Seismocardiography-Estimated $\dot{V}O_{2\max}$

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Cardiorespiratory fitness, often assessed via maximal oxygen uptake ($\dot{V}O_{2\max}$) testing, is an indicator of overall health and cardiovascular disease risk. Traditional cardiopulmonary exercise testing (CPET) is the gold standard for measuring $\dot{V}O_{2\max}$; however, it is often time-intensive, physically demanding, and requires specialized equipment and clinical expertise. A novel device uses seismocardiography for a non-invasive method of estimating $\dot{V}O_{2\max}$ without exercise. **PURPOSE:** This study investigated the accuracy of the seismocardiography device by comparing $\dot{V}O_{2\max}$ measurements against the gold standard CPET. **METHODS:** 30 healthy adults (17 female, 13 male, age = 41.47 ± 16.21 years, weight = 78.71 ± 19.19 kg, height = 167.89 ± 9.55 cm) completed a CPET and seismocardiography $\dot{V}O_{2\max}$ test on the same day. Statistical analyses consisted of a Pearson correlation coefficient, dependent samples t-test, Bland-Altman analysis, and Mean Absolute Percentage Error (MAPE) to determine the accuracy of the seismocardiography device. **RESULTS:** The seismocardiography device slightly overestimated $\dot{V}O_{2\max}$ by $1.28 \text{ mL} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$; however, there was no significant difference in $\dot{V}O_{2\max}$ between the two testing methods ($p = .23$). The limits of agreement (5.73 SD) were -10.23 to $12.51 \text{ mL} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$. There was a strong, positive relationship between seismocardiography and CPET $\dot{V}O_{2\max}$ ($r = .87$, $p < .001$). MAPE was 3.79%. **CONCLUSION:** The seismocardiography device demonstrated strong accuracy in $\dot{V}O_{2\max}$ estimation compared with CPET in healthy adults. Therefore, health and fitness professionals may use this device to make cardiorespiratory fitness testing more accessible to the general public. The authors declare no conflicts of interest.



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**COVID-19 Pandemic Impact on Sprint Triathlon Participation Demographics: A Retrospective
Longitudinal Study from 2015-2025**

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The COVID-19 pandemic had a profound impact on access to athletic facilities, personal trainers, group exercise sessions, and amateur competitive events. **PURPOSE:** This study sought to determine participation volume, sex, and age differences for the 5-years before and after the COVID-19 pandemic for a sprint triathlon. **METHODS:** Retrospective participation volume, sex, and age data were obtained online from DQEVENTS.COM for the 2015 to 2025 Long Beach Island, NJ Triathlons (swim=0.25 miles, bike=11 miles, run=3 miles). The 2020 triathlon was cancelled. A Chi-square analysis was used to compare the proportion of women versus men participating pre- to post-pandemic. Two-way ANOVAs were used to compare age and participation volume of for women and men pre- to post-pandemic. Significance was set at less than 0.05, with results shown as mean (SD). **RESULTS:** The percentage of women participating overall was 35.9% versus 64.1% for men ($p<0.001$), and the proportion did not differ significantly pre- to post-pandemic. The mean volume of participation for women 5-years pre- and 5-years post-pandemic was 94.6 (12.6) and 102.4 (8.5), $p=0.84$, and for men was 152.2 (12.0) and 196.2 (22.4), $p=0.003$. Overall, women were younger, with a mean age of 40.4 (13.5) years versus men 44.1 (14.6) years, $p<0.001$. Age did not differ pre- to post-pandemic for either women or men. **CONCLUSION:** For the Long Beach Island, NJ sprint triathlon from 2015 to 2025, 36% participation by women was proportionally less than men, and the men were older by an average of 4.3 years. For the 5-years post-pandemic, there was a significant increase in the volume of men participating that was not observed for women. These results suggest that the COVID-19 pandemic may have impacted women and men differently regarding triathlon participation. Further study is suggested to investigate post-pandemic factors that may influence amateur athletic event participation for women versus men.



Glucose Variability and Endothelial Function in Young Adults Without Diabetes

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Glucose variability (GV), defined as the magnitude of glucose fluctuations over time, has been associated with early markers of cardiovascular disease, including endothelial dysfunction, in individuals with diabetes. These associations are observed independent of traditional measures of glycemic control, such as hemoglobin A1c (HbA1c) and fasting blood glucose (FBG). However, whether these associations are present in individuals without diabetes remains unclear. **PURPOSE:** This study aimed to examine the relation between GV and endothelial function in young adults without diabetes. It was hypothesized that greater GV would be associated with lower endothelial function in young adults without diabetes. **METHODS:** Preliminary data from 10 healthy participants (8W/2M, age 23 ± 2 years, BMI 23.4 ± 4.1 kg/m², BP $114 \pm 15/73 \pm 10$ mmHg) were analyzed. Following a screening visit to confirm normoglycemia ($\text{HbA1c} \leq 5.7\%$, $\text{FBG} \leq 110$ mg/dL), participants completed a 14-day monitoring period during which interstitial glucose was measured every 15 minutes using a continuous glucose monitor (CGM). CGM-derived glycemic metrics included coefficient of variation (CV), time in range (TIR, 70-140 mg/dL), and mean amplitude of glucose excursions (MAGE). On day 14, endothelial function was assessed using brachial artery flow-mediated dilation (FMD). Pearson correlations were conducted to assess the associations between CGM-derived GV metrics and relative FMD. **RESULTS:** Mean CV was $16.7 \pm 2.0\%$ (range: 12.4-19.1%), TIR was $90.4 \pm 8.9\%$ (range: 73.7-98.1%), and MAGE was 35.8 ± 5.8 mg/dL (range: 23.2-43.1 mg/dL). Relative FMD was $6.8 \pm 2.1\%$ (range: 3.7-10.2%). FMD was not significantly correlated with CV ($r=0.26$, $p=0.48$), TIR ($r=0.27$, $p=0.44$), or MAGE ($r=0.15$, $p=0.67$). **CONCLUSION:** These preliminary data do not demonstrate significant associations between CGM-derived glycemic metrics and endothelial function in young adults without diabetes. Further investigation in a larger sample is warranted to determine the relation between GV and endothelial function in young adults without diabetes.

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Cardiac Autonomic Responses During Early Recovery Following Acute Resistance Exercise Using A Bivariate Framework

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Cardiac autonomic control is not necessarily reciprocal; therefore, concurrent assessment of sympathetic and parasympathetic indices may better characterize post-exercise autonomic responses. **PURPOSE:** To examine cardiac sympathetic and parasympathetic modulation before, immediately after, and 15 min after resistance exercise using pre-ejection period (PEP) and high-frequency heart rate variability (HF-HRV). **METHODS:** Thirty-one subjects completed a 5-repetition maximum (5RM) assessment on chest press, leg press, and low-row machines. During the second visit, each subject performed at 65-85% of 5RM until failure for the three exercises. PEP and HF-HRV were collected pre-exercise (PRE), immediately post-exercise (IPE), and 15 minutes post-exercise (15PE). HF-HRV was log-transformed (lnHF-HRV) due to positive skewness. Separate one-way repeated-measures analyses of variance (ANOVAs) were used to examine changes in PEP and lnHF-HRV across time, followed by Bonferroni-adjusted pairwise comparisons ($\alpha=.05$). **RESULTS:** There was a significant effect of time on PEP, ($F(2, 60) = 56.56, p < .001, \eta_p^2 = .653$). PEP significantly decreased from PRE (0.123 ± 0.020 s) to IPE (0.083 ± 0.017 s; $p < .001$). While PEP increased significantly at 15PE (0.111 ± 0.022 s; $p < .001$) compared to IPE, PEP remained significantly lower than PRE at 15PE ($p = .026$). There was also a significant effect of time on lnHF-HRV, ($F(2, 60) = 50.71, p < .001, \eta_p^2 = .628$). lnHF-HRV significantly decreased from PRE (6.533 ± 0.846) to IPE (4.228 ± 1.315 ; $p < .001$). While lnHF-HRV increased significantly at 15PE (5.625 ± 0.951 ; $p < .001$) compared to IPE, it remained significantly lower than PRE ($p < .001$). **CONCLUSION:** Resistance exercise led to cardiac sympathetic activation and parasympathetic withdrawal, followed by partial recovery at 15 minutes. Concurrent assessment of PEP and HF-HRV highlights the potential value of a bivariate framework for characterizing early post-exercise autonomic recovery.



Impact of Cardiac Rehabilitation on Depression and Quality of Life Across Surgical Sites and Procedures

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Cardiovascular disease (CVD) is the leading cause of death globally (3). After a cardiovascular event, cardiac rehabilitation (CR) is utilized to reduce secondary events and cardiac-related mortality, with the primary focus on physical restoration (2). Thus, very few studies have examined the psychosocial outcomes of CR by procedure type and incision location. **PURPOSE:** This study examined the effects of CR on depression and quality of life (QoL) amongst post-cardiac surgery patients. **METHODS:** Data were retrospectively extracted from electronic medical records (EMR) of 82 adults who completed all 36 sessions of phase II CR between January 2022 and October 2025. This includes 30 Coronary Artery Bypass Graft (CABG), 37 Percutaneous Coronary Intervention (PCI), 7 Aortic Valve Replacement (AVR), and 8 Transcatheter Aortic Valve Replacement (TAVR) patients. Variables included initial-discharge PHQ-9 and Dartmouth COOP scores, demographics, surgical procedure details, comorbidities, and medications. Descriptive statistics were calculated for demographic data and dependent variables. Paired t-tests were used for each surgical procedure and incision location. **RESULTS:** Depression and QoL improved significantly following CR across surgical groups (pre-post difference: 1.39 ± 0.38 , $p=0.001$; 4.41 ± 0.84 , $p<0.001$); however, depression in the AVR group had no statistically significant difference ($t=1.92$, $p=0.103$). Improvements also differed by incision location. Patients with chest incisions demonstrated the greatest improvements, with depression scores decreasing by approximately 50% from admission to discharge (pre: 3.08 ± 2.98 vs post: 1.57 ± 2.18 ; $p=0.002$). **CONCLUSION:** CR is effective in reducing depression and improving QoL; however, outcomes among patients undergoing AVR warrant further investigation due to the small sample size. These findings have significance as it highlights the differences in psychosocial recovery following cardiac procedures and suggest that targeted education, mental health resources, and routine check-ins may improve outcomes for patients at greater risk for poor mental health recovery. The authors declare no conflicts of interest.



Is It Nature or Nurture? Prenatal and Postnatal Environment on Infant Motor Development

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Infant gross motor development is influenced by both biological and environmental factors. Prenatal programming suggests that the maternal environment, including prenatal exercise, may influence offspring health and development, while the postnatal environment may further influence developmental trajectories. Although prenatal exercise has been associated with positive infant health outcomes, it remains unclear how prenatal exercise exposure influences gross motor development across the first year of life. **PURPOSE:** To determine the effects of prenatal exercise mode on infant gross motor skill trajectories at 1, 6, and 12 months of age and consider these findings within the context of postnatal environmental influences on infant motor development. **METHODS:** Healthy pregnant women between 18-40 years old were randomized into one of four groups (aerobic (AE), resistance (RE), combination (CE) exercise, or attention control (CON) group). Infant gross motor skills were assessed at 1, 6, and 12 months using the Peabody Developmental Motor Scales, 2nd Edition (PDMS-2). 168 mother infant pairs were included. Hierarchical linear growth curves analyzed the association between prenatal exercise and infant gross motor skill trajectories over the first year. **RESULTS:** Exercise mode had a significant positive influence on infant gross motor skill development over time. Stationary percentile ($p < .01$), Locomotion percentile ($p < .001$), and GMQ percentile ($p < .001$) scores were significantly higher across time in infants exposed to prenatal exercise, with the most significant differences observed in the CE group, followed by RE and AE, and the least amount of change in the CON group. **CONCLUSION:** Findings support an association between prenatal exercise and infant gross motor development throughout the first year of life. However, postnatal environmental factors, including responsive caregiving, tummy time, enriched home environments, and opportunities for movement, may also influence motor development. **SIGNIFICANCE/NOVELTY:** Considering both prenatal and postnatal environments may provide a more comprehensive understanding of factors contributing to infant motor development and opportunities to optimize developmental trajectories.

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1,3-Butanediol Ketone Supplementation and Resistance Exercise Performance: A Randomized Crossover Trial

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Exogenous ketone supplements acutely elevate circulating β -hydroxybutyrate (β HB) and may influence high-intensity exercise metabolism and performance. **PURPOSE:** This study examined the acute effects of R-1,3-butanediol (BDO) supplementation on repeated squat performance, blood metabolites, heart rate, perceptual responses, and tolerability in resistance-trained males. **METHODS:** Fourteen resistance-trained males (20.7 ± 1.7 yr; 92.9 ± 17.7 kg; squat one-repetition maximum [1RM]: 155.5 ± 25.1 kg) completed two experimental trials in a randomized, double-blind, placebo-controlled crossover design, ingesting either BDO ($0.5 \text{ g} \cdot \text{kg}^{-1}$) or placebo 60 min before completing five sets of squats at 70% 1RM to volitional failure. **RESULTS:** BDO increased blood β HB from 0.13 ± 0.08 to $1.56 \pm 0.34 \text{ mmol} \cdot \text{L}^{-1}$ ($p < 0.001$) and decreased blood glucose (BDO: 85.98 vs. placebo: $92.46 \text{ mg} \cdot \text{dL}^{-1}$; $p < 0.001$). Squat repetitions, power output, and bar velocity declined significantly across sets (all $p < 0.001$). Total repetitions (BDO: 58.1 ± 20.8 vs. placebo: 55.5 ± 18.2) and total weight lifted (BDO: 6366.9 ± 2692.6 vs. placebo: 6063.2 ± 2372.7 kg) were 5% higher following BDO, but no significant condition or condition $\times$ set interaction effects were observed. BDO was generally well tolerated, with only one participant reporting gastrointestinal discomfort. **CONCLUSION:** Acute BDO supplementation induced rapid metabolic changes during resistance exercise. Although total repetitions and total weight lifted were modestly higher following BDO, these differences were not statistically significant. Future work should assess whether BDO supplementation translates to significant differences in resistance exercise adaptations across multiple workouts.

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ADP Incubation Induces Acute Rearrangements of Mitochondrial Supercomplexes in Skeletal Muscle but not in Heart

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PURPOSE: During exercise, ATP hydrolysis in skeletal muscle increases rapidly, resulting in a rise in intracellular ADP. While ADP is well established as a signal for stimulating mitochondrial OXPHOS, it is unknown whether acute changes in ADP modify organization of the electron transport chain (ETC). ETC complexes I–IV associate into higher-order structures known as supercomplexes (SCs), increasingly recognized as dynamic arrangements that may influence electron flux through the respiratory chain. Exercise training (16 weeks) increases SC abundance in skeletal muscle and is associated with enhanced mitochondrial respiration; however, whether SC remodeling occurs acutely in response to exercise-related metabolic signals remains unclear. We sought to determine whether ADP, a primary intracellular signal of increased energetic demand during exercise, acutely modifies ETC SC organization in isolated skeletal muscle mitochondria. **METHODS:** Mito isolated from C57BL/6 mouse hearts and mixed SKM were provided respiration media and Pi and incubated with or without ADP and/or fuels in an unsealed chamber for 20'. Samples aspirated at baseline, 5', and 20' incubation were immediately pelleted. Blue Native Gel Electrophoresis was used to determine ETC SCs. Two-way, repeated measures or mixed-model ANOVA ($\alpha=0.05$) were used for analysis. **RESULTS:** In SKM mito, total SC content ($p=0.0479$; $p=0.0405$) and higher-order SCs (CI_2+CIII_2 ; SC-XL; $p<0.0001$; $p<0.0001$) increased progressively throughout 5' and 20' ADP incubation compared to mito incubated without ADP, and without ADP or fuels. Tissue comparison between heart and SKM mito revealed significant, progressive increases in total SC abundance in SKM but not in heart following ADP incubation at 5' and 20' incubation ($p=0.0001$; $p<0.0001$). SC-XL content increased at 5' and 20' compared to total protein ($p=0.0012$; $p=0.0072$) and total SCs ($p=0.0055$, $p=0.182$) in SKM but not heart. **CONCLUSION:** We reveal ADP incubation initiates SC formation in SKM, primarily driven by higher-order SCs, yet is insufficient to stimulate SC assembly heart mitochondria. Tissue-specific responses may indicate distinct, intrinsic mechanisms within SKM and heart mitochondria operate independently of extramitochondrial signaling to orchestrate ETC ultrastructural arrangements. Funding: UMD Graduate Research Initiative Project (GRIP); UMD STAR/ADAPT Program



Effects of Resistance Training on Anabolic Signaling Proteins Akt and PP2Ac in Sarcopenic Older Adults

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The age-related loss of muscle mass, known as sarcopenia, is a condition that increases in prevalence in older adults and contributes to greater risk of falls and loss of independence. Anabolic signaling proteins such as protein kinase B (Akt) and protein phosphatase 2A subunit c (PP2Ac) are regulators of skeletal muscle hypertrophy, where PP2Ac is thought to act as a negative regulator on Akt. Resistance training (RT) may enhance anabolic signaling and therefore improve muscle mass and strength, ameliorating the effects of sarcopenia. Currently, it is unclear whether RT can alter Akt and PP2Ac protein expression and whether this translates to improvements in muscle mass or strength in sarcopenic older adults. **PURPOSE:** To determine the effects of 12 weeks of RT on Akt and PP2Ac protein expression in sarcopenic older adults. **METHODS:** Ten sarcopenic older adults (65-88 yrs) completed 12 weeks of lower body RT, with vastus lateralis biopsies before and after RT. Protein expression (Akt & PP2Ac) was assessed by western blot. Isometric knee extensor strength and body composition (dual-energy X-ray absorptiometry) were measured at both timepoints. Data were analyzed using paired samples t-tests. **RESULTS:** Akt protein expression significantly increased in older adults with sarcopenia after 12 weeks of RT (1.05 ± 0.03 AU vs. 1.64 ± 0.08 AU, $p=0.038$), while no significant change was observed in PP2Ac protein levels (1.19 ± 0.06 AU vs. 1.35 ± 0.04 AU, $p=0.269$). Knee extensor force increased significantly after RT (111 ± 10 Nm vs. 126 ± 18 Nm, $p<0.05$), but there were no changes in lean body mass (44.0 ± 3.3 kg vs. 43.9 ± 3.3 kg), or body fat percentage ($36.8 \pm 1.4\%$ vs. $37.0 \pm 1.4\%$). **CONCLUSION:** Twelve weeks of RT increased Akt protein expression, reflecting the potential for anabolic signaling. However, while lower-limb strength improved, no significant change was observed in lean body mass or PP2Ac protein expression. This is among the first studies to examine Akt and PP2Ac expression in sarcopenic older adults following RT. Our findings suggest that, given the anabolic deficits associated with sarcopenia, anabolic signaling may remain blunted in sarcopenic muscle despite training and that a greater training stimulus may be necessary to fully elicit this pathway.

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Analyzing the Biomechanics of Baseball Pitching Using AI-Based Pose Detection Algorithms

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Baseball pitching generates substantial stress on players' elbows, placing considerable risk of injury. Pitch kinematics have been studied using motion capture systems, but there is a lack of evidence on pitching dynamics during live gameplay. Recent advancements in AI-based pose detection algorithms provide potential solutions by enabling motion analysis from a single camera view. **PURPOSE:** To examine the accuracy of a pose estimation algorithm (GVHMR) in analyzing pitching kinematics and the influence of camera view. **METHODS:** Four college-aged males (age: 22 ± 0.8 yrs) completed 15 pitching trials. Ground truth for pitching kinematics was derived from motion capture (Vicon). Trials were concurrently recorded by two video cameras positioned at posterior and sagittal views. Videos were processed with GVHMR, a monocular human pose estimation model. Six kinematic parameters — elbow flexion, shoulder abduction, shoulder external rotation, pelvis angular velocity, trunk angular velocity, and stride length — were computed at two events: maximal shoulder external rotation (MER) and ball release (BR). Accuracy was quantified as the mean absolute percentage error ($\text{MAPE} = 100\% \times |(GVHMR - VICON)/VICON|$). Paired two-tailed t-tests compared per-parameter MAPE between the two camera views ($\alpha = 0.05$). **RESULTS:** GVHMR was most accurate (MAPE 5–15%) when camera view was matched to the parameter's plane of motion. For frontal-plane motion, the posterior view was more accurate for shoulder abduction at MER ($14.7 \pm 5.3\%$ vs. $21.0 \pm 11.7\%$; $p = 0.03$) and BR ($12.9 \pm 6.5\%$ vs. $18.9 \pm 9.5\%$; $p = 0.03$), while elbow flexion did not differ by view ($9.7 \pm 6.6\%$ vs. $10.7 \pm 10.0\%$; $p = 0.68$). For sagittal-plane motion, shoulder external rotation at MER was more accurate from the sagittal view ($7.8 \pm 5.9\%$ vs. $14.6 \pm 9.6\%$; $p = 0.03$), with a similar non-significant trend for stride length ($4.9 \pm 3.6\%$ vs. $9.5 \pm 9.0\%$; $p = 0.09$). Transverse-plane parameters (pelvis/trunk angular velocity) were the least accurate overall (MAPE 17.5–30.5%).

CONCLUSIONS: GVHMR's accuracy for monocular pitching analysis depends on matching the camera view to each parameter's plane of motion. Given that baseball broadcasts commonly use posterior views (e.g., center field), the <15% error observed for most parameters is encouraging for practical application in real-world settings.

The authors declare no conflicts of interest.

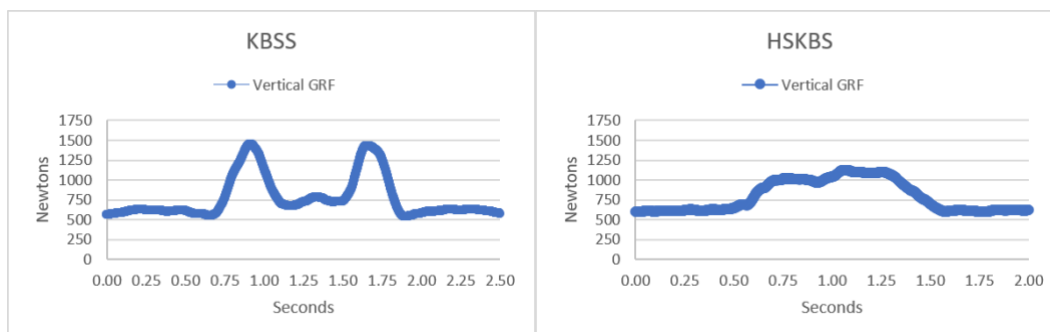


Kinetic Comparison of the One-Hand Kettlebell Sport Swing to the One-Hand Hard Style Kettlebell Swing

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Kinetics of the Hard Style Kettlebell Swing (HSKBS) are known. The Kettlebell Sport Swing (KBSS) is different in that the knees go through flexion and extension twice for each repetition as compared to once with the HSKBS. The KBSS involves a double knee bend and the HSKBS a single knee bend. The kinetic properties of the KBSS are not yet known. **PURPOSE:** This study compared the vertical ground reaction force (vGRF) profiles of the one-hand KBSS to the one-hand HSKBS. The primary variable compared was the peak vGRF. The secondary variables compared were the rate of force development (vRFD) of the vGRF as well as the time to peak vertical force (tPeak). **METHODS:** Preliminary data of ten participants (6 women; 4 men; age 31.7 ± 11.0 yrs; BMI 23.3 ± 2.8) were analyzed. Males used a 20 kg and females a 12 kg kettlebell to perform 12 consecutive repetitions for both the KBSS and the HSKBS while standing on force plates recording at 1000 Hz. The average of the middle 10 repetitions were used for analysis. Vertical force time curves (FTC) were used to visually identify the peak vGRF. Paired samples T-Tests were used for variable comparisons. **RESULTS:** The KBSS (M = 1381 N) had higher peak vGRF compared to the HSKBS (M = 1162 N) ($p < .001$; ES = 2.59), similar vRFD (M = 778 N/s) (M = 806 N/s) ($p < .728$; ES = -0.11) and a longer tPeak (M = 1.12 s) (M = 0.80 s) ($p < .001$; ES = 1.63). **CONCLUSION:** The KBSS had higher peak vGRF. The FTC of the KBSS shows two distinct peaks representing the downswing, first knee bend and upswing, second knee bend. Whereas the vGRF FTC of the HSKBS shows less distinct downswing and upswing peaks and instead shows more of a plateau of the single knee bend. The vRFD was similar between the KBSS and HSKBS. The KBSS took more time to reach the peak vGRF compared to the HSKBS. A KBSS repetition takes longer to complete compared to the HSKBS because of the double knee bend. Our findings can be applied when selecting kettlebell swing technique variations for training goals. The authors declare no conflicts of interest.



Graph 1: Vertical ground reaction force time curves of a single example repetition each of the KBSS, and the HSKBS.



The Role of Formal Nutrition Coursework in Sports Nutrition Knowledge Among Physically Active College Students

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Sports nutrition knowledge (SNK) among recreational and collegiate athletes can impact sport performance and injury rates. It is unclear what factors influence this knowledge. **Purpose:** This study's purpose was to examine SNK among physically active college students and to determine which factors, including exercise type, competitive level, training volume, body composition, and completion of a college-level nutrition course, were meaningfully associated with SNK. **Methods:** An online survey was completed by physically active college students in the U.S during fall 2020. A total of 425 initial responses were received. After exclusions for incomplete and/or ineligible responses, 224 were used for data analysis. Independent T-tests were used to determine what factors affected SNK. A MANOVA test was used to investigate factors affecting SNK subscores. **Results:** Respondents were primarily female (66%), White (63%), not of Hispanic or Latino origin (71%), and recreationally active (72%). Overall SNK scores were low ($M = 13.43 \pm 5.87$ out of 26; 51.65%). 67% ($N = 151$) have taken a college nutrition course. SNK was significantly higher among respondents who took a college course ($p = 0.02$). Respondents who took a college nutrition course did significantly better on the subsections of weight management and sports nutrition, but did not demonstrate significantly different knowledge on subsections of macronutrients, micronutrients, or supplements. There was no difference in SNK between vegetarians and non-vegetarians, or weight trainers and other exercisers ($p > 0.05$), nor was there any difference due to BMI, weekly training volume, or eating attitudes ($p > 0.05$). **Conclusion:** Among physically active college students, SNK scores are low. Prior enrollment in a college-level nutrition course led to higher knowledge scores, but only in certain areas. An opportunity exists to develop and implement nutrition education specifically for physically active college students.

The authors declare no conflicts of interest.



Exam-Related Stress and Microvascular Function in Undergraduates: Assessment of Reactive Hyperemia Area Under the Curve

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Acute mental stress is associated with detrimental effects on vascular endothelial function, abnormalities in blood flow, and impaired microvascular perfusion, which may contribute to cardiovascular disease (CVD) risk. University-level exam-related acute stress can induce physiological responses associated with endothelial dysfunction. Near-infrared spectroscopy (NIRS) with vascular occlusion is a cost-effective method for indirectly assessing microvascular function. **PURPOSE:** This study aims to determine whether microvascular perfusion differs during exam weeks compared to the beginning of the academic term and to examine its relationship with self-reported acute mental stress in college students. **METHODS:** Participants aged 18-30 years completed two laboratory visits: one in the first or second week of the academic term representing baseline, and the second on the morning of a mid-term examination. At each visit, participants completed the GAD-7 Anxiety Survey and microvascular perfusion was assessed using NIRS during a vascular occlusion protocol. A portable NIRS device was placed over the participant's left flexor digitorum superficialis muscle to measure skeletal muscle oxygen saturation (smO₂%), and a blood pressure (BP) cuff was secured around the antecubital space on the same arm. After a 5-minute baseline period, the BP cuff was inflated around the upper arm to super-systolic pressure for 5 minutes, followed by 5 minutes of post-occlusion monitoring. **RESULTS:** Thirteen participants completed both laboratory visits. Mean smO₂% area under the curve (AUC) during 5-minutes post-occlusion did not statistically differ between baseline (21,049.4 ± 2,369.2) and exam day (22,183.8 ± 1,667.5) based on a two-tailed paired *t*-test ($t(12) = -1.87, p = .087, 95\% \text{ CI } [-2,458.8, 190.0]$). Cohen's *d* was -0.52 (95% CI [-1.09, 0.07]). **CONCLUSION:** Although mean smO₂% AUC was higher on the exam day, preliminary analysis did not demonstrate a significant difference in microvascular perfusion as measured by smO₂% AUC between baseline and the exam day visit. Data collection is ongoing, and a larger sample may provide additional insight into the relationship between exam-related acute stress and microvascular function in college students.

Describing Underfoot Forces in Division 1 Softball Pitching

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Softball is a sport growing in popularity, and women's NCAA participation has continuously increased for over a decade. The pitching position is a key part of a softball team's success, and the underhand windmill pitch is a complex motion with high rates of upper extremity injury. Pitchers are over twice as likely to experience injuries as other position players. The ground reaction forces generated during pitching transfer energy into the pitching arm and can be used to evaluate risk of injury and level of performance.

PURPOSE: The study described ground reaction force (GRF) traces from in-shoe pressure insoles during fastball pitching in Division 1 (D1) softball athletes. **METHODS:** As part of a larger study, force data was collected using an in-shoe pressure insole system on 5 D1 female softball pitchers (19 ± 1.4 years; 24.8 ± 1.5 kg/m²). Each pitcher completed 4 fastball pitches. Estimated GRF traces were normalized to body weight and metrics relating to injury risk or pitch performance were extracted. The variables of interest, chronologically (Fig 1), were the weight shift on to the stride and drive leg during pitch initiation, peak force stride leg push-off, rate of force development (RFD) drive leg push-off, peak force drive leg push-off, and peak force stride leg landing. The mean, standard deviation, and median were calculated for each metric across all pitchers. **RESULTS:** Statistics for each metric (mean $\pm$ SD) are reported in percent body weight. Stride leg weight shift ($87.8\% \pm 9.9\%$), drive leg weight shift ($15.9\% \pm 12.5\%$), peak force stride leg push-off ($193.4\% \pm 44.2\%$), RFD (522.8 ± 58.4 %/s, 528.2 %/s), peak force drive leg push-off ($185.8\% \pm 14.6\%$), peak force stride leg landing ($329.5\% \pm 43.9\%$). **CONCLUSION:** Describing pitching forces is a critical step in understanding injury risk and performance in softball pitching. These metrics, in combination with performance metrics and motion capture data, will be used in future work to advance pitching biomechanics. The authors declare no conflicts of interest.

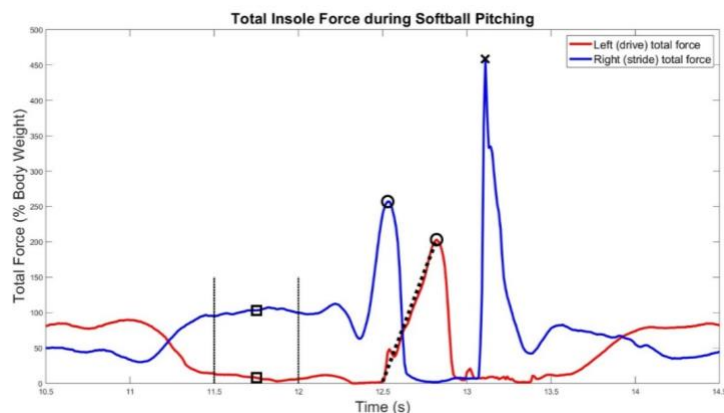


Fig 1. Estimated GRF trace from a typical fastball pitch with drive leg in red and stride leg in blue. Weight shift stride and drive leg during pitch initiation are denoted with $\square$ (Estimated plateaus shown by thin vertical dotted lines), peak force stride leg push-off (O on blue line), rate of force development (RFD) drive leg push-off (thick dotted line), peak force drive leg push-off (O on red line), and the peak force stride leg landing (X).



Subjective Sleep Quality is Associated With Microvascular Function, but Not Macrovascular Function, in Shift-Working First Responders

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Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in first responders. Insufficient sleep duration and irregular sleep schedules in first responders are major contributing factors to CVD. Insufficient and poor-quality sleep contributes to vascular endothelial dysfunction, an independent risk factor for CVD, by promoting a pro-oxidative environment (i.e., oxidative stress) and thereby reducing nitric oxide bioavailability. However, the relation between subjective sleep quality and vascular endothelial function in first responders has not yet been explored. **PURPOSE:** To determine if there is a relation between subjective sleep quality and macrovascular and microvascular function in young-to-middle-aged shift-working first responders. It was hypothesized that poor sleep quality would be correlated with lower macrovascular and microvascular function in shift-working first responders. **METHODS:** Participants (n=25) were Emergency Medical Technicians, paramedics, and police officers with a mean age of 28±9 yrs. Sleep quality was self-reported using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Macrovascular function was assessed as brachial artery diameter change during flow-mediated dilation (FMD), while microvascular function was assessed using femoral artery blood flow (BF) responses to passive leg movement (PLM). Pearson correlations were used to evaluate associations between sleep and vascular function. **RESULTS:** PSQI was not correlated to FMD percent ($r=-.13$, $p=.58$) or FMD absolute diameter change ($r=-.15$, $p=.51$). The BF area under the curve during PLM was negatively correlated with the PSQI score ($p=.19$) and was of large effect ($r=-.53$). The absolute BF change during PLM also trended to be negatively correlated with PSQI score ($p=.61$) but did not reach statistical significance, although the relation was of moderate-to-strong effect ($r=-.44$). **CONCLUSIONS:** Our preliminary findings suggest that subjective sleep quality is not associated with macrovascular function but may be associated with reduced microvascular function in shift-working first responders. Poor sleep quality may be a key factor in first responders' elevated CVD risk, although future work is warranted.

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Hemisphere-Specific Cerebral Oxygenation Reactivity During Executive Function Tasks

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Neurovascular coupling is a physiological mechanism connecting brain activity to cerebral blood flow (CBF). Low-cost portable near-infrared spectroscopy (NIRS) devices may offer an alternative to expensive full-array functional near-infrared spectroscopy (fNIRS) systems for studying neurovascular coupling; however, their sensitivity to hemisphere-specific, task-related changes in cerebral oxygenation is not fully established. **PURPOSE:** To examine hemisphere-specific reactivity of cerebral oxygenation, measured with a low-cost NIRS instrument, during cognitive tasks. **METHODS:** Twenty-one participants (age 22 ± 3 years, $n = 17$ female) underwent bilateral monitoring of cerebral hemodynamics using NIRS during seated rest and during two cognitive tasks known to preferentially activate the right prefrontal cortex (PFC): a Stop Signal Task (SST) and a Sustained Attention Task (SAT). Paired-samples t-tests compared cerebral hemodynamic measures during task conditions and rest across the left and right PFC. **RESULTS:** No significant differences from rest were found in the left PFC in any condition and for any parameter (Table 1, $p > .10$). Significant increases in regional oxygen saturation (rSO₂) (mean change = $+0.54\%$, $p = .041$) and decreases in deoxyhemoglobin (HHbi) (mean change = -0.52% , $p = .028$) from rest were found during SST in the right hemisphere (Table 1). There was a non-significant increase from rest in rSO₂ during SAT in the right hemisphere (Table 1, mean change = $+0.35\%$, $p = .073$). HHbi also showed a non-significant decrease during SAT in the right hemisphere (mean change = -0.30% , $p = .084$). **CONCLUSION:** There were right-lateralized changes in cerebral hemodynamic responses measured during cognitive tasks. Our findings suggest that lower-cost NIRS monitoring may be a useful and sensitive research tool to study neurovascular coupling across the left and right PFC.

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Table 1. Cerebral hemodynamics during cognitive tasks stratified by hemisphere

Measure	Hemisphere	Rest	SAT	SST	<i>p</i> -value SAT / SST
rSO ₂	Left PFC	68.18 ± 4.71	68.05 ± 4.98	68.24 ± 5.38	.602 / .842
	Right PFC	68.46 ± 6.52	68.81 ± 6.28	69.00 ± 6.55	.073 / .041
HHbi	Left PFC	-0.66 ± 1.14	-0.61 ± 1.25	-0.70 ± 1.07	.769 / .795
	Right PFC	-0.39 ± 1.05	-0.69 ± 0.98	-0.91 ± 1.19	.084 / .028
SAT, sustained attention task; SST, stop signal task rSO ₂ , regional oxygen saturation; HHbi, deoxyhemoglobin index					



Performance and Metabolic Effects of Stepwise Carbohydrate Ingestion During Prolonged Cycling in Trained Triathletes

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Current endurance-fueling recommendations commonly advocate carbohydrate (CHO) ingestion rates of 60-90 g/h during prolonged exercise, yet few randomized dose-response studies directly compare minimal, moderate, and high CHO intakes using endurance-capacity and performance outcomes. **PURPOSE:** We evaluated whether increasing CHO intake during prolonged cycling improves endurance capacity and performance, alters whole-body, exogenous, and endogenous CHO oxidation, and whether greater CHO availability and oxidation translate into improved performance. **METHODS:** Twelve competitive and trained male triathletes (35.3 ± 7.1 yr; $\dot{V}O_{2\max}$: 57.6 ± 10.0 mL·kg⁻¹·min⁻¹) habitually consuming a carbohydrate-based diet completed four trials in a randomized, double-blind, placebo-controlled, counterbalanced crossover design. Each trial consisted of cycling at 70% maximal oxygen uptake to volitional exhaustion followed by a 5-min recovery and a self-paced 20-km time trial (TT), while ingesting 0, 10, 60, or 90 g CHO/h. Repeated-measures analyses of variance were used; data are means $\pm$ SD. **RESULTS:** Time-to-exhaustion (TTE) did not differ across 0, 10, 60, and 90 g/h (88.8 ± 31.1 , 93.7 ± 33.7 , 86.2 ± 31.2 , and 91.0 ± 36.8 min; $P = 0.437$), nor did TT time (36.3 ± 3.0 , 36.7 ± 3.9 , 36.7 ± 3.1 , and 35.7 ± 2.8 min; $P = 0.297$). During TTE, CHO oxidation was 17% higher at 90 than 0 g/h ($P = 0.029$), while fat oxidation was lower at 90 than 0, 10, and 60 g/h ($P = 0.015$, 0.041 , and 0.022). During TT, CHO oxidation was 29% higher at 60 than 0 g/h ($P = 0.026$), while fat oxidation was lower at 60 and 90 than 0 g/h ($P = 0.012$ and 0.013). Exogenous CHO oxidation during TTE was higher at 60 and 90 than 10 g/h (0.49 ± 0.26 and 0.63 ± 0.24 vs. 0.08 ± 0.04 g/min; both $P < 0.001$) but did not differ between 60 and 90 g/h; endogenous CHO oxidation during exercise was similar across conditions. Blood glucose was higher with 60 and 90 g/h without corresponding improvements in performance or perceptual responses. **CONCLUSION:** Higher CHO intakes increased exogenous and whole-body CHO oxidation and suppressed fat oxidation without improving endurance capacity or TT performance. These findings indicate that greater exogenous CHO availability and oxidation did not reduce endogenous CHO oxidation during exercise or improve endurance performance under these conditions.

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P.B.L. is a cofounder of Athletica AI and HIIT Science. P.J.P. serves on the Scientific Advisory Board for Nutrishus. T.D.N. is an author of low-carbohydrate nutrition books; book royalties are donated to The Noakes Foundation, which contributes to the Eat Better South Africa Campaign. J.S.V. receives royalties from book sales; is the founder, consultant, and stockholder of Virta Health; and serves on the advisory board for Simply Good Foods. A.P.K. serves on the Scientific Advisory Boards for Simply Good Foods, Nutrishus, Medifoodz, and Health Via Modern Nutrition, Inc. All other authors declare no conflicts of interest.



Eccentric Rather than Concentric Electrical Stimulations Produce Greater Indirect Markers of Muscle Damage

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Eccentric contractions induce more muscle damage when completed voluntarily, but whether this holds true for involuntary electrical stimulations is unknown and may provide more information regarding the specific mechanisms behind exercise-induced muscle damage. **PURPOSE:** To determine whether eccentric or concentric electrical stimulations produce greater indirect markers of muscle damage. **METHODS:** Individuals completed three sets of 20 repetitions on an isokinetic dynamometer with 60s rest between sets. Both arms were moved passively at a speed of 30°/sec through 90° of elbow flexion. One arm was stimulated during the concentric and one during the eccentric phase. Each contraction lasted 3s and was completed at the maximal tolerable intensity that was chosen by the participant. Indirect markers of muscle damage were taken before and 48h after completion of electrical stimulations. **RESULTS:** A total of 22 individuals completed the study. There were no differences between the chosen stimulation amplitudes between concentric and eccentric protocols for set 1 (concentric: 39, eccentric: 40 mA; $p=0.501$), set 2 (concentric: 46, eccentric: 44 mA; $p=0.458$), or set 3 (concentric: 48, eccentric: 49 mA; $p=0.579$). Similarly, there were no differences in mean peak torque output when comparing concentric [20.4 (12.1) Nm] and eccentric [18.1 (5.5) Nm] protocols ($p=0.240$). Eccentric electrical stimulations resulted in greater decrements in isokinetic torque (concentric Δ : 2.4, eccentric Δ : -2.1 Nm; $p=0.004$), increases in pain-sensitivity (concentric Δ : 1.7, eccentric Δ : -4.2 N/cm²; $p=0.032$), and discomfort (concentric Δ : 0.7, eccentric Δ : 1.9; $p<0.001$). There were no differences in muscle thickness ($p=0.803$) or isometric strength ($p=0.107$). **CONCLUSION:** This is the first study to demonstrate that eccentric electrical stimulations produce greater indirect markers of muscle damage when compared to concentric electrical stimulations. As there were no differences in torque output, and no voluntary activation of muscle fibers, the difference must be related to the muscle lengthening, per se, and would appear to support the popping sarcomere hypothesis whereby eccentric contractions may target weaker fibers more susceptible to damage. The authors declare no conflicts of interest.



The Impact of Music and Timing on Bench Press and Reps Until Failure

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Music is often used as an ergogenic aid for athletic performance, but it can often only be played before competition or during breaks. **PURPOSE:** To determine whether the timing of self-selected motivational music impacts repetitions until failure (RTF) on bench press. **METHODS:** 8 males (Age: 21.8 ± 1.8 yr; Height: 181.1 ± 2.8 cm; Mass: 89.3 ± 16.2 kg; Body Fat: $17.9 \pm 8.7\%$) and 8 females (Age: 20.6 ± 0.7 yr; Height: 164.9 ± 7.2 cm; Mass: 67.3 ± 11.0 kg; Body Fat: $24.7 \pm 5.7\%$) participated. On the first visit, demographic data was assessed and subjects completed a self-selected warm-up followed by a 1RM bench press. On four follow-up visits (C = control, no music; A = music after warm-up; D = music for the duration of session; W = music during warm-up only) in a counterbalanced order, subjects completed their own warm-up, ending with 2 reps at 75%1RM. Next, they completed 3 reps as fast as possible and RTF, also at 75%1RM. Subjects rested for 2 minutes after the warm-up and their 3 reps, during which the Cravings for Rest and Volitional Energy Expenditure (CRAVE) scale was used to assess motivation levels. Peak and mean power were calculated using commercially available software. Repeated-measures ANOVAs were used for analysis. **RESULTS:** There was no significant difference for RTF, (C: 13.6 ± 5.7 , A: 13.7 ± 4.9 , D: 15.1 ± 3.9 , W: 14.6 ± 3.9 reps; $p = .244$), peak or mean power output during the 3 reps (peak- C: 454.4 ± 228.8 , A: 428.2 ± 263.3 , D: 438.0 ± 244.7 , W: 449.3 ± 215.8 W; $p = .682$) (mean- C: 286.2 ± 135.0 , A: 295.6 ± 152.9 , D: 287.2 ± 135.8 , W: 285.8 ± 144.7 W; $p = .669$) or RTF (peak- C: 445.8 ± 245.1 , A: 419.9 ± 221.1 , D: 374.1 ± 221.1 , W: 426.0 ± 232.7 W; $p = .297$), (mean- C: 205.7 ± 110.5 , A: 201.1 ± 107.3 , D: 201.2 ± 108.5 , W: 201 ± 113.2 W; $p = .695$). There were significant differences in several CRAVE outcomes between conditions ($p < .07$). During the control condition, subjects scored higher on “rest” items, indicating a desire to sit still, and lower on “move” items such as wanting to exert their muscles. Subjects scored higher on “rest” items in the control condition compared to all music conditions after the 3-reps (C: 2.2 ± 1.8 , A: 1.4 ± 1.1 , D: 0.9 ± 0.9 , W: 1.4 ± 1.1 ; $p < .001$). **CONCLUSION:** Performance was not impacted, but all music conditions improved subject motivation compared to the control condition, suggesting that even brief, strategic use of music can benefit motivation.



A Preliminary Investigation of Force Magnitude and Variability in Two Clubfoot Braces

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The standard treatment for clubfoot is the Ponseti method, which requires a bracing stage to maintain corrections. A brace commonly used in Kenya is the Steenbeek Foot Abduction Brace (SFAB); however, a unilateral and more dynamic brace called the Dynamic Torsional Knee Ankle Foot Orthosis (DTKAFO) was developed to increase comfort and treatment adherence. Despite the DTKAFO's success in US clinics, it is unknown how the DTKAFO differs from the SFAB in terms of foot-brace interaction forces. **PURPOSE:** This study examined the foot-brace forces on infants to determine the differences and similarities between both braces, contributing to the efforts of assessing if the DTKAFO is a viable alternative for infant patients in Kenya. **METHODS:** 15 DTKAFO patients (67% both feet, Total Pirani Score 0.40 ± 0.33) and 13 SFAB patients (38% both feet, Total Pirani Score 0.38 ± 0.45) undergoing the bracing stage of the Ponseti method participated in the study. While each infant wore the brace for around 9.17 ± 2.31 mins, compression resistive sensors inside the brace collected forces at the dorsiflexion of the heel (DH), abduction (AB), dorsiflexion of the ball (DB), and eversion (EV). All data were collected on the right foot. Average force, sample entropy (SampEn), and detrended fluctuation analysis (DFA) were used to compare foot-brace forces. T-tests ($\alpha = 0.1$) compared braces in general, and 2-way ANOVAs alongside multiple comparisons ($\alpha = 0.1$) determined differences at the sensor locations. **RESULTS:** In general, the average force ($p = 0.007$) and SampEn ($p = 0.031$) were larger for the SFAB than the DTKAFO. In terms of sensor locations, only the average force at EV ($p = 0.006$) was larger for the SFAB than the DTKAFO. No significant differences were found for DFA. **CONCLUSION:** If greater sustained force is the primary criterion for effectiveness at maintaining corrections during the Ponseti method, the SFAB should remain as the brace of choice for clinics in Kenya. However, the DTKAFO's positive outcomes in the US show that the force magnitude is not everything. The significant difference in entropy suggests that temporal organization of how the force is applied could be an important factor in brace effectiveness.

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Physical Fitness and Exercise Intolerance Symptoms in Persons With and Without Post-Treatment Lyme Disease Syndrome

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Lyme disease is a significant health concern in highly affected regions of the United States, with up to 20% of patients experiencing persistent symptoms following treatment, known as Post-Treatment Lyme Disease Syndrome (PTLDS). Common symptoms like fever, headache, extreme tiredness, joint stiffness/pain, chest pain, and shortness of breath may all contribute to long-term functional limitations. In turn, these long-term functional changes may lead to exercise intolerance and a reduced aerobic capacity. However, exercise intolerance and aerobic capacity remain highly understudied in patients with PTLDS.

PURPOSE: To compare aerobic capacity and exercise intolerance symptoms in individuals with and without PTLDS. **METHODS:** Currently, 5 PTLDS participants (38.2 ± 25.9 years, BMI; 26.9 ± 5.2 kg/m²) and 5 controls (38.6 ± 24.6 years, BMI; 27.2 ± 5.2 kg/m²) have been included in this study. Participants completed two physical fitness tests and an exercise intolerance questionnaire. Handgrip strength was measured using a Handgrip Dynamometer on their dominant hand. Three trials were completed with their best score recorded. Aerobic capacity was estimated via the YMCA Step-Test. After physical fitness testing, participants were given 10 common exercise intolerance questions and asked to rate their severity on a scale of 0-10. A total exercise intolerance score was calculated through the sum of the responses. An independent samples *t*-test was used to compare measures of physical fitness and exercise intolerance in individuals with and without PTLDS. **RESULTS:** There were no significant differences in handgrip strength (PTLDS: 51.4 ± 21.3 kg vs CON: 52.0 ± 21.1 kg; $p = 0.483$) or aerobic capacity (PTLDS: 41.3 ± 16.0 mL/kg/min vs CON: 40.4 ± 16.3 mL/kg/min; $p = 0.467$) between individuals with and without PTLDS. However, exercise intolerance symptoms were significantly higher in the PTLDS group compared to the control group (PTLDS: 8.0 ± 8.2 vs CON: 0.8 ± 1.3 ; $p = 0.044$). **CONCLUSION:** Our preliminary results display higher exercise intolerance symptoms in those with PTLDS than those without PTLDS. However, we found no differences in the physical fitness test results. This is an ongoing study, and we will continue to recruit a larger sample size to fully elucidate these relationships.

The authors declare no conflicts of interest.



Impact of Prolonged Ozone Exposure on Locomotor Activity and Memory in Mice

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Ozone (O₃) is a highly reactive air pollutant known to cause lung injury and impaired pulmonary function. While O₃ is traditionally studied as a pulmonary toxicant, recent evidence suggests an understudied association between O₃ inhalation and its negative impacts on the central nervous system. Acute O₃ exposure has been linked to the development of neuroinflammation and subsequent locomotor and cognitive impairments, however the accumulated effects of prolonged O₃ exposure are unknown. **Purpose:** Explore the effects of prolonged O₃ exposure on locomotive behavior and memory in mice. **Methods:** Male (M) and female (F) C57/Bl6 mice (4 months) were exposed to filtered air (control) or 2.5 ppm O₃ for 2h, 2x/wk for 6wk in whole body chambers. Twenty-four hours after exposure during weeks 2, 4, and 6, mice were tested in a 5 min open field test (OFT) to measure locomotor activity. A closed arena novel object recognition test (NORT) was used to assess short-term memory during week 6. For the NORT, mice were habituated for 10 min to two identical objects in orientation A; 1h later, mice were placed in the same arena for 10 min with one familiar object and one novel object in orientation B. Outcomes measured for the OFT included distance traveled (M), speed (mm/min), and acceleration (mm/s²); for the NORT, time spent exploring either the novel or familiar object were collected. OFT data were analyzed using a mixed-effects multiple comparison analysis and NORT outcomes were analyzed using a two-way ANOVA, both paired with a Turkey posthoc test and p<0.05. **Results:** O₃ exposure caused a decrease in the OFT on distance traveled (F (2, 25) =3.86, p=0.03) and speed (F (2, 25) =3.62; p=0.04) when compared to air-exposed animals. This deficit was evident from a comparison of percent differences in air vs. O₃-exposed mice between measurements for distance traveled (M, -21.9% vs. -42.1%; F, -4.6% vs. -15.6%) and speed (M, -21.0% vs. -42.0%; F, -3.5% vs. -15.7%). A significant inhibitory effect (p=0.006) of O₃ exposure was also noted in the NORT, with reductions in memory of familiar objects seen in both male (p=0.07) and female (p=0.05) mice. **Conclusion:** These studies demonstrate that prolonged exposure to O₃ decreases locomotor function and memory in mice. Future studies will assess the effects of prolonged O₃ exposure on exercise performance.

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Effect of One-Week Step Reduction on Cognition and Vascular Function in Middle-Aged and Older Adults

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Physical inactivity is prevalent in later life and is associated with elevated risk of dementia and cardiovascular disease. Previous studies have focused on increasing physical activity (PA), yet little is known about the effect of short-term inactivity on cognition and vascular function. Step reduction (SR) offers a practical model of limited ambulatory activity under free-living conditions. **PURPOSE:** This study examined the effect of one week of physical inactivity (ie, SR) on cognition and vascular function in middle-aged and older adults. **METHODS:** Fourteen physically active adults aged ≥ 50 years (65.2 ± 4.2 years, 71% female) were asked to maintain usual PA for 7 days (week 1) and then to avoid planned exercise and walk < 5000 steps/d for 7 days (week 2; SR). PA was assessed via waist-worn ActiGraph GT9X accelerometer; a pedometer was provided to self-monitor step count. Cognitive performance (via NIH Toolbox) and vascular function (central blood pressure, arterial stiffness) were measured after each week. We performed paired-samples *t*-tests; given the small sample, Bayesian random-effects models were used to obtain posterior estimates of change and quantify uncertainty. Pearson correlation examined associations between cognitive and vascular changes. **RESULTS:** All participants adhered to study protocol, reducing daily step from 7023 ± 1888 to 3855 ± 839 steps/d. We observed small declines in cognitive scores (range: $-2.7\% - -1.0\%$; $d = 0.08 - 0.29$) and vascular outcomes ($1.4\% - 4.3\%$; $d = -0.13 - 0.13$) following SR, but changes were not significant ($p > 0.05$). Bayesian analyses yielded estimates with 95% credible intervals including zero, indicating a low probability of changes ($P_{diff=0} = 0.28 - 0.61$). There were significant correlations between changes in pulse wave velocity with executive function ($r = -0.81$) and processing speed ($r = -0.65$), and between mean arterial pressure and working memory ($r = 0.63$). **CONCLUSION:** One week of SR may not result in adverse effects on cognition or vascular function in physically active individuals, potentially reflecting resilience associated with regular PA against brief inactivity (eg, disruptions to exercise routines). Results also provide insight into associations between cognitive and vascular responses. Further research with larger samples and longer SR is warranted. No funding support was used in this study. The authors declare no conflicts of interest.



Evaluating the Exercise is Medicine on Campus Program at Slippery Rock University

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The Exercise is Medicine on Campus (EIM-OC) program at Slippery Rock University provides free exercise training to community members referred by healthcare providers. Upon referral, a Graduate Assistant (GA) and student interns' complete health history and wellness questionnaires, fitness assessments, exercise logs, and satisfaction surveys for each participant through the 10-week exercise program. **PURPOSE:** The purpose of this project was to evaluate the EIM-OC program by quantifying participant compliance, exercise time per week, and sedentary time per day. **METHODS:** Descriptive statistics were calculated for age, sex, and program compliance. Inferential analyses were used to compare pre-post change of aerobic and resistance training exercise minutes per week, sedentary hours per day, and self-efficacy.

RESULTS: Data was collected from 82 participants (30 males, 52 females) aged 54.2 ± 16 years across five semesters: Spring 2026, Spring 2025, Fall 2024, Spring 2024, and Spring 2023. Completer analysis showed program compliance to be $88.6 \pm 14.1\%$. Aerobic and resistance training exercise time significantly increased by 76.7 ± 80.98 and 68.3 ± 25.2 minutes per week, respectively ($p < 0.05$). Sedentary time significantly decreased by 2.32 ± 3.40 hours per day ($p < 0.05$). Participants reported greater confidence ($p < 0.05$) in exercising when tired (0.60 ± 1.2), bad mood (0.5 ± 1.0), limited time (0.42 ± 1.2), on vacation (0.63 ± 1.3), and in bad weather (0.46 ± 0.99). **CONCLUSION:** In conclusion, EIM-OC at SRU has developed a unique framework in which local physicians refer community members to senior Exercise Science students for one-one-one exercise training. Participants increased their aerobic and resistance training exercise time per week and reduced their daily sedentary time. EIM-OC at SRU has successfully supported positive behavior change through high participant compliance.



The Effect of Aerobic Exercise on the Blood Pressure Response to a Mental Stress Task

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Mental stress has been shown to negatively affect blood pressure (BP) status. Studies have found that aerobic exercise (AE) interventions are efficacious in causing positive effects on improving cardiovascular measures and overall physical health. However, whether aerobic training improves cardiovascular markers following a mental stress task needs further investigation. **PURPOSE:** To investigate BP responses to a mental stress task before and after an aerobic exercise intervention. **METHODS:** Ten participants (35.7 ± 18.0 years, $n = 7$ women) completed BP measures following a mental stress task before and after an aerobic exercise intervention. Brachial measures of systolic and diastolic BP were measured via an automated BP device. Central pressures were estimated from brachial pulse waveforms. BP was taken while participants completed a mental stress task (Stroop Test), which was completed before and after exercise. For the exercise intervention, participants completed moderate intensity aerobic exercise on a treadmill. Participants were kept within 40 to 60 percent of their heart rate reserve to achieve moderate intensity exercise. A paired samples t-test was used to compare brachial systolic and diastolic BP as well as central systolic and diastolic BP before and after exercise. **RESULTS:** There was a trend towards lower brachial systolic BP (127.1 ± 7.5 mmHg vs. 122.7 ± 13.4 mmHg; $p = 0.135$) and higher brachial diastolic BP (74.7 ± 6.2 mmHg vs. 77.4 ± 5.9 mmHg; $p = 0.132$) after aerobic exercise during the mental stress task. Additionally, there was significantly lower central systolic BP (117.1 ± 8.6 mmHg vs. 108.3 ± 6.1 mmHg; $p = 0.027$) after exercise during the mental stress task. **CONCLUSION:** Our findings suggest benefit for aerobic exercise to reduce central systolic BP during a mental stress task. Given that mental stress has been shown to negatively affect BP responses, these findings suggest that moderate-intensity aerobic exercise may attenuate the cardiovascular response to acute psychological stress, particularly at the central level. Ultimately, aerobic exercise may build cardiovascular resilience to the physiological demands of mental stress.

The authors have no conflicts of interest to disclose.



Novel Indices of Muscle Quality Reveal Functional Differences in Older Veterans Versus Non-Veterans

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Older veterans exhibit increased fall risk due to exacerbated physical function decline compared with non-veterans. Physical function assessments are clinically relevant, but early declines may not be apparent with these assessments alone. Muscle quality (function or force per unit of muscle) may be a more sensitive assessment, as it includes both physical performance and muscle mass metrics to capture differences in muscle functional capability. Novel, more accessible muscle quality measurements, such as handgrip strength relative to lean body mass (LBM), may be easier to implement clinically than gold-standard methods; however, there are limited data on such measures in older veterans. **PURPOSE:** Compare novel muscle quality indices derived from functional performance and LBM in older veterans and age-matched non-veterans. **METHODS:** In 35 older veterans (70 ± 1 y) and 35 older non-veterans (70 ± 1 y) matched for age, sex, and BMI, we measured body composition (DXA), handgrip strength, 4m gait speed, 6-minute walk distance (6MWD), and 5 chair rise time (5CHRT). To assess muscle quality, handgrip strength, gait speed, 6MWD, and 5CHRT were divided by LBM. Independent samples t-tests were used to detect differences in variables between groups and data are reported as means $\pm$ SEM. **RESULTS:** Veterans had slower 5CHRT than non-veterans (15.2 ± 1.2 vs. 12.0 ± 0.6 s; $p=0.016$) but similar handgrip strength, gait speed, and 6MWD ($p>0.05$ for all). Veterans also had lower muscle quality (higher 5CHRT/LBM) than non-veterans (0.32 ± 0.03 vs 0.24 ± 0.01 s/kg; $p=0.012$), but slightly faster gait speed/ LBM than non-veterans (0.026 ± 0.001 vs. 0.025 ± 0.002 m/s/kg; $p=0.049$) **CONCLUSION:** While the difference in gait speed/LBM is likely not clinically significant, older veterans exhibited 5CHRT >15 s and higher 5CHRT/LBM, indicating lower leg power and potentially elevated fall risk. These findings align with previously established greater fall risk in older veterans, suggesting that more accessible muscle quality measurements, particularly 5CHRT/LBM, may be useful in assessing physical function and fall risk with a goal of maintaining independence in aging veterans.

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Examining the Relationship Between Weekly Training Load and Fatigue in NCAA Division II Football Players

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Monitoring athlete fatigue and readiness is increasingly important in collegiate American football, where high training demands create substantial amounts of physiological stress. **PURPOSE:** The purpose of this study was to investigate the relationship between GPS-derived external load metrics and force plate-derived neuromuscular fatigue measures in Division II collegiate football players across a competitive season. **METHODS:** Total Weekly Player Load (TWPL), measured via GPS, and countermovement jump (CMJ) height, measured via force plates, in NCAA Division II football players across a 12-week competitive season were measured. A retrospective longitudinal quantitative design was used. Twenty-one players, 14 starters and 7 non-starters, wore Catapult GPS units during three to four practice sessions per week and performed CMJ testing on force plates the day before each game. Pearson's correlation coefficients were calculated to assess relationships between TWPL and CMJ height, as well as between Player Load and other Catapult GPS-derived metrics (peak power, distance, accelerations, decelerations). **RESULTS:** largely negligible and inconsistent ($r=0.043$) relationship between TWPL and CMJ height across the sample, with no statistically significant group-level association. However, substantial individual variability emerged, with some athletes showing strong positive correlations ($r=-0.999$) and others strong negative ($r=0.921$) correlations. In contrast, Player Load showed moderate-to-strong correlations with other within-system GPS metrics, particularly power plays ($r = 0.688$) and decelerations ($r = 0.614$), confirming internal consistency of the GPS system. **CONCLUSION:** These findings suggest that GPS and force plate technologies capture distinct aspects of fatigue management rather than interchangeable ones, and that individualized, athlete-specific monitoring may be more useful than team-level averages for load-management and injury-prevention strategies in collegiate football. The authors declare no conflicts of interest.



Postural Alignment Differences Between Former High School Athletes and Non-Athletes

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PURPOSE: Repetitive sport participation may contribute to musculoskeletal adaptations that persist beyond high school athletics. The purpose of this study was to compare static postural alignment in college-aged former high school athletes and non-athletes. **METHODS:** Sixty participants aged 18–21 years were divided into an athlete group ($n=30$), consisting of individuals who participated in high school sport for at least four consecutive years, and a non-athlete group ($n=30$) with no high school sport participation. Standardized frontal and sagittal digital images quantified translations of the head, shoulders, hip/pelvis, and knees. Independent-samples t-tests compared groups. **RESULTS:** No significant differences were observed between athletes and non-athletes for head (1.41 ± 0.65 vs. 1.56 ± 0.46 , $p=.310$), shoulder (0.89 ± 0.54 vs. 1.11 ± 0.57 , $p=.135$), hip/pelvis (1.00 ± 0.53 vs. 0.89 ± 0.55 , $p=.447$), or knee translation (1.30 ± 0.82 vs. 1.25 ± 0.58 , $p=.787$). The largest descriptive difference occurred at the shoulder, with lower mean translation among former athletes; a smaller, opposite-direction difference occurred at the hip/pelvis. **CONCLUSION:** Sustained high school sport participation was not associated with significant differences in static postural alignment during emerging adulthood. However, opposing descriptive patterns at the shoulder and pelvis suggest that athletic and non-athletic activity histories may be associated with distinct region-specific postural adaptations. These findings provide novel comparative data suggesting that postural adaptations associated with athletic history may be region-specific rather than uniformly expressed across the body. Larger studies incorporating dynamic movement assessment are warranted.

The author declares no conflicts of interest.



Characterizing the Softball Pitching Motion of Collegiate Athletes Utilizing Inertial Measurement Units

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Despite the growing popularity of fastpitch softball at the high school, collegiate, and professional levels, a severe lack of evidence-based guidelines for injury prevention and performance enhancement exists.

These standards are of particular importance to pitchers, as they repeatedly perform high-powered rotational movements that create significant biomechanical loads across both the upper and lower extremities, which may contribute to degenerative injury progression. **PURPOSE:** The purpose of this study was to identify and assess kinematic variables that can characterize the softball pitching motion of Division I collegiate pitchers. **METHODS:** Pitching mechanics of five Division I collegiate softball pitchers (Age 19.0 ± 1.4 years, BMI 24.8 ± 1.5 kg/m²) were analyzed with an 8-Sensor Gen4 Expert System. Each pitcher threw four fastballs with the inertial measurement units attached to the throwing arm, trunk, and legs. Four of the twenty trials were excluded due to sensor error. The three metrics utilized to characterize the pitching motion were peak pelvis to chest separation during the closing phase (transverse-plane rotation of the pelvis and chest toward the catcher), upper arm angle at foot plant, and chest side bend angle (frontal plane lateral trunk lean) at foot plant. **RESULTS:** The mean peak pelvis to chest separation angle fell within the optimal range of 15 to 25°. The mean upper arm angle at foot plant showed the greatest variability among the three metrics. The mean chest side bend angle at foot plant was of comparable magnitude to the desired range (-6 to -10°) but was directed toward the glove side rather than the throwing side.

CONCLUSION: Inertial measurement units offer a novel and portable means of building a biomechanical profile of the collegiate softball pitching motion. Future data collection may help establish standards for injury prevention and performance enhancement.

The authors declare no conflicts of interest.

Table 1. Descriptive statistics for softball pitching kinematic variables			
	Minimum	Maximum	Mean $\pm$ Standard Deviation
Peak Pelvis to Chest Separation (°)	7.31	30.99	20.05 $\pm$ 6.40
Upper Arm Angle at Foot Plant (°)	51.05	118.43	77.33 $\pm$ 22.22
Chest Side Bend Angle at Foot Plant (°) + towards glove / - towards throwing arm	-5.54	32.78	8.10 $\pm$ 13.65



A Comparison of Bilateral Index in Upper-Body Force Production Between College-Aged Males and Females.

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PURPOSE: To compare the bilateral index of upper-body force production between college-aged males and females using a preacher curl exercise. Outcome measures included maximal dynamic strength, maximal isometric force, impulse, muscle activation, and neuromuscular efficiency. **METHODS:** Forty-one recreationally active college-aged participants (21 males, 20.4 ± 1.2 yrs; 20 females, 21.3 ± 1.9 yrs) completed two testing sessions. Dynamic strength was assessed using unilateral and bilateral 1-repetition maximum preacher curl tests. Maximal isometric contractions were performed while force and biceps brachii EMG was simultaneously recorded. Force values were normalized to lean body mass, and bilateral index, impulse, muscle activation, and neuromuscular efficiency were calculated. Sex differences were compared for all outcome variables. **RESULTS:** Males demonstrated significantly greater unilateral, combined unilateral, and bilateral dynamic (mean differences: $0.49 - 0.96$ kg/LBM^{0.67}; $p < 0.001$; effect sizes [ES]: $1.25 - 1.76$) than females. Males also produced greater bilateral and combined unilateral isometric force (mean differences: $8.06 - 9.45$ N/LBM^{0.67}; $p < 0.031$; ES: $0.69 - 1.01$), isometric impulse (mean differences: $45 - 104$ Ns/LBM^{0.67}; $p < 0.006$; ES: $0.90 - 1.35$), and muscle activation (mean differences: $325 - 982$ μ V; $p < 0.013$; ES: $0.80 - 1.17$) than females. In contrast, females demonstrated greater dynamic bilateral index (mean difference: 10.7% ; $p = 0.017$; ES: 0.76) and greater bilateral neuromuscular efficiency (mean difference: 0.05 kg/LBM^{0.67}/ μ V; $p = .012$; ES: 0.81). No significant sex differences were observed for the peak isometric bilateral index, bilateral RMS index, bilateral impulse index, or bilateral efficiency index ($p > 0.05$). Bilateral index differed significantly across the dynamic, peak isometric, and impulse conditions. **CONCLUSION:** Although males exhibited greater upper-body force and muscle activation, females demonstrated greater bilateral facilitation during dynamic contractions and greater bilateral neuromuscular efficiency. The absence of sex differences in the isometric bilateral index and the differences observed across contraction conditions suggest that bilateral force expression is task dependent and influenced by contraction type.

The authors declare no conflicts of interest.



Arterial Stiffness, Sleep Quality, and Access to Health Services in Low-Income Hispanic Adults

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PURPOSE: Arterial stiffness is an important indicator of vascular health, but its relationships with sleep health and healthcare access remain understudied in socioeconomically disadvantaged Hispanic adults. This study examined associations among arterial stiffness, sleep health, and access to health services in low-income Hispanic adults. **METHODS:** Sixty-three Hispanic adults aged 30–70 years from Cumberland County, New Jersey, participated in this community-based cross-sectional study. Carotid–femoral pulse wave velocity (cfPWV) and central blood pressure were assessed noninvasively. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and access to health services was assessed using the National Health Interview Survey Health Care Access and Utilization Questionnaire. Pearson correlations, multiple linear regression, and mediation analysis were performed; valid cfPWV measurements were available for 53 participants. **RESULTS:** cfPWV was positively associated with age ($r=.53$, $p<.001$) but not with PSQI ($r=-.11$, $p=.43$) or BMI ($r=-.01$, $p=.96$). In the adjusted model, age was the only significant predictor of cfPWV ($b=0.067$ m/s per year, $p<.001$; $R^2=.31$). Access to health services was not associated with cfPWV ($r=-.05$, $p=.71$), PSQI ($r=-.15$, $p=.26$), or sleep duration ($r=-.17$, $p=.18$) and did not mediate the PSQI–cfPWV relationship (indirect effect ≈ 0.006). Poorer sleep quality was associated with shorter sleep duration ($r=-.61$, $p<.001$). **CONCLUSION:** Sleep quality and duration were not associated with arterial stiffness, and healthcare access did not mediate the sleep–vascular relationship. These preliminary findings suggest that healthcare access alone may not explain sleep–vascular relationships and highlight the need to examine broader social determinants of vascular health in underserved Hispanic adults.

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The Effect of Arm Swing on Running Economy Across Different Exercise Treadmills and Speeds

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Lower body positive pressure (LBPP) treadmill running is being used in clinical and athletic settings. Previous research has shown a poorer run economy (RE) with LBPP compared to normal treadmill (NT), possibly due to the design of its support chamber system. **PURPOSE:** The purpose of the study was to measure RE ($\text{mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$) during treadmill running on a LBPP and NT with and without arm movement. **METHODS:** Eleven active, non-obese, college age participants completed two exercise tests of walking and running at 60% body weight on a LBPP and NT. Protocol included: (a) walking for 2 min at $0.894 \text{ m} \cdot \text{s}^{-1}$ (2 mph), (b) running for 3 min at $2.24 \text{ m} \cdot \text{s}^{-1}$ (5 mph) and (c) running for 3 min at $2.68 \text{ m} \cdot \text{s}^{-1}$ (6 mph). Participants were tested once with normal arm swing and once with arms stationary. Oxygen consumption was measured using open flow indirect calorimetry and last thirty-second averages were defined as steady state and used to determine RE. A one-tailed paired-samples t-test was used to determine whether running economy differed between running with normal arm swing and running without arm swing. **RESULTS:** With normal arm swing, average RE for NT at all speeds was 231.67 ± 27.31 and for LBPP was 297.43 ± 47.28 ($p < .0001$). RE comparison for the first running stage on the LBPP with normal arm swing was $286.42 \pm 42.83 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ versus $286.13 \pm 47.07 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ without arm swing (*n.s.*) and on the NT $212.59 \pm 18.28 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ with normal arm swing versus $226.93 \pm 18.31 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ without arm swing ($p < .0001$). At the second running stage on the LBPP was $308.46 \pm 50.60 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ versus $307.93 \pm 59.49 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ (with and without arm swing, respectively, *n.s.*) and on the NT $250.76 \pm 20.76 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ versus $256.71 \pm 23.55 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{km}^{-1}$ (with and without arm swing, respectively, $p \leq .05$). **CONCLUSION:** Running without arm swing on the LBPP was not significantly different than running with normal arm movement. Yet, on NT arm swing resulted in more economical running. The study is the first to demonstrate that running without normal arm swing on LBPP does not affect RE. It is suggested that volunteers using the LBPP have several familiarization sessions to ensure proper running arm swing technique.

The authors declare no conflicts of interest.



The Effects of Lunge Depth on Net Joint Moment Impulse Values in Lunge Exercises

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Net joint moment impulse (NJMI) is a measure of both the magnitude and duration of an activity's mechanical demand. Previous work has shown NJMI values of 53% (hip), 26% (knee), and 21% (ankle) for the front leg in a lunge exercise. **PURPOSE:** The purpose of this project was to analyze the effects of various lunge depths during lunge exercises on front and trail leg NJMI values. **METHODS:** 12 males and 12 females (age = 21 ± 1 yrs; mass = 74 ± 17 kg; height = 1.73 ± 0.11 m) performed 4 sets of unloaded standing lunges (all combinations of right/left, deep/shallow). The trail leg knee contacted a depth indicator at 16% (shallow) and 6% (deep) of the subject's height. Step length was 42% of height for all lunges. Participants' movements were recorded with 8 cameras, while ground reaction forces and moments were obtained via 2 force plates. The total NJMI values (entirety of movement) were normalized to participants' body mass. The relationships between NJMI, front leg, and lunge depths were assessed using two-way factorial ANOVA tests. **RESULTS:** The front leg NJMI values were significantly larger using a deep lunge than the shallow ($p < 0.05$ for hip (1.82 vs 1.07), knee (-1.36 vs -0.65), and ankle (0.85 vs 0.60) Nm•s/kg). The trail leg NJMI values were larger in the deep lunge than the shallow ($p < 0.05$ for hip (-1.12 vs -0.63), knee (-1.90 vs -1.15), but not for ankle (0.57 vs 0.77) Nm•s/kg). There were no significant differences between left and right limbs for any tested measures. **CONCLUSION:** This innovative study was the first to examine NJMI in the trail leg (in addition to the front leg) during lunges. NJMI values were larger in the deep lunge than the shallow for each lower extremity joint (except for the trail leg ankle). Our NJMI percentages were similar to previous literature for the front leg in the deep (45% hip, 34% knee, 21% ankle) and shallow (46% hip, 28% knee, 26% ankle) with the hip being slightly smaller and the knee slightly larger. We found NJMI percentages for the trail leg in the deep (31% hip, 53% knee, 16% ankle) and shallow (25% hip, 45% knee, 30% ankle). With no trail leg literature to compare to, we noted that the trail leg ankle remains the smallest contributor to overall NJMI, but the knee becomes the largest (even more than the hip). Results indicate that the lunge exercise focuses on the front leg hip musculature and the trail leg knee musculature.



Concurrent Validity of 3D Pose Estimation Models for Measuring Joint Kinematics During Treadmill-Induced Balance Perturbations

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Fall risk is elevated when an individual cannot execute an effective reactive step following perturbation, yet such responses are typically quantified with specialized equipment and motion capture, precluding assessment of real-world instability. Pose estimation models (PEM) can extract joint kinematics from standard video; however, accuracy varies with camera placement and model selection. **PURPOSE:** To examine the effect of camera view and PEM on reactive balance kinematics during treadmill perturbations.

METHODS: Five healthy young adults (2 female, age = 20.2 ± 1.1 yrs) completed balance loss trials on an instrumented treadmill and were randomly perturbed in four directions (forward/backward, 48 cm/s; right/left, 27 cm/s). Ground truth hip and knee flexion angles were derived from 39 markers recorded at 100 Hz via 3D motion capture. Trials were concurrently recorded by video cameras at three views relative to the participant: angled (45°), sagittal (90°), and posterior (180°). Videos were cropped to 7s and processed with three PEMs: PHMR, GVHMR, HSMR. Accuracy was quantified as RMSE normalized to range of motion (%RMSE). Per-joint 3×3 (model $\times$ view) ANOVAs were constructed with post-hoc Bonferroni contrasts. **RESULTS:** Accuracy differed by PEM, view, and their interaction at all joints ($p < .05$). For knee flexion, all three PEMs showed similar sagittal-view error (%RMSE: 11.4–17.4%). By contrast, posterior-view HSMR error more than tripled (left: $57.5 \pm 18.8\%$; right: $59.8 \pm 20.1\%$; $p < .001$), while PHMR increased modestly (left: $21.7 \pm 9.4\%$; right: $20.1 \pm 6.6\%$, $p=0.026$) and GVHMR was unaffected (left: $16.0 \pm 6.7\%$; right: $17.3 \pm 7.4\%$; $p > .05$). Hip flexion errors were larger and differed between models only in the posterior view, where PHMR (left: $23.4 \pm 13.2\%$; right: $27.5 \pm 17.2\%$) and GVHMR (left: $31.5 \pm 10.3\%$; right: $30.8 \pm 15.0\%$) outperformed HSMR (left: $44.0 \pm 26.8\%$; right: $42.4 \pm 31.4\%$; $p < .001$). PHMR and GVHMR performed similarly across 83% of view-specific comparisons, with GVHMR performance remaining view-invariant at every joint ($p > 0.05$). **CONCLUSION:** PEMs can accurately quantify reactive balance kinematics, but only when view and model are appropriately matched. View-invariant models may enable kinematic assessment of balance recovery from real-world video.

The authors declare no conflicts of interest.



Effects of Different Medical-Grade Compression Garment Pressures on Interval Training Performance in Distance Runners

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Medical Grade Compression Garments (MGCG's) are elastic sleeves to apply over a limb that needs treatment or rehabilitation. MGCGs have recently begun to be used in distance running due to the idea of enhanced skeletal calf muscle pump activity increasing blood re-oxygenation and lactate removal. In theory, MGCGs should allow runners to accumulate more training volume and recover faster, leading to better performance. **PURPOSE:** The purpose of this study is to observe how different pressures of MGCGs applied to calves during LT1 intervals affect training metrics **METHODS:** Data collection begins by performing a progressive lactate threshold test where we measure heart rate (HR), lactate (La-), and rate of perceived effort (RPE) against increasing running paces on 10 runners (<20:00 5k PBs). During this process we identify lactate threshold one (LT1) and lactate threshold two (LT2). 4 days later we begin trial 1, which consists of 4 sets of 5 minute intervals at LT1 running pace off of 60 seconds of walking rest. We measure lactate changes via [La-] monitor, HR via chest and arm monitor, and noting RPE from a scale of 6-20. We complete three trials 2 days apart from each other, in which trial 1 requires no compression, trial 2 requires 20 mmHg, and trial 3 requires 30 mmHg. **RESULTS:** The experiment uses linear and probable relationships to determine validity. [La-] and RPE against increasing compression saw statistically significant results ($r=-0.80$, $p<0.001$). However, HR displayed weak relationships with insignificant results ($r=0.20$, $p>0.001$). Limitations to these results include instrument error since it is an occasional issue during this study via lactate testing due to 20% of subjects resting values being higher than the national average, and outlier data points skewing 2 participant groups' data. Also, the majority of this study takes place 7,544 ft above sea-level, which could impact recovery and performance. **CONCLUSION:** Although statistical correlation demonstrates beneficial training metrics for [La-] and RPE, HR produced insignificant results. Further experimentation is being conducted at sea-level by the authors, including further data analysis to continue to interpret the results. By investigating this topic further, athletes, coaches, and physicians can use MGCGs to maintain and bolster health and performance.



Exploring the Disease Progression of Duchenne (DMD) and Becker (BMD) Muscle Dystrophy Through Non-Invasive Endothelial Function Testing

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Duchenne and Becker muscular dystrophy (DMD and BMD, respectively) are severe genetic disorders causing progressive muscle degeneration. Not only does this impact skeletal muscle, but recently it has been shown to impact cardiovascular muscle leading to early decline in cardiovascular (CV) function and high fatality rates. Endothelial function is a biomarker of CV function and an independent predictor of cardiovascular disease. Noticeably, endothelial function has previously been reported to be attenuated in patients with DMD and BMD. However, the progression and timing of endothelial dysfunction in these patients is relatively unknown. **PURPOSE:** To determine if a decline in endothelial function, assessed by reactive hyperemia index (RHI), can be detected over a 12-month follow up for patients with DMD and BMD. It was hypothesized that RHI would be lower 12 months following baseline assessments. **METHODS:** Eighteen boys (7-21 yrs) diagnosed with DMD and BMD were recruited. Microvascular endothelial function was assessed using RHI derived from pulse amplitude tonometry on the index fingers following 5 minutes of occlusion of the brachial artery. The RHI score is calculated as a ratio of post-deflation pulse wave amplitude to baseline amplitude in the occluded arm, and divided by the same ratio in the non-occluded arm. **RESULTS:** There was no difference between baseline and 12 month RHI values in either DMD (1.32 ± 0.433 vs 1.34 ± 0.47 a.u., $p = 0.64$) or BMD (2.67 ± 1.28 vs 1.845 ± 0.85 a.u., $p = 0.734$). **CONCLUSIONS:** In these preliminary data, changes in RHI in boys with DMD and BMD were not evident over 12 months. However, the wide range of participant ages, disease severity, and various pharmacological treatments may have limited our findings. Further testing over a longer duration of time will be important moving forward to fully elucidate endothelial function in these patients. The authors declare no conflicts of interest.



Multi-Domain Assessment for Pediatric Surf Therapy: A Pilot Study

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Surf therapy is increasingly utilized as an intervention for diverse physical and developmental needs especially in the pediatric populations. However, there is a lack of agreed-upon feasible outcome measures where existing assessments are often either too time-intensive, require equipment not readily available in the natural environment of the beach where the program occurs or not contextually relevant to surf therapy environments. **PURPOSE:** The purpose of this study is to evaluate the feasibility, acceptability and preliminary responsiveness of a multidomain surf therapy assessment across physical and psychosocial domains in children with developmental delays participating in an established surf therapy program.

METHODS: This study includes children (n = 4) with developmental delays enrolled in a 10-session program (2 times a week for 5 weeks). Assessments will span four domains: strength (Chair Test (CT), Sit-Up Test (SUT), Push-Up Test (PUT)), balance (Tandem Walk (TW), Single Leg Balance (SLS), Tandem Stance (TS), daily emotional regulation (Incredible 5-point scale (IPS)) and well-being (WHO-5 plus surf). Assessments occurred on the days of pre-program and post-program except for the IPS which occurred daily and should last about 15-20 minutes each. Parents must be present for all the pre-and-post-program assessments and can assist with the subjective assessments. **RESULTS:** The pre-and-post-program assessments lasted 10 minutes each and most (75%) participants tolerated the assessments. There was an improvement in the strength assessment averages (CT: 2.75x, SUT: 6.75x, PUT: 1.25x), a decrease in time with TW assessment averages (2.727), and improvements with average scores with the WHO-5 (2.25). Additionally, the IPS showed consistent improvement with participants, culminating in a post-surf rating of 1 out of 5, indicating a positive emotional response. **CONCLUSION:** The multi-domain assessment was feasible, tolerated well by most of the participants, and showed responsiveness of change with several of the assessments. These findings suggest that surf therapy was well-tolerated and potentially beneficial for children with developmental delays participating in the program, but larger sample sizes are needed. The authors declare no conflicts of interest.



Kinematic and Clinical Predictors of Injurious Falls in Long-Term Care Residents: A Preliminary Video-Based Analysis

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Falls are a leading cause of injury among older adults in long-term care, yet the kinematic factors distinguishing injurious from non-injurious falls remain poorly characterized. Markerless video-based motion capture offers a scalable method for extracting fall kinematics from real-world footage. **PURPOSE:** To determine whether video-derived kinematic parameters differ between injurious and non-injurious real-world falls in long-term care residents, and whether classification of fall outcome improves with the addition of participant demographic and clinical characteristics. **METHODS:** Real-world fall videos (N=78; 57% female, age 82.7 ± 7.0 yrs; 62% dementia, 57% hypertension, 38% arthritis) were processed with a single-camera pose-estimation pipeline (HSMR), which successfully tracked body motion in 55% of videos (43/78) despite using a pre-trained algorithm with no fall-specific training data. From the 43 successfully-tracked falls (Injury n=23, No Injury n=20), 13 kinematic parameters were extracted: bilateral peak hip and knee flexion, knee flexion at fall onset, hip vertical velocity and acceleration, bilateral hip and knee angular velocity, and trunk yaw. Group differences were assessed with Mann-Whitney U tests (Benjamini-Hochberg FDR correction). Random forest classification, with and without participant demographic/clinical features (age, sex, height, weight, fall history, functional and cognitive status), was evaluated using leave-one-out cross-validation (LOOCV). **RESULTS:** Peak hip flexion was significantly reduced in injurious falls (left hip: Injury $68.9 \pm 15.3^\circ$ vs. No Injury $88.1 \pm 14.5^\circ$, $p < 0.001$, FDR-significant; right hip: Injury $73.5 \pm 15.1^\circ$ vs. No Injury $85.6 \pm 12.5^\circ$, $p = 0.009$) and was the strongest classification feature. In a subsample with complete demographic data (n=39), random forest classification using kinematic features alone achieved 67% LOOCV accuracy (AUC=0.72); accuracy improved to 77% (AUC=0.77) with the addition of demographic/clinical features. **CONCLUSION:** Reduced hip flexion during real-world falls is associated with injury, consistent with a protective tucking/rolling strategy described in laboratory studies, and markerless video-derived kinematics augmented by clinical characteristics show promise for classifying fall outcome. Larger, prospective samples are needed to confirm these preliminary kinematic and clinical predictors of injurious falls.

The authors declare no conflicts of interest.



Evaluating a Targeted Mobility-Based Training Protocol on Pitch Velocity in NCAA Division II Pitchers

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Current literature on baseball pitch velocity emphasizes traditional strength and conditioning and weighted-ball training, leaving a gap in mobility-based interventions. **PURPOSE:** To examine the effects of targeted mobility-based protocols on pitch velocity and mechanical deficiencies. **METHODS:** Sixteen NCAA Division II pitchers (age: 20.64 ± 1.20 years, height: 187.17 ± 5.46 cm, mass: 92.97 ± 12.02 kg) were assessed for velocity and pitching mechanics. Participants completed a 7-week mobility protocol before reassessment. **RESULTS:** The Scapula/ER group had the greatest velocity improvement ($p = 0.158$), while the Thoracic Spine group had the greatest change in its targeted deficiency ($p = 0.225$). Pre-intervention elbow torque was moderately correlated with velocity ($R = 0.596$, $R^2 = 0.355$). Post-intervention, elbow torque ($R = 0.634$, $R^2 = 0.402$) and hip-shoulder separation ($R = 0.560$, $R^2 = 0.314$) were moderately correlated with velocity. **CONCLUSION:** No statistically significant effects were observed; further research on mobility-based training is warranted.

The authors declare no conflicts of interest.



Barriers to Resistance Training for Individuals With and Without Parkinson's Disease

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Exercise including resistance training (RT) has been shown to play a vital role in disease management in individuals with Parkinson's disease (PD). The American College of Sports Medicine (ACSM) recommends 2-3 days of RT for 30 minutes or more per session. However, barriers to exercise may reduce adherence to these guidelines. Understanding of exercise barriers specific to PD may allow for intervention and potential increases in RT engagement. **PURPOSE:** This study compared RT engagement and barriers to exercise in people with PD (PwPD) and individuals without PD (CON). **METHODS:** Responses from the Michael J. Fox Foundation's Fox Insight study, were evaluated. Questions included age, PD status, engagement in RT, and perceived barriers to exercise. Relationships among age, presence of barriers, and PD status were evaluated. Binary logistic regression evaluated impact of PD diagnosis on RT, controlling for age. Chi square tests evaluated relationship among resistance training and presence of exercise barriers, with data split by PD diagnosis and odds ratios (OR) reported. Bonferroni post hoc correction resulted in an alpha of 0.0055. **RESULTS:** 4,548 PwPD (68.4±8.6 years, 7.4±5.5 years with PD) and 1,958 CON (62.5±12.6 years) completed questionnaire. PD diagnosis was associated with significantly ($p<0.001$, $OR=-0.699$) lower RT engagement, controlling for age. Physical health condition (PwPD: $p=0.003$, $OR=-0.186$), low perceived benefit (PwPD: $p=0.004$, $OR=-0.735$) low interest (PwPD: $p=0.001$, $OR=-0.870$), low enjoyment (PwPD: $p<0.001$, $OR=-0.700$), and non-specified other (PwPD: $p=0.002$, $OR=-0.486$) barriers were significantly related to lower RT engagement among both PwPD and CON. Access challenges were significantly associated with RT engagement among PwPD ($p=0.003$) but not CON. Limited time, attitude against exercise, and safety were not significant related with RT engagement in either group. **CONCLUSION:** These findings suggest that it's important to consider shared and population-specific barriers to exercise such as interest, enjoyment, and perceived benefit for PwPD. These findings are novel as RT engagement and relationship with barriers to exercise has not been directly compared across PD and non-PD populations, allowing for a better understanding of distinct experiences of PwPD related to exercise.

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Hormonal IUD Use Does Not Impact 24-Hour Blood Pressure In Middle-Aged Women

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Middle age is associated with increased hypertension (HTN) risk in women. Middle-aged women use hormonal birth control, including hormonal intrauterine devices (IUDs). Hormonal IUD use has been associated with higher stress responses to mental stimuli, which may impact blood pressure (BP). However, the association between hormonal IUD use and BP remains unclear in middle-aged women.

PURPOSE: The purpose of this study is to determine the effect of hormonal IUD on BP. **METHODS:** Women aged 35-55 years who are either hormonal IUD users or are non-hormonal birth control users (controls) underwent office BP measurements, using an average of two automated BP measurements, followed by ambulatory BP measurement for 24-hours upon waking one morning to the next morning, with BP taken every 20-minutes during the day and every 30-minutes at night. Mean day, night, 24-hour, and BP dipping (%change from day to night) were compared between groups using an unpaired Student's t-test or Mann-Whitney U test, depending on normality. **RESULTS:** A total of n=13 (n=6 hormonal IUD, n=7 controls) participated in the study. Age (hormonal IUD: 39 ± 4 yrs vs. controls: 44 ± 7 yrs, $p=0.21$), body mass index (BMI, hormonal IUD: 25.2 ± 2.1 kg/m² vs. controls: 22.6 ± 2.2 kg/m², $p=0.053$), office systolic BP (SBP, hormonal IUD: 114 ± 10.2 mmHg vs controls: 114.3 ± 6.8 mmHg, $p=0.70$) and office diastolic BP (DBP, hormonal IUD: 74.8 ± 12.8 mmHg vs. controls: 74.4 ± 7.6 mmHg, $p=0.95$) were similar between groups. Day mean BP (SBP: hormonal IUD: 130.5 ± 16.2 mmHg vs. controls: 124.0 ± 18.3 mmHg, $p=0.51$; DBP: hormonal IUD: 75.7 ± 9.9 mmHg vs controls: 72.9 ± 10.2 mmHg, $p=0.63$), night mean BP (SBP: hormonal IUD n=4: 114.8 ± 23.4 mmHg vs. controls: 110.1 ± 19.1 mmHg, $p=0.99$; DBP: hormonal IUD n=4: 59.3 ± 8.3 mmHg vs. controls: 59.4 ± 6.9 mmHg, $p=0.97$), and 24-hour mean BP (SBP: hormonal IUD n=4: 121.3 ± 17.1 mmHg vs. controls: 120.1 ± 17.9 mmHg, $p=0.92$; DBP: hormonal IUD n=4: 68.3 ± 8.7 mmHg vs. controls: 68.9 ± 9.2 mmHg, $p=0.92$), %SBP dip (hormonal IUD n=4: $8.2 \pm 9.9\%$ vs. controls: $11.1 \pm 9.0\%$, $p=0.60$) and %DBP dip (hormonal IUD n=4: $16.6 \pm 4.1\%$ vs. controls: $18.0 \pm 3.6\%$, $p=0.55$) were similar between groups.

CONCLUSION: The results suggest hormonal IUD use does not alter BP and potentially HTN risk in middle-aged women.

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The authors declare no conflicts of interest.



Selected Kinematic Parameters in Shallow and Deep Lunge Exercises

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Lunge exercises are performed using a variety of techniques depending on the intent of the exerciser.

PURPOSE: The purpose of this project was to analyze the effects of utilizing varied lunge depths during standing lunge exercises on selected kinematic parameters. **METHODS:** 12 males and 12 females (age = 21 ± 1 yrs; mass = 74 ± 17 kg; height = 1.73 ± 0.11 m) performed 4 sets of unloaded standing lunges (all combinations of right/left, deep/shallow). The trail leg knee contacted a depth indicator at 16% (shallow) and 6% (deep) of the subject's height. Step length was 42% of height for all lunges, and participants' movements were recorded with 8 cameras. The lift times, % descent, % ascent, thorax angle, and front/trail thigh angles were analyzed for each condition. The relationships between kinematics, front leg, and lunge depths were assessed using two-way factorial ANOVA tests. Statistical significance was set at $\alpha = 0.05$. **RESULTS:** The total lift time was significantly larger in the deep lunge than the shallow (1.98 vs 1.59 sec). The % descent time was significantly larger than the % ascent time (61 vs 39 %). The thorax angle was $\sim 5^\circ$ larger (20° vs 15°), the front thigh angle was $\sim 24^\circ$ smaller (9° vs 33°), and the trail thigh angle was $\sim 10^\circ$ smaller (87° vs 77°) in the deep lunge than the shallow at the low point, $p < 0.05$. There were no significant differences between left and right limbs for any tested measures. **CONCLUSION:** This unique study examined lifter kinematics during shallow and deep lunges for both front and trail legs. As expected, the deep lunge took longer to complete than the shallow lunge, and the descent phase took longer than the ascent phase. Participants leaned slightly more forward ($\sim 5^\circ$) in the deep lunge. In order to achieve the required depth, participants positioned their front thigh 9° above the horizontal in the deep lunge, whereas they only needed a 33° front thigh angle in the shallow lunge. At the low point, participants' trail thigh was positioned 87° relative to the horizontal in the shallow lunge and 77° in the deep lunge. It was noted that several participants had "balance checks" during the performance of their lunges, especially in the deep conditions. In addition, while most participants reported that the 42% of standing height lunge step length was comfortable, future work can examine variations in step length.



Effects of Detraining and Alpha-Lipoic Acid Supplementation on Glycemic Control in Mice

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PURPOSE: Although exercise improves glycemic control, maintaining regular exercise is challenging, and reduced and/or inactivity can impair glycemic regulation. Given its role in glucose metabolism, alpha-lipoic acid (LA) may help mitigate these detraining-associated impairments. The objective of this study was to characterize the effects of detraining and evaluate the protective effects of LA in a mouse voluntary running model. **METHODS:** Forty-nine male C57BL/6 mice were randomly assigned to five groups for a 21-day training phase followed by a 14-day detraining phase: control diet (CON), western diet (WD, 45% energy from fat), WD with continuous exercise (WD+Ex), WD supplemented with 0.25% LA (WD/LA), or WD/LA with continuous exercise (WD/LA+Ex). Mice in the WD+Ex and WD/LA+Ex groups were further subdivided on day 21, with half retaining wheel access and half undergoing wheel locking to induce detraining (WD+Ex+WL and WD/LA+Ex+WL, respectively). An intraperitoneal glucose tolerance test was performed at the end of each phase, and glucose tolerance was assessed by area under the curve (AUC) using one-way ANOVA followed by a Tukey's multiple-comparisons test. **RESULTS:** On average, mice ran ~20 km/day with a max speed of ~1 km/h, with no differences noted ($p>0.05$) between groups. Consumption of the WD increased total AUC compared with CON (31,661 vs. 24,157 mg·min/dL; $p=0.02$), indicating impaired glycemic control. Exercise normalized this response in WD+EX mice (22,296 mg·min/dL; $p=0.002$ vs. WD). Wheel lock following exercise increased ($p=0.001$) total AUC in WD+EX+WL vs. WD+EX (32,755 mg·min/dL), indicating a detraining-associated impairment in glycemic control. LA supplementation attenuated this impairment, reducing ($p=0.02$) total AUC in WD/LA+EX+WL (25,401 mg·min/dL) compared with WD+EX+WL. **CONCLUSION:** This study is novel as it is the first to examine LA as a supplement to rescue detraining responses to glycemic control. Our data indicate that LA is a promising nutraceutical countermeasure against declines in glucose tolerance following disruptions in physical activity with implications for individuals at risk for metabolic dysfunction during periods of reduced physical activity. Supported by Collegiate Science and Technology Entry Program. The authors declare no conflicts of interest.



Effects of Maximal Apneas on Spleen Contraction and Central Vascular Hemodynamics.

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Repetitive apneas cause splenic contraction and increases oxygen carrying capacity of blood, through the release of high hematocrit blood. These changes may impact central hemodynamics via alterations of blood viscosity and increased resistance to flow near the central vasculature. Thus, specific alterations of central hemodynamics are unknown as it relates to splenic contraction. **Purpose:** To investigate how five maximal apneas in relation to splenic contraction alters central blood pressures (cSYS, cDIA) and pulse wave velocity (PWV) in healthy adults. **Methods:** Thirteen healthy participants completed five maximal apneas with pre/post measurements of splenic volume, central hemodynamics, hematocrit (Hct) and hemoglobin (Hb) measurements. Apneas were completed with a 30s hyperventilation and two min rest between apneas, while oxygen saturation (SPO₂), end-tidal oxygen (ETO₂), and end-tidal CO₂ (ETCO₂) were continually monitored. Splenic volume was measured via ultrasound and calculated via the Pilstrom Equation. Central hemodynamics were measured via pulse wave analysis and Cortaid-femoral PWV. Paired t-tests were used for pre-post measures, and correlation analyses were used to determine association of splenic volumetric and central hemodynamic changes. **Results:** Mean apnea time was 114±40s with an average pre-to-post apneas SPO₂ decrease of 11 ± 8%, ETO₂ decrease of 16 ±11 mmHg, and ETCO₂ increase of 5 ± 3 mmHg. Splenic volume decreased from 189.3±30.8 to 151.1±24.4 mL ($p < 0.01$). Hb increased from 14.7±1.4 to 15.6±1.5 g/dL ($p = 0.01$) and Hct did not differ 43.8±2.7, 44.4±2.3%, $p = 0.23$. cSYS increased 3.7±5.8 mmHg ($p < 0.05$), cDIA increased 2.1±3 mmHg ($p = 0.04$), and PWV did not differ ($p = 0.37$). Absolute change in splenic volume was not associated with changes in cSYS ($r=-0.213$, $p=0.49$), cDIA ($r=0.016$, $p=0.96$), or PWV ($r=-0.022$, $p=0.94$). **Conclusion:** Apneas caused splenic contraction, increased central blood pressures but did not alter PWV. However, in this preliminary analysis the association between central hemodynamics and splenic contraction was not present and is likely underpowered. This could also be related to a healthy homogenous participant group. The authors declare no disclosures or conflicts of interest. Supported by the HPU SURF program.



Frequency of Vascular Aging in Young Adults

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Arterial stiffness is an early sign that blood vessels in the human body may be aging faster than they should, even in young adults who appear healthy. **PURPOSE:** to explore whether early changes can be detected in people aged 18 to 26 and how their arteries react to a short bout of exercise. **METHODS:** 10 participants (4 female) completed a submaximal cycle ergometer test following the Astrand-Rhyming protocol until they reached 85% of the age-predicted heart rate maximum. Blood pressure, arterial diameters, arterial tonometry, and pulse wave velocity were measured before, immediately post-exercise, and 90 minutes post-exercise. Analysis of variance was used to examine interactions across all time points. **RESULTS:** Immediate post-exercise central SBP was significantly different from baseline (19 ± 3 mmHg mean difference (MD), $p < 0.001$) and 90 minutes post-exercise (18 ± 3 mmHg MD, $p < 0.001$). Central pulse pressure was significantly different from baseline (13 ± 3 mmHg mean difference (MD), $p < 0.001$) and at 90 minutes post-exercise (13 ± 3 mmHg MD, $p < 0.001$). No significant differences were noted in central augmentation index ($p = 0.937$). **CONCLUSIONS:** Although most participants were classified as having elevated resting blood pressure, the observed changes following exercise were temporary and consistent with a normal acute cardiovascular response. These findings do not support evidence of increased vascular pathology in this young college cohort. The authors declare no conflicts of interest.



Acute Effects of Neuromuscular Stimulation on Fatigue, Soreness, Heart Rate, and Blood Lactate

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High-Intensity Interval Training (HIIT) is highly effective for improving cardiovascular and metabolic performance but often induces significant fatigue and muscle soreness. A variety of neuromuscular stimulation (NMS) devices have been developed as a tool for increasing local blood flow and muscle activation. While most research has focused on post-exercise recovery, limited evidence exists regarding its potential role as a pre-exercise priming tool. **PURPOSE:** This study evaluated the acute effects of NMS applied before HIIT, on perceived exertion (RPE), heart rate (HR), muscle soreness, and blood lactate (bLa). **METHODS:** Twelve physically active individuals (age 19.8 ± 1.3 years, mass 77.5 ± 4.7 kg) participated in two randomized HIIT trials (NMS ON and OFF) in a crossover design separated by at least 48 hours. RPE and muscle soreness were assessed immediately post exercise using a visual analog scale. bLa and HR were measured pre-, post-exercise, and recovery at 15, 30, and 45 minute intervals. Paired sample t-test was used to compare the differences in physiological and perceptual measures between the conditions. **RESULTS:** End exercise RPE did not differ between the conditions (NMS ON: 7.83 ± 0.83 vs. OFF: 7.75 ± 1.06 , $p = 0.86$). Muscle soreness also did not differ significantly between the conditions (NMS ON: 2.00 ± 0.95 vs. OFF: 2.17 ± 0.58 , $p = 0.66$). Greater HR recovery was observed during ON condition when compared to OFF condition, although the differences were not statistically significant at 15 minutes (ON: 120.6 ± 21.0 vs. OFF: 129.6 ± 22.0 bpm, $p = 0.45$), 30 minutes (ON: 109.2 ± 18.8 vs. OFF: 116.2 ± 19.8 bpm, $p = 0.53$), and 45 minutes (ON: 100 ± 16.1 vs. OFF: 105.4 ± 16.6 , $p = 0.56$). Similar trend was observed in bLa recovery at 15 minutes (ON: 6.3 ± 2.7 vs. OFF: 7.5 ± 3.2 mmol/L, $p = 0.43$), 30 minutes (ON: 3.3 ± 1.1 vs. OFF: 4.0 ± 1.3 mmol, $p = 0.26$) and 45 minutes (ON: 2.5 ± 0.7 vs. OFF: 3.0 ± 0.8 mmol, $p = 0.20$). **CONCLUSION:** Based on the results of the study, NMS device appears to induce marginal improvement in recovery, however, did not significantly enhance physiological or perceptual recovery measures after an acute bout of high-intensity interval exercise. Investigating the effects of repeated NMS sessions over an entire training season could reveal possible long-term benefits for recovery and performance using the device.

The authors declare no conflict of interest.



Effect of a Familiarization Visit on State Anxiety Across Repeated TMS Sessions

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Transcranial magnetic stimulation (TMS) assesses corticospinal excitability via motor evoked potentials (MEPs), which may vary with psychological state. State anxiety may modulate corticospinal excitability, making initial-session novelty a potential source of variability in TMS-naïve participants. Familiarization visits are often used to reduce novelty and improve measurement consistency, but their effect on state anxiety across repeated TMS sessions remains unclear. **PURPOSE:** To determine whether a familiarization visit influences state anxiety across repeated TMS testing sessions in healthy adults. **METHODS:** Twenty TMS-naïve adults (22.5 ± 4.8 yr; 11 M, 9 F) were randomized to a familiarization group (FAM; $n=10$), completing one familiarization visit followed by two measurement visits, or a no-familiarization group (NOFAM; $n=10$), completing two measurement visits. At each visit, 10 single TMS pulses were delivered over the first dorsal interosseous hotspot at 130% of resting motor threshold, with MEPs recorded via surface electromyography. State and trait anxiety were assessed each visit using the 10-item short-form State-Trait Anxiety Inventory (5 items/subscale; range 5–20). A 2 (Group) $\times$ 2 (Visit) mixed-model ANOVA compared state anxiety, and Pearson correlations related anxiety to mean MEP amplitude ($\alpha=0.05$).

RESULTS: State anxiety was low in both groups (mean $\pm$ SD): FAM 6.20 ± 2.39 and 5.60 ± 0.97 ; NOFAM 5.80 ± 1.03 and 5.20 ± 0.63 , at measurement Visits 1 and 2 respectively. Twelve of 20 participants scored 5 at both visits (scale minimum); maximum was 12. There was no Group effect ($F(1,18)=0.52$, $p=0.482$) or Group $\times$ Visit interaction ($F(1,18)=0.00$, $p=1.000$). State anxiety tended to decline across visits ($F(1,18)=3.72$, $p=0.070$, $\eta^2p=0.17$). Neither state ($r=0.07$, $p=0.763$) nor trait anxiety ($r=0.24$, $p=0.315$) correlated with mean MEP amplitude. **CONCLUSION:** Familiarization did not reduce state anxiety across repeated TMS sessions, and anxiety was unrelated to MEP amplitude. Single-pulse TMS elicited minimal anxiety in TMS-naïve participants regardless of familiarization. These findings provide initial evidence regarding the psychological effects of TMS familiarization, suggesting state anxiety contributed minimally to MEP variability under these testing conditions.

The authors declare no conflicts of interest.



The Effect of Ventilation Rate on Muscular Power via the Quebec 10-second Test

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Anaerobic activity causes metabolic acidosis due to the accumulation of lactic acid, a byproduct of glycolytic metabolism. The accumulation of lactic acid may impair optimal performance during high-intensity exercise. Hyperventilation may help regulate blood acidity and lactic acid levels, and previous research has shown that voluntary hyperventilation may be efficacious for improving performance on muscular strength activities. **Purpose:** The objective of this study is to determine how hyperventilation before anaerobic activity may affect anaerobic power via a 10-second cycling test. We hypothesize that hyperventilation before performing a high-intensity cycling test will lead to an improvement in anaerobic power compared to normal breathing. **Methods:** Currently, 12 young adults (ages 20.3 ± 0.9 years, gender: 7 males, 5 females, BMI: 27.7 ± 4.4 kg/m²) completed anaerobic power testing following hyperventilation and normal breathing conditions. Participants completed two ten-second cycling tests working against a resistance of 9% of their body weight. Before one test, participants were asked to breathe normally for 30 seconds; before another test, the participants were asked to hyperventilate at 30 breaths per minute. The order of testing was randomized, with a 10-minute break between each test. Anaerobic power was measured as the highest power attained during the test (W/kg). A paired-samples t-test was used to compare anaerobic power between normal breathing and hyperventilating conditions. Due to the pilot study sample size, we set statistical significance at $p < 0.10$. **Results:** There were no significant differences in anaerobic power between normal breathing conditions (8.87 ± 2.39 W/kg) compared to the hyperventilation condition (9.09 ± 2.15 W/kg; $p = 0.217$). **Conclusions:** Our preliminary findings in this ongoing study suggest hyperventilation may not improve anaerobic power on a 10-second maximal output cycling test. A 10-second test may not be enough time to induce lactic acid accumulation, potentially explaining why hyperventilation may not have significantly improved power. The authors declare no conflicts of interest.



Title: Exploring the Impact of Sedentary Behavior and Physical Activity Levels in Military Veterans

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Physical activity (PA) is consistently evidenced as providing several health benefits, including improved sleep quality and symptoms of sleep disorders. Recent findings of the declining amount of sleep reported in the U.S. suggests a supportive role for short sleep duration as a risk factor for weight gain.

Unfortunately, the prevalence of physical inactivity and sleep difficulties is high among persons living with chronic illnesses, such as combat veterans. Although much of the literature supports that regular PA is associated with better sleep, evidence is lacking in veterans with complex deployment-related health concerns. **PURPOSE:** This analysis examined a subset of veterans' biobehavioral health features from one week of remote monitoring. **METHODS:** Data from 31 veterans (41.3 ± 8.9 yrs; 16% Female; 84% White, 12.5 ± 8.3 service years) were analyzed. Actigraphy was recorded on the non-dominant wrist and averaged over 3 days (i.e., 1 weekend day and 2 weekdays). Actigraphy data were processed using GGIR package in R (v. 3.3-8) to derive PA variables: time spent in light activity (LPA), moderate-to-vigorous activity (MVPA), total activity duration (TotPA), and inactivity (IPA; sedentary behavior); and sleep was characterized by total sleep time (TST). Generalized linear models controlling for age, sex and body composition (BMI) tested relationships between TST and PA variables. **RESULTS:** On average, veterans were inactive for approximately 13 hours per day, and only 6% met the ACSM PA guidelines for adults. After adjustment for the other predictors, there were negative associations for IPA ($\beta = -0.21, p = .022$) and BMI ($\beta = -3.97, p = .037$) with TST, but not for age ($\beta = -0.58, p = .614$) or sex ($\beta = -8.36, p = .755$). Additionally, separate generalized linear models revealed no significant relationships for LPA ($\beta = 0.03, p = .894$), MVPA ($\beta = -0.11, p = .671$), or TotPA ($\beta = -0.02, p = .876$) with TST.

CONCLUSION: Objective assessment of PA patterns in veterans with persistent multisystem conditions can help clarify how activity relates to symptom burden and health outcomes. Such insight is critical for the promotion of PA and reduction of physical inactivity to improve overall sleep and well-being for veterans living with chronic health concerns.



Effect of a Familiarization Visit on Between-Session Reliability of Resting Motor Threshold

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Transcranial magnetic stimulation (TMS) is widely used to assess corticospinal excitability. Resting motor threshold (RMT), the lowest stimulation intensity to reliably produce motor evoked potentials, determines stimulation intensity in TMS protocols. However, reported RMT reliability varies significantly. Familiarization visits are often routinely included to acclimate TMS-naïve participants and are assumed to improve measurement quality, but this assumption has not been tested experimentally. **PURPOSE:** To determine whether a familiarization visit improves between-session reliability of RMT in TMS-naïve adults. **METHODS:** Twenty TMS-naïve adults (22.5 ± 4.8 yr; 11 M, 9 F) were randomized to a familiarization group (FAM; $n=10$), completing one familiarization visit followed by two measurement visits, or a no-familiarization group (NOFAM; $n=10$), completing two measurement visits only. At each visit, RMT was determined over the first dorsal interosseous hotspot as the lowest percent of maximum stimulator output (%MSO) eliciting motor evoked potentials in at least 5 of 10 pulses. Between-session reliability was assessed separately for each group using single-measure absolute-agreement intraclass correlation coefficients (ICC) with 95% confidence intervals, standard error of measurement (SEM), and minimal detectable change (MDC_{95}). **RESULTS:** RMT was stable across visits in both groups (mean $\pm$ SD): FAM 52.9 ± 10.7 and 54.4 ± 12.7 %SO; NOFAM 52.8 ± 13.3 and 53.0 ± 13.4 %MSO at measurement Visits 1 and 2, respectively. Reliability was good to excellent in both groups and did not favor familiarization: FAM ICC = 0.87 (95% CI 0.55–0.96), SEM = 4.3 %MSO, MDC_{95} = 12.0 %MSO; NOFAM ICC = 0.93 (95% CI 0.73–0.98), SEM = 3.6 %MSO, MDC_{95} = 10.0 %MSO. Confidence intervals overlapped substantially. **CONCLUSION:** A familiarization visit did not improve between-session reliability of RMT, which was good to excellent regardless of prior TMS exposure. RMT appears robust to first-session novelty, suggesting familiarization may be unnecessary when RMT is the primary outcome, though effects on more variable measures such as MEP amplitude may differ. These findings provide the first experimental test of a widely assumed methodological practice.

The authors declare no conflicts of interest.



How Perceived Stress Influences Isometric Rate of Force Development in Collegiate Male Soccer Athletes

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Collegiate athletes are subject to dynamic psychosocial stressors that may impair neuromuscular readiness, yet stress impacts on explosive force production remain poorly explored. **PURPOSE:** To determine the impact of perceived stress, measured via the Acute Recovery and Stress Scale (ARSS), on isometric mid-thigh pull (IMTP) rate of force development (RFD) in collegiate male soccer athletes.

METHODS: Forty-eight male collegiate Division I NCAA soccer athletes (Age: 21.2±1.6yrs; Height 179.8±5.9cm; Mass 77.9±6.9kg) completed the ARSS survey and IMTP testing on force plates (VALD ForceDecks) during regular testing intervals across the athletes' competitive season (across 133 total sessions). ARSS mental stress (PS2), physical stress (PS1), and a recovery-stress balance index (RS) were derived from subscale scoring. RFD was extracted and averaged from three 3-second repetitions at 50, 75, 100, 150, and 200ms from force onset during the IMTP. Non-normalized outcomes were utilized as mass correlated negligibly with IMTP RFD ($r = 0.07-0.09$). Mental stress tertiles (Low/Medium/High) were identified via 33rd/67th percentile splits of PS2. One-way ANOVA and within-person correlations (linear mixed-effects models) were utilized to account for repeated measures. **RESULTS:** RFD at 200ms had a significant difference across mental stress tertiles ($F(2,130) = 3.31$, $p = 0.040$, $\eta^2 = 0.048$), with higher stress groups maintaining higher RFD values (Low: 2457 ± 1027; Med: 2872 ± 1043; High: 2993 ± 1115 N/s). Within-person analysis revealed a negative directional association between PS2 and RFD 200ms approaching significance ($r = -0.13$, $p = 0.14$). The RS Index demonstrated the most sensitive within-person association with RFD 200ms ($r = +0.16$, $p = 0.064$). No significant observations were observed at earlier RFD epochs. **CONCLUSION:** Recovery-stress balance may be a more sensitive predictor for neuromuscular explosive readiness as compared to stress alone. Mental stress maintained a consistent negative correlation with late phase RFD (approaching significance at RFD 200ms), possibly attributed to seasonal training load. Future studies emphasizing within-person approaches in athlete monitoring stands to limit confounding variables from seasonal training load. The authors declare no conflict of interest.



Myotendinous Intra-Tissue Fiber Organization and Functional Adaptations to U.S. Marine Corps Officer Candidate School Training

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U.S. Marine Corps Officers demonstrate higher tendon injury rates compared to other branches, yet it is unknown how myotendinous health changes and parallels functional outcomes in response to Officer Candidate School (OCS). **PURPOSE:** Evaluation of lower extremity tendon and muscle intra-tissue fiber organization, and lower body biomechanical performance in Candidates undergoing 10-weeks of OCS training. **METHODS:** Candidates ($n=95$ [Male=80, Female=15]; Age: 25.2 ± 2.1 yrs, BMI: 26.8 ± 3.5 kg/m²) were evaluated pre-/post-OCS. Bilateral ultrasound scans, coinciding with spatial frequency analysis, assessed collagen (tendon) and myofibril (muscle) fiber organization (PSFR), density (PWP), and structural integrity (Axis Ratio) of the Achilles (AT) and patellar (PT) tendons, and triceps surae (TS; medial/lateral gastrocnemius and soleus muscles) and quadriceps (QS; vastus lateralis/intermedius/medialis and rectus femoris muscles) muscle blocks. Additionally, countermovement jumps on dual force plates evaluated jump/landing force traits. Paired *t*-tests compared pre- to post-OCS differences, Cohen's *d* effect sizes were calculated, and $\alpha=0.050$. **RESULTS:** Candidates demonstrated increases in AT and PT PSFR, MMax%, and Axis Ratio, presented in Table 1. Additionally, PSFR increased in TS ($p<0.001$; $d=0.56$), and PWP and Axis Ratio increased in QS (both $p<0.001$; $d: 0.55-2.03$) muscle blocks. However, though these structural changes paralleled a decrease in jump height, peak force, impulse, and power, they coincided with reductions in peak landing force and acceleration (Table 1). **CONCLUSION:** These findings suggest that despite jump performance decrements following 10 weeks of OCS training, improvements in tendon and muscle fiber organization (PSFR), density (PWP), and structural integrity (Axis Ratio), and subsequent reductions in landing forces and shock, propose that OCS may be beneficial to mitigate future myotendinous injury risk in new officers.

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ABSTRACT CONTINUES ON NEXT PAGE



Table 1. Pre- to Post-Officer Candidates School (OCS) comparison of Candidates' bilateral Achilles Tendon, Patellar Tendon, Triceps Suræ, and Quadriceps Spatial Frequency Analysis Measures and Lower Body Countermovement Jump and Landing Force Characteristics.

Measure	Pre OCS	Post OCS	Percent Change	Sig. (p)	Cohen's <i>d</i>
Tendon Spatial Frequency Analysis (<i>Adjusted $\alpha=0.017$</i>)					
Achilles Tendon PSFR (mm^{-1})	2.0 $\pm$ 0.1	2.1 $\pm$ 0.1	+1.6	<0.001	0.41
Achilles Tendon PWP (kB^2)	13.0 $\pm$ 2.5	14.5 $\pm$ 2.6	+11.4	<0.001	0.58
Achilles Tendon Axis Ratio (AU)	2.6 $\pm$ 0.2	2.7 $\pm$ 0.2	+3.8	<0.001	0.63
Patellar Tendon PSFR (mm^{-1})	2.1 $\pm$ 0.1	2.1 $\pm$ 0.1	+1.4	0.014	0.28
Patellar Tendon PWP (kB^2)	7.8 $\pm$ 2.2	9.2 $\pm$ 2.5	+17.5	<0.001	0.59
Patellar Tendon Axis Ratio (AU)	2.2 $\pm$ 0.2	2.3 $\pm$ 0.2	+4.5	<0.001	0.56
Muscle Block Spatial Frequency Analysis (<i>Adjusted $\alpha=0.017$</i>)					
Triceps Suræ PSFR (mm^{-1})	1.4 $\pm$ 0.1	1.5 $\pm$ 0.1	+4.3	<0.001	0.56
Triceps Suræ PWP (kB^2)	132.9 $\pm$ 31.5	131.9 $\pm$ 28.2	-0.8	0.741	0.03
Triceps Suræ Axis Ratio (AU)	1.9 $\pm$ 0.1	2.0 $\pm$ 0.1	+1.5	0.019	0.27
Quadriceps PSFR (mm^{-1})	1.8 $\pm$ 0.2	1.8 $\pm$ 0.2	+1.2	0.413	0.10
Quadriceps PWP (kB^2)	128.1 $\pm$ 36.1	163.6 $\pm$ 54.4	+27.8	<0.001	0.77
Quadriceps Axis Ratio (AU)	2.1 $\pm$ 0.2	2.2 $\pm$ 0.2	+4.8	<0.001	0.55
Concentric Jump Phase Force Characteristics (<i>Adjusted $\alpha=0.013$</i>)					
Jump Height (cm)	32.9 $\pm$ 7.6	30.2 $\pm$ 6.5	-8.5	<0.001	0.40
Peak Force (kN)	1.8 $\pm$ 0.4	1.7 $\pm$ 0.3	-7.0	<0.001	0.36
Impulse (Ns)	198.5 $\pm$ 46.6	185.2 $\pm$ 40.6	-6.7	<0.001	0.31
Power (kW)	2.1 $\pm$ 0.6	1.9 $\pm$ 0.5	-11.1	<0.001	0.44
Landing Phase Force Characteristics (<i>Adjusted $\alpha=0.025$</i>)					
Peak Force (kN)	4.2 $\pm$ 1.3	3.9 $\pm$ 1.3	-8.4	0.001	0.28
Acceleration (m/s)	43.7 $\pm$ 13.4	40.3 $\pm$ 13.8	-7.9	0.010	0.25

Data are shown as means $\pm$ standard deviations for normally distributed data. **Bolded** significance values indicate significant differences between pre- and post-OCS after Bonferroni correction, with italicized significance values indicating measures that fell beyond the MDC. Abbreviations – PSFR: Peak Spatial Frequency Radius; PWP: Power Within Peak.



DOES THE BRAIN ALTER REFLEX ACTIVITY DIFFERENTLY IN THE SPINAL CORD OF OLDER ADULTS?

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The human nervous system has pathways descending from various parts of the brain into the spinal cord, which are responsible for motor control and possibly altering sensory information from the body. Each pathway serves different roles, and it is unclear how these pathways degrade and change with age. Additionally, these pathways may be very different in humans compared to other mammals, and primates. Due to this, findings from other animal models may not translate well to the understanding of human motor control affecting balance and daily life especially in older adults. **PURPOSE:** The purpose of this project is two-fold: first, to test the different cortical locations that join together to form the corticospinal tract (a descending pathway) to identify if they modulate sensory neurons in the spinal cord, and second, to quantify if this descending sensory modulation changes with aging. We hypothesize that transcranial magnetic stimulation (TMS) of the somatosensory cortex (S1) will lead to changes in H-reflexes, and that the descending modulation of these reflexes will differ in older adults. **METHODS:** Twenty-six subjects (20-70 yrs) completed this study (14 young, 12 older). Soleus H-reflex amplitude and latency were measured during an isometric contraction of 5% of max. TMS pulses were delivered to the premotor, primary motor, and S1 cortices calculated to arrive at the L4 spinal cord level approximately 5 ms prior to an H-reflex volley at 50% of H-max. **RESULTS:** Mixed factorial ANOVAs revealed no condition $\times$ age interaction for amplitude ($p = 0.120$, $\eta^2p = 0.084$) and no main effect for age ($p = 0.054$, $\eta^2p = 0.146$). There was a main effect of modulation ($p < 0.001$, $\eta^2p = 0.665$), as mean percent change from control to Premotor, M1, and S1 was +129%, +144%, and +152%, respectively. H-reflex latency showed no condition $\times$ age interaction ($p = 0.376$, $\eta^2p = 0.042$). There was no main effect of condition ($p = 0.376$, $\eta^2p = 0.058$). However, there was a main effect of age ($p < 0.001$, $\eta^2p = 0.349$) showing a mean increase in H-reflex latency of 3.02ms across all conditions. **CONCLUSION:** S1 may modulate the sensorimotor circuits within the lumbar spinal cord. This modulation may play a role in balance and other lower-body motor tasks. However, concerns regarding the limitations of lower body TMS warrant further investigation to support these findings.



Oral Contraceptive Pills Increase Systolic Ambulatory Blood Pressure In Middle-Aged Women

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Cardiovascular disease (CVD) risk sharply increases with the menopause transition in women. Increased blood pressure (BP) and arterial stiffness contribute to this increased CVD risk. BP and arterial stiffness increase with age, but also may be impacted by the fluctuations of endogenous hormones that occur throughout the menopause transition. CVD risk factors may also be impacted by exogenous hormones contained within oral contraceptive pills (OCPs), however, the impact of OCPs on BP and arterial stiffness in middle-aged women is unknown. **PURPOSE:** The purpose of this study was to evaluate the effect of OCPs on ambulatory BP (AMBP) and arterial stiffness in middle-aged women. **METHODS:** 8 middle-aged women aged 35-55 years were categorized as OCP users (n=4) or naturally menstruating (n=4). 24-hour AMBP cuffs were used to assess mean 24-hour, daytime, and nighttime systolic BP (SBP) and diastolic BP (DBP), as well as nocturnal BP dipping (%change in day to night BP). Arterial stiffness was assessed using carotid-femoral pulse wave velocity (cfPWV). **RESULTS:** Participants were age- and BMI-matched between OCP users and naturally menstruating controls (OCP: 45.5 ± 8.3 years, 25.27 ± 2.35 kg/m²; control: 44.8 ± 6.9 years, 23.64 ± 2.51 kg/m²). OCP users had significantly higher 24-hour SBP compared with controls (127.8 ± 8.7 mmHg vs. 105.5 ± 12.1 mmHg, $p = 0.028$). Daytime SBP was also higher in OCP users (134.3 ± 12.8 mmHg vs. 109.0 ± 13.9 mmHg, $p = 0.037$), as was nighttime SBP (114.8 ± 4.3 mmHg vs. 95.3 ± 8.4 mmHg, $p = 0.011$). No significant differences were observed in nocturnal SBP dipping between OCP users and controls (14.0 ± 7.6% vs. 12.4 ± 3.3%, $p = 0.714$). CfPWV was similar between groups (5.22 ± 1.07 m/s vs. 6.40 ± 0.34 m/s, $p = 0.119$). **CONCLUSION:** OCP users had higher 24-hour, daytime, and nighttime SBP, suggesting that OCP use may be associated with elevated SBP when comparing age- and BMI-matched women. These findings suggest that OCP use may influence AMBP and CVD risk in middle-aged women, though with no effect on central arterial stiffness risk factors. The authors declare no conflicts of interest.



Acute Effects of Yogic Breathing on Autonomic Modulation and Cerebrovascular Hemodynamics in Healthy Young Women

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Autonomic regulation plays a key role in modulating cerebrovascular resistance, with implications for cerebral perfusion and neurovascular health. Slow-paced yogic breathing techniques such as bhrumari pranayama are widely practiced to lower stress, increase focus, and improve mental health, but their acute physiological effects have not been well characterized in young adults. **PURPOSE:** This study examined within-subject changes in cardiac autonomic modulation with heart rate variability (HRV) and cerebral hemodynamics during bhrumari pranayama breathing compared to regular spontaneous breathing in young adults. **METHODS:** 12 female participants (21.9 ± 3.5 years; 40% Asian, 20% multiracial, 10% White, 10% Black, 10% Hispanic, 10% MENA) completed a 5-min spontaneous-breathing condition and a 5-min bhrumari pranayama breathing condition in a randomized order. Bhrumari pranayama was performed at a resonance frequency of 6 breaths per minute, with participants producing a soft humming sound during exhalation. RR intervals were captured with a heart rate monitor ($n=11$) and were analyzed for low-frequency (LF) power of HRV considered a proxy for integrated baroreflex function, and high-frequency (HF) power of HRV as a proxy of cardiac parasympathetic modulation. Transcranial Doppler quantified middle cerebral artery mean velocity (MCAv), pulsatility index (PI), and resistive index (RI). Two-tailed paired t-tests were used for normally-distributed differences (HF power, MCAv, PI, RI); Wilcoxon signed-rank tests were used for LF power, whose differences violated normality ($p=.025$). **RESULTS:** Pranayama increased LF power (1127 ± 1690 to 6873 ± 5443 ms², +510%, $p=.002$). HF power did not differ across conditions (1262.6 ± 1482.7 to 996.5 ± 1097.6 ms², -21.1%, $p=.219$). There were no differences in MCAv (54.9 ± 13.9 to 52.6 ± 15.7 cm/s, -4.2%, $p=.19$), PI (0.94 ± 0.11 to 1.04 ± 0.25 , +10.4%, $p=.12$), or RI (0.58 ± 0.04 to 0.60 ± 0.08 , +4.8%, $p=.17$) across breathing conditions. **CONCLUSION:** Although having minimal effects on cerebral hemodynamics, our findings suggest bhrumari pranayama can meaningfully shift cardiac autonomic tone by increasing LF power of HRV. Thus, a single bhrumari pranayama breathing session may be a simple, low-cost tool to favorably modulate the autonomic nervous system. The authors declare no conflicts of interest.



Improved Gait Performance following 4-Weeks of Static Calf Stretching in Peripheral Artery Disease Patients

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Peripheral artery disease (PAD) restricts lower-extremity blood flow and oxygen delivery, severely reducing walking capacity and physical activity. Adherence to walking exercise is limited in these patients due to exercise-induced leg pain. Passive calf stretching may provide a feasible, home-based alternative. Daily plantar flexor stretching has been shown to improve vascular function and 6-minute walk distance in PAD patients, but its effects on gait mechanics are unknown. **PURPOSE:** To determine the effects of 4 weeks of daily passive stretching on walk distance and gait mechanics in patients with PAD. We hypothesized that daily calf stretching would increase continuous walk test distance, peak plantar forces, and average step length. **METHODS:** Ten older (75 ± 7 yr; 6M/4F) patients with PAD (ankle-brachial index < 0.90) underwent 4 weeks of seated, static passive calf stretching (30 min per day, 5 days/week) using inflatable ankle splints to position both ankles in a moderately strenuous, but tolerable, dorsiflexed position. Prior to and after the intervention, participants completed a 6-minute walk test while gait mechanics were assessed using a pressure insole system (LoadSol™). Participants were also instructed to report calf tightness or claudication at any point during this test. Paired t-tests were used to determine pre-to-post intervention effects on continuous and total walk distance, step/stride characteristics, and insole forces. **RESULTS:** Following the stretching intervention, continuous walk distance (from 294 ± 107 m to 317 ± 102 m; $p=0.006$), mean step length ($p=0.019$), and mean stride rate ($p=0.019$) increased. These changes were accompanied by increases in peak medial ($p=0.0331$), lateral ($p=0.0051$), and total ($p=0.0081$) forefoot forces. **CONCLUSION:** Four weeks of daily passive calf stretching is a feasible home-based intervention that may produce a more vigorous push-off and improve walk test performance in older patients with PAD.

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Baseline Strength and Vascular Function Predict Magnitude of Training Adaptations in Middle-Aged Women

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Resistance exercise training (RET) is recommended for middle-aged women to counteract menopause- and age-related declines in muscle strength, but individual responses to RET vary. **PURPOSE:** The purpose of this study was to examine individual-level factors that may contribute to heterogeneity in training responses: baseline strength, vascular function, and menopausal status. **METHODS:** Twenty-two middle-aged women (51 ± 6 y; 0 y RET experience) completed an 8-week RET program. Menopausal status was classified per Stages of Reproductive Aging Workshop (STRAW+10) criteria. RET sessions included 3 sets of 8-12 repetitions of 8 total-body exercises at 60% of 1-repetition maximum (1RM), with weight increased by 5-10% after two sets of 12 repetitions for three consecutive sessions. Macrovascular function (flow-mediated dilation, FMD), microvascular function (reactive hyperemic area under the curve, RHAUC), and 1RM were assessed pre- and post-intervention. Pearson correlations examined relationships among variables at baseline and post-intervention ($\alpha=0.05$). **RESULTS:** Baseline handgrip strength correlated with absolute leg press gains ($R=0.51$, $p=0.019$). Baseline leg press strength correlated with absolute leg press gains ($R=0.74$, $p<0.001$). Baseline chest press strength was inversely correlated with percent chest press change ($R=-0.59$, $p=0.004$) and absolute FMD change ($R=-0.46$, $p=0.033$). Baseline leg press strength was inversely correlated with absolute FMD change ($R=-0.52$, $p=0.013$). Baseline FMD was inversely correlated with absolute FMD change ($R=-0.75$, $p<0.001$). Baseline RHAUC was inversely correlated with absolute RHAUC change ($R=-0.60$, $p=0.004$). Menopausal status was not associated with leg press, chest press, FMD, or RHAUC changes (all $p>0.05$). **CONCLUSION:** Baseline strength and vascular function, but not menopausal status, influence the magnitude of training-induced adaptations, with greater strength and vascular function showing smaller relative or absolute improvements. The authors declare no conflict of interest.



Do Nearby Weather-Station Data Reflect the Temperature and Relative Humidity People Experience in Daily Life?

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Accurate assessment of personal exposure to environmental temperature and relative humidity is important for research in exercise and environmental physiology. Such assessments often rely on data from fixed weather stations, which may not represent the immediate microenvironments individuals encounter during daily life. **PURPOSE:** To examine associations and systematic differences between temperature and relative humidity data from the weather station nearest to each participant and concurrent wrist-level measurements. **METHODS:** Fourteen participants (age: 32.1 ± 13.2 yrs; 50% female) completed 8 days of monitoring. A smartphone application recorded geolocation, and concurrent half-hourly temperature and relative humidity data from the nearest weather station were obtained from OpenWeather. Participants wore a wristband with an iButton sensor that recorded environmental temperature and relative humidity at 10-minute intervals. Temporally matched weather-station and iButton measurements were examined for linear associations and mean differences outdoors and indoors. **RESULTS:** Outdoors, correlations between sources were weak and not significant for temperature ($r = 0.18$, $p = 0.250$) or relative humidity ($r = -0.20$, $p = 0.181$). Mean wrist-level temperature was 8.5°C higher than weather-station temperature ($27.9 \pm 2.2^{\circ}\text{C}$ versus $19.4 \pm 1.9^{\circ}\text{C}$; $p < 0.001$), whereas mean wrist-level relative humidity was 29.8 percentage points lower ($36.6 \pm 9.4\%$ versus $66.4 \pm 11.5\%$; $p < 0.001$). Indoors, moderate correlations were observed between the two sources for temperature ($r = 0.61$, $p < 0.001$) and relative humidity ($r = 0.57$, $p < 0.001$). Nevertheless, mean wrist-level temperature was 5.6°C higher than weather-station temperature ($23.8 \pm 2.6^{\circ}\text{C}$ versus $18.2 \pm 3.1^{\circ}\text{C}$; $p < 0.001$), while mean wrist-level relative humidity was 9.6 percentage points lower ($50.1 \pm 11.5\%$ versus $59.7 \pm 14.0\%$; $p < 0.001$). **CONCLUSION:** Nearest-station and wrist-level measurements differed substantially in magnitude indoors and outdoors, while their linear associations were weak outdoors. Moderate correlations indoors indicated shared variation but not agreement. These findings suggest that fixed-station observations should not be assumed to represent the personal microenvironmental conditions individuals experience during daily life. The authors declare no conflicts of interest.



Sex Differences in the Acute Strength Response to First- versus Third-Person Action Observation Perspectives

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Action Observation (AO) is a technique in which a participant observes an actor perform a movement, targeting the central nervous system rather than the muscle tissue directly, with potential to elicit neuromuscular adaptations such as increased strength. However, it remains unclear whether these acute strength responses to AO differ between males and females, or whether AO perspective influences this relationship. **Purpose:** To investigate sex differences in the effects of AO on muscle strength, comparing first-person (1PP) and third person (3PP) observation perspectives. **Methods:** Sixteen healthy adults (8 men: 22 ± 4 yr, 177.7 ± 5.9 cm, 76.0 ± 7.4 kg; 8 women: 20 ± 2 yr, 166.4 ± 4.1 cm, 72.3 ± 15.7 kg) completed video observation of age- and sex-matched actors performing leg extension exercises from 1PP, 3PP and a control condition (CON) of watching a blank screen. AO conditions were randomized. Maximal voluntary contraction (MVC) peak torque (Nm) was assessed via isometric knee extension contractions of the dominant leg before and after video observation. Responses were expressed as percent change to account for baseline strength differences between sexes. A 2 (Sex) × 3 (Condition) mixed-model ANOVA compared percent change in MVC, with partial eta squared reported as the effect size ($\alpha = 0.05$). **Results:** MVC peak torque was greater in men than women at baseline (193.7 ± 43.7 vs 142.0 ± 23.8 Nm, $p = 0.011$). Percent change in MVC (mean ± SD) was $+3.00 \pm 5.86\%$ (1PP), $+2.13 \pm 3.99\%$ (3PP), and $+0.07 \pm 4.97\%$ (CON) in women, and $+1.05 \pm 9.88\%$, $-2.85 \pm 6.27\%$, and $-4.47 \pm 7.46\%$ in men. There was a large but non-significant main effect of Sex ($F(1,14) = 4.13$, $p = 0.062$, $\eta^2 p = 0.23$). Neither the main effect of Condition ($F(2,28) = 1.58$, $p = 0.224$, $\eta^2 p = 0.10$) nor the Condition × Sex interaction ($F(2,28) = 0.24$, $p = 0.792$, $\eta^2 p = 0.02$) was significant. **Conclusion:** Acute strength responses to AO did not differ by condition, and sex differences in response did not depend on viewing perspective. However, women tended to maintain strength while men declined across conditions, a large but non-significant sex effect. Few studies have examined AO perspective and sex interactions; these preliminary findings suggest sex should be considered in future AO research and rehabilitation applications.

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A Preliminary Evaluation of Maintenance Programming on Performance and Body Composition in NCAA DII Pitchers

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Programming is an integral component of team and individual athletic success. While pre-season training is pivotal for preparing athletes for their season, a well-structured maintenance phase is of equal importance for sustaining performance and physiological adaptations over the duration of the season. Monitoring body composition (BC) and pitch velocity (PV) may provide insight into performance variables for strength and conditioning, nutritional, and/or coaching personnel throughout a protracted regular season schedule. However, there is minimal research evaluating a maintenance program and its impact on BC and PV in DII pitchers. **PURPOSE:** To evaluate the impact of a 5-week, in-season maintenance program on BC and fastball PV in NCAA DII pitchers. **METHODS:** This study included NCAA DII collegiate baseball pitchers ($n=10$, age: $20 \pm .82$ yrs., height: 73.8 ± 2.62 in., weight: 210.24 ± 31.96 lbs.). Subjects were involved in the study for a 5-week period during their regular-season 50-game schedule. During this time, athletes followed a maintenance training program designed by their strength coach. Additionally, during weeks 1 and 5 of the season, 10 in-game fastball PV's (mph) were selected at random, averaged, and used for analysis. Also, during weeks 1 and 5 athletes had their BC, specifically bodyweight (BW) and lean body mass (LBM), assessed utilizing a bioelectric impedance analysis. To decrease diurnal variations, subjects were assessed at the same time of day wearing only compression garments. Using a paired T-test, data from weeks 1 and 5 were analyzed. **RESULTS:** There was no statistically significant difference in BW (210.24 ± 31.96 vs. 208.54 ± 31.94 , $p = >.05$), LMB (101.44 ± 9.75 vs. 101.38 ± 9.91 lbs., $p = >.05$) or PV (87.40 ± 1.71 vs. 86.96 ± 2.50 mph, $p = >.05$) from week 1 to week 5. **CONCLUSION:** Baseball is a demanding sport given its physical requirements and length of season. Utilizing a well-structured maintenance program can allow pitchers to maintain adequate body composition and pitch velocity in NCAA DII pitchers. Future studies should assess the impact of a maintenance program on BC and PV over the course of an entire season.



Laboratory Validation of the Variable Height Step Test for Cardiorespiratory Fitness Testing

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Cardiorespiratory fitness step tests can be used as a health indicator, but traditional step tests require a standardized step height that may not be practical in all settings. Adjusting stepping frequency to account for different step heights may allow exercise intensity to remain consistent while increasing the accessibility of the test. **PURPOSE:** To validate the variable height step test in a laboratory setting.

METHODS: Participants attended a screening visit, a maximal exercise treadmill test visit with indirect calorimetry, and three randomized step test sessions. The step test visits used the same estimated metabolic cost as the YMCA step test (25.8mL/kg/min) but varied the step height and adjusted the step frequency according to the American College of Sports Medicine stepping metabolic equation; 8inch step (32.5 steps/min), 12inch step (24 steps/min), and 16inch step (19 steps/min). The heart rate (HR) measured between 5-65s post stepping exercise was used as the primary variable of interest and was analyzed using a wireless chest strap electrocardiogram monitor. Stepping HR response was assessed for repeatability between step heights with intraclass correlation coefficients (ICC) and Cronbach's α with statistical significance set to lower 95%CI>0. Stepping HR relationship to VO_{2peak} was assessed with Pearson's correlation with statistical significance set to $p<0.05$. Statistics were performed in JASP 0.98.1.

RESULTS: 39 healthy adults participated (16 men, 23 women, age: 24 ± 6 yr, height: 168 ± 11 cm, weight: 67.8 ± 14.8 kg, body fat: $23.5\pm8.0\%$). The HR responses between step tests were well correlated with excellent repeatability: 8vs12inch ICC=0.840 95%CI=0.715:0.913, Cronbach's α =0.913 95%CI=0.858:0.968; 12vs16inch ICC=0.870 95%CI=0.766:0.930, Cronbach's α =0.931 95%CI=0.886:0.975; 8vs16inch ICC=0.859 95%CI=0.747:0.923, Cronbach's α =0.923 95%CI=0.875:0.972. The HR response to the 12inch step test vs the VO_{2peak} displayed a large effect: $r=-0.704$, $p<0.001$. **CONCLUSION:** The variable-height step test demonstrated excellent reliability and repeatability across an 8, 12, and a 16-inch step height, indicating that convenient step heights can be used instead of prescribed step heights if step frequency is adjusted accordingly.

The authors declare no conflicts of interest.



Profiling IGFBPs Following a 24-week High-Frequency Impact and Resistance Training Intervention.

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Insulin like growth factor-I (IGF-I) is a hormone whose bioavailability is regulated by IGF binding proteins (IGFBP) and responds to mechanical loading. **PURPOSE:** To examine the effects of acute exercise on the IGF-1 system before and after a 24-week (wk) exercise intervention. **METHODS:** Participants were randomized into a 24-wk intervention of high-frequency ballistic exercise combined with resistance and aerobic exercise training (n=66, [56% female]; Training) or a casually active control (n=29, [76% female]; Control). Participants completed an acute loaded ballistic resistance exercise test (AET; PlyoPress 10x10 at 40% 1RM). Fasted serum was obtained at four time points: pre- and post-AET at baseline, and pre- and post-AET upon completion of the 24-wks. Total circulating IGF-1, IGFBP-1, IGFBP-2, IGFBP-5, IGFBP-7 were assessed by ELISA and O-link proteomics at all time points. Linear mixed-effects models were fit with group (Training vs Control), acute exercise (Pre vs. Post AET), time (Pre vs. Post 24wks) and their interactions as fixed effects, with random intercepts for participant. **RESULTS:** Participants were similar in distribution of sex (p=0.107), age (yrs; Training 27 [24,30] v. Control 26 [22, 33]; p=0.506), BMI (kg/m²; Training 25.2±2.7 v. Control 24.3±3.4; p=0.187), and total soft tissue lean mass (kg; Training 50.4±11.2 v. Control 46.6±8.2; p=0.067). No interaction effects (group*AET*time) were seen for any of the measured biomarkers (p≤0.242). A significant main effect of time was seen for IGFBP1 (p=0.004), such that concentrations reduced from pre- to post-24 wks (D=-0.279±0.10). A significant main effect of acute exercise was seen for IGFBP7 (p=0.004), such that concentrations reduced after the AET (D= -0.087±0.03 (NPX), p=0.004). **CONCLUSION:** Given IGFBP-7’s low IGF-1 affinity, its decline may raise free IGF-1 bioavailability, aiding bone adaptation. This is among first studies to profile IGFBP with circulating IGF-1 in response to osteogenic exercise.

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The Psychological and Functional Performance Effects of Ankle Bracing in Active College Students

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Ankle sprains are one of the most prevalent musculoskeletal injuries in athletics. Semi-rigid ankle braces are known for their mechanical benefits, such as restricting excessive inversion while enhancing overall joint stability. What goes unmentioned is their potential psychological effects that remain unexplored.

PURPOSE: This study examined both psychological and functional responses to ankle bracing in physically active individuals. **METHODS:** A randomized, three-condition crossover design compared no brace (C), compression sleeve (P), and semi-rigid ankle brace (B). Eighteen participants (age 19.6 ± 1.3 years, mass 67.7 ± 11.9 kg) completed three performance and functional tests (a single-leg vertical jump (VJ), Biodex dynamic postural stability Index (BDPSI), and a four-way bounding agility test) and rated confidence, stability, safety, strength, and protection on a visual analogue scale. Data were analyzed using one-way ANOVA with repeated measures. **RESULTS:** The functional outcomes did not show significant differences between the conditions for VJ (19.7 ± 4.7 (P) vs. 18.6 ± 3.0 (B) vs. 18.4 ± 4.0 in (C), $p = 0.10$), BDPSI (2.7 ± 1.8 (P) vs. 2.8 ± 1.4 (B) vs. 3.1 ± 2.4 (C), $p = 0.29$) or bounding test index (1.0 ± 1.4 (P) vs. 1.3 ± 1.1 (B) vs. 0.7 ± 0.8 (C), $p = 0.33$). As for the psychological measures, the B condition showed the highest scores across all five scaled items. The most notable differences were observed in stability and protection. For VJ, the perceived stability (10.2 ± 1.6 (B) vs. 8.1 ± 2.6 (C) vs. 8.1 ± 2.4 (P); $p = 0.001$) and protection (10.2 ± 1.9 (B) vs. 7.4 ± 2.9 (C) vs. 8.6 ± 2.6 (P); $p = 0.01$) scores were significantly higher in B condition when compared to C and P condition. Similar results were found for stability (8.3 ± 1.9 (B) vs. 6.8 ± 2.6 (C) vs. 7.5 ± 2.8 (P), $p = 0.006$) and protection (10.0 ± 2.1 (B) vs. 6.4 ± 3.0 (C) vs. 8.5 ± 2.7 (P); $p = 0.008$) in the BDPSI and bounding test's stability (9.5 ± 2.3 (B) vs. 7.2 ± 2.2 (C) vs. 8.5 ± 2.8 (P); $p = 0.006$) and protection (9.7 ± 2.5 (B) vs. 7.4 ± 2.9 (C) vs. 8.5 ± 2.3 (P); $p = 0.017$). **CONCLUSION:** Semi-rigid ankle bracing elicited meaningful psychological benefits but did not for functional aspects. The psychological and physical findings suggest bracing may offer perceptual advantages that support safer and more confident performance in physically active individuals.

The authors declare no conflict of interest.



Impact of hormonal intrauterine devices on blood pressure reactivity to isometric handgrip exercise in women

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The use of a Levonorgestrel-releasing intrauterine device (IUD), a form of hormonal contraceptive, is rapidly growing in prevalence among reproductive aged women. IUDs were designed to have local, intrauterine-only effects, yet recent evidence suggests that IUD use potentiates heart rate (HR) responses to stressors. However, the impact of IUD use on blood pressure (BP) reactivity, a predictor for the development of hypertension, remains unexplored. **PURPOSE:** To test the hypothesis that IUD users have greater blood pressure reactivity to sympathoexcitatory stimuli compared to naturally cycling (NAT) women. **METHODS:** Young healthy premenopausal women (IUD: n=9, 23±3yrs, BMI: 24±4kg/m²; NAT: n=9, 23±4yrs, BMI: 23±3kg/m²) were included. BP reactivity was assessed during two minutes of isometric handgrip (HG) exercise at 30% of maximal voluntary contraction (MVC) and post-exercise ischemia (PEI; isolated skeletal muscle metaboreflex). Beat-by-beat BP and HR were measured continuously using a finometer and electrocardiogram, respectively. **RESULTS:** Baseline mean arterial pressure (MAP) (IUD: 81±8mmHg vs. NAT: 78±12mmHg, $p=0.52$) and HR (IUD: 60±11bpm vs. NAT: 66±10bpm, $p=0.20$) were similar between groups. MVC (IUD: 255±90N vs. NAT: 218±68N, $p=0.16$) and average force maintained during HG (IUD: 28±1% vs. NAT: 27±2%, $p=0.31$) were similar between groups. As expected, HG exercise increased MAP and HR in both groups ($p<0.05$). During the last minute of HG exercise, the increase in MAP (IUD: $\Delta 13\pm 8$ mmHg vs. NAT: $\Delta 17\pm 9$ mmHg, $p=0.38$) and HR (IUD: $\Delta 11\pm 6$ bpm vs. NAT: $\Delta 16\pm 4$ bpm, $p=0.07$) did not differ. MAP (IUD: $\Delta 9\pm 8$ mmHg vs. NAT: $\Delta 14\pm 6$ mmHg, $p=0.16$) and HR (IUD: $\Delta 3\pm 4$ bpm vs. NAT: $\Delta 3\pm 5$ bpm, $p=0.98$) remained elevated during PEI but did not differ between groups. **CONCLUSION:** Contrary to our hypothesis, IUD users did not exhibit greater BP reactivity to isometric HG exercise. Taken together with previous findings, LNG-IUD users exhibit potentiated HR responses to mental stress, but not during isometric exercise. Continued investigations are needed to fully elucidate the impact of IUD use on autonomic-cardiovascular regulation in women.

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Effects of Coherence Breathing on Heart Rate Recovery Following Maximal Exercise

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While structured breathwork has been examined as a post-exercise recovery strategy, it remains unclear whether slow-paced breathing performed before maximal exercise can influence subsequent cardiovascular recovery. **PURPOSE:** To determine whether pre-exercise coherence breathing alters heart rate (HR) and heart rate recovery (HRR) following maximal cardiopulmonary exercise testing (CPET) compared with spontaneous breathing. **METHODS:** Fourteen healthy adults (9 men, 5 women; age 27.8 ± 8.0 years; BMI 24.0 ± 3.8 kg/m²) completed two CPET sessions in a randomized crossover design. Participants were randomized 1:1 to testing sequence and completed sessions 48 hours to 7 days apart. Before each CPET, participants completed five minutes of slow-paced coherence breathing (6 breaths per minute) or spontaneous breathing. Mean HR was assessed at baseline and during each breathing condition. HRR was calculated as the reduction from peak HR at 1, 2, and 5 minutes post-exercise. Linear mixed-effects models accounted for repeated within-participant observations and tested condition, recovery time/phase, condition x time/phase, and testing sequence, with participant as a random intercept. Acute changes from baseline to breathing conditions were compared. **RESULTS:** Peak HR was similar between breathing conditions (mean paired difference, 0.62 bpm; 95% CI, -2.15 to 3.38; p=.636). HRR increased over time (F(2,65)=229.72, p<.001), with no effect of breathing condition (F (1,65)=0.07, p=.789), condition x time interaction (F (2,65)=0.18, p=.832). Estimated marginal mean HRR at 1, 2, and 5 minutes was 40.2, 65.3, and 82.8 bpm following coherence breathing and 40.3, 65.7, and 81.0 bpm after spontaneous breathing. Mean HR changed from 75.5 to 77.9 bpm with coherence breathing and from 74.2 to 73.3 during spontaneous breathing. There was a main effect of condition (F(1,39)=4.45, p=.041). However, no condition x phase interaction (F (1,39)=1.33, p=.256). **CONCLUSION:** Five minutes of pre-exercise coherence breathing did not alter peak HR or differentially change HR from baseline, and did not influence subsequent HRR after maximal exercise compared with spontaneous breathing. These preliminary findings extend breathwork research to the pre-exercise period and suggest that a brief pre-exercise slow deep breathing intervention does not meaningfully modify HR responses or HRR after maximal exercise.

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Physiological and Perceptual Responses to Cycle Exercise in Virtual Reality

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Full-immersion virtual reality (VR) gaming is growing in popularity and accessibility. However, limited research has studied its use in commercially available exercise applications. **PURPOSE:** To compare heart rate (HR), ratings of perceived exertion (RPE), and exercise enjoyment between two different VR exercise conditions and a no-VR control session. **METHODS:** 20 young adults (14 men, 6 women; mean age 20.4 ± 1.3 years) participated in this investigation. Each subject visited the laboratory on 4 separate occasions. Session 1 included a peak oxygen consumption test on a cycle ergometer for determination of HR and RPE at the ventilatory threshold (HR_{VT} and RPE_{VT} , respectively). Sessions 2-4 were the following, performed in a random counterbalanced order on a stationary bike: no-VR self-paced control (No-VR), VR bike racing game (VR-bike), VR first-person shooter tank game (VR-tank). The VR games were played with a system that syncs the VR headset and computer to an exercise bike with an accelerometer on a pedal to control speed in the games. Each exercise session included a 5-minute warm-up, 10-minute experimental exercise session, and 5-minute cool-down. HR was measured continuously throughout exercise. Acute and session RPE were assessed with the Adult OMNI-Cycle Scale. The Physical Activity Enjoyment Scale (PACES) was assessed post-exercise. Responses were compared between sessions using a repeated-measures analysis of variance. **RESULTS:** HR during VR-bike (141 ± 22 bpm) was significantly higher than No-VR (122 ± 20 bpm) and VR-tank (122 ± 19 bpm), while all three were significantly lower than HR_{VT} (162 ± 14 bpm) ($F_{3,57} = 51.89$, $p < 0.001$). RPE during VR-bike (3.9 ± 1.5) was significantly higher than No-VR (2.7 ± 1.2) but not VR-tank (3.0 ± 1.2). All three were significantly less than RPE_{VT} (6.2 ± 1.2) ($F_{3,57} = 42.46$, $p < 0.001$). Session RPE after VR-bike (5.1 ± 1.8) was significantly higher than No-VR (3.7 ± 1.4) and VR-tank (3.9 ± 1.4) ($F_{2,38} = 7.19$, $p = 0.002$). PACES after VR-bike (96.5 ± 9.8) was significantly higher than No-VR (83.6 ± 16.0) but similar to VR-tank (91.1 ± 12.0) ($F_{2,38} = 7.90$, $p = 0.001$). **CONCLUSION:** Certain VR exercise games can produce a higher heart rate response with greater exercise enjoyment compared to standard self-paced cycle exercise.



Sodium-to-Potassium Ratio and Blood Pressure in Midlife Adults and Midlife Former Athletes

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Midlife former collegiate athletes face many physiological challenges as a result of discontinuing sport due to significant injury. Unhealthy diets characterized by a high sodium (Na) and low potassium (K) intake are one factor that may contribute to the prevalence of elevated blood pressure (BP) seen in former athletes. The dietary Na:K ratio is shown to be more strongly associated with elevated BP than either mineral independently. **PURPOSE:** This study examined the relation between the Na:K ratio and BP in midlife former collegiate athletes with or without a history of lower extremity injury and non-athlete controls. **METHODS/DESIGN:** Cross-sectional data from healthy midlife adults (40-64 yrs) were stratified into three groups: former athletes with a history of injury (MFA-I; 37W/36M, 50±7 years; 131/85±17/10mmHg), former athletes without a history of injury (MFA; 41W/30M, 50±7 years; 132/85±18/11mmHg), and non-athlete controls (NA; 39W/35M, 51±8 years; 125/81±16/15 mmHg). Three-day habitual diet logs were used to assess nutrient intake and calculate the Na:K ratio. BP was measured using standardized clinical protocols. Differences in Na:K ratio and BP were analyzed using a one-way ANOVA with Tukey post-hoc analysis. Correlations between Na:K and BP were assessed using a partial Pearson correlation and controlled for sex as a covariate. **RESULTS:** The Na:K ratio was lower in MFA-I compared to MFA (1.15±0.4 vs. 1.32±0.5; $p=0.04$) while neither was different from NA (1.23±0.04; $p>0.05$). MFA had a higher systolic BP (SBP) and mean arterial pressure (MAP) compared to NA ($p<0.05$) but was not different from MFA-I ($p>0.05$). Na:K ratio was correlated with diastolic BP (DBP) and MAP in MFA (DBP: $r=0.28$, $p=0.02$; MAP: $r=0.24$, $p=0.04$) and NA (DBP: $r=0.26$, $p=0.03$; MAP: $r=0.27$, $p=0.02$), but not MFA-I ($p>0.05$ for both). There was no significant correlation between the Na:K ratio and SBP for any group. **CONCLUSION:** These data show that a higher Na:K ratio is related to an elevated BP in former athletes without prior injury and non-athletes while no relation was seen in former athletes with prior injury. While it is not clear why no relation was seen in former athletes with a prior injury, our results suggest lowering Na and increasing K intake is beneficial for midlife adults regardless of sport participation.

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Jump Around and Find Out: Repeated Fatigue Bouts Reduce Single-Leg Hop Distance

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Most fatigue research focuses on single-bout protocols, leaving gaps in understanding how repeated exertion cumulatively affects lower extremity function. **PURPOSE:** This study examined how repeated bouts of lower limb fatigue influence motor performance during a single-leg forward hop (FWD Hop) in healthy young adults. A secondary aim was to explore fatigue accumulation across successive bouts.

METHODS: Ten healthy young adults (6 males, 4 females; 23 ± 3 yrs; 171.7 ± 5.3 cm; 69.1 ± 5.7 kg) completed three 60-second (s) fatiguing bouts of continuous countermovement jumps at 60 beats per minute. Rating of perceived exertion (RPE) was recorded every 15s during each bout. Motor performance was assessed via FWD Hop distance (average of three repetitions per leg) at four time points: baseline, post-fatigue 1 (PF1), post-fatigue 2 (PF2), and post-fatigue 3 (PF3). RPE was analyzed using a 3x4 (Fatigue Bout x Time) repeated measures ANOVA (RMANOVA). FWD Hop distance was analyzed using a 1x4 (Time) RMANOVA. **RESULTS:** For RPE, significant main effects occurred for fatigue bout ($p = .025$) and 15-s intervals ($p < .001$), with no interaction ($p > .05$). RPE increased significantly across every 15-s interval within bouts (all $p < .001$), and overall RPE during bout 3 was significantly higher than bout 1 ($p = .046$) and bout 2 ($p = .027$). For FWD Hop distance, a significant main effect of time was observed ($p = .020$). Distance decreased from baseline (132.1 cm) to PF1 (128.1 cm), PF2 (121.7 cm), and PF3 (117.7 cm), with post-hoc analysis revealing a significant drop between PF1 and PF2 ($p = .047$). Data collection is ongoing to adequately power secondary analyses evaluating sex and limb dominance differences. **CONCLUSION:** Repeated bouts of lower limb fatigue elicit compounding increases in perceived exertion and progressive decrements in FWD Hop distance. Notably, a significant drop in functional performance occurred between the first and second fatiguing bouts. These novel findings highlight the importance of assessing multi-bout fatigue, rather than single-bout protocols, to more accurately capture cumulative functional decline and potential injury risk in repetitive athletic and occupational settings.

This project was approved by the Towson University Institutional Review Board. The authors declare no conflicts of interest.



Ageist Behaviors in College Students and Intent to Participate in Sport as an Older Adult

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Participation in formal sport competition represents a strategy to increase physical activity in older adults. Identifying factors that hinder or promote participation in such events is therefore important. **PURPOSE:** The present study aimed to determine: (a) whether younger adults' beliefs are associated with older adults' participation in formal sport competition, and b) whether younger adults' intentions to participate in such events in the future are related to endorsement of ageist behaviors. **METHODS:** Ninety-four college students (60% female) completed a survey assessing beliefs associated with formal sport competition for older adults and frequency of endorsement of ageist behaviors (Cherry & Palmore, 2008). **RESULTS:** Most participants agreed or strongly agreed that participation in formal sport competition by older adults is "beneficial" (96%), "appropriate" (95%), and "safe" (88%). Participants who intended to participate in formal sport competition in the future endorsed positive ageist behaviors with greater frequency (0.58 ± 0.16) than those that did not (0.47 ± 0.19 ; $p = 0.006$). There was no difference in endorsement of negative ageist behaviors between participants who intended to participate (0.27 ± 0.12) and those who did not (0.23 ± 0.13), although the difference approached significance ($p = 0.06$) when data were normalized. **CONCLUSION:** These findings suggest that younger adults who endorse positive ageist behaviors may be more likely to engage in formal sport competition as older adults. Further research is needed to confirm these findings and to explore their implications for promoting physical activity among older adults. The authors declare no conflicts of interest.



Effect of Caffeine on Hydration Levels in College Athletes

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The existing research is limited regarding caffeine's diuretic effect on college athletes. The consumption of caffeine has increased in the United States over the years, which could contribute to the diuretic effect due to the dosage increase. **Purpose:** The purpose of this study was to assess the effects of caffeine intake on hydrations levels of college athletes. **Methods:** PennWest Edinboro athletes, 20 male ($20.25 \pm 1.33y$, 71.45 ± 2.84 in., 187.05 ± 27.75 lbs.) and 15 female ($20.33 \pm 1.11y$, 67.07 ± 2.40 in., 144.93 ± 20.95 lbs.), with varying caffeine consumption on day of testing (00-300 mg; 89.14 ± 101.61 mg), provided a urine sample for hydration levels using a urine specific gravity (USG) refractometer. Hydration status was considered typical at $USG < 1.020$, and any value ≥ 1.020 suggesting some level of dehydration. **Results:** Analysis revealed a weak correlation between day of caffeine consumption and USG ($r=0.320$, $p=0.061$) which was approaching significance. Dosage analysis of caffeine in milligrams per kilogram (mg/kg) of body weight (1.64 ± 2.34 mg/kg) was further insignificant and not correlated to USG ($r=0.238$, $p=0.169$). Urine color was shown to be a moderate to strong indicator of USG values ($r=0.572$, $p<0.001$). **Conclusions:** Results suggest that despite heightened caffeine doses, caffeine intake does not significantly impact the hydration levels of college athletes. Findings indicate that even with caffeine consumed in large doses, it may not exert a significant diuretic effect on athletes. Urine color was significantly related to USG.



External Needle Placement Geometry Across Examiners With Different Dry Needling Experience

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PURPOSE: Palpation-based landmark guidance in dry needling shows variable accuracy, particularly in deep or complex regions. This pilot study examined whether external needle placement geometry differs between early-career and expert clinicians across elbow and hip targets to inform when ultrasound imaging (USI) guidance may be warranted. **METHODS:** Two certified physical therapists (early-career <200 treatments; expert >1,000 treatments) performed palpation-guided placement of electromyography needles into the supinator, brachioradialis, common extensor tendon, tensor fascia lata, gluteus medius, and lateral hip tendon. Each clinician needled one side of each participant. Needle insertion point, base, and handle top were digitized in ImageJ, and triangular geometric areas were calculated. Descriptive statistics and generalized linear mixed modeling ($\alpha < 0.10$) evaluated clinician, region, and segment differences. **RESULTS:** Of 270 placements, 232 (86%) were visualized. Mean insertion-point area was $13,425.92 \pm 14,421.93$ pixels in the elbow and $54,191.41 \pm 31,652.33$ pixels in the hip. Areas increased from insertion to handle top, with smaller increases in the hip due to greater needle verticality. No clinician differences were found ($F=1.060$; $P=0.305$), nor clinician-by-segment interaction ($P=0.837$). A clinician-by-region interaction was present ($P=0.075$), with hip placements showing larger variability and more missing data. **CONCLUSION:** External needle geometry differed by clinician only when considering body region. Greater variability in hip placements suggests palpation-guided needling is less reliable in deeper tissues or individuals with larger body habitus, potentially increasing adverse event risk. Findings highlight the novel use of geometric external needle mapping and support USI guidance for deep or high-risk regions. Larger studies comparing palpation-guided, USI pre-scan, and real-time USI techniques across body morphologies are needed.



Descending Modulation of Spinal Cord Circuitry from the Somatosensory Cortex: A Preliminary Analysis

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The corticospinal tract (CST) is traditionally recognized as a descending motor pathway, but a portion of its fibers originate from somatosensory cortex (S1) rather than motor cortex. These fibers are hypothesized to modulate sensory information in the spinal cord, though their functional role in humans remains poorly understood. **PURPOSE:** To determine whether the corticospinal pathway from S1 modulates sensory afferent transmission in human spinal cord circuitry. **METHODS:** Ten participants (8 female; age: 38.3 ± 23.2 yrs, height: 168.1 ± 8.7 cm, weight: 71.7 ± 14.8 kg) completed the study. H-reflexes of the abductor pollicis brevis were elicited via median nerve stimulation, with and without preceding transcranial magnetic stimulation (TMS) over S1. A change in the spinal reflex with S1 stimulation would confirm a functional pathway allowing S1 to modulate spinal sensory input. Given the preliminary sample, H-reflex persistence (percentage of trials producing an H-reflex), amplitude, and latency were compared descriptively between conditions (without vs. with TMS over S1) using means $\pm$ SD, and standardized effect sizes (% change). Amplitude and latency were assessed in the subset ($n = 4$) who produced at least three H-reflexes per condition. Given bidirectional responses, persistence change was characterized as absolute change (percentage points), along with the number showing facilitation vs. inhibition. **RESULTS:** Persistence changed by 24.0 ± 17.3 % with S1 TMS; 7 of 10 participants showed facilitation, 3 of 10 showed inhibition. In the subset with sufficient H-reflexes for analysis ($n = 4$), amplitude increased with TMS (0.25 ± 0.1 vs. 0.54 ± 0.24 mV); latency was similar (24.2 ± 1.5 vs. 24.5 ± 1.6 ms). **CONCLUSION:** Preliminary work suggests S1 modulates sensory information at the spinal cord level via the CST, facilitating or inhibiting spinal circuits depending on participant. We hypothesize that the pathway is capable of both facilitatory and inhibitory modulation, and reasons for why stimulation facilitates reflexes in some while it inhibits in others is likely methodological and remains unresolved.

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Case Study: Effects of Acute Aerobic Exercise on Verbal Fluency in Individual with Dementia

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Aerobic exercise has been associated with acute improvements in cognitive function, specifically executive function and language. Verbal fluency (VF) is the ability to rapidly receive and generate words within a specified category. This is a commonly used measure of cognitive and language function, often used to observe individuals with cognitive dysfunction like dementia. **PURPOSE:** This study examines the effects of acute aerobic exercise on semantic VF in an individual with dementia across 3 sessions. **METHODS:** VF was assessed directly before and after exercise using response intervals of 0-60 seconds and 61-90 seconds. Total correct from 0-90 seconds was recorded and observed in final results. Designated categories were provided for the individual to generate words. Two consistent categories, fruit and animals, were used across the pre-exercise and post-exercise of Sessions 1, 2, and 3. An additional category was introduced in the post-exercise VF assessment of each session. Aerobic treadmill exercise intensity was quantified as metabolic equivalents (METs). Sessions were performed at 3.12, 3.12, and 3.62 METs for 20, 25, and 25 minutes, respectively. **RESULTS:** Post-exercise VF increased across the repeated fruit category in all three sessions. Total correct responses in the fruit category increase from 5 to 10 (+5) in Session 1, 6 to 10 (+4) in Session 2, and 7 to 11 (+4) in Session 3. Total correct responses in the animal category increase from 7 to 11 (+4) in Session 2 and 8 to 11 (+3) in Session 3. A Session 1 decrease was observed from 9 to 8 (-1). Additional categories from the postexercise VF assessment included 9 correct responses in Session 1, 10 in Session 2, and 12 in Session 3. **CONCLUSION:** Acute aerobic exercise was followed by improved semantic VF from pre-to-post in each session, but also from Session 1 to 2, and 2 to 3. The consistency of postexercise improvements across sessions suggests that there may be a dose response associated with aerobic exercise and that may be a potential strategy for temporary enhancement of VF in individuals with dementia. These findings support the need for further investigation into acute exercise as a cognitive intervention for those with dementia.

The authors declare no conflicts of interest.



Building Better Support Systems: Parent-Identified Priorities in Elite Female Youth Soccer

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Tailoring support programs to the needs of elite female youth soccer players may improve participation and promote athletic and personal development. **PURPOSE:** This study examined parent-identified priorities for supporting club-level female soccer players in the U13-U19 age groups. **METHODS:** Parents of 117 elite female youth soccer players completed a Qualtrics survey on support priorities. Parents represented first-team (55%) and second-team (45%) athletes in the U13-U14 ($n=41$), U15-U16 ($n=42$), and U17-U19 ($n=34$) age groups. Parents ranked their top three priorities from ten domains: physical performance, injury support, mental performance, student-athlete identity, team dynamics, sleep and nutrition, communication, leadership development, college pathway, and community impact. Responses were compared by competition level and age group, and open-ended responses were analyzed thematically. **RESULTS:** Mental performance (75%) and physical performance (73%) were the most frequently selected top-three priorities across all parents. Injury support (29%) and team dynamics (29%) were secondary priorities. Compared with second-team parents, first-team parents more frequently prioritized student-athlete identity (17% vs. 11%) and the college pathway (19% vs. 15%), while second-team parents more often prioritized physical performance (77% vs. 69%) and team dynamics (32% vs. 27%). Among U13-U14 parents, team dynamics (42%) and student-athlete identity (20%) were top priorities. U15-U16 parents more frequently selected leadership development (29%) and sleep/nutrition (29%). College pathway priorities increased with age (7%, 17%, and 29% for U13-U14, U15-U16, and U17-U19, respectively). Open-ended responses emphasized mental performance training, ACL injury prevention, female athlete mentorship, age-specific programming, and accessible delivery. **CONCLUSION:** Parents consistently identified mental and physical performance as the most important support priorities for elite female youth soccer players. Age-appropriate programming should integrate mental skills training, injury prevention, mentorship, and college preparation resources across stages of athlete development. The author declares no conflicts of interest.



Does Cardiovascular Function Differ in Persons With and Without Post-Treatment Lyme Disease Syndrome?

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Lyme disease affects approximately 475,000 people annually in the United States, and may result in persistent symptoms after treatment, a condition known as Post-Treatment Lyme Disease Syndrome (PTLDS). Persistent symptoms of PTLDS include muscle/joint pain and chronic fatigue, which may potentially have deleterious downstream effects on cardiovascular function. However, it remains understudied whether patients with PTLDS have worsened cardiovascular function compared to those who have never had Lyme Disease. **PURPOSE:** To compare measures of cardiovascular function between persons with PTLDS and controls. **METHODS:** Currently, 5 PTLDS participants (38.2 ± 25.9 years, BMI: 26.9 ± 5.2 kg/m²) and 5 controls (38.6 ± 26.4 years, BMI: 27.2 ± 5.2 kg/m²) have been included in this study. Brachial blood pressure was taken in duplicate using an automated blood pressure cuff in the supine position. Cardiovascular function was measured using central systolic blood pressure (CSBP), arterial stiffness and wave reflections. CSBP was measured via pulse wave analysis using a generalized transfer function from brachial waveforms. Arterial stiffness was measured by carotid femoral pulse wave velocity (PWV) using applanation tonometry. Wave reflections were measured by the augmentation index (Alx). An independent samples t-test was used to compare cardiovascular function measures between participants with PTLDS and controls. **RESULTS:** Independent samples t-test results revealed no statistically significant differences between PTLDS and controls across all three cardiovascular parameters: PWV (PTLDS: 6.6 ± 0.7 m/s vs CON: 6.5 ± 2.4 m/s; $p=0.918$), Alx (PTLDS: $16.6 \pm 14.6\%$ vs CON: $22.6 \pm 20.7\%$; $p=0.611$), CSBP (PTLDS: 109.6 ± 12.3 mmHg vs CON: 115.8 ± 16.5 mmHg; $p=0.520$). **CONCLUSION:** No significant differences were found in our measures of cardiovascular function between PTLDS and controls, suggesting that persons with PTLDS may not have worsened cardiovascular functioning. However, we currently have a pilot study sample size. As this is an ongoing study, we will continue to recruit participants to increase our statistical power in order to fully determine these relationships.

The authors declare no conflicts of interest.



Evaluation of Resource Implications Related to Longitudinal Mental Health Screenings for NCAA Division II Student-Athletes

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The National Collegiate Athletics Association (NCAA) has made significant progress in identifying needs, generating awareness, and creating best practices regarding the Mental Health (MH) of its own Student-Athletes' (SA). These progressions warrant an evaluation, specifically regarding staffing, resources, and workload implications related to longitudinal screening protocols. It is uncommon for universities to implement screenings after Pre-Participation Evaluations (PPE). Previous literature evaluating the resource implications for member institutions' support staff is limited. **PURPOSE:** The purpose of this study was to evaluate the implications of increasing screening frequency for NCAA SA throughout the academic year for member institutions' support staff. **METHODS:** Over two academic years, 764 subjects were screened for MH one to six times per year, with 222 subjects participating in both years. Year 1 included 375 subjects from a limited sample of team sport athletic teams. Year 2 included 606 subjects from a more inclusive sample of athletic teams. All Time Data, represented in hours, was collected by the Primary Investigator (PI) who prepared, scheduled, administered, and referred SA at all the screenings across the study period. **RESULTS:** The PI clocked 110 hours on average across both years, 55 hours per Fall and Spring Semester, and 4.2 hours per week dedicated to MH screening. The most demanding period across both years was PPE (averaging 44.8 total hours across 9 weeks, and 5.1 hours per week). At three periods outside of PPE, the average total hours of work were 17.5 hours (61% decrease from PPE) across 5.3 weeks, or 3.9 hours per week (20% decrease from PPE). **CONCLUSION:** In practice, the responsibility for conducting screenings commonly falls on sports medicine staff and athletic training departments. Most institutions only screen annually at PPE, due to feasibility issues regarding staffing. In this study, workload requirements for screening outside the PPE period substantially decreased which may serve as encouragement to practitioners to adopt longitudinal practices in the future.



Differences in Vascular Function and Intestinal Permeability Across the Menopause Transition

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Vascular dysfunction, characterized by reduced endothelial function and increased arterial stiffness, occurs during the menopause transition, likely due to declines in estradiol. Estradiol also impacts intestinal permeability (IP) and has been shown to have protective effects against IP in cell and animal studies.

Increased IP may negatively affect vascular function. **PURPOSE:** This study examined the relation between IP and vascular function among pre- (PreM), peri- (PeriM), and post-menopausal (PostM) women.

METHODS: Twenty-eight women were classified as either PreM (n=14; 36±7 years; 24.1±3.0 kg/m²; 106/63±10/7 mmHg), PeriM (n=5; 48±3 years; 27.1±4.4 kg/m²; 111/65±7/8 mmHg), or PostM (n=9; 57±2 years; 24.7±3.4 kg/m²; 111/62±17/10 mmHg). Endothelial function was assessed using brachial artery flow-mediated dilation (FMD). Arterial stiffness was measured using pulse wave velocity (PWV). IP was assessed using the lactulose:mannitol (L:M) ratio, a measure of IP in the small intestine and lipopolysaccharide-binding protein (LBP), a marker of IP in the colon. Data were analyzed using one-way ANOVA with Tukey's post hoc test. Pearson correlations were run to examine relations between FMD and PWV and measures of IP. **RESULTS:** FMD was lower in PostM (3.77±2.60%) compared to PreM (9.09±5.48%, p=0.048) and PeriM (11.02±4.90%, p=0.032) but did not differ between PreM and PeriM (p>0.05). PWV was lower in PreM compared with PostM (5.46±0.74 vs. 6.72±1.19 m/s, p=0.007); however, did not differ between PreM and PeriM or PeriM and PostM women (all p>0.05). The L:M ratio was not different among groups (all p>0.05); however, LBP was lower in PreM compared with PeriM (2.56±0.55 vs. 3.83±1.17 µg/mL, p=0.006) but did not differ in PostM vs. PreM or PostM vs. PeriM (all p>0.05). Furthermore, no significant relation was observed between FMD and the L:M ratio (r=-0.08, p=0.69) or LBP (r=0.18, p=0.37) nor between PWV and L:M ratio (r=-0.15, p=0.47) or LBP (r=0.17, p=0.38). **CONCLUSION:** These preliminary data suggest that although the L:M ratio did not differ among groups, LBP was lower in PreM compared to PeriM which may suggest changes in colonic permeability prior to the menopause transition. However, this appears to be unrelated to vascular function. Given the pilot nature of this study, more data is needed to examine these changes in IP.

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Relationship Between Spleen Volume and Vascular Hemodynamic Response to Thermoneutral Head-Out-of-Water-Immersion

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As cardiovascular (CV) disease is a leading cause of death worldwide, understanding how hemodynamics are altered during various stressors may provide future benefits to CV health. The spleen serves as a versatile volumetric organ that can regulate hepatic portal dynamics via dilation and contraction, but it is unknown how splenic volumetric changes alter central hemodynamics. Knowing that splenic dilation occurs during thermoneutral head out of water immersion (HOWI). This study aimed to define the relationships between changes in spleen volume and central vascular hemodynamics during HOWI. **Purpose:** To test the hypothesis that a HOWI induced augmentation of spleen volume will decrease central blood pressures and carotid-femoral pulse wave velocity (PWV). **Methods:** 13 self-reported healthy participants, (4 female, Age: 20±1yr, Body Mass: 76±13kg, Body fat: 28.3±8.2%, BMI:24.4±2.9kg/m²) completed brachial blood pressures (bSys and bDia), central blood pressures (cSys and cDia), and PWV pre and post HOWI in the supine position. Spleen volumes were measured via doppler ultrasound at pre, 10-, and 30-min HOWI, in 35 °C water, with volume calculated via the Pilstrom equation. **Results:** There was no change in oral temperature ($p = 0.18$). Spleen volume increased from baseline (189 ± 31 ml) at both 10 min (218 ± 34 ml, $p < 0.01$) and 30 min (232 ± 38 ml, $p < 0.01$). PWV increased significantly from pre (4.82 ± 0.68 m/s) to post HOWI (5.38 ± 0.83 m/s, $p < 0.01$). Both bSys (pre 119 ± 8 , post 127 ± 10 mmHg, $p < 0.01$) and cSys (pre 101 ± 4 , post 105 ± 6 mmHg, $p = 0.02$) increased, while neither diastolic pressure changed (bDia $p = 0.05$ mmHg, cDia $p = 0.25$) were not significant. Relative change in spleen volume was not correlated with change in PWV ($r = 0.096$, $p = 0.75$). Relative change in spleen volume was not correlated with change in bSys ($r = 0.121$, $p = 0.69$) or cSys ($r = 0.15$, $p = 0.63$). Relative change in spleen volume was not correlated with change in bDia ($r = 0.310$, $p = 0.30$) or cDia ($r = -0.18$, $p = 0.56$). **Conclusion:** PWV increased post HOWI likely from fluid shifts via water immersion, however there was no association with the spleen volume augmentation. Systolic blood pressures increased without an association to splenic volume changes, while diastolic remained unchanged.

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The Effects of Low-Intensity Exercise on Executive Function Fatigue

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PURPOSE: The purpose of the present study was to determine if low intensity exercise lasting 10 minutes influences executive function fatigue. **METHODS:** A total of seven participants (male: three; female: four; Age: 21-30years) volunteered to participate. Participants completed two visits. Each visit began with a 10-minute quiet rest. Following this, measures of executive function were assessed (Rest), and included the Go-NoGo Test (GNG), and N-Back Test (NB). The GNG assessed reaction time (RT) and accuracy (ACC) in both the Go and NoGo conditions, while the NB assessed RT and ACC in both the 1-Back and 2-Back conditions. Participants then completed a series of executive function fatiguing tasks, lasting approximately 30 minutes, which were immediately followed by a 10-minute condition. One visit utilized a condition consisting of walking for 10 minutes at a light intensity (Walk); the other utilized a condition consisting of sitting quietly for 10 minutes (Con). Executive function was assessed immediately following the condition (Post). A two-way repeated analysis of variance (ANOVA) was utilized to assess the impact of condition (Walk, Con) across the repeated factor of time (Rest, Post) on measures of executive function.

RESULTS: There were no significant main effects of time or condition for RT during Go ($F(2,36)=2.11$, $p=0.15$) or NoGo ($F(2,36)=0.16$, $p=0.68$), or ACC during Go ($F(2,36)=2.08$, $p=0.59$) or NoGo ($F(2,36)=0.43$, $p=0.52$) conditions of GNG. Additionally, there were no significant main effects of time or condition for RT during 1-Back ($F(2,36)=2.33$, $p=0.13$) or 2-Back ($F(2,36)=0.13$, $p=0.72$), or ACC for 1-Back ($F(2,36)=0.61$, $p=0.43$), or 2-Back ($F(2,36)=0.61$, $p=0.43$) conditions of NB. **CONCLUSION:** Walking for 10 minutes at a light intensity does not alter measures of executive function following executive function fatigue. As such, individuals can engage in light intensity walking following bouts of executive function fatigue without amplifying executive function fatigue.



Effects of Multi-Strain Probiotic Supplementation on Mood Symptoms and Cognitive Function in Symptomatic Adults

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Mood disorders are the leading cause of disability worldwide, primarily affecting adults aged 18-60 years.

PURPOSE: To assess the effects of a probiotic supplement on mood disorder symptoms in healthy but symptomatic college-aged individuals. **METHODS:** Forty-three adults (19.8 ± 1.2 yrs) with elevated mood-related symptoms from the Depression (14.6 ± 7.3) Anxiety (15.7 ± 7.7) Stress (21.4 ± 6.7) scales (DASS) were recruited for this randomized, double-blind, placebo-controlled study. Participants were assigned to a probiotic (PRO; $n=22$) or placebo (PLA; $n=21$) group and instructed to take the supplement twice daily for 8 weeks. Questionnaires and cognitive tests were completed at baseline, week 4, and week 8. The questionnaires included DASS, Beck Anxiety Inventory (BAI), Profile of Mood States (POMS), and the Leiden Index of Depression Sensitivity (LEIDS). Cognitive tests consisted of congruent and incongruent Stroop and task-switching. **RESULTS:** There was a significant ($p < .005$) interaction in LEIDS control scores between the PRO and PLA groups. The PRO group exhibited less maladaptive control between week 4 (4.9 ± 2.4) and week 8 (3.5 ± 2.5), whereas scores increased in the PLA group between week 4 (3.6 ± 2.2) and week 8 (4.1 ± 2.9). There was a significant ($p < .008$) interaction in cognitive function between groups. Mean reaction time decreased in the PRO group (baseline: 620.9 ± 113.6 ms, week 4: 591.0 ± 75.9 ms, and week 8: 575.7 ± 90.6 ms) compared to an increase between week 4 (579.8 ± 92.2 ms) and week 8 (580.8 ± 82.7 ms) in the PLA group. PRO significantly ($p < .001$) decreased BAI neurophysiology score at baseline (5.3 ± 4.2), week 4 (3.5 ± 3.3), and week 8 (2.7 ± 3.2). A significant effect of time was observed for POMS score in both groups, reflecting improved mood from weeks 4 (PRO: 41.5 ± 21.0 ; PLA: 37.0 ± 18.1) to 8 (PRO: 35.2 ± 20.0 ; PLA: 30.0 ± 18.8). **CONCLUSION:** Eight weeks of probiotic supplementation improved cognitive function and select mood-related symptoms in clinically healthy but symptomatic college-aged adults. This is a novel study supporting probiotic supplementation as a strategy for improving psychological well-being and cognitive function in adults experiencing mood-related symptoms who may not seek formal treatment. Supported by Grove City College Swezey Fund. The authors declare no conflicts of interest.



Seven Days of Berberine, Blackcurrant, and Curcumin Supplementation Reduces Oxygen Consumption and Skin Temperature During Exercise-Heat Stress

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We have previously shown that each of berberine, blackcurrant, and curcumin can provide select cardiometabolic and thermoregulatory benefits during exercise-heat stress. In the present study, the combination of these supplements was examined to determine if the whole might be greater than the sum of its parts. **PURPOSE:** This study examined the effect of 7d of combination dietary supplementation (1.5g berberine/0.6g blackcurrant/0.5g curcumin) on systems-level physiological responses to exercise-heat stress. **METHODS:** Eight participants (Stature: 1.78 ± 0.07 m, Mass: 78.5 ± 12.2 kg, $\dot{V}O_{2max}$: 54 ± 6 mL·kg⁻¹·min⁻¹) ingested Supplement or Placebo twice daily for 7d prior to 1hr treadmill run (65% $\dot{V}O_{2max}$) in hot ambient conditions (35°C/25%RH). Condition order was counterbalanced. Conditions were separated by a 2-wk washout period. Oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$), minute ventilation ($\dot{V}E$), respiratory rate (RR), tidal volume (V_t), heart rate (HR), core temperature (T_c), and mean skin temperature (T_{sk} : tricep, chest, thigh, calf) were measured throughout exercise. Two-way RM ANOVAs were used to evaluate changes between groups. Significant main and interaction effects were further evaluated with Sidaks multiple comparison tests. Data (mean $\pm$ SD) are reported as delta values. **RESULTS:** There was no difference in the ambient environment between study conditions (Placebo: 35.8 ± 0.6 °C & $31 \pm 3\%$ RH; Supplement: 35.9 ± 0.5 °C & $30 \pm 3\%$ RH; $p = 0.947$). Although the rise in T_c during exercise was not different between study conditions (Supplement: 1.86 ± 0.63 °C vs Placebo: 1.99 ± 0.63 °C; $p = 0.445$), $\dot{V}O_2$ was reduced ($p = 0.0377$) in Supplement (2.35 ± 0.77 L/min) as compared to Placebo (2.41 ± 0.80 L/min) and T_{sk} was also reduced ($p = 0.0006$) from 40 - 60 min of exercise (Supplement: 35.12 ± 0.61 °C vs. Placebo: 35.36 ± 0.70 °C). **CONCLUSION:** Seven days of combined berberine, blackcurrant, and curcumin supplementation reduced $\dot{V}O_2$ and T_{sk} during prolonged exercise-heat stress, despite similar increases in T_c . These responses suggest enhanced exercise economy and reduced peripheral thermal strain. Combination supplementation may therefore represent a practical strategy to attenuate physiological strain during exercise-heat stress, though confirmation in larger cohorts is warranted.



Vascular Stiffness, Cerebral Hemodynamic Pulsatility, and EEG Alpha Reactivity in Young Adults

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Carotid artery stiffness increases with age and can contribute to greater cerebral pulsatility. In middle-aged and older adults, cerebral pulsatility causes microvascular damage that could potentially disrupt synchronized neural activity in the brain. Whether carotid stiffness and related cerebrovascular pulsatility influence neural activity in young adults is unknown. **PURPOSE:** To examine the association of neural activity measured as alpha reactivity from electroencephalography (EEG) with carotid stiffness and cerebral hemodynamic pulsatility in young adults. **METHODS:** Data from 90 participants (age, 22 ± 4 yrs; BMI, 22.6 ± 3.7 kg/m²; 79% female) were analyzed. Relative alpha power (8-13 Hz), computed as absolute alpha power divided by total absolute band power, was measured during eyes-closed (EC) and eyes-open (EO) rest using a 20-channel dry EEG. Alpha reactivity was calculated as (EC-EO)/EC. Carotid Doppler ultrasound was used to measure beta-stiffness, intima-media thickness (IMT), pulse pressure (PP) from distension waveforms, and pulsatility index (PI), while transcranial Doppler measured middle cerebral artery PI. Differences in EC and EO alpha power were assessed with a paired-samples t-test. Pearson correlation coefficients were used to test for associations between alpha power reactivity and vascular-hemodynamic measures. **RESULTS:** Relative alpha power decreased from EC (0.27 ± 0.13 aU) to EO (0.15 ± 0.06 aU), confirming alpha reactivity in our cohort of young adults ($t(89) = 13.08$, $p < .001$). Alpha reactivity was not associated with carotid beta stiffness ($r = 0.036$, $p = 0.735$), carotid IMT ($r = -0.052$, $p = 0.627$), carotid PP ($r = 0.012$, $p = 0.909$), carotid PI ($r = 0.035$, $p = 0.740$), or MCA PI ($r = 0.127$, $p = 0.231$). **CONCLUSION:** Carotid stiffness and cerebral hemodynamic pulsatility were not associated with alpha reactivity, a measure of neural function, in young adults. These findings suggest that the effects of arterial stiffening and hemodynamic pulsatility on neural activity may not emerge in early adulthood and may vary across the lifespan.

The authors declare no conflicts of interest.



Effect of Sodium Density and Sex on Blood Pressure Variability in Normotensive Adults

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High sodium diets are known to increase blood pressure (BP). Sodium guidelines recommend a single intake level regardless of energy intake. More recent data suggests the relation between sodium and BP may vary by energy intake. Similarly, while elevated BP is a cardiovascular (CV) risk factor, it has been shown that BP variability (BPV) may provide additional insight into CV risk and may differ between women and men. **PURPOSE:** This study examined whether the relation between sodium density and BPV differs between normotensive men and women. **METHODS:** Fifty-five individuals (33W/22M; age: 30±9 years; SBP: 113±13 mmHg; DBP: 70±9 mmHg; BMI: 23.8±2.9 kg/m²) underwent ambulatory BP monitoring for 24 hours. BPV was assessed using average real variability (ARV), calculated as the mean of the absolute differences between consecutive BP measurements. During the same 24-hour period, participants collected their urine. Additionally, participants completed 3-day diet records, which were used to calculate sodium density, and provided a blood sample. Data were analyzed using unpaired t-tests to compare men and women, and sex-stratified Pearson correlations were used to examine relations between sodium density and BP and BPV. **RESULTS:** Absolute sodium intake was higher in men (3609±1167 mg) than women (2950±874 mg, p=0.03); however, once normalized to energy intake, sodium density did not differ between groups (p=0.54). Twenty-four-hour urinary sodium excretion was also greater in men (p<0.05). Twenty-four-hour, daytime, and nighttime systolic BP (SBP) were lower in women (all p<0.05); however, diastolic BP (DBP) did not differ (all p>0.05). Twenty-four-hour, daytime, and nighttime SBP and DBP ARV did not differ between women and men (all p>0.05). Furthermore, no significant relations were observed between sodium density and SBP or DBP ARV in men (all p>0.05). However, sodium density was inversely related to both SBP and DBP ARV during the 24-hour and daytime periods in women (all p<0.05).

CONCLUSION: While no differences between men and women were found in measures of BPV, an inverse relation between sodium density and BPV was observed in women, suggesting a potential sex-specific relation between dietary sodium density and BPV.

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Acute Responses to a Resistance Exercise Challenge Test in Individuals with FSHD

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Facioscapulohumeral muscular dystrophy (FSHD) is a neuromuscular disorder characterized by progressive muscle weakness affecting multiple muscle groups. Whether muscle thickness (MT) and muscle quality (MQ) vary along the length of affected muscles remains unclear. Additionally, no studies have examined the acute effects of resistance exercise on muscle function and vascular parameters in this population.

PURPOSE: 1) assess MT and MQ (via echo intensity) across the length of affected muscles; 2) evaluate acute responses to an exercise-challenge test in individuals with FSHD vs. controls (CON). **METHODS:** FSHD (n=11) and age-, sex-, and physical activity-matched CON (n=6) completed tests for physical function, including the Timed Up and Go (TUG), grip strength, stair climb, and upper- and lower-limb maximal voluntary contraction tests. Participants then performed three sets of 10 repetition maximum exercises targeting the biceps brachii and quadriceps muscles. Upper- and lower-limb strength, vascular assessments (SphygmoCor) and blood samples were collected pre- vs. post-exercise. Ultrasound measurements were obtained along the length of the biceps brachii (BB), vastus lateralis (VL), rectus femoris (RF), and vastus intermedius (VI). **RESULTS:** Time to ascend 5 steps was different between groups (CON: 1.9±0.2sec; FSHD: 3.1±1.2sec – p<0.05), while other functional outcomes were similar. In FSHD, MT was greater (p<0.05) at 30% vs. 70% of muscle length for VL (2.7±0.2cm vs. 1.7±0.2cm), RF (1.6±0.2cm vs. 1.1±0.2cm), and VI (1.6±0.2cm vs. 1.2±0.2cm), while MQ was greater at 30% vs. 70% for VL and RF (p<0.05). Elbow flexion decreased (p<0.05) following exercise in both groups by (CON: 17%; FSHD: 13%), whereas knee extension torque declined only in the FSHD group (p<0.05). **CONCLUSION:** This is the first study examining acute responses to a resistance exercise challenge and to assess MT and MQ along the length of affected muscles using ultrasound in individuals with FSHD. Preliminary findings indicate substantial heterogeneity in skeletal muscles and acute impairments in muscle function following exercise in FSHD. Future analyses will evaluate blood-based biomarker responses to the exercise challenge.

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Performing Electrical Stimulations Eccentrically Does Not Further Enhance the Protective Effect Against Voluntary Eccentric Exercise

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One session of novel eccentric exercise confers a protective effect against muscle damage following future bouts of eccentric exercise. It is unknown whether performing eccentric contractions involuntarily via electrical stimulations (E-STIM) results in a protective effect against muscle damage following a future bout of voluntary eccentric exercise. **PURPOSE:** To determine if a prior bout of eccentric or concentric E-STIM confers a greater protective effect against indirect markers of muscle damage following a future bout of voluntary eccentric exercise. **METHODS:** Individuals completed an initial bout of E-STIM involving three sets of 20 repetitions at the maximal tolerable intensity. Individuals held onto a lever arm that moved through 90° of elbow flexion and were asked to hold the lever arm but not generate any torque. In a counterbalanced fashion, one arm had E-STIM applied during the concentric phase, and the other during the eccentric phase. Two weeks later, individuals completed one set of eccentric elbow flexion exercises to volitional failure designed to induce muscle damage. Before and 48h after the voluntary exercise bout, indirect markers of muscle damage were measured. **RESULTS:** A total of 21 individuals completed the study. While there were main effects of time ($p < 0.05$), there were no interactions for isometric strength ($p = 0.374$), isokinetic strength ($p = 0.632$), pain sensitivity ($p = 0.520$), muscle thickness ($p = 0.215$), or discomfort (0.182), indicating that markers of muscle damage from the voluntary exercise protocol did not differ based on whether the arm was previously preconditioned with either eccentric or concentric E-STIM. When compared to a historical control group, the magnitude of discomfort was reduced when individuals were preconditioned with either concentric [-2.3 (95% CI: -4.0, -0.5); $p = 0.010$] or eccentric [-2.9 (95% CI: -4.5, -1.4); $p < 0.001$] E-STIM. **CONCLUSION:** This is the first study to demonstrate that, despite greater initial muscle damage, eccentric E-STIM did not confer any greater protective effect against muscle damage resulting from a future bout of voluntary eccentric exercise when compared to concentric E-STIM. Eccentric E-STIM may be working through a different mechanism and/or stressing different muscle fibers than that of voluntary eccentric exercise. The authors have nothing to disclose. The authors declare no conflicts of interest.



The Effect of Post-Exercise Static Stretching on Range of Motion and Delayed Onset Muscle Soreness

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Many athletes are unaware of the importance of flexibility training and its ability to assist in muscle recovery and improved extensibility. **PURPOSE:** The purpose of this experiment was to measure the effect of post-exercise static stretching (SS) on delayed onset muscle soreness (DOMS) and range of motion (ROM). **METHODS:** A total of ten participants (20 ± 2 yrs, 78.5 ± 23.5 kg, 1.71 ± 0.17 m) were gathered for this study. Participants consisted of healthy males and females with both athletic and non-athletic backgrounds. Following a supervised laboratory visit during which proper stretching techniques were demonstrated, and baseline measurements were collected, participants completed an unsupervised, full-body flexibility training intervention for 4 weeks. Baseline upper-body range of motion (ROM) was assessed using bilateral elbow extension, while lower-body ROM was assessed using the sit-and-reach test. Muscle soreness was assessed weekly using an electronic visual analog scale (VAS).

RESULTS: Results revealed no significant differences in lower-body ROM ($p = 0.74$) or right-arm ROM ($p = 0.12$). However, a significant difference was observed in the left-arm ROM ($p = 0.02$). No significant change in delayed-onset muscle soreness (DOMS) was observed ($p = 0.30$). **CONCLUSION:** This study demonstrated no significant effect of post-exercise static stretching on dominant-arm ROM or DOMS. However, a significant increase in non-dominant-arm ROM was observed. This experiment was unconventional due to the variety of participants' backgrounds, including both male and female and both athlete and non-athlete. Future research should incorporate a supervised stretching intervention, control participants' physical activity status, and examine whether athletic status influences the response to stretching



Hormonal Changes and Associations with Neuromuscular Performance Following Marine Corps Officer Candidates School

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Marine Corps Officer Candidates School (OCS) is a military training program that exposes individuals to physically and mentally challenging environments. Stress disrupts homeostasis, triggering activation of the hypothalamic-pituitary-adrenal axis with suppression of the hypothalamic-pituitary-gonadal axis; trends associated with arduous military training. **PURPOSE:** This study examined whether pre-to-post changes in serum DHEA, salivary cortisol (C), and salivary testosterone (T) were associated with changes in neuromuscular performance after 10 weeks of OCS. **METHODS:** Male (n=47) and female (n=26) OCS candidates completed countermovement jumps to assess jump height (JH) and average relative propulsive power (RPP), and isometric mid-thigh pulls to assess average relative peak force (RPF) and rate of force development (RFD). Change scores (Δ) were calculated as post minus pre. Standard venipuncture and oral swab techniques were used to collect physiological stress markers (DHEA, C, T). Paired sample T-test examined changes in neuromuscular performance and endocrine responses, and Pearson and Spearman correlations examined associations between endocrine and performance change scores stratified by sex ($\alpha=0.05$). **RESULTS:** In men, JH (0.422 ± 0.070 vs 0.372 ± 0.057 m), RPP (27.29 ± 4.65 vs 24.55 ± 3.72 w/kg), and RPF (36.45 ± 3.99 vs 35.30 ± 5.08 N/kg) decreased following OCS ($p<0.05$). Similar declines were observed in females: JH (0.303 ± 0.421 vs 0.275 ± 0.036 m), RPP (22.25 ± 3.01 vs 19.97 ± 2.86 N/kg), and RPF (30.14 ± 3.81 vs 29.40 ± 4.89 N/kg) ($p<0.05$); DHEA decreased in men (3.74 vs 2.9 ng/mL) and female (4.33 vs 3.10 ng/mL) ($p<0.05$); C decreased only in men (0.80 vs 0.68 , $\mu\text{g/dL}$) ($p=0.044$); T was unchanged in men (135.86 vs 138.66 , pg/mL) and females (62.71 vs 59.90 , pg/mL) ($p>0.05$). No endocrine-performance associations were significant in men ($p>0.05$), whereas in female ΔC was inversely associated with ΔJH ($r=-0.457$, $p=0.028$), while ΔDHEA was positively associated with ΔRPF ($r=0.434$, $p=0.049$). **CONCLUSION:** These findings suggest that, in men, neuromuscular changes during OCS may not be explained by changes in concentrations of androgen and adrenal hormones and highlights the importance of considering sex specific mechanisms when monitoring training load, recovery, and readiness in military populations. Funded by ONR Grant N-00014-22-1-2769



Association Between Objectively Measured Physical Activity and Pain-Related Functional Limitation Among Older Adults With Pain

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Pain can affect physical activity in older adults, but the association between physical activity and pain-related functional limitation among those with bothersome pain remains unclear. **PURPOSE:** This study examined whether objectively measured physical activity would be associated with pain-related functional limitation among community-dwelling older adults with bothersome pain. **METHODS:** We conducted a cross-sectional analysis of data from the 2023 National Health and Aging Trends Study (NHATS) Round 13. Among 8,597 participants, 305 community-dwelling older adults with bothersome pain had accelerometry data. Physical activity was assessed using active minutes and log total activity counts. Self-reported walking was examined as a comparison measure. Survey-weighted logistic regression accounted for the NHATS sampling design and adjusted for age, sex, arthritis, and depression. Exploratory random forest models tested whether adding physical activity improved prediction beyond these covariates. **RESULTS:** Participants without pain-related functional limitation accumulated about 48 more active minutes/day than those with limitation (355.9 vs 307.9 minutes/day). Each additional 30 active minutes/day was associated with lower odds of limitation (OR = 0.918; 95% CI, 0.860-0.979; $p = 0.010$). A 1-SD increase in log total activity counts was also associated with lower odds of limitation (OR = 0.633; 95% CI, 0.474-0.845; $p = 0.003$). Self-reported walking was not associated with limitation. In exploratory machine-learning analyses, adding log total activity counts provided the greatest improvement beyond core covariates, increasing AUC from 0.615 to 0.671 and reducing Brier score from 0.242 to 0.229. **CONCLUSION:** Objectively measured physical activity was associated with pain-related functional limitation among older adults with bothersome pain across two complementary accelerometer-derived measures, whereas the association was not detected using the binary self-reported walking measure. The novelty of this study is the demonstration of this association using objective free-living activity measures specifically among older adults already experiencing bothersome pain. The authors declare no conflicts of interest.



Evaluation of Velocity-Based Training in Powerlifters: Usage and Barriers

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Velocity-based training (VBT) is a method of power training where barbell speed is measured during lifts like the squat, bench press, deadlift, or clean. Measurement is provided by linear position transducers, video or phone apps, accelerometers, or inertial measurement units. Data may inform training decisions and identify long-term performance trends. Previous research informs use in strength and conditioning team coaching; however, VBT usage in individual competitive powerlifters remains unknown. This gap is relevant as new VBT devices have entered the commercial market with claims of lower cost, increased access, and increased ease of use. **PURPOSE:** This study examined attitudes regarding VBT, training history, and demographics in competitive powerlifters, comparing users and non-users of VBT technology.

METHODS: An anonymous online survey assessed demographics, training and competition history, VBT usage, and level of agreement with statements related to VBT technology. Mann-Whitney U tests compared users and non-users of VBT technology across outcomes with alpha set at 0.05. **RESULTS:** Data from 52 respondents (28.2 ± 9.4 years, 15% female/gender-neutral) were analyzed. Individuals who use VBT technology ($n=10$, 35.6 ± 9.5 years) were significantly older ($p=0.004$, effect size=-1.048) than individuals who do not use VBT technology ($n=42$, 26.4 ± 8.6 years). Differences in beliefs regarding VBT usage identified were inadequate knowledge ($p<0.001$, effect size=-0.729), set-up and logistics challenges ($p=0.039$, effect size -0.398), lack of desire ($p<0.001$, effect size=-0.757), and high costs relative to possible benefits ($p=0.002$, effect size=-0.605). **CONCLUSION:** VBT users were significantly older than non-users. Main differences in beliefs were lack of knowledge, low desire to use VBT, high perceived cost, and setup requirements, informing potential barriers to VBT use. These findings are novel as individual competitive powerlifters have not been previously evaluated regarding VBT usage patterns and beliefs.

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Early Feasibility of Multimodal Ambulatory Monitoring in Mother-Child Dyads

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PURPOSE: To evaluate early feasibility and adherence during intensive, synchronized assessment of physical activity, sleep, digital behavior, affect, and cognition in mother-child dyads. **METHODS:** This ongoing prospective micro-longitudinal study is enrolling 30 mothers and their children aged 11-14 years. Each dyad completes baseline measures followed by four weeks of continuous wrist-worn activity and sleep monitoring, passive smartphone sensing, ecological momentary assessment (EMA), and brief mobile cognitive assessment. Feasibility indicators include recruitment, retention, EMA completion, device wear, synchronized data completeness, technical problems, and participant-reported burden. Adherence is evaluated separately for mothers and children to identify generation-specific protocol demands. **RESULTS:** Seven dyads have enrolled to date. Mean maternal and child ages are 44.0 ± 3.12 and 13.4 ± 1.18 years, respectively. Preliminary EMA completion is 98.34% among mothers and 87.21% among children, exceeding the prespecified 65% adherence benchmark in both groups. Mean daily wearable use is 19.0 ± 4.88 hours/day among mothers and 17.0 ± 3.01 hours/day among children. Although average device wear exceeds the 16-hours/day criterion for a valid monitoring day in both groups, children demonstrate lower EMA completion and approximately two fewer hours of daily wear than mothers. These differences identify child adherence as an important target for continued monitoring and protocol refinement. **CONCLUSION:** Preliminary findings support the feasibility of collecting intensive, temporally aligned behavioral data from mothers and children over four weeks. High EMA completion and average daily device wear demonstrate sustained engagement with the multimodal protocol, while generation-specific differences highlight opportunities to strengthen child-focused adherence supports. This first empirical evaluation extends the published protocol by providing real-world evidence regarding the implementation of synchronized ambulatory assessment within families. The authors declare no conflicts of interest.



Hormonal IUD Use Does Not Influence Vascular Function in Middle-Aged Women

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Women experience an increase in hypertension (HTN) risk during middle-age due to the combined effects of aging and changing ovarian hormone concentrations leading to decreased vascular function. Middle-aged women use hormonal intrauterine devices (IUDs) to decrease the risk of pregnancy and menopausal symptoms, such as heavy bleeding, although vascular function implications of hormonal IUD use are unknown in this population. **PURPOSE:** The purpose of this study is to determine the effect of hormonal IUD use on vascular function in middle-aged women. **METHODS:** Women aged 35-55 yrs who were current hormonal IUD users or were not hormonal birth control users (controls) were recruited. Blood pressure (BP) was assessed in duplicate using an automated cuff. Macrovascular (large artery) function was assessed using the flow-mediated dilation (FMD) technique measured via ultrasound, with microvascular (small artery) assessed using the post-ischemic reactive hyperemia (RH) area under the curve (AUC) during FMD. Post-ischemic shear rate AUC to peak brachial diameter (SR AUC_{peak}) was also calculated and used to normalize %FMD values. **RESULTS:** N=13 women (n=6 hormonal IUD users, n=7 controls) participated in the study. Age (hormonal IUD: 38 ± 4 yrs vs. controls: 45 ± 7 yrs, $p=0.06$), body mass index (BMI, hormonal IUD: 25.3 ± 2.2 kg/m² vs. controls: 23.5 ± 3.0 kg/m², $p=0.27$), resting systolic BP (SBP, hormonal IUD: 114.7 ± 9.8 mmHg vs controls: 112.1 ± 2.2 mmHg, $p=0.52$) and resting diastolic BP (DBP, hormonal IUD: 73.5 ± 13.2 mmHg vs. controls: 73.3 ± 6.3 mmHg, $p=0.97$) were similar between groups. Additionally, %FMD (hormonal IUD: $6.0 \pm 4.7\%$ vs. controls: $6.8 \pm 3.7\%$, $p=0.72$), SR AUC_{peak} (hormonal IUD: 44255 ± 63748 s⁻¹ vs. controls: 67204 ± 36546 s⁻¹, $p=0.85$) and %FMD normalized to SR AUC_{peak} (hormonal IUD: n=5, $0.08 \pm 0.06\%$ vs. controls: $0.13 \pm 1.0\%$, $p=0.35$) were similar between groups. RH AUC (hormonal IUD: n=5, 407.6 ± 136.5 ml/min vs. controls: 325.8 ± 49.6 ml/min $p=0.17$) was also similar between groups. **CONCLUSION:** Macrovascular and microvascular function are similar between middle-aged hormonal IUD users as compared to non-hormonal birth control users, suggesting hormonal IUD use does not impact vascular function in this population.

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The authors declare no conflicts of interest.



Exploring Menstrual Cycle Dynamics: The Strategic Hormonal Evaluation and Instrument-Reliability Study

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Hormonal fluctuations across the menstrual cycle can influence women's physiology, including resting energy expenditure (REE), substrate utilization, and body composition. However, findings across menstrual phases remain inconsistent, and longitudinal studies examining these physiological changes across multiple consecutive menstrual cycles are limited. **PURPOSE:** The Strategic Hormonal Evaluation and Instrument-Reliability Study (SHE IS) examined changes in REE, respiratory quotient (RQ), and total body water across menstrual cycle phases in relation to hormonal blood markers, including follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone. **METHODS:** Eleven women (27.4 ± 7.0 yrs; 3 Black, 3 Asian, 5 White) with regular menstrual cycles were enrolled, with most completing at least two monitored cycles. Participants used femtech devices to track menstrual phases and completed weekly, phase-based laboratory visits. REE, RQ, total body water, and hormonal blood markers were assessed across menses, follicular, ovulatory, and luteal phases. A one-way repeated-measures ANOVA, accommodating missing values due to incomplete testing, was conducted to compare outcomes across menstrual phases, with menses as the reference phase ($\alpha=0.05$). **RESULTS:** Analysis revealed a trend toward significance for total body water ($p=0.065$) and REE ($p=0.052$). Total fat mass did not reach significance ($p=0.191$). A significant effect was observed for RQ across phases ($p=0.041$); however, no post hoc comparisons reached significance, with the luteal phase showing the greatest variation. Progesterone (ng/mL) remained low during menses (0.4349 ± 0.2623) and the follicular phase (0.5206 ± 0.3959), then rose post-ovulation (1.78 ± 1.18), and peaked during the luteal phase (17.75 ± 4.306).

CONCLUSION: These findings suggest menstrual-phase changes in metabolism and body composition and highlight the value of longitudinal monitoring across multiple cycles. The integration of femtech devices with laboratory measures may improve menstrual health research and provide a foundation for future menstrual health studies. Supported by the Ohio State College of Education and Human Ecology DHS Seed Grant Program, with an exclusive gift for research from the Kathleen R. Kelly Health and Wellbeing Fund. The authors declare no conflicts of interest.



Effects of Acute Multimodal Active Recovery on Blood Lactate Clearance Following Anaerobic Activity

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Recovery following high-intensity exercise is critical for restoring physiological function and optimizing performance. A key component of recovery is the removal of blood lactate (BLa), which accumulates during anaerobic metabolism and contributes to fatigue. **PURPOSE:** To compare the effects of multimodal (MM) and monomodal (MO) active recovery on post-Wingate anaerobic test (WAnT) BLa clearance. **METHODS:** Seventeen, college-aged participants (13 male, BMI=27.0±4.2 kg·m⁻² and 4 female, BMI=21.9±2.5 kg·m⁻²) were recruited for the study. Prior to the first exercise session, subject characteristics were obtained. Each subject completed a WAnT followed by 12 minutes of the MO cycling recovery condition. BLa, perceived readiness, and heart rate (HR) were collected at specific intervals. After one week, subjects returned for post-testing where the WAnT protocol remained identical, but subjects completed the MM recovery condition, combining cycling for 6 minutes and treadmill walking for 6 minutes. **RESULTS:** BLa significantly decreased during recovery ($p<0.001$). BLa at 2 minutes post WAnT (MM: 11.46±2.64 mmol·L⁻¹ vs MO: 11.45±2.36 mmol·L⁻¹) was nearly identical for both conditions ($p=0.0485$). BLa at minute 12 (MM: 6.30±1.80 mmol·L⁻¹ vs MO: 7.43±1.78 mmol·L⁻¹) of recovery was more substantially reduced in the MM condition ($p=0.010$). Greater BLa percent reductions were observed during MM from 2 minutes post-WAnT to 12 min post (MM: 45.0% vs. MO: 35.1%), with 6–9 min (MM: 16.9% vs MO: 10.2%), 9–12 min (MM: 20.4% vs MO: 13.1%), and 6–12 min (MM: 33.8% vs MO: 21.9%) windows all being significantly reduced ($p<0.001$) vs. MO. No significant differences were observed in perceived readiness ($p=0.302$). HR showed a significantly greater decrease from 6–12 min in MM compared to MO ($p=0.009$). **CONCLUSION:** MM active recovery, consisting of cycling followed by treadmill walking, was more effective than MO cycling at promoting BLa clearance following high intensity exercise. Incorporating multiple modalities during recovery may be a practical strategy for athletes to enhance recovery and subsequent performance. Different combinations and sequences of recovery modalities should be further explored. Investigating additional performance outcomes and muscle-specific lactate measures may provide further insight.



Proteomic Changes in Myokine Levels to Acute Exercise Following a 24-week Multimodal Exercise Intervention Featuring High-Frequency Ballistic Training

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The primary mechanism of skeletal adaptation is through mechanical stimulation of resident bone cells; however, biological pathways supporting bone turnover may be influenced through uptake of muscle-derived signaling factors, called myokines. **PURPOSE** This study investigated how six months of structured chronic exercise training alters the circulating concentration of key myokines at rest and following acute exercise. **METHODS** Fasted blood samples (n=63, [32 females], mean age 28 years) were collected at rest and immediately following an acute ballistic exercise test (AET; 10x10 weighted jumps on a PlyoPress), at the beginning and end of a 24-week high-frequency, ballistic exercise combined with resistance and aerobic exercise training intervention. Two Olink Target 96 proteomics panels (Inflammation and CV III) were used to identify potential plasma biomarkers of acute and chronic exercise training. A two-way ANOVA (AET x chronic) was utilized to analyze the effects of acute exercise before and after a chronic training program on selected key myokines. **RESULTS** No significant interaction effects were observed. Main effects of the exercise intervention were observed for FGF-21 (pre v. post: 0.02493 ± 1.402 , $(-)-0.3155 \pm 1.348$; $P=0.0152$), MCP-1 (0.0314 ± 0.0300 , $(-)-0.04788 \pm 0.03048$; $P=0.0278$), CX3CL1 (0.03874 ± 0.3383 , $(-)-0.03979 \pm 0.2996$; $P=0.0121$), and IL6 (0.2842 ± 0.8833 , $(-)-0.04506 \pm 0.8390$; $P=0.0015$) such that FGF-21, MCP-1, CX3CL1, and IL6 all had a decrease in concentration following the exercise intervention. Main effects of the AET were observed for FGF-21 (pre v. post AET: 0.03219 ± 0.1274 , $(-)-0.3228 \pm 0.1157$; $P<0.0001$), MCP-1 (0.06048 ± 0.3280 , $(-)-0.07719 \pm 0.3453$; $P<0.0001$), and CX3CL1 ($(-)-0.07425 \pm 0.3155$, 0.07409 ± 0.3110 ; $P<0.0001$) demonstrating a decrease in concentration for FGF-21 and MCP-1 and an increase in concentration for CX3CL1 after the AET. VEGFA and LIF did not show significant main effects from the exercise intervention or from the AET. **CONCLUSION** Reductions in the myokines FGF-21 and MCP-1 following the AET and intervention suggest an adaptive reduction in systemic and localized inflammatory stress following acute and chronic exercise. This dampened inflammatory response may also create a more favorable cellular environment to support skeletal adaptation. Supported by DOD Grant W81XWH2110542. The authors declare no conflicts of interest.



Sex Differences in Lower-Limb Blood Flow Following Fixed-Workload Cycling

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Sex differences have been observed in vascular responses to physiological stimuli, with premenopausal women often demonstrating greater responses than men. However, the interpretation of sex differences following exercise may depend on how the exercise stimulus is prescribed, as matching exercise by relative intensity can result in differences in absolute work performed between men and women. Whether sex differences in post-exercise vascular responses are evident when external workload is held constant remains unclear. **PURPOSE:** To examine common and superficial femoral artery leg blood flow (LBF) following fixed-workload cycling and determine whether post-exercise responses differ between men and women. **METHODS:** Left superficial femoral artery (SFA) and common femoral artery (CFA) diameter and blood velocity were measured by Doppler ultrasound in 8 men (26 ± 6 years, body mass index [BMI] = 24.0 ± 4.4 kg/m²) and 8 women (23 ± 3 years, BMI = 21.1 ± 1.6 kg/m²) before and 5 and 25 minutes after 30 minutes of cycling at 100 W or seated rest, completed in randomized order. Vessel diameter and mean blood velocity were used to calculate CFA and SFA LBF. Mixed-design repeated-measures ANOVAs were used to examine sex differences in the LBF response to exercise. **RESULTS:** Across the control (men = 318.4 ± 216.0 , 254.0 ± 152.4 , and 197.8 ± 175.0 mL/min; women = 322.2 ± 144.8 , 194.7 ± 88.7 , and 292.9 ± 214.6 mL/min) and exercise (men = 298.8 ± 153.0 , 392.2 ± 150.2 , and 291.0 ± 152.3 mL/min; women = 338.8 ± 198.9 , 597.6 ± 274.2 , and 453.6 ± 261.7 mL/min) conditions, there was a sex $\times$ condition $\times$ time interaction for CFA LBF ($p = 0.03$). Post hoc analyses indicated that the exercise-specific pre-to-5-minute change in CFA LBF was greater in women than in men (386.3 vs. 157.8 mL/min, $p = 0.02$). No sex $\times$ condition $\times$ time interaction was observed for SFA LBF ($p = 0.09$). **CONCLUSION:** The CFA LBF response differed between men and women, with women demonstrating a greater increase five minutes after exercise relative to the control condition. In contrast, no sex difference in the exercise-specific SFA LBF response was detected. Sex differences in CFA blood flow despite the same absolute workload suggest that external exercise dose alone may not explain variation between men and women in the regional lower-limb vascular response to exercise.



Pre- and Per-Palm Cooling Effects on Lower Body Muscular Endurance in College-Aged Females

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PURPOSE: This study examined the effects of combined pre- and per-set palm cooling on performance, perceptual, and physiological responses during lower-body muscular endurance exercise in resistance-trained college-aged females. **METHODS:** Fourteen resistance-trained females (18–25 years) completed three randomized crossover conditions: palm cooling (PC; 10–15°C), sham cooling (SC; 16–21°C), and no cooling (NC). Participants performed five sets of barbell back squats to volitional failure at 60% one-repetition maximum (1RM) with three-minute rest intervals. Cooling interventions were applied during seated rest before exercise and during each inter-set recovery period. Performance, perceptual, and physiological responses were measured throughout exercise. **RESULTS:** Total repetitions did not differ significantly between conditions ($p = 0.507$), although PC and SC showed small non-significant increases (6–7%) compared with NC. No significant condition effects or condition by set interactions were observed for velocity (PC = 0.47 ± 0.02 , SC = 0.45 ± 0.03 , NC = 0.45 ± 0.03), power output (PC = 218.00 ± 10.60 , SC = 209.40 ± 15.19 , NC = 211.00 ± 15.02), peak force (PC = 565.80 ± 8.50 , SC = 564.60 ± 10.64 , NC = 564.40 ± 11.19), thermal responses (PC = 1.00 ± 0.21 , SC = 0.63 ± 0.19 , NC = 0.71 ± 0.16), Ratings of perceived exertion (RPE) (PC = 8.33 ± 0.45 , SC = 8.37 ± 0.64 , NC = 8.57 ± 0.68), or Feeling Scale (FS) (PC = -1.1 ± 0.70 , SC = -1.24 ± 0.82 , NC = -1.20 ± 0.83) ($p > 0.05$). Significant main effects of set indicated progressive fatigue across the protocol ($p \leq 0.05$). Perceived recovery (PRS scale) demonstrated a significant condition $\times$ set interaction ($p = 0.041$), with lower PRS in NC (3.57 ± 1.79) versus SC (4.36 ± 1.86) during set 3 and a significant decline from set 1 (5.00 ± 2.08) to set 3 (3.57 ± 1.79) within NC only ($p = 0.001$). **CONCLUSION:** Combined pre- and per-set palm cooling at 10–15°C did not meaningfully improve lower-body muscular endurance performance or physiological and perceptual responses in resistance-trained females. Similar responses between PC and SC suggest that expectancy or perceptual factors may partially explain the modest effects observed. The authors declare no conflicts of interest.



Effect of Acute Aerobic versus Resistance Exercise on Subendocardial Viability Ratio

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Exercise has beneficial effects on the heart and reduces the risk of cardiovascular disease, yet different forms of acute exercise may impose different stress on the heart. Subendocardial Viability Ratio (SEVR) is a measure of cardiovascular strain and estimates the ratio of myocardial oxygen demand to coronary perfusion supply. **PURPOSE:** To compare the acute effect of aerobic exercise (AE) and resistance exercise (RE) on SEVR. **METHODS:** Twenty-nine participants (n=15 female, Age:26±5 years, BMI:24±4kg/m²) completed an acute AE bout followed by an acute RE bout on two separate days. AE consisted of moderate-intensity cycling exercise (65-75% of heart rate reserve) for 30 minutes. RE consisted of 5 sets of 5 repetitions of barbell bench press and 5 sets of 10 repetitions of biceps curl at 100% of participants' 5-repetition maximum and 10-repetition maximum, respectively, determined after the previous AE session. SEVR was calculated as the ratio of Diastolic Pressure Time Index (DPTI) to the Systolic Pressure Time Index (SPTI), estimated from synthesized aortic pressure waveforms measured with a brachial oscillometric cuff. Measures were taken during supine rest and within 5 minutes of the exercise bout (supine recovery). Data were analyzed using a 2-condition (AE vs RE) x 2-time point (pre vs post exercise) repeated measures analysis of variance. **RESULTS:** There was a significant condition-by-time interaction for SEVR (p< 0.001). The reduction in SEVR was greater after AE (162.1±22.6 % to 104.5±16.4 %) compared to RE (149.6±27.4 % to 121.2±22.7 %). There was a significant condition-by-time interaction for DPTI (p= 0.018). DPTI slightly decreased after AE (3098.2±248.2 mmHg.s/min to 2868.7±354.8 mmHg.s/min), with no change after RE (2923.3±268.9 mmHg.s/min to 2899.6±279.0 mmHg.s/min). There was a significant condition-by-time interaction for SPTI (p< 0.001). There was a greater increase in SPTI after AE (1932.3±293.2 mmHg.s/min to 2779.9±318.4 mmHg.s/min) compared to after RE (2005.4±338.1 mmHg.s/min to 2451.7±419.2 mmHg.s/min). **CONCLUSION:** Both acute AE and RE increased cardiac work and reduced coronary perfusion, resulting in a decreased SEVR. Acute RE may impose less cardiac strain than AE because of preservation of coronary perfusion relative to myocardial oxygen demand. The authors declare no conflicts of interest.



Males Exhibit a Prolonged Elevation in Muscle Metabolism Following Maximal Exercise Compared with Females

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Near-infrared spectroscopy (NIRS) can detect differences in muscle metabolism (mVO_2) at rest and in response to exercise. Sex differences in muscle metabolism in response to exercise or throughout the post-exercise recovery period are currently underexplored. **PURPOSE:** Determine whether changes in NIRS-derived metabolic rate of the vastus lateralis (VL) muscle differ between males and females at rest and throughout a 60 min recovery period following maximal exercise. **METHODS:** Twenty-eight healthy volunteers ($N = 12$ females) completed this study in a single visit to the lab. A NIRS device was placed on the VL, and a pneumatic cuff capable of rapid inflation was placed proximal to the device. The cuff was inflated to 300 mmHg 3 x for 30s to assess resting mVO_2 . Participants then performed a maximal work rate test on a cycle ergometer to exhaustion, and mVO_2 was assessed again at 1-, 5-, 15-, 30-, 45-, and 60-min post-exercise. mVO_2 was derived from desaturation slopes ($\% s^{-1}$) calculated from analyses of the differences in oxygenated and deoxygenated hemoglobin (Hbdiff). A repeated measures ANOVA (time*sex) was used to assess sex differences at rest and at the six post-exercise time points. **RESULTS:** Total work was higher in males than in females (102 ± 59 vs. 49 ± 21 kJ, respectively; $p = 0.006$). There was a significant time*sex interaction ($p < 0.001$) as well as main effects of time ($p < 0.001$) and sex ($p = 0.005$). Males and females had similar mVO_2 at rest (0.29 ± 0.06 vs. $0.33 \pm 0.10 \% s^{-1}$, respectively; $p = 0.152$) and immediately post-exercise (2.59 ± 0.47 vs. $2.73 \pm 0.60 \% s^{-1}$, respectively; $p = 0.498$), but males had a significantly higher mVO_2 at all timepoints thereafter ($p = 0.001 - 0.026$). While mVO_2 was still significantly elevated from rest by 60-min post-exercise in males (0.29 ± 0.06 vs. $0.52 \pm 0.16 \% s^{-1}$; $p < 0.001$), in females, mVO_2 was similar to resting levels by 30-min post-exercise (0.33 ± 0.10 vs. $0.47 \pm 0.23 \% s^{-1}$; $p = 0.690$). **CONCLUSION:** Despite no differences in resting or immediate post-exercise muscle metabolic rate, males exhibit a more prolonged elevation in muscle metabolism following maximal exercise compared with females. These findings align with previous work demonstrating faster parasympathetic reactivation in females after exercise.

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Apoptotic but Not Activated Endothelial-derived Extracellular Vesicles Are Associated with the Structural Component of Stiffness

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Endothelial-derived extracellular vesicles (EEVs) are an emerging nontraditional marker of vascular dysfunction, as elevated levels are associated with endothelial dysfunction and cardiovascular disease (CVD). EEVs are small membrane-bound particles released into the circulation in response to endothelial activation and apoptosis, thereby reflecting the physiological state of their parent cells, and potentially contributing to downstream vascular changes. Increased arterial stiffness is an independent contributor to CVD risk, comprising structural (intrinsic to the vessel wall) and load-dependent (arterial pressure) components, and may be impacted by EEVs. **PURPOSE:** To test the hypothesis that EEV subtypes are related to the structural and load-dependent components of arterial stiffness. **METHODS:** Venous blood samples were collected from 36 participants (Young: 6M/6F, 26 ± 3 y/o, Midlife: 6M/6F, 49 ± 7 y/o, and Older: 5M/7F, 65 ± 5 y/o). Participants were non-hypertensive (BP < 140/90 mmHg), non-obese (BMI < 32 kg/m²), and free of chronic disease. Platelet-free plasma was incubated with fluorochrome-labeled antibodies (anti-CD31-APC, anti-CD42b-PE, or anti-CD62e-PE). EEVs were enumerated via nanoscale flow cytometry. CD31⁺/CD42b⁻ and CD62e⁺ events between 200 and 900 nm were considered apoptosis-derived and activation-derived EEVs, respectively. Arterial stiffness was assessed by carotid-femoral pulse wave velocity (PWV). Participant-specific exponential models were standardized to a reference blood pressure (DBP of 80 mmHg) to determine the structural (S-PWV) and load-dependent (LD-PWV) components of PWV. Linear regression analysis was used to assess the ability of EEV subtypes to predict PWV, S-PWV, and LD-PWV. **RESULTS:** Apoptosis-derived EEVs were positively associated with overall PWV ($r^2 = 0.134$, $p = 0.028$) and with S-PWV ($r^2 = 0.125$, $p = 0.034$). Relations between apoptosis-derived EEVs and LD-PWV, or activation-derived EEVs and the components of PWV, were not significant. **CONCLUSION:** These data suggest that apoptosis-derived EEVs may serve as a biomarker of vascular health, specifically arterial stiffness. Further research should examine how EEVs may contribute to arterial stiffness, especially the structural component of stiffness.

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